



Opportunities for expanding ancient woodland across the Greensand Country

Author:

Dr Jim Rouquette & Dr Mark Ashby

Reviewed by:

Dr Alison Holt, Natural Capital Solutions

Contact details:

Dr J.R. Rouquette

Natural Capital Solutions Ltd

www.naturalcapitalsolutions.co.uk

jim.rouquette@naturalcapitalsolutions.co.uk

Report prepared for and funded by:

The Greensand Country Landscape Partnership, funded by the
National Lottery Heritage Fund

April 2021



Introduction

The importance of landscape-scale conservation and ecological networks has become increasingly recognised over recent years. Many wildlife sites have become isolated in a landscape of unsuitable habitats and efforts are now being directed towards linking existing habitat patches and increasing connectivity. Species are more likely to survive in larger habitat networks, are able to move and colonise new sites, and are more resilient to climate change and other detrimental impacts.

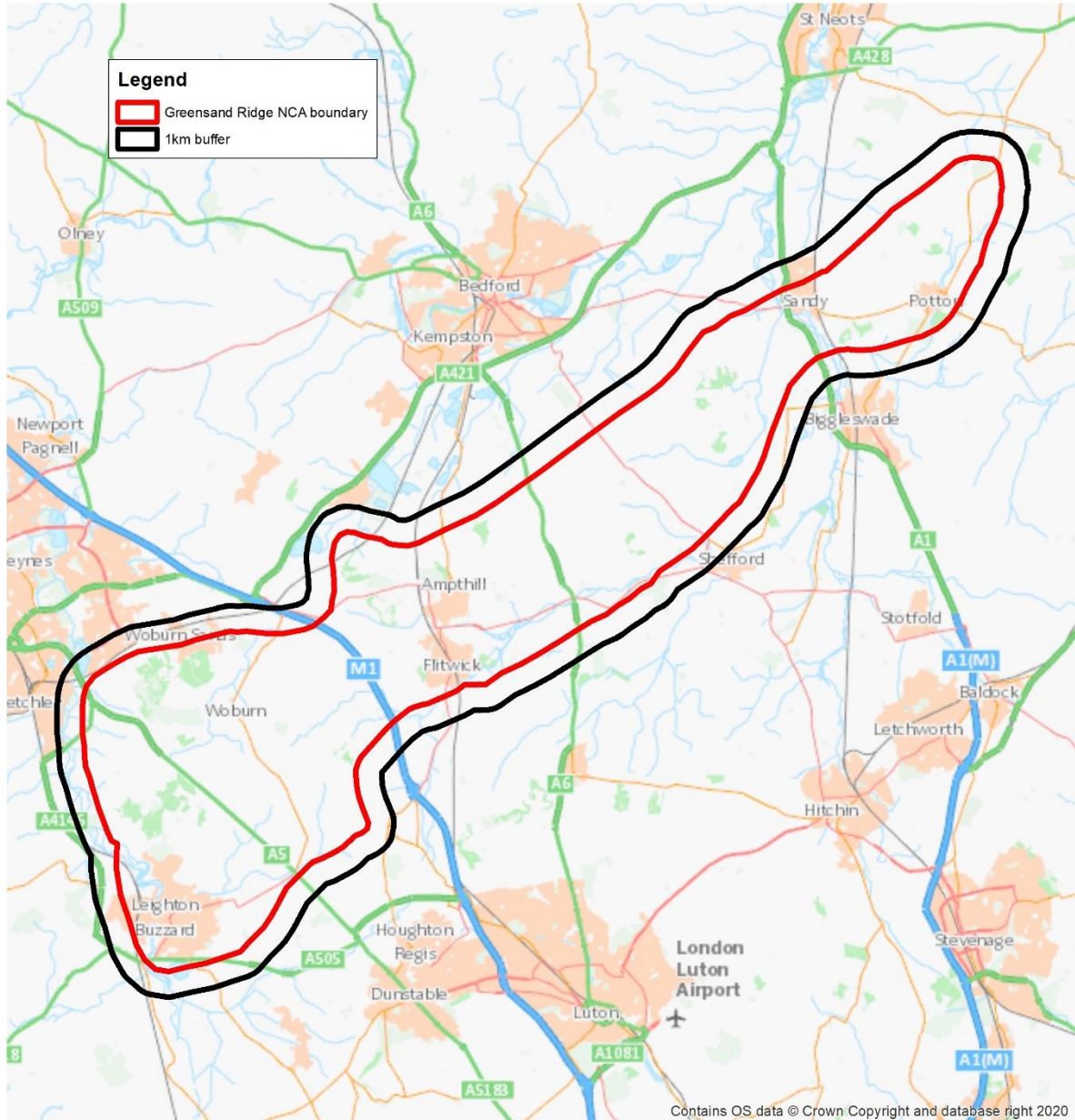
Habitat opportunity mapping is a Geographic Information System (GIS) based approach used to identify potential areas for the expansion of key habitats, whilst taking constraints into account. Habitat opportunity mapping to enhance biodiversity uses ecological networks to identify potential areas for new habitats. Identified areas will be ecologically connected to existing habitats, thereby expanding the size of the existing network, increasing connectivity and resilience, and potentially increasing the ecological quality of the new site.

