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Anthropogenic biodiversity and geodiversity – can legacy industrial waste help offset falling global biodiversity?

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Anthropogenic substrates are produced as waste materials and/or by-products of various industries. Such substrates include: blast furnace/steel slag; colliery spoil; oil shale spoil; and paper mill sludge (Ash et al. 1994; Riley et al. 2020). Historically, in the UK, these substrates were dumped in or close to the sites where they were being produced (Riley et al. 2020). Many examples of anthropogenic substrate sites still exist in the UK, despite the fact that there has been much cultural motivation to restore these sites (Ash et al. 1994; Bradshaw, 1995; Riley et al. 2020). This often results in either the total removal of anthropogenic substrate, or the covering of anthropogenic substrate with a clay cap/similar natural substrate. However, if left undisturbed, such sites could potentially provide undisturbed spaces for wildlife.

Various studies have been carried out which demonstrate that wildlife, including unusual and/or important species communities, can colonise and live on anthropogenic substrate sites (Ash et al. 1994; Riley et al. 2020). It is important to note that because anthropogenic substrate often differs greatly from the natural substrate in the surrounding area, such sites can support species and communities which might not otherwise survive in that area. For example, plants that rely on calcareous substrates might settle on slag sites or on Solvay process waste sites, but might not otherwise settle in the area if natural calcareous substrate is absent (Ash et al. 1994). Anthropogenic substrate sites can, therefore, act as refugia for many species and communities.

This study investigates three important aspects of anthropogenic substrate sites: substrate chemistry and mineralogy; plant species and communities; and certain invertebrate species. The investigation of these aspects allows for a detailed study of both anthropogenic geodiversity and biodiversity. For the substrates, various analyses will be carried out to determine the minerals, elements and pH levels present, including X-ray Diffraction, ICP and pH analysis for the six study sites. Different plant communities, as well as the species within them, were recorded in 2021 using quadrats in the six study sites. Different invertebrate species were recorded in 2021, throughout three of the study sites. Due to the current biodiversity crisis, it is more important than ever before to record and assess the biodiversity of places, especially if such places are often overlooked in terms of biodiversity potential. Additionally, very few studies have investigated the relationships between plant species and the mineralogical and elemental composition of the substrates on

which they are growing – this work helps us to investigate plant establishment, survival and growth on anthropogenic substrates in a novel manner.

Ash et al., 1994, J. Appl. Ecology, 71, 74-78

Riley et al., 2020, J. Geochem. Explor., 219, 106630

Bradshaw, 1995, Can. J. Fish. Aquat. Sci. 53, 3-9