WOLF POPULATION GOALS FOR WISCONSIN:

OPINIONS OF THE WISCONSIN CHAPTER OF THE WILDLIFE SOCIETY – 2016

TIMBER WOLF ALLIANCE - TECHNICAL REPORT



*Wordcloud constructed from respondents comments

Erik R. Olson

Assistant Professor of Natural Resources Northland College 1411 Ellis Avenue Ashland, WI 54806 P.O. 688 Phone: 715-682-1235 eolson@northland.edu

Adrian P. Wydeven

Chair of the Timber Wolf Alliance Board Timber Wolf Alliance Sigurd Olson Environmental Institute Northland College 1411 Ellis Avenue Ashland, WI 54806 P.O. 688

TIMBER WOLF ALLIANCE



Abstract

In 2014, the Wisconsin Department of Natural Resources (WDNR) started updating the 1999 state wolf management plan. During that process the WDNR developed four potential wolf population management goals for consideration: $350 (\pm 10\%)$, $650 (\pm 10\%)$, 300-650, and minimum of 350, with no maximum. To assess the scientific integrity of the potential goals, the Timber Wolf Alliance conducted an online survey of state wildlife professionals in the Wisconsin Chapter of The Wildlife Society (WCTWS) during fall of 2016 that included quantitative and qualitative assessments. Among Wisconsin wildlife professionals, the 650 goal received the most support and was considered "more reasonable" and "realistic," and relatively "better" than the alternatives. The 350 goal received the least support and was generally considered "unscientific and outdated." The 300-650 goal received moderate support, but was criticized for such a "dangerous[ly]" low minimum value. The 350 minimum goal received some of the most varied responses, which were likely driven by issues of trust in the WDNR and the role of politics in wolf management (e.g., "...leaving too much at the whim of the winds of political change."). No single goal received overwhelming support. In general, however, wildlife professionals were most supportive of the 650 goal, which was the highest numerical goal considered. Respondents generally felt the 650 goal would allow wolves to fulfill their ecological role and was more based on the best available science (relative to the other goals). There was a clear divide regarding the value of non-numerical goals or a goal based on a broad range. If the WDNR wishes to consider a non-numerical goal (e.g., 350 minimum) or a goal based on a broad range (e.g., 300-650), public acceptance might be improved if the WDNR provided assurance

that the population would not be allowed to fall below the predicted maximum sustained yield based on population dynamics. Respondents were also concerned with management flexibility and many respondents indicated that narrow population goal "windows" would be unrealistic given the natural fluctuation of wildlife populations. Based on our survey results, we believe the previous wolf management goal of 350 is clearly in need of revision as it appears to no longer be compatible with our scientific understanding of wolf population demographics or human attitudes and tolerance of wolves in the state. We believe narrow management windows would be unrealistic and limit management flexibility. We believe ensuring a healthy, sustainable, and ecologically functioning wolf population should be fundamental goals of wolf management.

Introduction

In 1999, the Wisconsin Department of Natural Resources (WDNR) set a state management goal of 350 wolves over winter, outside of Indian reservations (WDNR 1999). The goal did not include Indian reservations, because the state does not have management authority over wildlife on tribal lands. At the time, there were less than 200 wolves in Wisconsin, and wolves were listed as an endangered species under the federal Endangered Species Act (Figure 1).

Since 1999, the wolf population grew and efforts to reclassify (as threatened under the Endangered Species Act) and delist wolves were initiated. However, environmental and animal rights groups disagreed with the recovery status and challenged these efforts on both procedural and substantive arguments. Since 2003, wolves' legal status has fluctuated as a result of legal challenges, and in one case it changed three times within one year (Figure 1).

In January of 2012, wolves were removed from the Endangered Species list entirely and management authority was returned to the states and tribes. At that time, the WDNR winter minimum count¹ was 815 wolves in the state (Figure 1) with at least 774 of these wolves occurring primarily outside Indian reservations. Following federal delisting, the Wisconsin legislature immediately established a state-wide wolf hunting and trapping season. The wolf harvest bill was signed into law by Governor Scott Walker in April of 2012, designating wolves as a game species. Harvest seasons occurred in 2012, 2013, and 2014.

In 2014, the WDNR began work on a new wolf management plan for the state. At that time, the WDNR winter minimum count was 660 wolves in the state (Figure 1). The WDNR's Wolf Advisory Committee² provided input on the development of the new plan. After considering a variety of population goal options the WDNR eventually identified four potential population goals for wolves in the state: 1) 350 (\pm 10%), 2) 650 (\pm 10%), 3) a range of 300-650, and 4) a 350 minimum with no maximum.

¹ WDNR counts the wolf population during the winter using aerial telemetry, winter snow track surveys, and observations. The winter count occurs when the wolf population is typically at its lowest point.

² Group membership: Great Lakes Indian Fish and Wildlife Commission, Timber Wolf Alliance, WI Conservation Congress, WI Trappers Assoc., WI Cattleman's Assoc., WI Wildlife Federation, WI Bear Hunters Assoc., Safari Club Int'l, WI Bowhunters Assoc., WI County Forest Assoc., USDA APHIS-Wildlife Services, U.S. Forest Service, DNR Customer Service, DNR West-central District, DNR Northern District, DNR Southern District, DNR Northeast District, DNR Law Enforcement, DNR Science Services, DNR Wildlife Damage Specialist, and DNR Large Carnivore Specialist.

However, in December of 2014, as a result of a successful court challenge, wolves in Wisconsin were relisted as Endangered under the Endangered Species list, once again returning management authority to the federal government. Consequently, the WDNR suspended work on the new management plan. Recent efforts in the U.S. Congress indicate a renewed push for legislative efforts to remove wolves in the Western Great Lakes Region, including Wisconsin, from the Endangered Species Act and wolves in the state may be removed from the Endangered Species Act sometime in the near future. We anticipate that the WDNR would resume its efforts to establish a new wolf management plan following such a congressional action.



