



Uses of drone imagery on our reserves and local wildlife sites

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Panoramic image of Godmanchester Nature Reserve (2017)

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Introduction

Unmanned aerial vehicles (UAVs) or drones can capture detailed imagery from the air. These images have been used to accurately map habitats and inform our management. This report provides case studies of how the technology has been used by the Wildlife Trust BCN in 2016/2017. There is also discussion of future applications and planned surveys.

Case studies

Pegsdon Grassland CWS

Aerial images were used to direct scrub clearance undertaken during winter 2016/2017. The aerial image (fig 1) shows part of the site before scrub clearance.



Figure 1 UAV image of scrub at Pegsdon Grassland CWS (2016)



Figure 2 Pegsdon Grassland CWS before scrub removal (2016)



Figure 3 Pegsdon Grassland CWS after scrub removal (2017)

The two fixed point photos (figs 2 & 3) show the area from the aerial image before and after scrub clearance. The surveys were funded by the ‘scrub-off’ project and

demonstrate how we can use aerial photography to effectively target our management.

Felmersham Gravel Pits

Aerial images were used by the reserve team to locate small patches of water soldier *Stratiotes aloides*. This enabled the team to plan the route taken by a boat and remove this invasive species by hand. Access is difficult at this site and its visibility is a problem without aerial imagery. This survey supported the Natural England Conservation & Enhancement Scheme at the site.



Figure 4 Aerial image of Felmersham Gravel Pits showing targeted area of water soldier (2016)



Figure 5 Close-up of water soldier from fig 4 (2016)

Figure 5 shows how the distinctive rosette pattern of water soldier can be seen from detailed aerial images. It is possible to see the species whilst floating and submerged due to high water clarity at the site.

Suncote Pit

Suncote Pit is an extension of Sewell Cutting. Scrub management at this site is being planned using recent aerial imagery. One possibility is to find the most efficient way to join the existing clearings by cutting through bramble and other scrub.



Figure 6 Suncote Pit showing existing clearings and extensive scrub growth - overlaid on Google Satellite image (2016)

Fulbourn Fen

The entire site was surveyed – with the images from 6 individual flights stitched together into a single image. Images were taken before scrub removal to enable future monitoring of controlled trials.



Figure 7 Detail of scrub growth at Fulbourn Fen (2016)

Figure 7 shows how widely small scrub is distributed across this part of the site – making conventional survey very difficult.

Collyweston Quarries

Drone images have mainly been used to see where scrub may be encroaching into the meadow so that we can target future scrub clearance. As a SSSI, they are useful for estimates of scrub cover for Natural England. The images are also useful for events to help promote the work we do at Collyweston.



Figure 8 Aerial image of Collyweston Quarries with reserve boundary and Streetmap (2016)

Twywell Gullet and Whitestones

This was an extensive survey to look at habitat change over time. Scrub growth in the Gullet is particularly difficult to assess without a UAV, due to steep banks and dense bramble growth.



Figure 9 Twywell Gullet and Whitestones image with Streetmap (2016)

