UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WISCONSIN

RED CLIFF BAND OF LAKE SUPERIOR CHIPPEWA INDIANS OF WISCONSIN, a federally recognized Indian tribe, on its own behalf and as *parens patriae* for its members, BAD RIVER BAND OF THE LAKE SUPERIOR TRIBE OF CHIPPEWA INDIANS OF THE BAD RIVER RESERVATION, a federally recognized Indian tribe, on its own behalf and as *parens patriae* for its members, LAC COURTE OREILLES BAND OF LAKE SUPERIOR CHIPPEWA INDIANS OF WISCONSIN, a federally recognized Indian tribe, on its own behalf and as *parens patriae* for its members, LAC DU FLAMBEAU BAND OF LAKE SUPERIOR CHIPPEWA INDIANS OF THE LAC DU FLAMBEAU RESERVATION OF WISCONSIN, a federally recognized Indian tribe, on its own behalf and as *parens patriae* for its members, ST. CROIX CHIPPEWA INDIANS OF WISCONSIN, a federally recognized Indian tribe, on its own behalf and as *parens patriae* for its members, and SOKAOGON CHIPPEWA COMMUNITY, a federally recognized Indian tribe, on its own behalf and as *parens patriae* for its members, Plaintiffs, -v.- PRESTON D. COLE, in his official capacity as the Secretary of the Wisconsin Department of Natural Resources, DR. FREDERICK PREHN, in his official capacity as a person who claims to be, and is acting as, both the Chair and a member of the Wisconsin Natural Resources Board,	Civil Case No.: 3:21-cv-00597

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GREGORY KAZMIERSKI, in his official capacity as the Vice Chair and a member of the Wisconsin Natural Resources Board, BILL SMITH, in his official capacity as the Secretary and a member of the Wisconsin Natural Resources Board, SHARON ADAMS, in her official capacity as a member of the Wisconsin Natural Resources Board, WILLIAM BRUINS, in his official capacity as a member of the Wisconsin Natural Resources Board, TERRY HILGENBERG, in his official capacity as a member of the Wisconsin Natural Resources Board, MARCY WEST, in her official capacity as a member of the Wisconsin Natural Resources Board, Defendants.	

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DECLARATION OF ADRIAN P. WYDEVEN

I, Adrian P. Wydeven, declare as follows:

1. I am a certified wildlife biologist and a resident of Cable, Wisconsin.

Educational and Professional Experience

2. My academic training includes a Bachelor of Science degree in Biology and Wildlife Management from the University of Wisconsin-Stevens Point in 1976 and a Master of Science degree in Wildlife Ecology from Iowa State University in 1979.

3. I worked as a wildlife biologist for the Missouri Department of Conservation from 1980 to 1982, and for the Wisconsin Department of Natural Resources from 1982 through 2015. While working for the Wisconsin Department of Natural Resources, I led the Wisconsin gray wolf recovery and conservation programs from 1990 through 2013. While working in that capacity, my responsibilities included developing state wolf management policy, including through development of the state Wolf Management Plan that was issued in 1999. I served as chair of the state Wolf Advisory Committee that developed that plan. My responsibilities also included developing an annual determination of the wolf population; assisting in conducting wolf surveys; serving as a spokesperson for the Wisconsin Department of Natural Resources on wolf conservation issues; working with other states' wildlife agencies to coordinate wolf management and conservation in the Western Great Lakes region; working with federal agencies such as the U.S. Fish and Wildlife Service, the U.S. Forest Service, and the U.S. Department of Agriculture Wildlife Services, as well as Wisconsin state forestry officials, on matters of wolf conservation; preparing quarterly and annual reports on the status of the Wisconsin wolf population; and assisting researchers with studies of the Wisconsin wolf population and associated biological and ecological questions.

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4. I have written extensively about wolves. I have authored and co-authored over 100 articles on wolves, including 51 peer-reviewed scientific publications. As discussed, I was chair and lead editor of the 1999 Wisconsin Wolf Management Plan, and served in the same role in preparing the 2007 addendum to the plan. I was the senior editor, with co-editors Timothy R. Van Deelen and Edward J. Heske, of the 2009 book, "Recovery of Gray Wolves in the Great Lakes Region of the Unites States," and co-authored 6 of the 21 chapters in that book.

5. After retirement from the Wisconsin Department of Natural Resources in 2015, I continued working with wolf researchers and graduate students and have remained actively involved in conservation and study of wolf populations. From 2015 to 2017, I worked with an organization called the Timber Wolf Alliance to assist with developing a curriculum for wolf education programs. The Timber Wolf Alliance is a program developed by the Sigurd Olson Environmental Institute at Northland College for the purpose of promoting wolf recovery through public education, citizen science, and volunteer activities. I have also assisted with Northland College research efforts focused on wolves in northern Wisconsin. I continue to help conduct annual wolf snow-track surveys as a volunteer with the Wisconsin Department of Natural Resources. This volunteer work is part of a citizen science program that aims to obtain data for the Department to use in estimating the size of the wolf population. I frequently give talks on wolves to various organizations, and help train and mentor volunteer trackers and wolf howlers through the Timber Wolf Alliance. I am an active volunteer with Wisconsin's Green Fire, a non-governmental organization that aims to support the conservation legacy of Wisconsin by promoting science-based management of Wisconsin's natural resources. My volunteer work with Wisconsin's Green Fire focuses on promoting sound wolf conservation and assessing impacts of management activity on the Wisconsin wolf population.