Figure 1. Wolf population (winter minimum count) and distribution (km²) for Wisconsin, USA relative to periods with state management authority (gray bars; dark gray indicates period of wolf harvest)

The Timber Wolf Alliance (TWA) of the Sigurd Olson Environmental Institute at Northland College is a science-based wolf education organization and a member of the WDNR Wolf Advisory Committee. The Timber Wolf Alliance's mission is to *use science-based information to promote an ecologically-functional wolf population within areas of suitable habitat, and* promote human coexistence with emphasis on Michigan and Wisconsin (TWA 2017). As a member of the WDNR's Wolf Advisory Committee, it is appropriate to assist in evaluating and comment on state management recommendations. Therefore, TWA conducted an objective evaluation of expert opinion of the four population management goals identified by the WDNR so that it could advise the WDNR, its members and the public about their quality. Thus, TWA asked the question, "What are the opinions of state wildlife professionals on the quality of these four wolf population goals?" To answer this question, TWA developed a questionnaire for state wildlife professionals to get their opinions of the quality of the four wolf population goals. In the fall of 2016, TWA conducted a survey of members of the Wisconsin Chapter of The Wildlife Society on this issue.

The Wisconsin Chapter of the Wildlife Society (WCTWS) was founded in 1972, as a chapter within The Wildlife Society that was founded in 1937. The WCTWS *is a scientific and educational organization of over 200 wildlife professionals, students, and retirees interesting in wildlife conservation in the state* (WCTWS 2017).

Methods

Questionnaire development

The TWA board collaboratively developed and approved the survey instrument. We administered the questionnaire online via Qualtrics (<u>www.qualtrics.com</u>)(Appendix 1). We designed the survey to be confidential and anonymous. We informed potential respondents that they could skip any questions they did not feel comfortable answering or that they may end the survey at any time. We also informed potential respondents that the results would be summarized and distributed publicly. We required that all respondents be 18 years of age or older.

The TWA board generated a set of criteria for assessing each population goal. We asked respondents to rank (using a 5-point scale from *Very good* to *Very poor*) how well each goal met each of the following criteria: a) Based on the best available science, b) Allows wolves to fulfill their ecological role, c) Improves social acceptability of wolves, d) Allows for effective coordination of management with tribes, e) Reduces and prevents wolf-human conflicts, f) Considerate of the feasibility of adequate monitoring required, g) Considerate of the costs associated with management, and h) Ability to harvest wolves sustainably. In case respondents

had other criteria they used for evaluation of these goals we then asked respondents to provide their overall assessment of each goal on a 5-point scale from *Very good* to *Very poor* (Appendix 1). After evaluating each goal, we provided respondents the opportunity to provide open-ended comments regarding a specific goal.

Additionally, we asked respondents to rank each of the four goals in order from their most favorable to their least favorable. We also asked respondents to weight each of the criteria we had identified (a-h) along a 10-point scale from *least favorable* (0) to *most favorable* (10) in order to assess which criteria were the most important for assessing the goals (Appendix 1).

To assess respondent's expertise on the subject we asked individuals to rank their knowledge on a 5-point scale from *Extremely knowledgeable* to *Not knowledgeable at all*, for the following topics: 1) Wildlife population dynamics, 2) Wildlife population management, 3) Wolf biology, 4) Wolf management, and 5) Human attitude research regarding wolves. We also asked respondents some general background information, including: education, employment, selfidentification as a hunter, and years of experience as a wildlife professional (Appendix 1).

We summarized the data using Qualtrics visualization tools and simple summary statistics.

To evaluate wolf population management goals, we used multiple techniques to provide a rank evaluation of the four goals.

First, we calculated the mean (\pm standard error) rank score for each goal using respondent ranking of goals in order from *most favorable* (1) to *least favorable* (4).

Second, we calculated a weighted-rank score, *s*, for each individual respondent, *i*, for each goal using the following equation,

$$s_i = \sum_{j=1}^8 w_{ij} \times r_{ij}$$

where the weight (Q10, as a percent of 100), *w*, for all eight criterion, *j*, is multiplied by the rank (*Very good* = 5, *Good* = 4, *Fair* = 3, *Poor* = 2, and *Very poor* = 1), *r*, for each goal. We then calculated the mean (\pm standard error) weighted-rank score, for each goal overall, which ranged from 8 to 40, with 8 being poor and 40 being good.

Third, we calculated a *good-poor rank* based on the overall assessment scores from respondents for each goal (e.g., Q4, *Your overall assessment*). We calculated the *good-poor rank* by calculating the mean rank (*Very good* = 2, *Good* = 1, *Fair* = 0, *Poor* = -1, and *Very poor* = -2), for a given goal (-2 to 2). Negative values indicate more respondents assessed the goal as poor or very poor and positive values indicate more respondents assessed the goal as good or very good.

We used multiple approaches in order to assess the resilience of the goal ranking across various techniques.

To assess the relative type of support respondents had for goals or how well a goal met a given criterion, we used a 15% threshold for *Very good* and *Very poor*, a 20% threshold for *Good* or *Poor* support, and a 30% threshold for *Fair* support for a given criteria. Thus, if a criterion for a certain goal had 22% of respondents indicating *Good* support criteria, and had 32% of respondents indicating *Fair* support for the criteria – we would consider the goal to have *Good* to *Fair* support for that specific criteria.

Comment analysis

We analyzed the comments provided for each goal by coding each comment as having a negative, positive, or neutral association with the goal. We coded general comments not relevant to the goal as non-applicable. We also examined and coded comments for common themes to identify common patterns.

Participants

To assess the opinions of state wildlife professionals we turned to the Wisconsin Chapter of The Wildlife Society – the leading organization representing wildlife professionals in the state. The WCTWS agreed to email a link to our online questionnaire and an introductory message (Appendix 1) explaining the survey to their membership listserv on September 25, 2016. Our questionnaire was sent through the WCTWS email distribution list to 230 members. We closed the survey period once cumulative responses leveled-off for at least seven days.

Our protocol was reviewed and approved by the Northland College Institutional Review Board.

Results

We had a total of 99 respondents which represents a 43 percent response rate. We collected responses for 25 days.