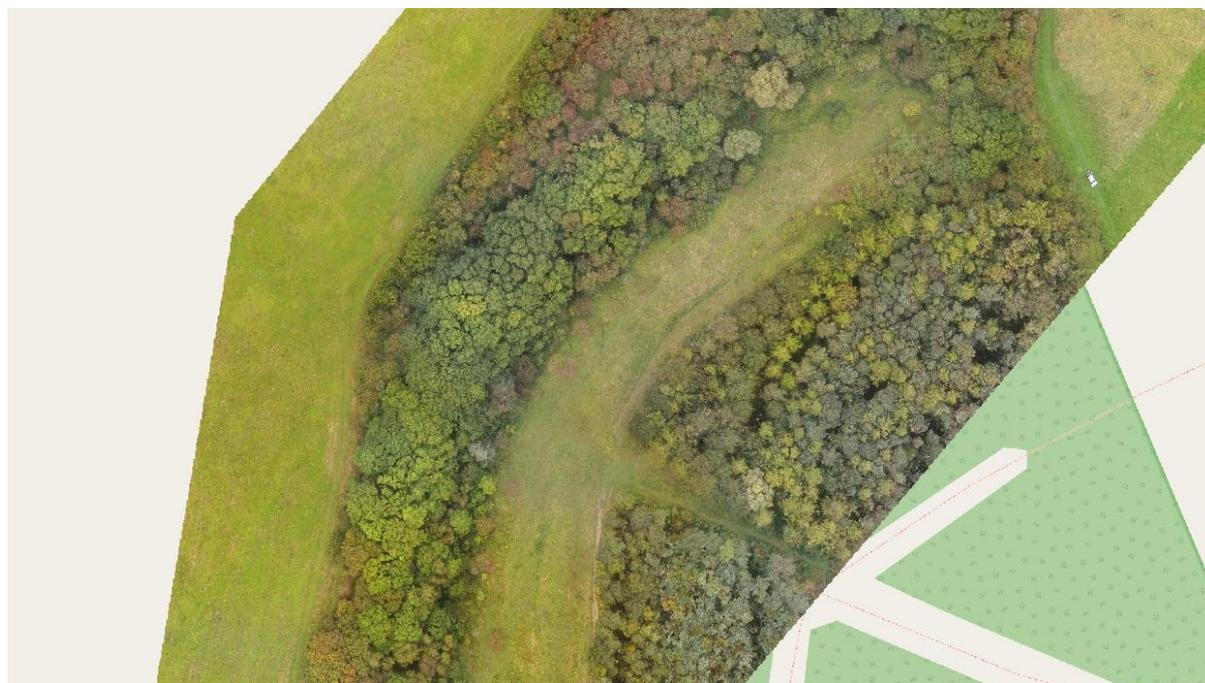


Figure 10 Detail from fig 9 showing Gullet, woodland and grassland with Streetmap (2016)

Kings Cliffe Cutting & Meadow

This was an extensive survey of this disused railway cutting, common land and meadow. The surveys were funded by 'scrub-off' to support and direct future habitat improvements.

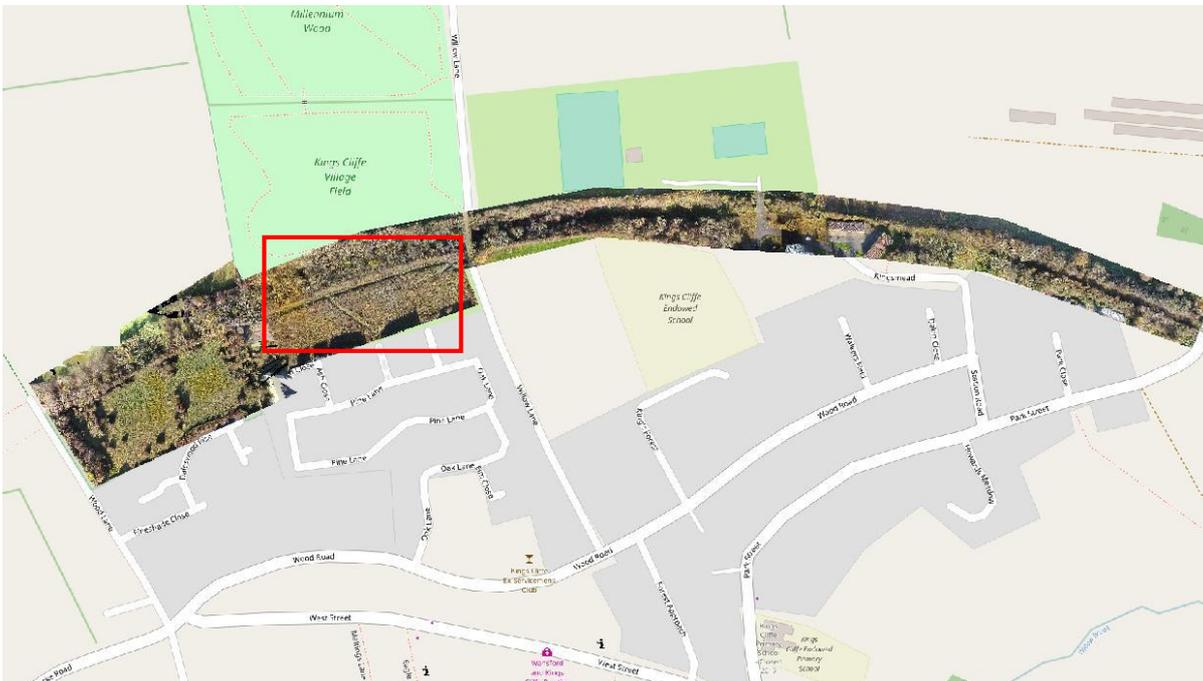


Figure 11 Kings Cliffe cutting, common and meadow with Streetmap (2016)



Figure 12 Detail from fig 11 showing common (2016)

Cherry Hinton Chalk Pits

Remote sensing software was used to analyse the images taken by a contractor at Cherry Hinton in 2010 and 2016.