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6. In addition to these Wisconsin-focused activities, I have provided advice to and consulted on wolf conservation for: the states of Maine, Minnesota, Michigan, Oregon, and Washington; the U.S. Fish and Wildlife Service regarding the Mexican wolf program and wolf conservation concerns in the northeastern United States; the National Park Service with respect to wolf management in Isle Royale and Yellowstone National Parks; and the country of Sweden.

7. A copy of my curriculum vitae is attached to this declaration.

8. As a result of my training and experiences, I have extensive knowledge of the biology, management, and conservation of wolf populations, with a specific focus on the wolf population in Wisconsin. I submit this declaration to address issues concerning wolf biology, management, and conservation in Wisconsin.

Biology of the Gray Wolf

9. The gray wolf (*Canis lupus)* is the largest wild member of the dog family (Canidae). Despite its name, a gray wolf's fur can range from white to shades of gray to coal black. Gray wolves are territorial and social animals that exhibit group hunting behavior, normally living in packs of two to eight individuals led by dominant, or "alpha," male and female wolves. In Wisconsin, wolf packs in late winter average four individuals, typically consisting of the alpha male and female and two sub-adult offspring. Wolves primarily prey upon ungulates such as deer, elk, moose and caribou as well as on medium-sized mammals such as beaver and hare. In Wisconsin white-tailed deer and beaver are the most important prey for gray wolves.

10. Gray wolves reach sexual maturity when they are 22 months old but generally only the alpha male and female in a pack breed and produce pups. Breeding takes place between late January and early March. Pups are born in early to mid-April. A female gray wolf typically

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averages about 5 pups, which remain at the wolves' den site for 6 to 8 weeks before being moved to rendezvous sites where the pups are kept while the adults in the pack hunt for food. By September and October, when the pups have grown large enough to travel with the adults in the pack, the pack members move nomadically together throughout their territory. Winter wolf territories in Wisconsin average about 130-150 square kilometers or 50-60 square miles.

11. Within the United States, including Wisconsin, studies of gray wolves show that wolves' predations may significantly shape their ecosystems by altering the numbers and behavior of prey species, promoting biodiversity and overall ecosystem health. Studies in Wisconsin have concluded that, where wolves are present in sufficient numbers, the impacts of wolf predation on deer include greater growth and species richness of forest plants, including maple saplings and rare forbs, that would otherwise have been suppressed by deer browsing. Wolves also impact their environment through their interactions with other predators, particularly mid-sized predators such as coyotes, which wolves generally will not tolerate within their territories. A study in Wisconsin and Michigan documented increased abundance of snowshoe hares and foxes in areas of high wolf use because coyotes, which frequently prey on these species, were less prevalent. Wolves also impact their ecosystems by removing sick and weak deer from the herd. Wolves typically test their prey by running them to attempt to detect less fit individuals that are more easily targeted for predation, including those that are injured or weakened by disease. Several lines of evidence suggest that this impact may extend to selective predation on deer infected with chronic wasting disease, an incurable disease that is spreading among deer in Wisconsin. Such selective predation may result in reducing the prevalence of this disease. This evidence includes data demonstrating selective predation by another predator, the cougar, on deer afflicted with chronic wasting disease, which suggests a similar or even greater

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degree of selective predation on such deer by wolves, given that cougars generally take their prey by ambush rather than running their prey to detect weakened individuals as wolves do. Other available information includes evidence showing that wolf predation has helped control a different disease that weakens afflicted individuals (tuberculosis) in wild boar in Spain, and a modeling analysis demonstrating that selective predation by wolves on deer infected with chronic wasting disease would significantly diminish the persistence of chronic wasting disease in a susceptible deer population. Consistent with this evidence, there is little overlap between wolf range and the geographic area where chronic wasting disease has been detected among deer in Wisconsin. Recent research also documents that the impacts of wolf predation on deer include fewer deer collisions with human vehicles.

