AMCA
THE AMERICAN MOSQUITO CONTROL ASSOCIATION

Individuals enhancing the health and quality of life through the suppression of mosquitoes, other vectors and pests of public health importance.

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Endangered and Threatened Wildlife and Plants; Draft Recovery Plan for the Rusty Patched Bumble Bee

The American Mosquito Control Association (AMCA) is submitting these comments in response to the Fish and Wildlife Service issuance of a notice in the Federal Register on January 24, 2020 proposing a draft recovery plan for the Rusty Patched Bumble Bee (*Bombus affinis*) under the authority of section 4(f) as amended (Act; 16 U.S.C. 1531 *et seq.*) of the Act that provides measures that are necessary to provide for the conservation of the species.

The AMCA is a not-for-profit professional association of 1600 public health officials, academicians, county trustee/commissioners and mosquito control professionals dedicated to providing leadership, information and education leading to the enhancement of public health and quality of life through the suppression of mosquito and other vector transmitted diseases and the reduction of annoyance levels caused by mosquitoes and other vectors and pests of public health importance. This is accomplished through implementation of integrated mosquito management components to exploit the vulnerabilities of mosquitoes at various life stages within an environmentally-aware context. The AMCA is committed to preserving and promoting the health of the environment and is fully cognizant of its members' responsibilities to maintain protections for listed species.

The AMCA wishes to submit the following comments for your consideration in finalizing the Draft Recovery Plan:

1. Mosquito control methodologies and product application parameters are fundamentally different from the agricultural applications cited in the SSA. Thus, the results and conclusions derived therefrom are not applicable with respect to mosquito control product applications. Ultra Low Volume (ULV) insecticides used against adult mosquitoes are specifically engineered to work rapidly at extremely small dosages, targeted at compromising the mosquito's ability to fly. ULV label dosages of pyrethroids of .007 lbs. AI/acre (<25 applications to a site/year) and malathion application rates of .03-.06 lbs. AI/acre are dispersed as fine droplets in an air column volume of 435,600 cubic feet up to 10 feet above an acre of ground. Droplet spectra are prescribed on the label and are in the range of 20-50 (8-30 for truck-mounted ULV applications) micron volume mean diameter. The recommended time for use of these products is limited to only the peak activity periods of mosquitoes (dawn and dusk), when wind velocities are >1mph, e.g. Permanone 30-30), and the ambient temperature is above 50^{o}F (except in the case of Fyfanon). All of these contribute to promoting exposure of the target mosquito while minimizing environmental loads and exposures to diurnal nontargets such as RPBB.

2. The definition of "population" used to determine the historical baseline upon which the Recovery Plan rests is characterized as, "…[a] verified record of 1 or more individuals in a 10 x 10 km^2 grid since 1900" (USFWS 2020, p. 2), while the definition of "population" used for downlisting is much more restrictively defined as, "A population is documented by the detection of at least one individual in 3 of the last 5 years (within a 10 x 10 km^2 grid as defined in USFWS 2016, p. 11)" (USFWS 2020, p. 4). As a result, this plan sets an unreasonably high bar for eventual downlisting that far surpasses the USFWS's own definition of population outlined elsewhere in the Recovery Plan. In the Recovery Plan, population is defined expansively (only one observation required) to maximize the number of populations required for recovery and then defined restrictively (one observation in three years out of five years) to limit which bumblebee observations will count as a documented population. The multiple ways "population" is defined is arbitrary and capricious and results in two different standards of assessment being applied.

3. With respect to specific conservation objective #4 on page 3 of the Recovery Plan, addressing amelioration of primary pervasive threats, including pathogens, pesticides, habitat loss, etc., the precipitous decline of several wild bumble bee species (including RPBB) since the mid-1990s occurred simultaneously with severe declines experienced by commercially-bred western bumble bees (*B. occidentalis*). The collapse in commercially-bred bumble bees was attributed to the parasitic fungus *Nosema bombi*. While the declines in wild bumble bees have been attributed to the "spillover" of the fungus from the commercial colonies to the wild populations, this does not completely explain the patterns of losses observed in wild bees like the RPBB. Chronic spillover of disease-causing organisms (*i.e.*, bacteria, fungi or viruses) from commercial bumble bees as a main cause of wild bumble bee declines is still being debated among apiarists. If this recent pathogen is a primary driving factor in the recent decline of Bumble Bees as stated above by USFWS, then all other recovery actions for RPBB will be ineffective. Furthermore, a lowest theoretical threshold of *Nosema* infection allowing maintenance of

a healthy RPBB population needs to be established if recovery actions are to be successful.