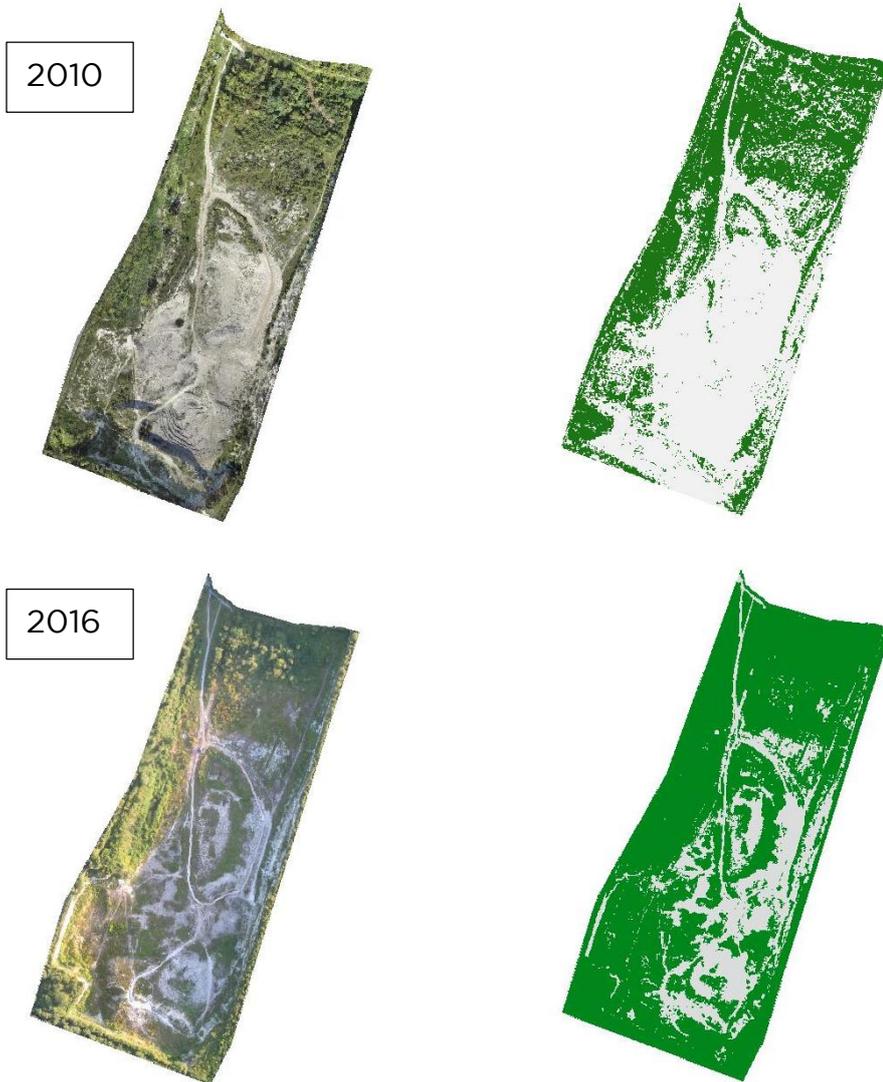


Figure 13 Remote sensed images from Cherry Hinton showing areas of vegetation (green) and bare chalk (light grey). Top images were taken in 2010 and bottom images in 2016

Figure 13 shows that the area of bare chalk has declined from 58% - 24% since 2010. This information is being used to make a proposition to Natural England for maintaining bare chalk as early successional habitat.

Paxton Pits

Aerial images of Cloudy Lake were used to map habitats and assist with development of a new management plan. Current images were compared with google satellite data to monitor change over time.



Figure 14 Google satellite image of Cloudy Lake at Paxton Pits



Figure 15 UAV aerial image of same location (2016)

2017 and future developments

The first year of aerial imagery has shown potential applications of the technology. The next stage is to develop processing of the images – using software similar to the example at Cherry Hinton.



Figure 16 Clipped aerial image of Mouldings Meadow at Godmanchester Nature Reserve (2017)



Figure 17 Habitat map following manual processing in QGIS. Tree/scrub is in green and reed is in yellow/brown

Recent aerial images at Godmanchester (fig 16) have been used to provide an example of manual habitat mapping. In this case QGIS was used to manually draw polygons around the different habitat types of tree/scrub and reed/rush (fig 17). This provides a relatively quick way of estimating cover for different habitat types and can help to record change over time and direct future management.