One individual response appeared to be submitted as a prank. The individual wanted wolves eliminated from the state, reported to have worked in the profession since the age of 12, had extremely poor grammar (e.g., "...we have wolfs in are yard so we are afraid to let ower dogs out at night. There are on deer in ower airea...;"), and appeared to reside in northern Illinois. However, we couldn't be certain they were not a member of the WCTWS so we decided to retain this individual's data for the analysis to avoid any concerns associated with potential manipulation of the dataset. Additionally, one individual indicated they had aborted the survey earlier and had to retake the survey. We were able to identify that individual's aborted survey (which was only partially completed to Q5) and remove it from the dataset.

Demographic characteristics of respondents

Demographic data indicated that our respondents were predominantly mid- to late-career wildlife professionals with many years of experience in the wildlife profession. Respondents were an average of 49 years of age (range=19-77, *n*=72). Respondents represented a cumulative total of 1,574 years of professional wildlife experience (range 0-54 yrs, mean=21.9 yrs). This indicates that we were successful in targeting career wildlife professionals with many years of experience in the field. Most respondents (84%, 62 of 74 as *Definitely yes* or *Probably yes*) self-identified to some degree as a hunter and only 11% (8 of 74 as *Definitely not* or *Probably not*) did not self-identify as a hunter. All 74 respondents that answered the education question indicated to have a minimum education of some college or technical college with 25 respondents (34%) attaining a bachelors degree of science, 41 attaining a master's degree in science (55%), and 3 attaining a PhD (4%; 25 respondents did not answer demographic questions). Respondents had a wide-variety of backgrounds including working for Federal, State, Tribal, or County agencies, College or Universities, or private companies or organizations, with a large percentage of the respondents representing Federal, State, or County agencies.

Wildlife knowledge characteristics of respondents

Respondents in general considered themselves to be very knowledgeable of wildlife management and population dynamics, and moderately knowledgeable of wolf biology, management, and social science (Figure 2).



Figure 2. Respondent's self-proclaimed knowledge of various topic areas relevant to wolf management (n=73)

Ranking of population management goals

The 650 ($\pm 10\%$) goal was ranked the most favorable and the 350 ($\pm 10\%$) goal was ranked the least favorable based on our mean rank score (Figure 3), our weighted-rank score (Figure 4), and our good-poor score (Figure 5). All three indices were consistent in regards to these outcomes reinforcing the validity of the findings. However, the 300-650 goal and the 350 minimum with no maximum goal showed more variable outcomes across the three indices (Figures 3-5), suggesting these two goals scored similarly. Respondents supported our use of the eight criteria as they indicated that all eight had relatively high importance (Figure 6). However, the two criteria with the greatest mean importance were *based on best available science* and *allow wolves to fulfill their ecological roles*. The weighted-rank score (Figure 4), which accounts for these differential weighting of criteria within respondents still indicated a significant difference in preference between the 650 ($\pm 10\%$) goal and the 350 ($\pm 10\%$) goal.

When we examined the percentage of respondents who selected each rank (*Very good* to *Very poor*) for their overall assessment of each goal we see a similar pattern (Figure 7). We see a more positive evaluation for the 650 (\pm 10%) goal overall, a more negative evaluation for the 350 (\pm 10%) goal overall, and a more intermediate evaluation for the remaining two goals. We see a similar pattern when we observe the percentage of respondents who ranked each goal as 1, 2, 3, or 4 respectively (1 being the most favorable, 4 being the least favorable; Figure 8).

Ranking of criteria by goal

When we examined the ranking of criteria for each goal based on the percentage of respondents who selected each rank (*Very good* to *Very poor*) we observed similar patterns to what was observed in the overall ranking of the goals. The 650 (\pm 10%) goal had the highest amount of *Very good* and *Good* responses for almost every criterion relative to the other goals (Figures 8-11), and the 350 (\pm 10%) goal had the highest amount of *Very poor* and *Poor* responses for most criteria relative to the other goals. The other two goals showed highly variable and divergent patterns of support, especially the 350 minimum goal. The 350 minimum goal had a high percentage of respondents indicating *Very Good*, *Good*, or *Poor*.

The 350 (±10%) goal was rated relatively *Poor* to *Very Poor* for most of the criteria, especially for *based on best available science*, *fulfill their ecological role*, *coordination of management with tribes*, and *ability to harvest wolves sustainably* (Figure 8). It received *Good* to *Fair* support for *improves social acceptability of wolves* and *Good* support for *reduces and prevents wolf-human conflict*. It also received *Good* support for *considerate of the costs associated with management* and *feasibility of adequate monitoring required*, however, we suspect respondents may have been confused by these two criteria.

The 650 (\pm 10%) goal overall did the best across all criteria (Figure 9). It received *Good* support for almost all of the criteria, and received *Very good* to *Good* support for *ability to harvest wolves sustainably*. It received *Good* to *Fair* support for *improves social acceptability of wolves* and *reduces and prevents wolf-human conflict*.

The 300-650 goal received mixed support, with support ranging from *Poor* to *Good* (Figure 10). It received *Good* to *Fair* support for *based on the best available science*, *improves social*

acceptability of wolves, reduces and prevents wolf-human conflicts, and considerate of the feasibility of adequate monitoring required. It received Good and Poor support for ability to harvest wolves sustainably, fulfill their ecological role, and costs associated with management.

The 350 minimum goal had the most divergent assessment, receiving *Very good*, *Good*, and also *Poor* support for many of the criteria (Figure 11). It received *Very good* and *Good* ratings for *based on best available science*, *fulfill their ecological role*, and *ability to harvest wolves sustainably*. It received *Good* to *Poor* support for *improves social acceptability of wolves* and *considerate of the costs associated with management*. It received *Good* to *Fair* support for the remaining criteria. This goal clearly had the most mixed support, which is further explored in our analysis of the comments.

Comments and context

The 350 (±10%) goal received a total of 34 comments. Four comments were considered general (i.e., "I feel that no matter what the final plan is it will always be an uphill battle to get a majority of people to accept wolves.") and were not associated with the goal and were removed from analysis of percentages. Most comments regarding this goal were predominantly negative (20 of 30, 67%), with few positive (7 of 30, 23%) or neutral comments (3 of 30, 10%). Negative commenters considered the 350 (±10%) goal to be: "too low" (11 of 30), "Unscientific and outdated" (lacking science, 9 of 30; outdated, 6 of 20), "...too low to sustain a yearly harvest..." (4 of 30), or to threaten the sustainability of the wolf population (4 of 30) and challenge the ability of the state to monitor the population (3 of 30). Individuals characterized the goal as "ridiculous" and a gross misinterpretation of the original goal. Multiple respondents indicated that the original goal "...was based on the perception of human tolerance for wolves before wolves reached this level, without the benefit of any formal human dimensions research," and that "The 350 goal is far below biological and social carrying capacity." Positive comments focused on personal experiences of conflict with wolves and a desire by a few to see wolves eradicated from the state.