4. On page 5 of the draft Recovery Plan for the Rusty-Patched Bumblebee, *Bombus affinis* ("Recovery Plan") the number of historical populations since 1900 is cited as 1385 populations, defined as a unit of 1 or more individuals within a 10km X 10km grid. However, the 2016 Rusty-Patched Bumblebee Species Status Assessment ("SSA"), states that the number of historical occurrences (where a grid occurrence is the total number of grids having at least one individual over a decade) as 845 from 1900-1999 (USFWS 2016, pp. 29-30). The population unit estimate of 1385 cited in the Recovery Plan therefore represents a nearly 64% increase in the occurrence of this species from what was cited in the SSA. Furthermore, the cited population number of 1385 comes from an unpublished USFWS database (USFWS 2020, p. 4). The use of unsupported, uncited and unpublished data in this instance arbitrarily inflates the baseline number of populations required to fulfill recovery criteria #1 and ensures that "recovery" as defined in the plan will be problematic at best. Population data should be published and peer-reviewed before being used as a basis for the Recovery Plan. At a minimum, the SSA and the Recovery Plan should be relying on the same dataset for analysis. An explanation for the increased population estimates in the 2020 Recovery Plan versus the original figure used in the 2016 SSA to justify the listing of this species should be included or another valid rationale provided for increasing the historical population level.

5. In the SSA the decadal percent occupancy is defined as the median percent occupancy over 10 years. On page 5 footnote number 1 of the Recovery Plan, the minimum number of occupied populations was determined by multiplying the inflated historical number of populations (1385) by one half the decadal average (one half of 23% occupancy) for a total of 159 populations (USFWS 2020, p. 5). It is mathematically incorrect to take an average (mean) of a series of medians. In this case, the mean of 6 median values was taken to determine the average percent occupancy (USFWS 2020, p. 5).

It is similarly incorrect to combine the decades 1900-1950 into one median occupancy percent value as was done in the SSA (USFWS 2016, pp. 29-30). Therefore, the minimum number of populations (Criteria #1) and all calculations that flow from this initial calculation are incorrect because they are based on an incorrect calculation of central tendency (the mean of six medians). To do this calculation correctly would require taking a measure of central tendency (mean or median of 99 values) <u>for each year</u> from 1900-1999 and not the average of the median from each decade. This is a critical error that obfuscates the year to year variation in the population of this species and incorrectly calculates the minimum number of populations required to meet criteria #1.

6. In the 2016 SSA, year to year variation in population counts is obscured by the creation of a decadal median percent occupancy (USFWS 2016, pp. 29-30). Especially for the period 1900-1950 which is combined into one single median. The true range (minimum and maximum) of percent occupancy over a decade is unknown or unstated. In the Recovery Plan, a population will only be counted when it is observed in 3 out of 5 years (USFWS 2020, p. 4). However, it is unknown if positive observations in "3 of the

last 5 years" encompasses the range of possible observations over the last 100 years. Due to the use of the decadal median, it is unknown how many years, on average this species was absent from the historical record and how many it can reasonably be expected to be absent from a future population census. It is possible that this species is regularly absent in more than 2 out of 5 years in the historical record. Without further description of the historical range of population values seen over the last 99 years (including how many years have zero observations), the criteria that a population must be seen in 3 out of 5 years seems arbitrary and may make the threshold for recovery unobtainable.

7. On page 5 footnote 1, the minimum number of populations for each conservation unit was determined by multiplying the historical number of populations by one half of the decadal average occupancy (11.5%). From pre-1950 through the 1990's, the median percent occupancy per grid has varied by as much as 8% (from 20% pre- 1950's to 28% in the 1990's with an incorrectly calculated average of 23%) (USFWS, 2016 Table 3.2 pg. 29). A wide decadal variation would mean that one half of the decadal median occupancy could range from 10% to 14%. Since the decadal average is incorrectly calculated as noted in comment 3 above, it is difficult to know what the true central tendency for this data set is and similarly impossible to know if a minimum of 159 populations is an appropriate number of populations to fulfill recovery goals. The SSA cites a range in decadal occupancy from 20-28% which, using the mathematics outlined in the Recovery Plan could yield a minimum number of populations of between 136 and 194, which is a difference of 58 populations. This difference is significant. Without knowing more about the variation in historical observations, the values used to underpin criteria #1 are flawed.

8. On Page 6 of the Recovery Plan, Criteria #2, 2.1 states that the identification of distinct colonies, "may be identified through genetic analyses or by using the number of individuals detected." How many individuals will qualify as a distinct colony? Furthermore, what genetic analysis will be conducted to ensure distinct populations? What genetic criteria will be utilized to ensure that populations are distinct? Frankly, Criteria #2, 2.1 lacks a quantifiable threshold for the identification of a distinct colony. (USFWS 2020, p.6). Thus, the criteria cannot be met with certainty.