1999 Wisconsin Wolf Management Plan

12. As discussed above, I chaired the Wolf Advisory Committee that prepared the 1999 Wisconsin Wolf Management Plan. At the time this plan was created, it was uncertain how many wolves could be sustained by the wolf habitat that existed in Wisconsin. Wolves had begun to recolonize parts of their historic range in Wisconsin in the mid-1970s, and the Wisconsin wolf population numbered about 200 individuals in 1999, but wolves occupied only a portion of estimated suitable habitat that had been determined by mapping analysis in 1995 and 1997. Lacking actual experience with the biological carrying capacity of Wisconsin's wolf habitat, planners used this mapping analysis to conclude that 500 wolves was a reasonable estimate of the potential carrying capacity of wolves in Wisconsin. At that time, planners did not understand that suitable wolf habitat in Wisconsin could support a biological carrying capacity of about 1,242 wolves, as demonstrated by research published in 2015.

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13. The wolf management planning team in earlier drafts of the Wisconsin Wolf Management Plan recommended a population goal of 300 to 500 wolves for Wisconsin, but after negotiations, roundtable discussions, and political compromise, settled on a state management goal of a winter count of 350 wolves outside of Indian reservations (92-96 percent of the state wolf population). This management goal was based on population viability analysis, understanding of wolf carrying capacities at the time, and some political compromise. The 1999 goal was about 150 more wolves than existed in the state and was intended to be the minimum level at which proactive depredation control by government agents could be authorized and the possibility of public hunting could be considered. It was not intended to be a population cap.

Causes and Impact of Overkill in February 2021 Wolf Hunt

14. The Wisconsin Department of Natural Resources conducted a wolf-hunting season from February 22 to 24, 2021 that resulted in a final reported removal of 218 wolves. This number of reported removals exceeded the total quota for state-authorized hunters by 99 wolves, or 83 percent.

15. The significant overkill that occurred during the February 2021 wolf hunt resulted from a confluence of factors. First, an application of state law dictated a hunt during the wolves' breeding season. Wisconsin state law mandates that the Department of Natural Resources must allow the hunting and trapping of wolves whenever the wolf is not listed on the federal or state endangered species list, with the hunting season to run through the end of February if the applicable quota is not reached before then. Litigation under this law in February 2021 succeeded in forcing state officials to conduct a wolf hunt that occurred exclusively during that month despite the fact that February marks the midst of the wolves' breeding season. By comparison, previous Wisconsin wolf hunts in 2012-2104 ran from October 15 to early or mid-

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December, when state quotas were filled, and the largest state-wide quota exceedance during these hunts was six wolves.

16. Second, Wisconsin state law also mandates that any state wolf license entitles the hunter to use dogs to track or trail wolves beginning on the first Monday following the last day of the State's firearm deer-hunting season. The state firearm deer season typically runs from the Saturday before Thanksgiving until the Sunday after Thanksgiving, so this provision generally allows wolf hunting with dogs beginning in late November or early December. During the February 2021 wolf hunt, large groups of hunters were reported with multiple sets of dogs and multiple vehicles using radio- and cellular-based communications to coordinate their pursuit of wolves, including by releasing fresh dogs to replace dogs already in the field during the chase. This type of hunting increased the hunt's impact on the wolf population because Wisconsin lacks large roadless areas offering remote wolf habitat and probably all wolf packs are located in areas that are accessible by four-wheel drive, and most even by two-wheel drive, vehicles. Given this ease of access, hunters with dogs were able to coordinate their activities to surround known wolf-pack locations. The February hunt demonstrated that hunting with dogs in this manner can quickly lead to overkills. During the February 2021 hunting season, 188 of the 218 wolves reported killed (86 percent) were taken by hunters using dogs.

17. Third, Wisconsin state law requires a minimum of 24 hours' notice by state officials from the time of a season closure announcement before a closure order can take effect. This requirement forces the Department of Natural Resources staff to anticipate the need to issue a closure order for a hunting zone before the applicable quota is reached and to essentially guess at how many wolves might be killed in that hunting zone during the 24 hours of additional hunting opportunity that occurs following announcement of the closure order. During previous

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wolf hunting and trapping seasons that started on October 15 in 2012, 2013, and 2014, harvests occurred at steady rates that allowed Department managers to close zones without drastic overkills. The February 2021 hunting removals during the winter breeding period with use of hounds occurred so quickly that Department managers were unable to close zones in time to avoid an overkill.

18. Fourth, and compounding the difficulty created by the third factor discussed above, a Wisconsin Department of Natural Resources regulation allows hunters up to 24 hours from the time of kill to register their wolf kill. This registration period operates to further extend the permissible hunting period past the point when state officials deem it necessary to provide public notice of a hunting closure. So, for example, the Department's order to close a zone issued at 3 p.m. on a Tuesday would allow legal hunting to occur until 3 p.m. on a Wednesday under the state's 24-hour notice period, and then any hunters that killed a wolf during that 24-hour notice period could legally register their kills until as late as 3 p.m. Thursday. During the February 2021 hunt, social media postings indicated that some hunters sought to manipulate these provisions to delay reporting of kills so as to extend the wolf-hunting season to the latest time possible. In this regard, the Department's regulation allowing hunters a 24-hour period to register kills reflects an earlier era when hunters lacked access to modern communications and logistical difficulties might delay reporting. Today, I am not aware of any place in Wisconsin where a hunter could not access a location with cell phone service within one-hour driving time or less that would enable reporting in a relatively short period.