The 650 (\pm 10%) goal received a total of 26 comments. Seven comments were considered general and were not associated with the goal and were removed from analysis of percentages. Most comments regarding this goal were predominantly positive (11 of 19, 58%), with few negative (5

of 19, 26%) or neutral comments (3 of 19, 16%). Most respondents considered the 650 (\pm 10%) goal to: be "more reasonable than 350" or "more realistic" (5 of 19), balanced (3 of 19) and more sustainable (3 of 19) – especially relative to the 350 (\pm 10%) goal ("...better number than 350..."). Some critiques of this goal included: "too many" (2 of 19), concerns with the narrow management window (2 of 19, "... range is too tight..."), and a concern regarding the fact that 650 may now be an outdated number because the state wolf population has surpassed this goal (3 of 19). Generally speaking, comments tended to consider the 650 (\pm 10%) goal to be more reasonable than the 350 (\pm 10%) goal, but with some hesitation or concern.

The 300-650 goal received a total of 24 comments. Two comments were considered general and were not associated with the goal and were removed from analysis of percentages. Most comments regarding this goal were predominantly negative (10 of 22, 45%), with few positive (5 of 22, 23%), or neutral comments (4 of 22, 18%). Some respondents considered the 300-650 goal to: be "dangerous" or "risky" (3 of 22) especially in regards to issues associated with sustainability of the population (4 of 22) or that the lower end of the range was "too low" and could result in changes to the legal status for wolves (7 of 22). There were also concerns associated with the influence of politics in setting annual population management goals (5 of 22), with some respondents asking, "Who decides?" (2 of 22). Some were concerned with too wide of a range for management (2 of 22) while others thought the range would provide managers with much needed "flexibility" (4 of 22). A few respondents also thought the range would be socially acceptable (3 of 22).

The 350 minimum goal received a total of 28 comments. Two comments were considered general and were not associated with the goal and were removed from analysis of percentages. Most comments regarding this goal were predominantly mixed, with a few positive (3 of 26, 12%), and a number of negative comments (12 of 26, 46%) or neutral comments (11 of 26, 42%). There were clearly mixed feelings associated with the 350 minimum and no maximum goal. These mixed feelings appeared to be driven by issues associated with trust and the role of politics in wolf management (11 of 26). "There would be a lot of struggles with varied stakeholder groups over what the population should be every year. It would be a source for perpetual turmoil." "…leaving too much at the whim of the winds of political change." "This would be a goal of 350 often, based on political forces in power." At least two respondents asked

"Who would decide?" Many were concerned that the minimum number was too low (5 of 26) or that there was no maximum number (6 of 26). Others criticized the broad, non-numeric range (4 of 26), while others thought it was reasonable (2 of 26) and would provide more flexible management opportunities (3 of 26).



Figure 3. Mean rank score of each wolf population management goal (*n*=64) for Wisconsin, USA (lower score indicates greater favorability)



Figure 4. Weighted-rank score (8-40) for each wolf population management goals for Wisconsin, USA (higher score indicates stronger support)



Figure 5. Good-poor score for each wolf population management goal for Wisconsin, USA (higher score indicates stronger support)



Figure 6. Mean (± standard error) rank for each criterion for assessing wolf population management goals in Wisconsin, USA (note: y-axis scale)



Figure 7. Overall assessment for each goal with percentage of respondents selecting each rank (Very good – red to Very poor – yellow; Orange=No opinion).



Figure 8. Percent respondents that selected a rank for each of the four goals from most favorable (1) to least favorable (4) (*n*=62)





Figure 8. Assessment of each criteria for the 350 (\pm 10%) wolf population management goal option with percentage of respondents selecting each rank (*Very good* – red to *Very poor* – yellow; Orange=No opinion) (*n*=81 to 84, depending on criteria)



Figure 9. Assessment of each criteria for the 650 (±10%) wolf population management goal option with percentage of respondents selecting each rank (Very good – red to Very poor – yellow; Orange=No opinion) (n=73 to 75, depending on criteria)

Reduces and prevents wolf-human conflicts



Figure 10. Assessment of each criteria for the 300-650 wolf population management goal option with percentage of respondents selecting each rank (*Very good* – red to *Very poor* – yellow; Orange=No opinion) (*n*=67 to 69, depending on criteria)



Figure 11. Assessment of each criteria for the 350 minimum, with no maximum, wolf population management goal option with percentage of respondents selecting each rank (*Very good* – red to *Very poor* – yellow; Orange=No opinion) (*n*=66 to 68, depending on criteria)

Page 22 of 39

Discussion

Key concepts for consideration

Our data highlight some key concepts for consideration when evaluating the four wolf population management goals being contemplated by the WDNR.

- 1. No one management option received overwhelming support.
- The 650 (±10%) goal was ranked as the most preferred option of the four, though many simply felt it was *more* reasonable than the 350 (±10%) goal ("…better number than 350…").
- 3. The 350 (±10%) goal was ranked as the least preferred option in all cases and many considered it "Unscientific and outdated", unsustainable, and "ridiculous". This goal is also "…too low to sustain an annual harvest…" and would limit conflict management options. "The 350 goal is far below biological and social carrying capacity."
- 4. There were clearly mixed or ambiguous feelings associated with the 350 minimum and no maximum goal. Many felt that a non-numeric goal would be effective, while others had more negative perspectives. Many of these issues were associated with trust of the WDNR and political influence in wolf management in the state.
- 5. Ranges or non-numeric goals were considered to improve management flexibility, but were also considered to be too susceptible to politics ("…leaving too much at the whim of the winds of political change."). On the other hand, many respondents considered narrow management "windows" (small population ranges) to be unrealistic and to limit flexibility.
- 6. Minimums of 300 or 350 were considered to be too low by a number of wildlife professionals. Many indicated they would be more willing to support some of the population goals if their minimum values were higher. When the 1999 wolf plan was developed, the wolf carrying capacity for Wisconsin was generally thought to be about 500 wolves (WDNR 1999), but recent analysis of the Wisconsin wolf population suggests that the carrying capacity may be as high as 1250 wolves (Stenglein et al. 2015; Olson et al., *unpubl. data*).