Here we have identified opportunities to expand new woodland, focussing particularly on expanding ancient woodland patches. Ancient woodland is woodland that has been in existence since at least 1600 and represents the most important and biodiverse woodland sites in the UK. There are two types of ancient woodland identified: ancient semi-natural woodland (ASNW) and plantations on ancient woodland sites (PAWS), which are locations where the original tree cover has largely been felled and replaced by plantation forestry, but understory flora and abiotic conditions often remain and are sites that can be readily returned to a more natural state. In this short report, we present opportunities for woodland expansion around ancient woodland sites and compare this to wider opportunities around all broadleaved woodland areas.

Location

This assessment focusses on the Greensand Country; a distinctive area of sand and sandstone that forms a ridge between the clay vales of lowland Bedfordshire, to the south of Bedford (Figure 1). Greensand Country stretches for 45 km, the vast majority in Bedfordshire, but reaching onto Cambridgeshire at the eastern end and Buckinghamshire and Milton Keynes at the western end. This study area is similar to the Greensand Ridge National Character Area (NCA 90), which was also the basis for the Greensand Nature Improvement Area (NIA). However, as the Greensand Country has a slightly different boundary and occupies some areas just outside of the Greensand Ridge NCA, we have produced maps and analyses for the Greensand Ridge plus a 1 km buffer (Figure 1).

The Greensand Country study area



© Natural Capital Solutions Ltd 2021. Contains Ordnance Survey data
© Crown copyright and database right 2021

0 10 km 1:200,000
(at A4 paper size)

Figure 1: The Greensand Country study area.

Approach

We determined opportunities based on two different woodland types:

- A. Ancient woodlands
- B. All broadleaved and mixed woodlands

The approach required a map of habitats across the area and a way to identify woodland areas of interest. To create a map of habitats, a natural capital basemap was created as part of a parallel project to carry out a natural capital assessment for Bedfordshire. This was based on the OS Mastermap Topography GIS layer (the most detailed mapping available across GB), but then used a series of additional data sets to classify each polygon within OS Mastermap to an appropriate habitat type. Full details of the method and data used can be found in the Bedfordshire Natural Capital Assessment report. The Bedfordshire basemap was merged with similar maps produced using the same methodology for Cambridgeshire, Buckinghamshire and Milton Keynes and then clipped to the Greensand Country boundary.

To identify ancient woodlands, we used the Ancient Woodland Inventory, published by Natural England, which highlights all ancient semi-natural woodland (ASNW) and plantations on ancient woodland sites (PAWS). To identify all broadleaved and mixed woodlands, we used the basemap described above. Note that some PAWS sites are coniferous woodland, so will not be included in the broadleaved and mixed woodland map.

Biodiversity opportunity mapping followed a four-step process, as explained below, and was based on the approach developed by Catchpole (2006)¹ and Watts et al. (2010)².

1. Landscape permeability

This step involves assessing the permeability of the landscape to typical woodland species and builds on work carried out by JNCC, Forest Research and others. Generic focal species are assessed to provide an average assessment for typical broadleaved woodland species. It is assumed that a species will have optimal dispersal capabilities in broadleaved woodland and hence the landscape is fully permeable if it consists only of this primary habitat. Each of the remaining habitat types is then assigned a permeability score that shows how likely and how far the species will travel through that habitat. Habitats are scored on a scale from 1 (most permeable) to 50 (least permeable). Permeability scores were based on expert scores compiled by JNCC and then adjusted by Natural Capital Solutions for the area. High (10m) resolution maps were then produced showing the permeability of the landscape for each polygon in the basemap for these generic woodland species.