19. Fifth, the Department of Natural Resources issued an exceptionally large number of hunting licenses for the February 2021 wolf hunt. After the Department of Natural Resources proposed to issue up to 10 licenses per quota wolf in the February 2021 hunt, the Wisconsin

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Natural Resources Board increased the number of licenses to as many as 20 per quota wolf. Implementing this direction, the Department ultimately sold 1,548 licenses to wolf hunters and trappers for the February 2021 hunt. This number represented a 13:1 ratio of hunters to each of the 119 wolves in the state quota, yielding an extraordinarily high number of hunters in the field attempting to take a wolf. This represented about 1.5 permits for every living wolf and 6 permits per wolf pack in the state. By comparison, the Department of Natural Resources issues about 1 permit for every 2 bears and 1 firearm permit for every 2.5 deer in the state. Also, the Department authorized 5 licenses for an allocated quota of 5 bull elk during the state's northern elk herd hunt in 2020, for a 1:1 ratio of hunters to quota elk.

20. Sixth, because the February 2021 wolf hunt occurred entirely during the wolves' breeding season, it targeted wolves during a period when they are especially vulnerable to detection. During the breeding season in late winter, wolf territorial marking activity peaks as wolves leave easily detected sign and extensively patrol their established territories, especially along forest roads and trails where they are more readily detected by hunters. The vulnerability created by these circumstances was compounded during the February 2021 hunt by the fact that roads were generally in good driving condition and fresh snow allowed especially easy detection of wolves. However, even if the latter conditions had not existed, wolves would have been more vulnerable to hunters during this period because of their increased activity and visibility during the breeding season.

21. As discussed, these factors yielded 218 registered wolf kills in just three days during the February 2021 hunt, representing an overkill of 99 wolves based on registered kills alone. However, as with any hunting season for any species, the number of registered kills does not equal the total number of individuals killed. Missing from the total of 218 wolves registered

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as killed in the February 2021 hunt would be wolves that were shot but unrecovered and wolves killed illegally and not registered. A factor that may have contributed to such unregistered killing was the Department of Natural Resources' authorization of night hunting during the February 2021 hunt. During the February 2021 wolf hunt, the Department allowed night hunting to occur in conjunction with baiting or using wolf calls for hunters not using dogs. The Department has not reported how many wolves were killed at night during the February 2021 hunt, but this type of hunting presents an increased risk of hunters losing shot wolves and therefore not registering them as kills that would count against the quota. Based on experience with other hunting seasons in Wisconsin, it is reasonable to estimate that unregistered kills during the February 2021 hunt amounted to at least 10 percent of the registered kill total, or at least 22 wolves. However, given the large number of hunters in the field and the intense nature of hunting activity over the short February 2021 season, it is very possible that the number of unregistered kills was even higher, amounting to as much as 50 percent of the registered total. For this reason, the reported total of 218 wolves killed in the February 2021 hunt should be viewed as a minimum number that understates the total number of wolves killed in connection with that hunt.

22. In addition to the direct removal of individual wolves through both registered and unregistered kills, the February 2021 hunt during the wolves' breeding season also impacted wolf reproduction. As with any species, removal of pregnant females has a strong effect on population growth and reproduction. Because generally only one female wolf in a pack mates and produces pups, killing pregnant wolves generally eliminates any spring pup production in their packs. In addition, removing adult males can significantly affect wolf reproduction. This is because female wolves raising pups are extremely dependent on adult males to provide food for the pack and to defend the pack's territory against intruders that threaten pup survival. This

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dependency is especially strong in Wisconsin wolf packs, which average four wolves, a smaller number than in other areas of wolf range such as Yellowstone National Park. The smaller wolf packs in Wisconsin have fewer members to assist the female with the work required to raise pups. Loss of adult males may even lead to packs dissolving. Further, because the February 2021 wolf hunt occurred entirely during the wolves' breeding season, there was no opportunity for packs to substitute new members for key individuals killed in the hunt, as there would be during a fall hunting season.

23. Because the Wisconsin Department of Natural Resources did not require hunters in the February 2021 hunt to submit carcasses of the wolves they killed for inspection, the breeding status of female wolves killed in the hunt cannot be determined with certainty. However, the 218 wolves registered as killed in the hunt included 116 males and 102 females. Of these, at least 39 percent were adults and 51 percent were yearlings. Most of these adults and some of the yearlings likely would have been breeding-age animals. Based on prior research information, it is likely that as many as 65 percent of the adult females and 50 percent or more of the yearling females registered as killed in the February 2021 hunt may have been pregnant at the time they were killed or would have become pregnant during that breeding season if they had not been killed. Taken together, this rate of loss would lead to approximately 50 wolf packs not producing pups during 2021 due to loss of breeding females alone.