- Wildlife professionals supported all of our criteria used for evaluating the goals. However, they clearly felt that, above all else, management decisions should be sciencebased and goals should allow wolves to fulfill their ecological role.
- 8. The 650 ($\pm 10\%$) goal was perceived by most wildlife professionals as allowing the most effective coordination with tribes, but about $1/5^{\text{th}}$ had no opinion on this topic, and according to a number of comments, some respondents felt that population goals by themselves are not useful metrics of effective coordination with tribes.
- 9. The 350 (±10%) management goal did rank highest as perceived social acceptability and ability to reduce conflicts. But multiple respondents indicated that given state management authority, conflicts can be mitigated when wolf populations are higher. Conflict has been shown to be influenced by other factors beyond the number of wolves in the state (Olson et al. 2015; Olson, *unpubl. data*); therefore, manipulation of wolf populations may not be the only way to mitigate wolf conflict in the state. In fact, when the state had management authority (specifically the authority to kill wolves attacking livestock or pets near homes) during the recent delisting period (2012-2014) depredations on cattle declined 58% while the wolf population only declined by 8%, suggesting that with active management conflicts can be drastically reduced without major population reductions.

350 in context

The 350 (\pm 10%) wolf population goal stems from the 1999 Wisconsin Wolf Management Plan. However, it is unclear to how the number 350 was intended to be interpreted in the 1999 plan. Some have interpreted it as a 350 threshold (similar to the 350 minimum goal), above which the state would initiate proactive depredation control by government trappers and public harvest could be considered (WDNR 1999, pp. 21).

The state population management goal would be a late winter count of **350** outside of Native American reservations. At the management goal, proactive depredation control by government agents can be authorized. WDNR 1999, pp. 15

Yet, others have interpreted the 350 number as a target goal – a goal at which to maintain the population.

A public harvest can be considered if other control activities do not adequately maintain the population near the 350 goal. WDNR 1999, pp. 21

Despite the ambiguity of the 1999 goal, it is worth considering where the number 350 originated. Indeed, many respondents indicated that a wolf population goal of $350 (\pm 10\%)$ is outdated and unscientific.

The 350 goal was created at a time when the best estimate of state-wide biological carrying capacity was about 300 to 800 wolves (WDNR 1999). The estimate of carrying capacity was based on habitat suitability modeling that compared the habitat characteristics of existing wolf packs at that time to the available environment (Mladenoff et al. 1995; Mladenoff et al. 1997; WDNR 1999). The analysis estimated 28,041 km² of wolf habitat (primary and secondary combined) existed in the state (WDNR 1999). However, such modeling is limited in its ability to predict a species distribution or carrying capacity when a species is in the process of recolonizing a landscape (Mladenoff et al. 2009). In such cases, a species' current distribution does not necessarily represent its full potential. Not surprisingly, when Mladenoff et al. (2009) redid their analysis in 2009, they found that the area considered to be suitable habitat had changed and expanded. Current research on the Wisconsin wolf population suggests that the carrying capacity for current wolf range may be as high as 1250 wolves (Stenglein et al. 2015; Olson et al., *unpubl. data*). Clearly, the scientific understanding of wolves in the state of Wisconsin has changed substantially since 1999.

State management of the wolf has also changed since 1999. Currently, a wolf harvest is required by state law when wolves are federally delisted. This legislative mandate approach almost necessitates a revision of the 1999 management goal (i.e., 350), because as one respondent indicated, the 350 goal would be "too low [biologically] to sustain an annual harvest."

The Wolf Advisory Committee initially recommended a state population goal of 300-500 wolves (WDNR 1999, Appendix 1, p.71). However, the WDNR eventually selected the goal 350 based on a political compromise between a state delisting goal of 250, and assumed carrying capacity of 500 (WDNR 1999). This goal was assumed to be an initial approximation of social carrying capacity for the state. The WDNR reaffirmed this goal based on the fact that persons

commenting on the goal during a public comment period were almost split equally in terms of support (WDNR 1999). But such public comments are a very limited approach for assessing public perceptions of wolf management goals (Innes and Booher 2004).

In early spring of 2014, the WDNR distributed an attitude survey to 8,750 Wisconsin households and received over 5,000 responses (59% response rate) (Holsman et al. 2014). Respondents were asked their opinions regarding whether or not they wanted to see more, the same, or fewer wolves in Wisconsin in the future (Holsman et al. 2014). At the time of the survey the state wolf population was estimated at 660-689 wolves in winter 2014, although that number was not published until the end of April, and the previous year's winter minimum count was 809-834 wolves (Wiedenhoeft et al. 2014). Thus, respondents were basing their reactions to such questions based on a Wisconsin wolf population somewhere between 660-834 wolves. For respondents from outside wolf range the most frequent response was to keep the wolf population the same (29%), and 56% wanted as many or more wolves (Holsman et al. 2014). For respondents in wolf range, keeping the wolf population the same was also the most frequent response (26%), and 45% wanted as many of more wolves (Holsman et al. 2014). In both areas the second most frequent response was no opinion including 17 % in wolf range and 28 % outside wolf range (Holsman et al. 2014). Opinions on preferred wolf populations did range widely among various stakeholders from many more to many fewer, but overall it seems clear based on the data assessed by Holsman et al. (2014) that a large percentage were accepting of a wolf population similar to what existed at that time. Similarly, in 2014 (n=245) and 2015 (n=272), Olson et al. (unpubl. data) surveyed citizens of the greater Ashland area, encompassing most of Ashland and Bayfield Counties (within wolf range). Olson et al. asked respondents whether they preferred more, the same, or fewer wolves. In both years, respondents preferred to keep the wolf population the same (25% in 2014, 34% in 2015; most frequent response in both years) or for slightly more wolves (23% in 2014, 29% in 2015; second most frequent response in both years) (Olson et al., unpubl. data). Clearly, as one respondent from this survey accurately stated, "The 350 goal is far below biological and social carrying capacity."