2. Habitat networks

Step 2 uses the permeability map created above, along with information on average dispersal distances, to map which habitat patches are ecologically connected and which are ecologically isolated from each other. Woodland source areas were identified for the two types of woodland, as described above. Dispersal distances were obtained from JNCC, which had performed a review of the scientific literature to ascertain the dispersal distances of a range of species for each habitat type. These were

¹ Catchpole, R.D.J. (2006). Planning for Biodiversity – opportunity mapping and habitat networks in practice: a technical guide. *English Nature Research Reports*, No 687

² Watts, K., Eycott, A.E., Handley, P., Ray, D., Humphrey, J.W. & Quine, C.P (2010). Targeting and evaluating biodiversity conservation action within fragmented landscapes: an approach based on generic focal species and least-cost networks. *Landscape Ecology*, 25: 1305–1318.

typically species of small mammals, smaller birds, butterflies, and plants. The average dispersal distance for broadleaved and mixed woodland was taken to be 3.0 km.

3. Identifying constraints

The habitat network map created in Step 2 can be used to indicate where new habitat could be created; any habitat created within the existing network would be ecologically connected to existing patches. However, in reality a number of constraints exist that need to be taken into account when producing opportunity maps. The aim of this step, therefore, is to produce a series of maps of constraints that can be used to show where habitat cannot or should not be created. The following constraints were mapped:

- Land-use constraints – infrastructure (roads, railways, and paths), urban (all buildings), gardens, and water (standing and running), as it is highly unlikely that these would be available for habitat creation.
- High quality habitats – all existing habitats of high nature conservation interest were identified, as it would not make sense to destroy existing high-quality habitat to create new habitat of a different type. A full list of these habitats is shown in the box below.
- Historic sites – data were obtained from Historic England on the location of Scheduled Monuments, Registered Parks and Gardens, and Registered Battlefields across the study area and a 30m buffer was applied around each individual site, as recommended by Historic England.
- National Grid gas pipelines, overhead lines and cables – data were obtained from the National Grid and a 10m buffer was applied around both features, as it would not be possible to plant trees in these locations.

High quality habitats

The following habitats were identified from the basemap and used as constraints:

- | | |
|---|----------------------------|
| • Broadleaved woodland | • Floodplain grazing marsh |
| • Mixed woodland | • Marshy grassland |
| • Woodland/scrub with semi-natural habitats | • Heathland |
| • Unimproved and semi-improved acid grassland | • Fen, marsh and swamp |
| • Unimproved and semi-improved neutral grassland | |
| • Unimproved and semi-improved calcareous grassland | |

4. Habitat opportunity for biodiversity

In the next step, the constraints map was used to exclude areas that would be unsuitable or unavailable for new habitat. Two layers of habitat opportunity were then created for each type of woodland (ancient woodland and all broadleaved and mixed woodland):

- **Buffer opportunity** – this layer identified habitat opportunity areas that are immediately adjacent to existing habitat patches and fall within the previously identified ecological network.
- **Stepping-stone opportunity** – this layer identified potential sites that fall outside of the ecological network, but are immediately adjacent to it. These areas could potentially be used to create stepping-stone habitats that could link up more distant habitat patches.

For both opportunity layers, a minimum threshold size was set at 0.1 ha, to remove tiny fragments of land and to replicate the minimum sizes of habitat creation grant schemes.

As the above map identifies portions of land in relation to the ecological network for each habitat, it often results in thin slivers of land being identified adjacent to existing habitats, which bear no relationship to existing fields and boundaries. As habitat creation or restoration projects usually operate on whole fields, an additional step was taken to identify those fields that present buffer or stepping-stone opportunities. To do this, the buffer layer was overlain over a version of the basemap with all constraints removed, to identify whole fields that are immediately adjacent to existing habitat patches and are not constrained by the factors described in Step 3. Parts of these fields fall within the previously identified ecological network and creating new habitat will extend the network. To avoid the chance of identifying fields where only a tiny corner fell within a buffer zone, a minimum threshold was set, so that at least 10% of the field or polygon needed to fall within the buffer zone for the field to be identified. In the same way, the stepping-stone layer was also overlain to identify whole fields and polygons that fall outside of the ecological network, but are immediately adjacent to it.

