

Introduction about British Limestone Grasslands

Ms. Meenakshi Jhanwar

Assistant Professor, Department of Environmental Science, Presidency University, Bangalore, India,
Email Id-meenakshi@presidencyuniversity.in

ABSTRACT:

British limestone grasslands are exceptional ecosystems with a wide range of plant species, distinctive plant adaptations, and a striking aesthetic. They serve as vital habitat for many species and are influenced by conventional land management techniques. The ecological, cultural, and aesthetic value of these priceless grasslands is threatened, and conservation efforts are essential to protect and restore them. The term British limestone grasslands describe a particular kind of grassland habitat that is mostly found on limestone or chalk bedrock in the United Kingdom. The distinctive geological foundation of these grasslands and the plant communities that have evolved to the particular conditions of these habitats are what make them distinctive.

KEYWORDS:

Blue Moor, Carboniferous Limestone, Land Management, Management Techniques, Plant Species.

I. INTRODUCTION

The lowland limestone grasslands of Britain are characterized geochemically by their predominance of calcium carbonate-rich rocks. Additionally, they served as southern England's primary sheep pastures until recently and were not enclosed. These grasslands are frequently referred to as semi-natural grasslands, despite the fact that they may have never been farmed or have avoided cultivation for hundreds of years. They are distributed over five major geological formations in England, Chalk, limestone politic, crystalline limestone, Magnesium calcite the Devonian limestone. Physical rather than chemical variations appear to be the most significant ones that affect the vegetation they carry. Since limestone's are tougher, they frequently produce rocky outcrops on slopes that can develop into cliffs, which are frequently accompanied by screes. There are large areas in some districts where caustic features landscape elements formed when rocks are broken down by flowing water are created. It has been hypothesized that the difference in rock hardness may have played a significant role in shaping the current flora, with the harder rocks particularly those on cliffs, gorges, and other exposed sites possibly remaining exposed throughout the period of forest maximum while the softer limestone hills were covered in trees in the early post-glacial era.

This idea proposes that some of these sites may have acted as refuges for plants before forest clearing by people throughout the Neolithic (3000-1850 B.C.) and Bronze Age (1850-550 B.C.) periods led to the colonization of the open grasslands. Lowland calcareous grasslands are formed from sedimentary layers of serpentine, mica schist, or other forms of limestone, such as chalk. Calaminarian grassland can also grow on other base-rich substrates such ultrabasic igneous rocks and soil that has been contaminated with heavy metals. On shallow rending soils on calcareous bedrock, the most diverse communities with distinctive flora, including some significant lower plant groups, distinctive and specialized invertebrates, and birds can be found. Other criteria for quality include the existence of transient disturbance patches, places with continuous low-intensity grazing, and patches of growing and mature scrub [1], [2].

Large sites frequently appear along escarpments where traditional farming methods are not prevalent and the calcareous bedrock is not covered by soils from glacial deposits. Large or smaller contiguous areas are more likely to support distinctive species with wide distributions and offer chances for decolonization when local extinctions do occur. The southernmost point of Great Britain is in Cornwall's Lizard peninsula. There are more nationally identified Sites of Special Scientific Interest (SSSIs) and regionally significant county geology sites (formerly known as RIGS) in Cornwall than anywhere else. The Lizard's rocks are entirely distinct from those in the rest of Cornwall. The serpentine, which is the greatest outcrop, is the most extensive (20 square miles).

Serpentine and gabbro create soils that are rich in magnesium or calcium, and it is this alkalinity that has allowed numerous, extremely rare plants to flourish in these areas of the Lizard, including dropwort, salad burnet, bloody cranesbill, and the rare Cornish heath that can only be found there.

Chalk

Chalk is a particularly soft variety of limestone that weathers to produce rounded, smooth hills known as downs or worlds, which are frequently divided by valleys with flat bottoms and noticeable spurs. About 60 million years ago, the rock formation was formed in shallow seas. Chalk only creates cliffs at the coast (such as the White Cliffs of Dover) and rarely outcrops. There are four primary regions that make up the English down land:

