MEMO

Dear Officials:

Recently, we discovered that a species called the Asian bumblebee has begun to invade Washington state.

To further analyze the seriousness of the issue, we modeled its spread. By 2020, the number of reports of suspected Asian bumblebee sightings has increased each year.

Our model suggests that if nothing is done about the bumblebee invasion, the impact could be so dramatic after five years that the ecological and economic losses could be incalculable. We recommend tracking the insect's movements as soon as possible and taking prompt action to limit damage. It is impossible to carry out a comprehensive investigation of this pest with limited resources and manpower.

Relying on people to report suspected targets is a good means of information collection, but because ordinary people do not have the knowledge and experience to collect information on such insects, most of the information reported is chaotic, and it is difficult to conduct accurate analysis. In addition, it is difficult to process such a huge amount of information with limited manpower. In this regard, we have established a report reliability assessment system to help filter valuable reporting information, to help you quickly determine whether a sighting report is valid or not.

So far, we have analyzed and evaluated the sightings provided, and made a brief analysis of the temporal and spatial distribution of the reported locations. According to the analysis, bumblebee sightings are more likely to occur in these areas, which can be used as a reference when dispatching commissioners to investigate.

Due to the limited amount of data available, the results of our analysis are incomplete. However, we have taken this into account, and as soon as we have new data, we can update the model further to achieve better results. Our model will give the probability index of whether the report is valid or not, and then judge whether to update the model. If the report can be judged by professionals and then input into the model, the

accuracy can be improved. Given the importance of computational cost and model accuracy, we recommend that departments adopt an update strategy: if there are valid reports, update them immediately; otherwise, update the models with new reports at the end of each month.

The following methods can be used to determine whether the bumblebee has been eliminated:

We consider the month to be safe if reports received within a year from a certain month have reliability predictions below 0.9999. Of course, this could be influenced by chance, but the analysis of the reports so far does not indicate that there is such a chance for six months. If it is safe for six months in a row, then we can rest assured.

Based on our analysis, we offer some suggestions for controlling the Asian bumblebee:

1. Small survey teams can be sent to investigate areas of high bumblebee density to obtain more detailed and reliable data.
2. On the website receiving the report, it is advocated to use scientific and accurate words for the characteristics of observed insects and briefly introduce the scientific methods of photographing insects. Improving the relevant literacy of the people will help to improve the effectiveness of the report.
3. Timely update the model with time changes to improve the accuracy of the model and track the trend of Asian bumblebee more accurately and timely.
4. A combination of chemical and biological control may be considered.Spraying interferon or other chemicals targeted at the Asian bumblebee in dense nesting areas reduces its population density, and introducing its natural enemies slows its growth.

We believe this model has implications for controlling the effects of the Asian bumblebee.Please contact us for further cooperation.

Sincerely yours
FROM: Team #2111874
Date: Feb. 6, 2021