Results

The Greensand Ridge NCA and 1km buffer zone contains 1,534 ha of ancient woodlands, consisting of 750 ha of ancient semi-natural woodlands and 784 ha of plantations on ancient woodland sites (Table 1). Together these occupy 4.0% of the land area. Together with the Yardley Whittlewood Ridge in the north of Bedfordshire, these are the only two areas with significant ancient woodlands across the whole of Bedfordshire. Woodland cover as a whole is shown in Table 2 and occupies 4,748 ha or 12.4% of the area. Ancient woodlands therefore make up approximately 32% of the woodland resource across the area, although only about half of these are ancient semi-natural woodlands. Note that although all the ancient semi-natural woodlands will be broadleaved woodlands, several of the PAWS sites are coniferous woodland, therefore, the ancient woodlands are not a subset of the broadleaved woodland category. The Greensand ancient woodlands are mapped in Figure 2 and broadleaved and mixed woodlands are shown together in Figure 3.

Table 1 Area and percentage cover of ancient woodland across the Greensand Ridge and 1km buffer.

Broad habitat	Area (Ha)	% cover
Ancient semi-natural woodlands (ASNW)	750	2.0
Plantations on ancient woodland sites (PAWS)	784	2.0
Total ancient woodlands	1,534	4.0

Table 2 Area and percentage cover of woodland types across the Greensand Ridge and 1km buffer.

Broad habitat	Area (Ha)	% cover
Broadleaved woodland	3,266	8.5
Coniferous woodland	1,208	3.2
Mixed woodland	273	0.7
Total woodland cover	4,748	12.4

Opportunities to expand ancient woodlands are shown in Figure 2. Opportunities exist across the Greensand Ridge and will be particularly effective at joining together sites that are currently relatively close together but are disconnected. In some locations creating these opportunities will create quite large networks of sites. Note that Figure 2 shows the field scale opportunities – whole fields that present opportunities and fall within an opportunity zone, with buffer opportunities identified adjacent to existing sites, and stepping-stone opportunities identified slightly further away.

Figure 3 shows field scale buffer and stepping-stone opportunity areas for the wider broadleaved and mixed woodland resource, not limiting the analysis to ancient woodland, and shows that extensive opportunities are present across the area. Woodland is currently spread right across the area, but is rather scattered into lots of fairly small patches. Woodland creation based on the opportunity maps could increase the connections between these woodland patches, to create a much larger, more resilient network.

