IN THE SPOTLIGHT: Natural England

This article has been put together in collaboration with Richard Clarke and Harjit Panesar at Natural England. Richard is a Lead Advisor in the Regulatory Improvement and Specialist Services Team. Harjit is a Lead Advisor in the Geographical Information and Analysis Services Team. This article explains how specialists at Natural England have used their GIS skills to successfully deliver a recent project on the protection of Native Bees and how access to the e-learning at GIS247 supported the spatial analysis component of the project.

Natural England – Native Bees Project

The GIS247 e-learning service was initially rolled out across Natural England to support GIS users as a software migration took place to ArcGIS. GIS247 has been a valuable training and support tool during the migration; it now provides different levels of ongoing training to all levels of user throughout the organisation. Access to the e-learning at GIS247 has helped support a range of projects including the spatial analysis component of the Native Bees study.

"There is a desire in the UK to ensure that the spread of non-native insect species to protected sites such as Special Areas of Conservation (SACs) is minimised. Geographical Information Systems and analysis are useful tools in modelling the potential spread of insects such as bumblebees across the landscape and locating sites which may be at risk."

"Many farmers producing fruit and vegetables now utilise factory reared imported non-native bumblebee species for pollination purposes. These bumblebees are released into greenhouses and poly tunnels in order to pollinate crops within them. Using commercially reared bumblebees for pollination might offer more predictable levels of pollination, as well as allowing some control over when pollination occurs. However, the release of non-native bumblebees carries a number of risks to both the ecology of wild pollinators and to the health of honey bees."

"Wild pollinators and honey bees have a very important role in food production in England and any negative impacts on these insect communities could have major consequences for the agricultural industry in England."

"The risks posed by escaping non-native bumblebees vary. These include: the spread of disease to native species, which could lead to them being wiped out; hybridisation, where the non-native species and the native

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species breed – diluting the genetic integrity of the native species; or mated (i.e. pregnant) non-native queens could escape and reach a suitable habitat, create a nest and thus establish a colony in the wild which could then proliferate the chances of the other two risks occurring."

"Sites using non-native bumblebees can be either enclosed greenhouses or open sided poly tunnels, which are categorised with either a low biosecurity risk or a high biosecurity risk respectively based on the risk of non-native bumblebees escaping from them."

"Natural England wanted to investigate the potential scale of risks posed by non-native bumblebees. This involved an investigation into both the proximity of non-native use sites to known sites where rare native bumblebee species exist, as well as into the number of designated sites, which might hold suitable habitats for non-natives to become established in the wild, within flying distance of a mated non-native queen."

"We obtained spatial data from all the growers in England using non-native bumblebees for pollination of their crops. This data included a grid reference, the type of crop being grown (fruit, vegetables etc) and whether the site was using poly tunnels or greenhouses. Using ArcGIS we were able to convert the spreadsheet containing information on the location of businesses using non-native bumblebees to a spatial dataset using coordinates provided. The crop type and greenhouse / poly tunnel information was retained in the attributes table when the location of these sites was plotted in ArcGIS, to allow data points to be selected based on these criteria. By following the GIS247 courses, we were able to build up basic skills to use ArcGIS; and by using specific modules we were able to learn how to use the ArcToolbox buffer tools. Each module was broken into sections that allowed us to focus precisely on our learning requirements."

"In addition to data from the growers we also obtained some data from BWARS, which is the Bees Wasps & Ants Recording Society. BWARS hold records of the distribution of various bee species around the UK. We were particularly interested in obtaining records for four species of bumblebees, *Bombus humilis, Bombus ruderarius, Bombus ruderatus & Bombus sylvarum*. These four bumblebee species are on the UK Biodiversity Action Plan (BAP), i.e. they are recognised as being of particular conservation concern and have had specific plans drawn up for them in order to aid their conservation, they are also key species for the maintenance of biological diversity in the UK. Spreadsheet data obtained from BWARS contained a grid reference, the name of the person who made the sighting and a date. Again the skills learnt from GIS247 allowed us to convert this tabular information into a spatial dataset."

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"Data on protected sites such as Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) is owned and maintained by Natural England. These protected sites support habitats and species that are important for nature conservation on either a national or European scale. Such sites receive protection in UK and European law as a result of their designated status. Sites within the designated sites network may support the four UK BAP bumblebee species, or may contain habitats which could support non-native species if they successfully colonise them."

"Using ArcToolbox buffer function we could then buffer the non-native bumblebees data to simulate expected maximum distances the bumblebees are capable of travelling. With the process being to tell the system to draw a modelled flight distances buffer around each individual point in the 'growers sites' data set."

Map extract showing an example of modelled bee flight distance buffer analysis – This map does not contain actual data used in the project (to maintain confidentiality)

"Once the buffer layer had been created this was overlaid over the designated sites layers and over the four UK BAP bumblebee species layers. The buffer was used to select features from each layer that fell within the modelled flight distance from the grower's sites data."

"The training information available at GIS247 on using buffers is extensive, covering the different types of buffers that could be used and how the attribute data is managed. Access to this information was very useful in determining the best way to approach the buffering components and how to manage the data."

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"The intersect analysis feature was used; the GIS system was instructed to select all features from the protected site and UK BAP species layers that were intersected by or fell within the modelled flight distance buffer. The selected features were then extracted from the larger dataset and maps were created showing the growing sites, as well as either the designated sites at potential risk of colonisation by mated non-native queens, or the sites of known UK BAP species activity where native / non-native bumblebee interaction was possible." Again comprehensive information on the intersect and other geoprocessing functions are available via the GIS247 training. This was useful in support of using this function in the ArcGIS software.

"Using the buffers and intersect analysis it was then possible to select SACs that were within the modelled flight distances and identify them as high-risk locations, as it was possible non-native bumblebees might migrate to these sites. This could both be mapped in ArcGIS and exported as a table to be used in other non-GIS software packages."

"Using the results from this project it has been possible for Natural England to successfully identify potential threats from non-native bumblebee species and to focus its resources to best effect."

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