Figure 18 Detail of Mouldings Meadow (2017)

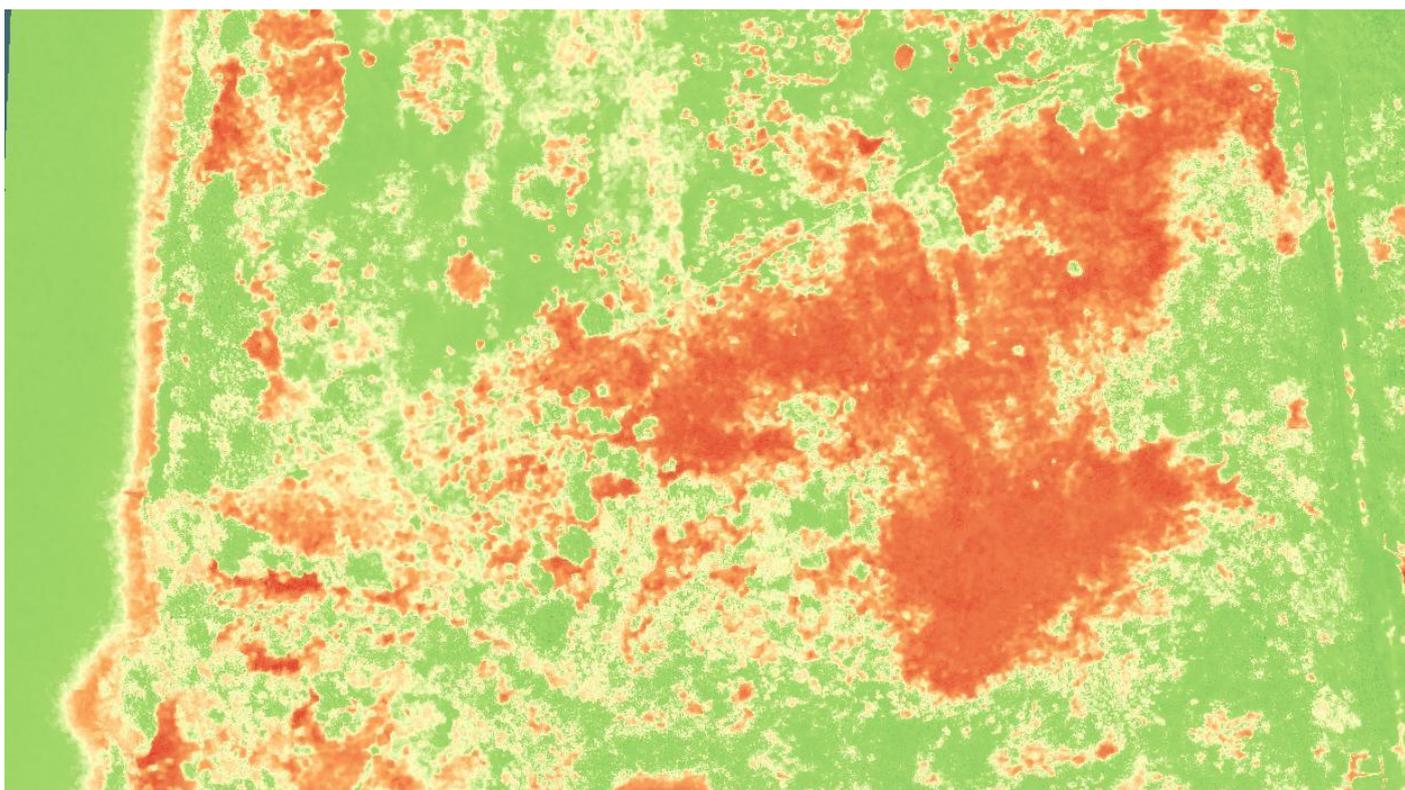


Figure 19 Remote sensed image of fig 16 using NGRDI analysis

Figure 19 shows a remote-sensed image from Mouldings Meadow using NGRDI (normalized green red differences index analysis). This analysis uses the RGB spectrum (standard camera) to indicate surface greenness. This is therefore an indicator of leaf chlorophyll content and plant health - but can be used in conservation to differentiate habitat types and plant species.

In the image above (fig 19), brown reed and other patches of dead vegetation display as red. Green growth (and water) displays somewhere on a spectrum from green to yellow/red.

With further research it may be possible to automatically estimate habitat cover using this software.

Suggestions for future work are:

- Further research into image analysis;
- Routine surveys at sites where change over time is recorded;
- Before and after surveys following habitat management;
- Surveys of controlled trials at Coopers Hill (heather) and Fulbourn (scrub).