1. The North Downs in Surrey and Kent.
2. The larger South Downs of Hampshire, Sussex, and the Isle of Wight.
3. Chiltern Mountains.
4. Salisbury Plain is located in the middle of the Wiltshire, Dorset, Hampshire, and Berkshire Wessel Downs.
5. The majority of this area's townlands were used for sheep farming up until the middle of the 20th century. Wooded areas can be found all across the chalk, and certain regions, like the Chilterns, have significant beech forests. Unglazed chalk grasslands will eventually be overrun by trees and plants. These data serve as the foundation for the conservation of down land since they show that grazing by animals, mostly domestic sheep and wild rabbits, is the only factor keeping grassland stable today. The original forest that covered these chalk hills must have been at least partially removed by 2500 B.C., according to the concentration of late Neolithic artefacts on the Wessel Downs and, to a lesser extent, on the South Downs; it is possible that in these areas, a significant portion of the chalk grassland turf is about 4,000 years old. The open down land must have originated much more recently in other locations, such as the North Downs, where there was no such pervasive early civilization. In numerous locations, lynchets, or ancient Celtic ploughing terraces, can be seen in mature beech forests of today, suggesting that the woodland of today may not be all that old.

More Robust Limestone

When referring to calcareous strata that are older and harder than chalk, the word limestone is frequently employed. As a generalization of their distribution, it can be said that in the British Isles, the chalk areas are found in the east and south-east of England, where the young rocks are exposed; next, to the north and west, are located the older Politic limestone's, which are the soft yellowish stone so beautifully used for construction in the Cotswold's, for example; and finally, farther north and west, in a larger arc, are the Carboniferous or Mountain limestone's, such as the majority of the rocks in north and west Britain are ancient siliceous strata, and the limestone's are sparsely distributed there. Although there is a lot of Carboniferous limestone in Ireland, very little of it is devoid of peat, which is kept as an organic ground cover due to the country's extremely humid environment. In general, climatic variations may be used to explain a large portion of the geographic heterogeneity of lowland calcareous grassland over the entire nation [3], [4].

II. DISCUSSION

Upper Wharf dale's shallow limestone soils are deficient in nutrients and support a variety of interesting species that would otherwise get overgrown. These well-drained fields' long-standing grazing practices hold down the coarser plants that may otherwise outcompete smaller ones. Twit, a bird whose number in Britain is significant for Europe, feeds on the limestone grasslands in the autumn. Other species that frequent these regions include buzzard, which has recently returned to upper Wharf dale, redstart, green woodpecker, wheatear, and lapwing. The bird's-eye primrose, also known as mealy primrose, is a typical flower of the limestone grasslands. Geoffrey Grison called it one of the dozen most exquisite natives of the British Isles because of its dusty white stem and under-leaves. It frequently coexists with the insectivorous butterwort in moist depressions. Its only geographic range is the northern Pennines. The nationally endangered blue moor-grass, sheep's fescue, and herbs such limestone bedstraw, thyme, small scabrous, salad burnet, and common rock-rose are frequently found in the Malham-Arncliffe region.

Larger flowers, such as bloody crane's-bill and the nationally endangered Jacob's ladder, flourish in locations where grazing is less severe. Wild thyme, common milkwort, fairy flax, bird's foot trefoil, salad burnet, autumn gentian, harebell, eyebright, and the critically endangered limestone bedstraw can all be found at Cool Pasture. A tiny fern called moonwort can be found in various amounts depending on the season. There are a number of mountain and northern species that can be found here, including mountain havens, which is at its southernmost

point in England, alpine cinquefoil, which is also found in Scotland, and mountain everlasting, which has declined in its lowland habitats and is now found in the uplands. There are large areas of calcareous grassland, including sheep's fescue, rockrose, dropwort, and limestone bedstraw at Coniston Old Pasture. In flushed regions, you can find grass of Parnassus and bird's eye primrose.

A limestone grassland flora, which includes blue moor-grass and herbs like common rockrose, bloody crane's-bill, salad burnet, and betony, has formed in the more open areas of Grass Wood. A patch of limestone grassland with rockrose, thyme, and purging flax can be found at Hawks wick Wood. Butterwort and purple moor grass grow in seepage areas. A variety of calcareous herbs, including salad burnet and fairy flax, and blue moor-grass are found in the grassland on the steep top slopes of Soaks Wood. In Pen-y-Ghent Gill, salad burnet and fairy flax are some of the dominant herbs along with blue moor-grass. Upper Wharf dale's thin dale side soils support common rock-rose, wild thyme, and autumn gentian in addition to blue moor-grass and limestone bedstraw, two plants that are exclusive to the Carboniferous Limestone of Northern England. Both kinds of kidney vetch and dropwort, which are uncommon in the Dales, may be found nearby [5], [6].