24. For the reasons discussed above, the removal of adult males increases this impact on wolf reproduction in 2021. Given the cumulative loss of likely bred females and alpha males, it is reasonable to estimate that 60 to 100 of Wisconsin's wolf packs may lose all pup production due to the February 2021 hunt. This would represent a loss of 24 to 40 percent of the expected reproduction from 245 known wolf packs in Wisconsin outside of tribal reservations. During a

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normal year, about 30 percent of wolf packs in Wisconsin fail to raise pups, and about 70 percent of packs produce pups that survive to the end of their first year. But because of the impact of the February 2021 winter wolf hunt, actual packs with surviving pups may have been reduced to 30 to 46 percent of state packs.

25. Efforts to further investigate the impact of the February 2021 hunt on wolf reproduction are ongoing. These efforts involve surveying wolf pack territories by imitating wolf howls and recording whether pups are heard howling in the packs' response. I personally have been participating extensively in these surveys following the February 2021 wolf hunt. While survey work continues and final results are not yet available, to date these surveys indicate that approximately half of all surveyed packs lacked pups in 2021.

26. This reduced level of wolf reproduction has a significant impact on the total wolf population and its ability to sustain additional losses without further decline. This is because normally the birth of pups would be expected to approximately double the total number of wolves in the Wisconsin population each spring, as about 5 pups are typically born in most packs that average about 4 members (range 2 to 12 wolves). This year, however, given what we know and are learning about the impact of the February 2021 hunt on the Wisconsin wolf population, it appears likely that reproduction may have yielded no more than a 50 percent increase in the population, rather than a 100 percent increase. Given that typically only about 30 percent of pups survive to the end of their first year of life and about 25 percent of adults die from various non-hunting-related causes during this same period, the result is a significant reduction in the wolf population's numbers as well as its ability to compensate for the losses sustained in the February 2021 hunt.

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27. The majority of wolves registered as killed in the February 2021 hunt were taken from larger blocks of public lands that are considered prime wolf habitat. Of the 218 wolves registered as killed in February 2021, 160 (73 percent) were reported taken on public lands. Examination of the percentage of public lands within the square-mile sections where wolves were killed during the February 2021 hunt revealed that 122 wolf-kill locations (56 percent) occurred in sections with greater than 50 percent public ownership. Of those locations, 95 (43 percent) were greater than 75 percent public ownership.

28. This result demonstrates that the impacts of wolf removal during the February 2021 hunt were disproportionately concentrated on wolves occupying public lands. Wolves in wildland areas of public land have the greatest potential of providing ecological services. Therefore, removal of wolves from those public lands has impacted their ecosystems through loss of the biological functions performed by wolves, including functions that increase plant growth and plant and mammal diversity, and remove sick and weak deer from the herd, as discussed above.

The Department of Natural Resources' Planning for the November 2021 Wolf Hunt

29. On July 26, 2021, the Wisconsin Department of Natural Resources sent a memorandum to members of the state Natural Resources Board requesting the Board's approval for a statewide quota of 130 wolves for a second 2021 wolf hunt to begin on November 6, 2021. The Department's quota memorandum attempted to support this request by stating that the proposed 130-wolf quota reflected a conservative and cautious approach given factors including admitted uncertainty about the impacts of the February 2021 wolf hunt, the absence of any post-hunt population monitoring data, and the lack of experience with both the consequences of a hunt focused during the wolves' breeding season and a second hunt in the same calendar year. The

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Department asserted that its approach was calculated to be most likely to result in 0 percent annual population change from the wolf population that exists following the February 2021 hunt.

30. However, the analysis utilized by the Department to arrive at its proposed 130-wolf quota for the hunting season beginning in November 2021 included a series of unfounded methodologies, assumptions, and omissions. As a result, the Department's proposed 130-wolf quota is not likely to result in 0 percent annual population change from the post-February 2021 hunt wolf population, but rather is likely to result in further reduction of the wolf population. The Department's unfounded methodologies, assumptions, and omissions include the following:

Lack of Reliable Population Estimate

31. The Department relied on an analysis published in the scientific literature—Adams, et al., (2008) Population Dynamics and Harvest Characteristics of Wolves in the Central Brooks Range, Alaska, *Wildlife Monographs* 170:1-25—to identify the quota level that the Department deemed likely to result in 0 percent annual population change from the post-February 2021 hunt population. The Adams, et al. (2008) publication analyzed data from North American wolf populations from 26 publications and determined that annual rates of population increase have an inverse, curvilinear relationship with human-caused mortality. As the Department acknowledged, one of the key pieces of information needed to reach reliable conclusions about the likely impact of any quota set through use of the Adams, et al. (2008) study is the starting population size of the wolf population in question. However, as the Department admitted, it lacks sufficient information to reliably estimate the size of the Wisconsin wolf population following the February 2021 hunt.