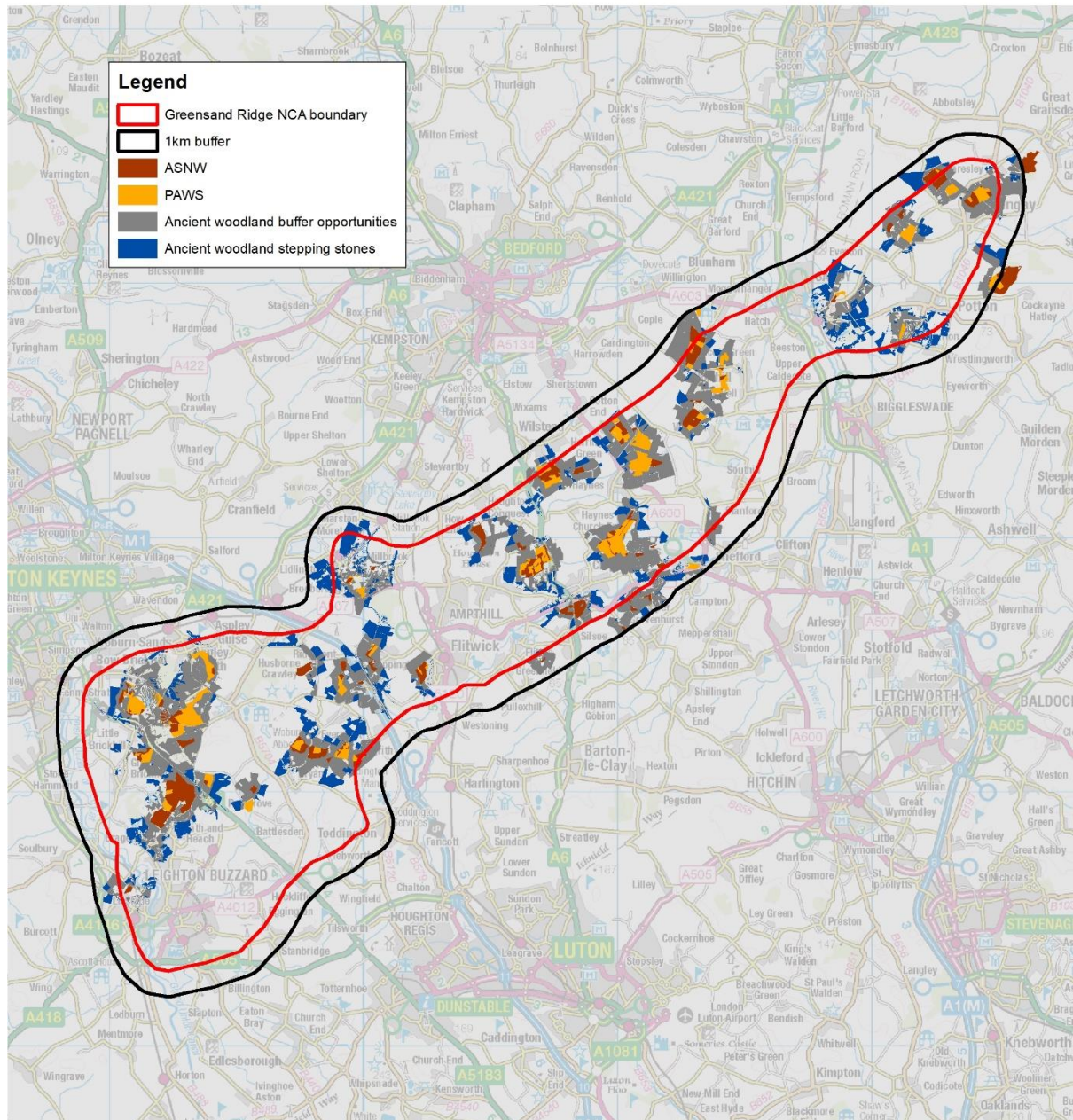
Conclusion

Greensand Country contains a number of ancient woodland sites, which are spread across the area, within a larger network of woodland. The ancient woodland patches are largely ecologically isolated from each other. Opportunity mapping has identified locations where new woodland could be created to enlarge existing ancient woodland sites and to start to connect sites, thereby increasing the ecological resilience of the network. Opportunities have also been mapped for the wider broadleaved and mixed woodland network, which offers opportunities to expand woodland cover and increase connections across the area.

In terms of priorities for woodland conservation across Greensand Country, we would recommend the following (in priority order):

1. Explore options for restoration of PAWS sites wherever possible. These are locations that occupy ancient woodland sites and often still contain ancient woodland flora, mycorrhizal communities and abiotic conditions that could help to establish ecologically rich sites following careful management.
2. The opportunity areas identified around existing ancient woodland sites (Figure 2), represent the priority locations for new woodland creation as these can be used to expand, buffer and join together existing sites. This will increase the resilience of the existing network and enable it to better withstand pressures caused by climate change and other factors. They can also be used to provide recreational opportunities in woodland, thereby reducing impacts on any sensitive ancient woodland sites.
3. Opportunity areas around the wider network of broadleaved and mixed woodland (Figure 3) has identified a series of locations of secondary importance for habitat creation. Many of these locations could still be important for expanding woodland cover, enhancing connectivity, and delivering a range of ecosystem services, so would be worthy of further investigation, but are less important from an ecological perspective compared to the above.