Plants

The various categories of plants are a generalization of regional botanical diversity. Helianthemum Apennine, for instance, is confined to the outcrop of Devonian limestone and to specific regions in the Men dips in Matthew's oceanic southern biodiversity factor, while Celeriac valerian is confined wholly to the Men dips. While Polygala caldaria is more widely distributed, its abundance peaks in the western chalk grasslands and its northern limit on the Politic limestone in Rutland. Polygala caldaria is a significant species of the Chalk and Politic limestone inside the marine southern element. Matthew's continental southern element includes 26 European species, the majority of which are rare or local plants of calcareous grasslands. In Britain, this element has a noticeably southern distribution, with the highest species density in south-east England, south of a line connecting the Bristol Channel and the Wash. Zero Opry's fuciflora. Purplish and zero. Simian are only found in the chalk in Kent, and there are no 0.

Spheroids has been discovered in the Jurassic formations of Dorset, Kent, Sussex, and the Isle of Wight. Hippocratic compose, one of the more frequent species in this group, can be found as far north as the carboniferous limestone in northern England, although it is only abundant in the chalk meadows of southern England. The following other species, each with a distinctive pattern of distribution, are also a part of this significant south-eastern floristic element. Many of the uncommon species that are typical of the chalk and politic limestone in the south and southeast and are largely absent from the western Carboniferous limestone are found in the continental element. On the carboniferous limestone of Northern England, the northern and sub-montane calicle element of the flora is well represented below 1,000 feet, but only one species of this floristic element reaches the chalk, even though Rhytidium rug sum is widely distributed on the chalky boulder clay in the Rockland.

Animals

The distribution of animals is largely influenced by the same variables that seem to drive the spread of plant species. The special wealth of the fauna in these counties is unquestionably related to the proximity of the European Continent to the eastern chalk in Kent and Sussex. Although the insects of the Cornish peninsula, particularly those associated with vegetation of the calcareous maritime serpentine rocks at the Lizard, are likely to include many species that are unique to this part of Britain, relatively few species appear to be more numerous or only present in western Britain. There is little question that species like the Small Blue butterfly Cupid minimums are more prevalent in Western Britain than the East. In Britain, the distributions of several animal species are distinctly southern. Some are unique to England's south coast, others are absent north of the Thames, while still others are found only in the Midlands. Finding out whether a species is unique to limestone formations is frequently challenging, especially in the case of rapacious species. In southern England, limestone warms up quickly and shares a wealth of thermophiles animal species with erinaceous and cindery substrates that are less common on the colder clay soils [7], [8].

The presence of specific food plants and their abundance are frequently directly correlated with the diversity of phytophagous animals on limestone in southern Britain. The physical properties of limestone rocks and soils, their abundance in southern England, and the development and diversity of the vegetation on limestone's appear to be the most crucial variables in influencing the distribution and abundance of the animals. When it comes to the existence of numerous terrestrial Mollusca, for instance, chemical considerations can often be of utmost importance. Many marine species are strongly correlated with limestone cliff tops and cliff faces, suggesting that the presence of the water may have a strong moderating influence. The makeup of the fauna has been influenced

by the history of the grasslands in Britain over several time periods, including the long term i.e., throughout the Pleistocene, the medium term and the recent. Studies on paleoecology have revealed how Britain's fauna has changed over the course of recent geological time. The fossil fauna gathered from various sites reflects the evolution of grasslands from the prehistoric forest. Historical examples of the significantly altering impact of human activity on the fauna of calcareous grasslands include the introduction of the Rabbit (*Oryctolagus cuniculus*), the extinction of the Great Bustard and the nearly extinct Large Blue butterfly (*Masculine anion*).

Locations and Objectives

The objectives for lowland dry calcareous grassland were listed in the Biodiversity Challenge and Agenda for Conservation in the UK (1994), which was created by a consortium of non-profit conservation organizations. Create and/or sustain adequate management of the current resource while safeguarding locations from destructive activity. To construct a buffer zone for the main site, restore nearby regions whenever it is feasible. This zone should consist of a mosaic of bare soil habitats, short-grazed and tall-sward pastures, and varying ages of scrub. A vital first step in attaining these goals is to determine the exact size of the remaining resource. According to the UK Action Plan, the total area of unimproved grassland ecosystems in the country is less than 0.3 million ha, with only a part of that area 'supporting its characteristic biodiversity'. Compared to 28,000 acres in 1811, Dorset has only 2,268 ha of unimproved cha grassland left in 1972. The UK currently has less than 20,000 acres of lowland unimproved calcareous grassland, according to best estimations. The following are action priorities:

1. Saline plain.
2. Scarp Chiltern.
3. South and North Downs.
4. Scarp Cotswold.
5. A Men dips.
6. The Welds of Yorkshire and Lincolnshire.
7. Wales's Vale of Clyde and Anglesey.
8. (CG7b) Rockland
9. Durham's (CG8) magnesia limestone meadows.
10. The Downs at Dorset.
11. Island of Wight.
12. The Derbyshire Carboniferous limestones.
13. The coast of Pembroke (CG1b).