32. In this regard, since 2018 the Department has been using an occupancy model to estimate the size of the state's wolf population. This model relies on winter tracking surveys and

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collared wolf packs to estimate the total area occupied by packs, and then combines average pack territory size with the average number of wolves in each pack to estimate the state's wolf population. In winter 2021, the Department's survey period was truncated due to the February wolf hunt. The Department conducted tracking surveys until the beginning of the hunt on February 22, but typically would have continued its surveys into mid-March. Then, hunting and removal of wolves occurred immediately following the survey period that the Department utilized to gather data for the occupancy model. Therefore, as the Department admitted in its July 26 quota memorandum (on page 3), estimating the post-February 2021 hunt population size with the occupancy model was impossible. Accordingly, the Department relied on a quota-setting methodology that required a reliable population estimate while admitting that it lacked a reliable population estimate of the state wolf population after the February wolf hunt.

Substitution of an Unfounded Population Estimate

33. Lacking a reliable post-February 2021 hunt population estimate of the state wolf population, the Department apparently substituted an adjusted population estimate to calculate a proposed wolf quota through application of the Adams, et al. (2008) study. The precise methodology used by the Department is unclear from available information, but nevertheless it is clear that the Department omitted important information that is necessary to reach a reasonable post-February 2021 hunt population estimate and otherwise relied on non-conservative assumptions and methods of analysis.

34. To begin with, the Department inexplicably appeared to use an occupancy modeling estimate from winter 2020 rather than winter 2021 as the baseline for calculating a post-February 2021 hunt population estimate. On July 14, 2021, three Department wildlife scientists (Jennifer Price Tack, Glenn Stauffer, and David MacFarland) reported that their

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occupancy modeling analysis produced a population estimate of 1,126 wolves with a 95% credible interval of 937-1,364 wolves for winter 2021 prior to the February 2021 hunt. However, the Department's July 26, 2021 quota memorandum to the Wisconsin Natural Resources Board (in Table 3, page 11) instead used an estimate of 1,195 wolves as the pre-hunt estimate in winter 2021. This latter number of 1,195 wolves actually represents the Department's occupancy modeling estimate for the late winter wolf population in 2020, not 2021. The Department's occupancy modeling estimate for late winter 2020 is available at https://dnr.wisconsin.gov/sites/default/files/topic/WildlifeHabitat/wolfreport2020.pdf and the population estimate of 1,195 wolves is stated on page 4 of that document. It is unclear why the Department's July 26, 2021 quota memorandum to the Natural Resources Board used the 2020 estimate instead of the 2021 estimate reported by the agency's scientists earlier in July 2021. The Department's July 26 quota memorandum does not refer to the occupancy modeling estimate for winter 2021 of 1,126 wolves or the 95% credible interval reported by Department scientists earlier that same month. By using the 2020 occupancy modeling result, the Department set the pre-February 2021 hunt estimate of the Wisconsin wolf population at a level 69 wolves higher than if the 2021 occupancy modeling estimate had been used.

35. To develop its adjusted population estimate of the Wisconsin wolf population following the February 2021 hunt, the Department in the July 26 quota memorandum apparently started with the winter 2020 occupancy modeling estimate of 1,195 wolves and then subtracted the registered take of 218 wolves from the February 2021 hunt and 42 wolves living mainly on Indian reservations. The Department does not include wolves living on tribal reservations in its quota-setting calculations. This approach yielded a post-February 2021 hunt population estimate apparently of 935 wolves that the Department then utilized as the starting population size for its

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quota-setting process using the Adams, et al. (2008) study. While this appears to be the approach taken by the Department based on the discussion in the July 26 quota memorandum, in Figure 2 of that memorandum, which includes a graph for setting the quota, it is unclear what wolf population estimate is being used. Regardless, the Department's approach creates at least two additional areas of concern and uncertainty.

36. First, the Department did not subtract any wolves from its pre-February 2021 hunt population estimate to reflect wolves killed during the February 2021 hunt but not registered as killed by hunters. As discussed above, it is virtually certain that unregistered kills occur in any hunt, and this was especially so for Wisconsin's February 2021 wolf hunt given the number of hunters in the field and the intensity of hunting activity. For these reasons, as further discussed above, it is likely that unregistered wolf kills during the February 2021 hunt amounted to 10 percent or even up to 50 percent above the registered kills. The registered taking of any wildlife species represents a minimum count of animals removed from a wildlife species population, and in the case of the winter hunt of wolves, removals occurred very rapidly and with extremely efficient methods. Accordingly, it is likely that registered kills significantly under estimated wolves removed from the population. The Department's calculation of the Wisconsin wolf population following the February 2021 hunt did not take account of unregistered kills.