Non-numeric goals

Non-numeric goals are becoming more common in recent times and there is good theoretical support for their use (Olson, *unpubl. data*). Among Western Great Lakes states with breeding

wolf populations, both Minnesota and Michigan have non-numeric goals with minimum thresholds. Minnesota has a minimum threshold of 1600 and no population goal (Minnesota DNR 2001) and the Minnesota wolf population has ranged from 2,200 to 2,900 in recent years. Michigan has a minimum threshold goal of 200 wolves (Michigan DNR 2015), for wolf population that has recently fluctuated between 618-687 wolves.

In fact, the Wisconsin White-Tailed Deer Trustee report of 2012 that currently guides management of deer and other wildlife in Wisconsin, recommended a move towards non-numerical population goals for managing wolves (Kroll et al. 2012).

Based on our survey results, wildlife professionals in Wisconsin remain uncertain of a nonnumeric goal for wolves. Respondents considered such goals to be flexible, but also too susceptible to politics. It seems clear that any non-numeric goal needs to be developed in conjunction with other management objectives that specify how the population will be managed. Such specifics provide a more rigorous framework for evaluating the quality of non-numeric goals and the success of management actions. Wildlife professionals in the state would likely be more supportive of non-numeric goals that have a higher minimum, and if the WDNR were to take steps to ensure a healthy, sustainable, and ecologically functioning wolf population (Figure 6). In fact, according to the Code of Ethics for The Wildlife Society (2017; see also Murie 1954), a wildlife professional's prime responsibility is to the "public interest, conservation of the wildlife resource, and the environment." Thus, management objectives designed to ensure the conservation of the wildlife resources, in this case wolves, would be standard professional conduct for a wildlife professional – to do otherwise would likely be perceived as professionally unethical. Clearly defining what a healthy, sustainable, or ecologically functioning wolf population looks or functions like would be a required step in this process. How criteria are measured and defined would be fundamental in guiding and evaluating management actions. Non-numeric population goals essentially shift the focus of management from population numbers to aspects of concern for stakeholders and species conservation.

Where are they?

While many people are interested in *how many* wolves there should be, it is also important to ask questions about *where* wolves should be (Olson 2013). Holsman et al. (2014) did determine that among Wisconsin residents, most support having wolves in forested areas with large blocks of

forest, but few supported having wolves in farmland areas or rural areas near suburbs. Thus, it is important that wolf management goals also be developed within a spatial context. For example, 350 wolves in packs spread across current wolf range is different than 350 wolves in packs only in northwestern Wisconsin. However, for the scope of our study, we felt it would be too complicated to incorporate a spatial component into the assessment of wolf population goals. We acknowledge this is one limitation of our survey. Yet, we believe our survey effort provides a critically important evaluation of these population management goals by state wildlife professionals, especially since these goals will likely be discussed independently of questions regarding where wolves should live, as such questions weren't explicitly discussed by the Wolf Advisory Committee.

Conclusions

The previous wolf management goal of 350 is clearly in need of reevaluation as it is no longer compatible with our scientific understanding of wolf biological carrying capacity or human attitudes and tolerance of wolves in the state. Narrow management windows would be unrealistic and limit management flexibility. Ensuring a healthy, sustainable, and ecologically functioning wolf population should be fundamental goals of wolf management.

Acknowledgements

We thank the respondents who participated in the survey. We are grateful to the Wisconsin Chapter of The Wildlife Society for allowing us to survey their membership. The Timber Wolf Alliance Board were key players in the development of this research idea and the survey instrument. We thank the Northland College Center for Rural Communities for providing us with guidance and access to Qualtrics. We thank multiple anonymous reviewers of our survey instrument and this technical report. This project was funded in part by the Timber Wolf Alliance of the Sigurd Olson Environmental Institute and the Natural Resources Department of Northland College. Funding was also provided, in part, by the Sigurd Olson Professorship in Natural Resources awarded to ERO.

References

- Holsman, R., Kaner, N., and J. Petchenik. 2014. Public attitudes toward wolves and wolf management in Wisconsin. Wisconsin Department of Natural Resources, Draft Report, August 2104, Madison, WI, 177pp, <u>http://dnr.wi.gov/topic/WildlifeHabitat/wolf/documents/WolfAttitudeSurveyReportDRA FT.pdf</u>
- Kroll, J.C., D.C. Guynn Jr, and G.L. Alt. 2012. A 21th Century Model for Deer Management in Wisconsin: Final Report and Recommendations. Presented to Wisconsin Department of Administration. <u>http://dnr.wi.gov/topic/wildlifehabitat/documents/trusteereport.PDF</u>
- Innes, J.E., and D.E. Booher. 2004. Reframing public participation: Strategies for the 21st century. *Planning Theory & Practice*. 5(4):419-436.
- Michigan DNR. 2015. Michigan Wolf Management Plan. Michigan Department of Natural Resources, Lansing, Michigan, <u>https://www.michigan.gov/documents/dnr/wolf_management_plan_492568_7.pdf</u>
- Minnesota DNR. 2001. Minnesota Timber Wolf Management Plan. Minnesota Department of Natural Resources, St. Paul, Minnesota, <u>https://www.fws.gov/midwest/wolf/stateplans/pdf/mn-wolf-plan-01.pdf</u>
- Olson, E.R. 2013. As a Wolf: A Wisconsin Case-Study of Wolf-Human Conflicts and Predator-Prey Ecology. PhD Dissertation, University of Wisconsin-Madison, Madison, WI, USA 214 pp.
- Olson, E.R., J.L. Stenglein, V. Shelley, A.R. Rissman, C. Browne-Nunez, Z. Voyles, A.P. Wydeven, and T. Van Deelen. 2015. Pendulum swings in wolf management led to conflict, illegal kills, and a legislated wolf hunt. *Conservation Letters*. doi:10.1111/conl.12141.
- Mladenoff, D.J., Clayton, M.K., Pratt, S.D., Sickley, T.A., and A.P. Wydeven. 2009. Change in occupied wolf habitat in the Northern Great Lakes region. In: *Recovery of gray wolves in the Great Lakes region of the United States: an endangered species success story* (ed. A.P. Wydeven, T.R Van Deelen, & E.J. Heske). Springer, New York, USA, pp. 119-138.