9. On Page 6 of the Recovery Plan, Criteria #2, 2.2 states, "Evidence of genetic health over the most recent 10 years. Genetic health must be demonstrated by at least two genetic metrics (for example, effective population size, heterozygosity, and allelic richness)." However, many species naturally vary in allelic richness and heterozygosity due to life history strategy, ecological niche, historical bottlenecking and other factors. What historical or intraspecies baseline will be used to compare measures of genetic health? What molecular methods will be used to assess genetic health? This criterion, too, can never be met because the actual thresholds for recovery are indeterminable and undefined. Therefore, under this plan, recovery can never be achieved.

10. On page 6 of the Recovery Plan, Criteria #2, 2.3 states, "Pathogen and pesticide loads are below levels that could cause meaningful loss of reproductive capacity of the population." How will pesticide load be defined and measured? In addition, what defines

a “meaningful loss” of reproductive capacity? Most of the language used in this criterion is, again, without clear definition making the criterion impossible to objectively meet. The words, “pathogen load”, “pesticide load”, and “meaningful loss” should be clearly defined with ascertainable thresholds.

In line with the above on page 6, Criteria #2,2.4 states, “A high level of certainty – demonstrated via a rigorous analysis – that the populations will persist given stressors and environmental variation.” How is “a high level of certainty” defined? What statistical methodologies will be utilized as the “rigorous analysis”? How are the specific stressors and environmental variations defined that will be compared using the analysis chosen?

11. Recovery action #2 on page 8 of the Recovery Plan states “Minimize exposure to harmful pesticides: Successful minimization measures may include…: Estimated cost: $855,000 (+ undetermined cost for potential land acquisition).” Conspicuously absent from this cost estimate are costs associated with crop damage from lack of pesticide use or public health costs from prohibited applications, decrease in property values, adverse effects on tourism and lower quality of life.)

In addition, the Recovery Plan hypothesizes that RPBB populations may experience some kind of cumulative adverse impact from the other “possible” stressors to which they are subjected in addition to mosquito control activities. While possible, this is purely speculative. We are not aware of any definitive data confirming the hypothesis or that establishes mosquito control operations as the primary or even significant driver. In light of this, the AMCA requests that the USFWS take into account the dangers mosquitoes pose to both people and wildlife resulting from the proscriptions being considered. Included in these negative mosquito-borne disease impacts on humans and wildlife are those caused by high biting numbers of mosquitoes found in particular habitats.

12. Page 53 of the SSA is couched in speculative terminology on the unknown causes of the decline, e.g. : “*It is likely”: ”likely more harmful”; ”There is recent evidence”; “could be”; “may compromise”; “may have”; “evidence of the relationship between low genetic diversity and disease susceptibility was discussed”; “who stated that” and ”evidence suggests*” being a few examples. If we are to seriously address recovery efforts for RPBB, our actions must be predicated on more than conjecture.

13. The RPBB’s former habitat has been sub-divided into regions. Each region has a set of criteria that must be met which includes, in part, a certain number of colonies. In the Iowa and Illinois regions there are many colonies that the USFWS believes still exist and their recovery could be accomplished. However, in the Michigan, Ohio and Pennsylvania regions there are very few colonies that currently exist. If the aim is to restore colonies to these regions, this could be extremely problematic. Indeed, this would impose new considerations/restrictions on vector control operations in these areas that currently do not have any considerations from the RPBB. These restrictions on vector control could result in negative impacts on public health. Does the lack of current RPBB colonies in historic Michigan habitat mean that the species stays listed even if recovery has been seen elsewhere?

The Integrated Mosquito Management techniques that form the activities endorsed by the American Mosquito Control Association and employed by their member agencies ensure that the maximum protection is afforded both the RPBB and the citizenry we are mandated to protect. Our comments are predicated on this fundamental value. In addition, the AMCA is keenly aware of the inherent difficulties the Service encountered in researching the SSA. However, the uncertainties, assumptions and ambiguities manifested in the Recovery Plan and SSA need to be addressed if stakeholders are to be expected to fully ratify the Recovery Plan as currently drafted. The stakes involved with the health and welfare of both the RPBB and its human neighbors make it imperative that recovery actions and their rationales be fully validated and not reliant upon speculative population assessments and conjectural levels of stressors.

The AMCA recognizes and applauds the efforts made by the US Fish and Wildlife Service to appropriately evaluate the status of the Rusty Patched Bumble Bee and we look forward to further collaboration in addressing the concerns we've expressed.

Sincerely,

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Literature Cited

U. S. Fish and Wildlife Service. 2016. Rusty Patched Bumble Bee (*Bombus affinis*) Species Status Assessment. 94pp.

U. S. Fish and Wildlife Service. 2020. Draft Recovery Plan for Rusty Patched Bumble Bee (*Bombus affinis*). 10pp.