37. Second, the Department's use of a population estimate generated through occupancy modeling to inform a quota recommendation utilizing the Adams, et al. (2018) study represents an apples-to-oranges method of analysis that likely inflated the recommended quota. Most of the wolf population data utilized in the Adams, et al. (2008) study was generated through methodologies that yield a minimum population estimate using territorial mapping, not occupancy modeling. Minimum population estimates are generated through methods that use

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ground-based tracking, aerial observations, and location data from collared wolves to map each pack territory, and then estimate pack size in each territory. These data are combined to estimate the minimum number of wolves each winter. Thus, minimum counting systems tend to be more conservative and have been traditionally used extensively for estimating wolf abundances and assessing impacts of human-caused mortality. Occupancy modeling is becoming a useful tool for determining abundance of robust wolf populations, especially those approaching 1,000 or more individuals, but occupancy modeling can overestimate wolf abundance if the population is fragmented or highly dispersed (Stauffer, et al. (2021) Scaling Occupancy Estimates up to Abundance for Wolves, *J. Wildlife Manage*. 85:1410-1422). Previously, from 1980 through 2020, the Wisconsin Department of Natural Resources used more conservative estimates of the wolf population employing a minimum counting system. In 2018-2020, the Department conducted winter surveys from early December to mid or late March, using both minimum counts and occupancy modeling to estimate wolf numbers. The population estimate produced by occupancy modeling was a more liberal estimate and averaged 14.5 percent more than minimum counts during this period. By using the more liberal occupancy modeling estimate to calculate a quota recommendation using the Adams, et al. (2008) study, the Department generated a higher quota than if a population estimate obtained through minimum counting had been used. Further, a minimum counting system is more of an apples-to-apples comparison when used for setting wolf quotas using the Adams, et al. (2008) model, which, as discussed, incorporated extensive minimum-counting population data.

38. If, instead of using a population estimate generated by its occupancy model, the Department had utilized a likely minimum population count number that was more consistent with the data inputs for the Adams, et al. (2008) study, the Department's starting point would

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have been 14.5 percent lower than the 1,126 wolves reported by Price Tack, et al. for winter 2021, or approximately 963 wolves. Subtracting the 218 registered kills from the February 2021 hunt and 42 reservation wolves from that number would further reduce the population estimate for the quota analysis to 703 wolves. Then, subtracting 22 more wolves to reflect the most conservative estimate (10 percent) of likely unregistered kills in the February 2021 wolf hunt would yield a population estimate of 681 wolves—254 wolves or 27% fewer than the estimate that the Department apparently used as its starting population size for quota setting utilizing the Adams, et al. (2008) study. By using this higher population estimate, the Department skewed higher the number of quota wolves that it concluded could be removed while maintaining 0 percent annual change in the Wisconsin wolf population.

Unwarranted Assumption of Normal Recruitment

39. The Department's quota-setting analysis for the Wisconsin wolf hunt beginning in November 2021 also made no allowance for the February 2021 hunt's likely impact on wolf reproduction. As discussed, the Department relied on the Adams, et al. (2008) study to establish its proposed quota. As the Department acknowledged (in the caption for Figure 2 on page 8 of the July 26 quota memorandum), the Adams, et al. (2008) study's assessment of the relationship between human-caused mortality and wolf population trend assumes "normal recruitment"—i.e., normal reproduction and rearing of young wolves into the population. There was no reasonable scientific basis for the Department to assume that normal recruitment of wolves into the Wisconsin wolf population occurred following the February 2021 hunt. Instead, as discussed above, based on the timing and known outcomes of that hunt, it is reasonable to estimate that the February 2021 wolf hunt yielded a significant loss of expected reproduction from wolf packs in Wisconsin outside of tribal reservations. During most years, 70 percent of wolf packs raise pups

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to the end of their first year (Wydeven et al. (2009), p. 99, *Recovery of Gray Wolves in the Great Lakes Region of the United States*, Springer, N.Y., N.Y.). However, due to the disruptions of the February 2021 Wisconsin wolf hunt, actual packs successfully raising pups are likely only 30 to 46 percent of state wolf packs. The Department's failure to make any allowance for this loss of reproduction represented another unjustified aspect of its quota-setting process that skewed the proposed quota higher than would have been determined through a scientifically justifiable methodology that accounted for likely reduced reproduction.

40. For each of the reasons discussed above, the Department's conclusion that a proposed quota of 130 wolves would likely result in 0 percent annual population change from the post-February 2021 hunt population was not reasonably justified by scientific methodology and was not based on sound biological principles. Instead of yielding a quota likely to result in 0 percent annual population change, the Department's proposed quota analysis that incorporated the inappropriate methods, assumptions, and omissions discussed above appears likely to skew the proposed quota to a level that is too high to maintain 0 percent annual population change and instead will result in further reduction of the Wisconsin wolf population.