- Mladenoff, D.J., Haight, R.G., Sickley, T.A., and A.P. Wydeven. 1997. Causes and implications of species restoration in altered ecosystems: A spatial landscape project of wolf population recovery. *Bioscience*. 47(1):21-31.
- Mladenoff, D.J., Sickley, T.A., Haight, R.G., 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.
- Murie, O.J. 1954. Ethics in wildlife management. *The Journal of Wildlife Management*. 18:289-293.
- Refsnider, R.L. 2009. The Role of the Endangered Species Act in Midwest wolf recovery. Pp. 311-329 in A.P. Wydeven, T.R. VanDeelen, and E.J. Heske (eds.). *Recovery of Gray Wolves in the Great Lakes Region of the United States: An Endangered Species Success* Story. Springer, New York, New York, USA.
- Stenglein, J.L., Gilbert, J.H., Wydeven, A.P., and T.R. Van Deelen. 2015. An individual-based model for the southern Lake Superior wolves: A tool to explore the effect of humancaused mortality on a landscape of risk. *Ecological Modeling*. 302:13-14.
- Timber Wolf Alliance. 2017. Timber Wolf Alliance: Science, Outreach, & Education. Accessed October, 2017. < <u>https://www.northland.edu/sustain/soei/twa/</u>>
- U.S. Fish and Wildlife Service. 1992. Recovery Plan for the Eastern Timber Wolf. U.S. Fish and Wildlife Service, Twin Cities, Minnesota, USA. 73 pp.
- Wiedenhoeft, J.E., MacFarland, D.M., and N.S. Libal. 2014. Wisconsin gray wolf post-delisting monitoring 15 April 2013 through 14 April 2014. Wisconsin Department of Natural Resources, Madison, Wisconsin,
 <u>http://dnr.wi.gov/topic/Wildl</u>ifehabitat/wolf/documents/PostDelistMonitor2014.pdf
- Wildlife Society [The]. 2017. Code of Ethics. < <u>http://news.wildlife.org/who-we-are/code-of-</u> <u>ethics</u>> accessed on November 9, 2017.
- Wisconsin DNR.1999. Wisconsin Wolf Management Plan. PUBL-ER-099 99, Wisconsin Department of Natural Resources, Madison, Wisconsin, USA. 74 pp., http://dnr.wi.gov/files/PDF/pubs/ER/ER0099.pdf

TIMBER WOLF ALLIANCE

Appendix 1: Email message & online survey questionnaire for assessment of the proposed Wisconsin wolf population goals (developed on Qualtrics)

Email message

Dear Wildlife Professional:

As part of the development of a new wolf management plan, the Wisconsin Department of Natural Resources (DNR) identified four potential population goals for wolves in the state. The Timber Wolf Alliance <u>https://www.northland.edu/sustain/soei/twa/</u> would like to assess the opinion of state wildlife professionals on the quality of these four wolf population goals.

We would like you to rank each management goal against certain criteria.

If you are willing, please take 10-15 minutes to assess each of the four wolf population goals and provide some general background information on yourself. The survey will be confidential and anonymous. You can skip any questions you do not feel comfortable answering or you may end the survey at any time.

Results will be summarized and distributed publicly.

The Timber Wolf Alliance supports scientific management of wolves and maintains a neutral stance on wolf hunting.

Please click on the following link to begin the survey:

WolfPopulationGoalAssessment_NorthlandCollege_TimberWolfAlliance_2016 https://northlandcrc.qualtrics.com/SE/?SID=SV_2fP1ELby9fk3K0R

Thank you, Timber Wolf Alliance

For more information contact Adrian Wydeven, Timber Wolf Alliance Coordinator, via email awydeven@northland.edu<mailto:awydeven@northland.edu> or phone 715-682-1489

Online Survey Questionnaire

Assessing the Proposed Wisconsin Wolf Population Goals

Q1 Dear Wildlife Professional: As part of the development of a new wolf management plan, the Wisconsin Department of Natural Resources (DNR) identified four potential population goals for wolves in the state. The Timber Wolf Alliance would like to assess the opinion of state wildlife professionals on the quality these four wolf population goals. We would like you to rank each management goal against certain criteria. If you are willing, please take 10-15 minutes to assess each of the four wolf population goals and provide some general background information on yourself. The survey will be confidential and anonymous. You can skip any questions you do not feel comfortable answering or you may end the survey at any time. Results will be summarized and distributed publicly. The Timber Wolf Alliance supports scientific management of wolves and maintains a neutral stance on wolf hunting. Please begin the survey by entering your age below and clicking on the arrow.Thank you, Timber Wolf Alliance For more information contact Adrian Wydeven, Timber Wolf Alliance Coordinator, via email awydeven@northland.edu or phone 715-682-1489

Q2 What is your age?

If What is your age? Is Less Than 18, Then Skip To End of Survey

Q3 Potential wolf population goals for Wisconsin mentioned in this questionnaire are referring to the state-wide minimum counts of wolves that occur in mid/late winter.

	Very good (1)	Good (2)	Fair (3)	Poor (4)	Very poor (5)	No opinion (6)
Based on the best available science (1)	1.	2.	3.	4.	5.	6.
Allows wolves to fulfill their ecological role (2)	7.	8.	9.	10.	11.	12.
Improves social acceptability of wolves (3)	13.	14.	15.	16.	17.	18.
Allows for effective coordination of management with tribes (4)	19.	20.	21.	22.	23.	24.
Reduces and prevents wolf-human conflicts (5)	25.	26.	27.	28.	29.	30.
Considerate of the feasibility of adequate monitoring required (6)	31.	32.	33.	34.	35.	36.
Considerate of the costs associated with management (7)	37.	38.	39.	40.	41.	42.
Ability to harvest wolves sustainably (8)	43.	44.	45.	46.	47.	48.
Your Overall Assessment (9)	49.	50.	51.	52.	53.	54.