Opportunities to expand ancient woodland sites



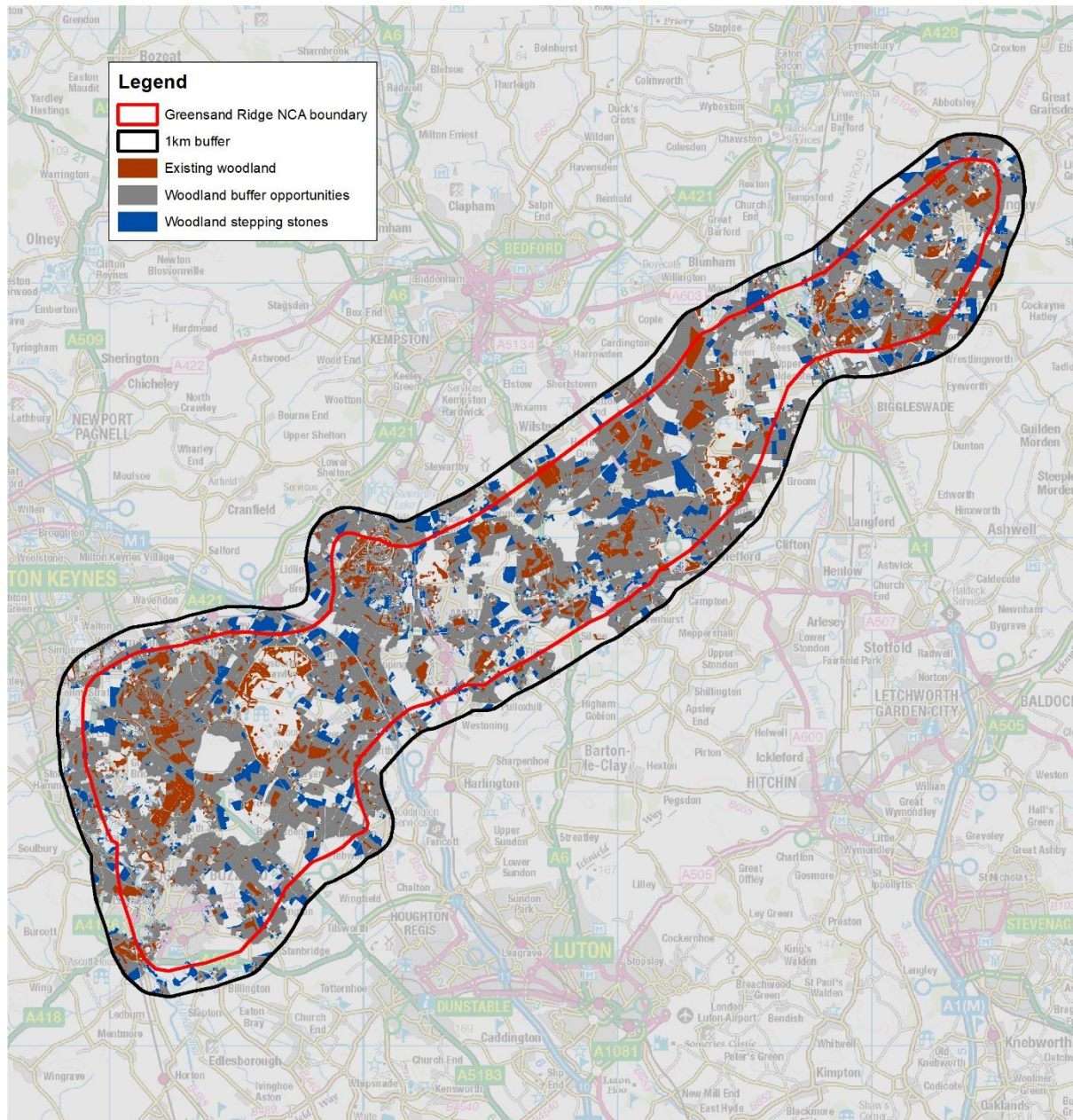
© Natural Capital Solutions Ltd 2021. Contains Ordnance Survey data
© Crown copyright and database right 2021

0 10 km 1:200,000
(at A4 paper size)



Figure 2: The location of ancient woodlands across the Greensand Country and field-scale opportunities to expand these habitats. ASNW are ancient semi-natural woodlands and PAWS are plantations on ancient woodland sites.

Broadleaved and mixed woodland opportunity areas



© Natural Capital Solutions Ltd 2021. Contains Ordnance Survey data
© Crown copyright and database right 2021

0 10 km 1:200,000
(at A4 paper size)

Figure 3: Existing broadleaved and mixed woodlands of all ages, and field-scale opportunities to expand these habitats.