41. On August 11, 2021, the Wisconsin Board of Natural Resources voted to more than double the Department's proposed quota, approving a quota of 300 wolves for the hunting and trapping season beginning in November 2021. By more than doubling the Department's proposed quota, the Board's decision compounds the likely impacts of the unjustified aspects of the Department's proposed quota-setting methodology discussed above, and therefore would likely yield even greater reduction in the Wisconsin wolf population.

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Likely Impacts of the November 2021 Wolf Hunt and 300-Wolf Quota

42. If the Wisconsin wolf hunt scheduled to commence on November 6, 2021 goes forward with a 300-wolf quota, the likely impact will be to reduce the Wisconsin wolf population to 350-400 individuals. Based on assessments discussed above, the minimum wolf count in Wisconsin after the February 2021 wolf hunt would reasonably be estimated at about 681 wolves. Because of reduced reproduction in spring 2021, even with a 0 wolf quota in fall 2021, the Wisconsin wolf population would likely show little growth by late winter 2022. Additional removal of 300 wolves could reduce the population to as few as 350-400 wolves by late winter 2022.

43. It is also foreseeable that the Wisconsin wolf population could be reduced even lower than 350-400 individuals if the hunt scheduled to commence in November yields another overkill that exceeds the established quota target. There is a legitimate threat of such an overkill because most of the regulatory features that contributed to the overkill that occurred during the February 2021 hunt remain operative. The only unknown in this regard is the number of licenses the Department will issue for each quota wolf. During previous wolf harvests (2012-2014) when 5-10 times as many permits were offered as the desired quota, and wolves were taken by trapping and hunting without use of dogs, the Wisconsin Department of Natural Resources was able to hold the kill within 2 percent of the established quota. But in winter 2021, when 20 times as many permits were offered as the quota, and hunting was primarily with dogs, the Department's quota was exceeded by 83 percent. If the fall 2021 hunting season concludes before the end of November when use of dogs are authorized, and permits are kept low, the Department may be able to limit the kill close to the established quota. But if permit numbers are high, and the hunt extends until the period when use of dogs is authorized, the risk of another

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overkill will be high. This risk is greater for the hunt beginning on November 6, 2021 than it was for the hunts conducted in 2012-2014 because a post-2014 statutory change has shifted the opening date for the wolf hunt from October 15 to the first Saturday in November, thereby pushing the opening of the wolf-hunting season closer to the late November-early December timeframe when hunting with dogs is authorized. In addition, a 300-wolf quota is higher than the quotas for Wisconsin's 2012-2014 wolf hunts. This higher quota also increases the risk that the quota will not be filled when hunting with dogs becomes authorized. The experience of February 2021 demonstrates that, once hunting of wolves with dogs is authorized, the result may be a substantial overkill in a very short period of time (e.g., only three days in the February 2021 hunt).

44. Regardless whether such an overkill occurs, the wolf population reduction resulting from Wisconsin's fall wolf hunt is likely to have significant impacts on wolf conservation and the broader ecology of currently occupied wolf habitat in Wisconsin. In wildlife population management, it is undesirable to allow populations to fall to less than 50 percent of biological carrying capacity, because such reductions can result in unstable populations that risk rapid decline or reductions. Even where further decline does not occur, it can take long periods for populations to recover significantly following such a substantial reduction, as demonstrated by the experience in Wisconsin when the wolf population remained at low levels (below 200 individuals) from the return of wolves to the state in the mid-1970s through most of the 1990s. The most recent estimates place the gray wolf biological carrying capacity in Wisconsin at about 1,242 wolves (Stenglein et al. 2015, *Ecological Modeling*, 302:13-24). The Wisconsin wolf population seemed to be stabilizing at minimum counts of 900-1,030 wolves in recent years (2017-2021) prior to the February 2021 wolf hunt. Wildlife

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managers typically try to manage wildlife populations at 75-80 percent of the carrying capacity, levels similar to what had occurred for wolves in Wisconsin in recent years. But the February wolf hunt may have reduced the wolf population to as few as 650-700 wolves or 52-56 percent of the carrying capacity. Further reduction would risk increased instability and reduced resilience, as discussed above. The abilities for tribes to maintain viable wolf packs on areas of suitable habitat on reservation lands will be diminished as the wolf population declines and wolf range shrinks. This population would be more vulnerable to further reduction through natural and human-caused stressors.

45. Commensurate with this population reduction, significant portions of established wolf range in Wisconsin would become mostly or entirely depopulated of wolves. This reduction would also drastically reduce wolf distribution across the state, and reduce ecological benefits from a healthy wolf population. The ecological benefits that would be lost or diminished by such a reduction include reducing deer impacts on forest vegetation, moderating the impact of mid-sized predators such as coyotes, and removing weak and sick deer from the population, as discussed above. The ability of wolves to prevent or slow the spread of chronic wasting disease also may be compromised if wolf range and populations are drastically reduced.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct. Executed on September 29, 2021 in Cable, Wisconsin.

Adrian P. Wydeven

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