Plain wonderful

Salisbury's unique ancient grassland

Covering an area the size of the Isle of Wight, Salisbury Plain contains the largest military training area in the UK and the largest single expanse of chalk grassland in Western Europe. John Redhead explains how this sometimes turbulent landscape provides both a conservation challenge and some unique habitats for wildlife.

Burnets on Echium.

Salisbury Plain is a unique place. Rolling hills stretch into the distance and the breeze carries the scents of wild thyme, chalk dust and a whiff of tank exhaust. The air is filled with the buzz of innumerable foraging bees, the song of dozens of skylarks and the rumble of distant gunfire.

Used for everything from infantry training to firing live artillery, the plain is a busy, dangerous place. But it's also an immensely valuable haven for wildlife. Its chalk grassland is incredibly diverse – as many as 40 different plant species can be found in a single square metre. These rich plant communities support a vast array of insects, birds and other animals. Salisbury Plain first became military property in around 1900 and since then the UK has seen huge changes in farming practices. During the 20th century vast areas of grassland were ploughed for crops, or 'improved' (from an agricultural perspective) with chemical fertilizers and pesticides. More than 80 per cent of British chalk grasslands were lost to such processes by 1987. But Salisbury Plain, kept largely off-limits to intensive farming by military ownership, has retained its precious grassland and is now a vital refuge for a whole range of rare species – from plants like the tuberous thistle, to butterflies such as the Adonis blue and spectacular birds including the stone curlew and recently reintroduced great bustard.

Scientists at the Centre for Ecology & Hydrology (CEH) have been monitoring Salisbury Plain's grassland since the 1990s. At the time, major training exercises and lack of management had caused concerns about the state of the grassland. CEH was commissioned by the Ministry of Defence (MoD) to perform a comprehensive survey of the entire training area. Based on the findings of this survey, improved management plans were adopted, including the construction of hardened tracks to help keep military traffic away from the grassland. Since then CEH has continued to be involved in monitoring the impacts of military activities and the effectiveness of conservation management.

I work as a spatial ecologist at CEH. Spatial ecology involves anything that can be represented on a map – from GPS points and hand-drawn maps, to aerial photographs and satellite imagery. My job is to combine and analyse such spatial datasets to find answers to ecological questions. Over the past five years I've worked with a wide variety of spatial datasets to help meet the unique challenges posed by CEH's work on Salisbury Plain. The sheer size of the Plain limits the extent that can be covered by field surveyors, as do the restrictions of working on such an active military area. Strict procedures ensure that everyone knows which sections are safe to enter, and how to work there in safety, but access to some areas remains limited to a few days a year. This means that using spatial data can bring big advantages, both in working out the most effective places for field surveys and collecting data remotely.

To keep track of the effect of military disturbance, CEH has established a network of easily surveyed monitoring plots across the entire Plain. I have analysed a wide variety of maps to make sure these plots are strategically placed so we can identify different levels

Smoke grenade and dyer's greenweed.

and causes of disturbance from relatively quick surveys. Mostly, the disturbances of shell craters and tank tracks are lost in the vastness of the overall landscape, and frequently give rise to interesting communities of their own: tiny, rare fairy shrimp breed in water-filled wheel ruts, and butterflies bask amongst brilliant blue bugloss where manoeuvring tanks have exposed patches of glaring white chalk. But regular surveys of the plots by CEH botanists enable us to detect changes in vegetation communities, which act as an early-warning system for damage to the grassland. By looking at variation at the level of the whole plant community we can detect genuine shifts in the health of the grassland, as the community becomes more or less similar to one typical of good-quality ancient chalk grassland. We can also identify likely causes of change by looking at changes in groups of species within the community which share certain characteristics, like vulnerability to disturbance.

Spatial data can also provide information that would be impossible to collect by regular field surveys. Even simple aerial photography can be used to survey huge areas in comparison to a worker on the ground. I've used image analysis of aerial photographs from different years to detect bare ground in the surroundings of the monitoring plots, adding local context to the data on plant communities. I have also developed analyses to count and measure invasive scrub bushes (a major issue for chalk grassland) from aerial photographs. I combined these with rapid field surveys to advise the MoD on which scrub-management methods had a lasting effect on both scrub cover and grassland quality. I'm currently adapting the image analysis method to detect and map the spread of invasive tor-grass and potentially make use of higher-resolution imagery from unmanned aerial vehicles.

Spatial data doesn't have to be recent to be useful in answering contemporary questions. The oldest data I've used comes from the 1840s, when tithe records required mapping of which land was used for grazing and which for crops. Similar surveys in following years, plus land-use surveys in the 20th century, allowed me to piece together a map of land-use history across large areas of the Plain. I combined this with CEH botanical survey data to compare the plant communities between grasslands of different ages. The results were surprising. Grasslands more than 100 years old not only had many rare and distinctive species, but differences at the level of the whole plant community. These results emphasise the importance of preserving the last few existing chalk grasslands. Once they're gone, they take a very long time to return.

These widely-applicable techniques ensure our work on Salisbury Plain has impacts beyond the management of this nationally important grassland. I'm currently involved in a project examining how the biodiversity of the wider landscape surrounding Salisbury Plain contributes to ecosystem services. These are the services delivered by natural processes on which we all depend, such as pollination of crops, natural filtering of drinking water or capture of greenhouse gases, and 'cultural services' in the form of aesthetics and outdoor space for recreation. Studying these helps us to understand how monitoring and managing important reservoirs of biodiversity, like Salisbury Plain, can have benefits not only for the wildlife they support but for all our lives.

Images: John Redhead, Lucy Humes

Surveying Salisbury Plain with tanks on the horizon.

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