Q4 Wolf population goal of 350 wolves +/- 10% This goal is similar to the state goal in the 1999 Wisconsin Wolf Plan.Please rank how well this management goal meets the following criteria:

Q5 Additional comments regarding a wolf population goal of 350 wolves +/- 10%

Q6 Wolf population goal of 650 wolves +/- 10% This goal is similar to the state wolf population at the time the new plan was being developed in 2014, when 660 wolves were counted in the state.Please rank how well this management goal meets the following criteria:

	Very good (1)	Good (2)	Fair (3)	Poor (4)	Very poor (5)	No opinion (6)
Based on the best available science (1)	55.	56.	57.	58.	59.	60.
Allows wolves to fulfill their ecological role (2)	61.	62.	63.	64.	65.	66.
Improves social acceptability of wolves (3)	67.	68.	69.	70.	71.	72.
Allows for effective coordination of management with tribes (4)	73.	74.	75.	76.	77.	78.
Reduces and prevents wolf-human conflicts (5)	79.	80.	81.	82.	83.	84.
Considerate of the feasibility of adequate monitoring required (6)	85.	86.	87.	88.	89.	90.
Considerate of the costs associated with management (7)	91.	92.	93.	94.	95.	96.
Ability to harvest wolves sustainably (8)	97.	98.	99.	100.	101.	102.
Your Overall Assessment (9)	103.	104.	105.	106.	107.	108.

Q8 Additional comments regarding a wolf population goal of 650 wolves +/- 10%

Q7 Wolf population goal of 300-650 wolves This goal would require that wolves be managed within the range specified. The state threatened criteria for wolves is ≤ 250 wolves.Please rank how well this management goal meets the following criteria:

	Very good (1)	Good (2)	Fair (3)	Poor (4)	Very poor (5)	No opinion (6)
Based on the best available science (1)	109.	110.	111.	112.	113.	114.
Allows wolves to fulfill their ecological role (2)	115.	116.	117.	118.	119.	120.
Improves social acceptability of wolves (3)	121.	122.	123.	124.	125.	126.
Allows for effective coordination of management with tribes (4)	127.	128.	129.	130.	131.	132.
Reduces and prevents wolf-human conflicts (5)	133.	134.	135.	136.	137.	138.
Considerate of the feasibility of adequate monitoring required (6)	139.	140.	141.	142.	143.	144.
Considerate of the costs associated with management (7)	145.	146.	147.	148.	149.	150.
Ability to harvest wolves sustainably (8)	151.	152.	153.	154.	155.	156.
Your Overall Assessment (9)	157.	158.	159.	160.	161.	162.

Q9 Additional comments regarding a wolf population goal of 300-650 wolves

Q10 Minimum wolf population threshold of at least 350 wolves, but no maximum. This goal was intended to be a non-numeric goal. Wolf populations would be adaptively managed to maximize positive benefits and minimize negative impacts of wolves, while maintaining the population above 350 wolves.Please rank how well this management goal meets the following criteria:

	Very good (1)	Good (2)	Fair (3)	Poor (4)	Very poor (5)	No opinion (6)
Based on the best available science (1)	163.	164.	165.	166.	167.	168.
Allows wolves to fulfill their ecological role (2)	169.	170.	171.	172.	173.	174.
Improves social acceptability of wolves (3)	175.	176.	177.	178.	179.	180.
Allows for effective coordination of management with tribes (4)	181.	182.	183.	184.	185.	186.
Reduces and prevents wolf-human conflicts (5)	187.	188.	189.	190.	191.	192.
Considerate of the feasibility of adequate monitoring required (6)	193.	194.	195.	196.	197.	198.
Considerate of the costs associated with management (7)	199.	200.	201.	202.	203.	204.
Ability to harvest wolves sustainably (8)	205.	206.	207.	208.	209.	210.
Your Overall Assessment (9)	211.	212.	213.	214.	215.	216.

Q11 Additional comments regarding a wolf population goal of a minimum of 350 wolves, but no maximum:

Q12 Please rank the four goals from most favorable (1) to least favorable (4): Drag and drop each goal in the rank order you desire.

_____ 350 +/- 10% goal (1) _____ 650 +/- 10% goal (2) _____ 300-650 goal (3) _____ 350 minimum/no maximum (4)

Q13 Please weight the eight criteria you just used to assess the goals from least favorable (0) to most favorable (10)

- _____ Based on the best available science (1)
- _____ Allows wolves to fulfill their ecological role (2)
- _____ Improves social acceptability of wolves (3)
- _____ Allows effective coordination with tribal governments (4)
- _____ Reduces and prevents wolf-human conflicts (5)
- _____ Considerate of the feasibility of adequate monitoring required (6)
- _____ Considerate of costs associated with management (7)
- _____ Ability to harvest sustainably (8)

Q17 Please rank your knowledge of the following topics

	Extremely knowledgeable (1)	Very knowledgeable (2)	Moderately knowledgeable (3)	Slightly knowledgeable (4)	Not knowledgeable at all (5)
Wildlife population dynamics (1)	217.	218.	219.	220.	221.
Wildlife population management (2)	222.	223.	224.	225.	226.
Wolf biology (3)	227.	228.	229.	230.	231.
Wolf management (4)	232.	233.	234.	235.	236.
Human attitude research regarding wolves (5)	237.	238.	239.	240.	241.

Q14 Background information

Q15 What is your highest level of education?

- 242. High School (1)
- 243. Some college or technical college (2)
- 244. BS Degree (3)
- 245. MS Degree (4)
- 246. PhD Degree (5)

Q16 Which of the following best represents your employer?

- 1. State or County agency (1)
- 2. Federal agency (2)
- 3. Tribal agency (3)
- 4. College or University (4)
- 5. Private company or organization (5)
- 6. Other (6)

Q18 Please indicate how the following statement best describes you:"I consider myself to be a hunter."

- 247. Definitely yes (1)
- 248. Probably yes (2)
- 249. Might or might not (3)
- 250. Probably not (4)
- 251. Definitely not (5)

Q19 Please indicate how many years of experience you have as a wildlife professional.

Q21 Please provide us with any additional comments:

Q20 If you have any questions about this study, please contact Adrian Wydeven, TWA Coordinator, at awydeven@northland.eduThank you for your time.Sincerely,Timber Wolf Alliance