The following factors, in particular, pose a threat to the grasslands:

1. Abandonment of grazing on steep slopes, which causes coarse grasses and brush to encroach.
2. Fertilizing.
3. Ploughing.
4. Gentician *Ella angelica* and other RDB vascular plants of lowland calcareous grasslands are more typical of the short, grazed pastures produced by low-intensity sheep grazing, mixed livestock grazing, or uncontrolled rabbit grazing.

Threatened Species Examples

The following list provides examples of important species whose preservation is intimately related to the preservation of unimproved lowland calcareous grasslands. For each species, a potential conservation goal is provided.

Lichens: Brick lichen with stars, *Biella aster Ella* by using proper management, you may lessen scrub encroachment and bring back rabbit grazing. Prosecute botanists who are stealing specimens. Only three locations in the Suffolk Rockland are known. Typical of calcareous, sandy, lichen-dominated turf that has been rabbit-grazed.

Bryophytes: Glucose beard moss is *Barbule glance*. Known only from one location, a dry chalk crevice in Wiltshire. The site has to be properly managed, and collection should be prohibited by legal action because it is threatened by shading, trash dumping, and collecting.

Plants with Flowers: Hairy mallow, *Althea hirsute* Continue to implement proper management at the Kent facility and just the threatened Somerset location. Keep an eye on the recovery of these populations and the third native population. Only three native locations are known. A plant that grows in disturbed patches on calcareous

hillsides facing south. Early gentian *Ella angelica* is still present in 25 sites on chalk in southern England. Unique to the UK species [9], [10].

Military Orchids include Orchids Militaries

Maintain conservation management to boost populations at the FC's two only known sites in the UK. Using gene or enzyme analysis, determine the degree of genetic diversity between British and continental plants. Other historic places should be managed appropriately to permit natural decolonization.

Insects:

1. Wart-biting grasshopper, *Decius verrucivorus*.
2. Check for further populations in the Wiltshire chalk grasslands. Re-establish at the county's sole previously known location.
3. Grasshopper *Gomphocerripus Rufus*.
4. Keep your range on a grassland with limestone. Stop decrease and increase range, *Hesperia comma* (silver-spotted skipper).
5. Moth with black veins, *Siena lineated*.
6. Keep the remnant populations at the two Kent chalk grassland locations. Restore to more sites within the prior area.

Birds

Stone-curlew *Burinus oedicnemus* the RSPB/JNCC species action plan's target species. By the year 2000, double the number of breeding pairs in England, keeping them within their current range, which also includes arable and calcifuges grassland. Promote the colonization of the former breeding range in England. Increase the percentage of the population that nests in areas with semi-natural grasslands. In southern England's chalk grasslands, a significant portion of the population nests.

Role of British Limestone Grasslands

British limestone grasslands are extremely important to the UK's natural and cultural landscape. These grasslands are distinguished by diversified plant communities and distinctive species assemblages. They are often located on limestone or chalk bedrock. The following are some of the major functions and significance of British limestone grasslands:

1. Limestone grasslands are recognized for having a high level of biodiversity. They are home to a wide range of plant species, including rare and specialized ones that have evolved to thrive in these environments due to the alkaline soils and distinct microclimate. Many of these plant species have unique conservation value and are uncommon or endangered. Additionally, a variety of insects, birds, and small mammals can all find a home in limestone grasslands due to their diversified flora structure.
2. British limestone grasslands are regarded as a hotspot for conservation because of their ecological significance and the existence of rare and endangered species there. These grasslands frequently support a significant number of species that are both domestically and internationally protected, including orchids, butterflies, and certain grassland bird species. For the preservation of these species and the maintenance of biodiversity at both the regional and national levels, these grasslands must be protected and managed.
3. Grasslands, notably those in limestone, have the ability to capture and store carbon. The extensive root systems of grasses and other herbaceous plants assist in capturing atmospheric carbon dioxide and storing it in the soil. Carbon sequestration can aid in reducing greenhouse gas emissions and mitigating climate change by preserving and restoring limestone grasslands.
4. Limestone Grasslands' Cultural and Historical Importance: In the UK, limestone grasslands have a rich cultural and historical history. Traditional land management techniques like grazing, which have been a part of British agricultural traditions for millennia, have influenced them. These grasslands are linked to folklore, cultural history, and traditional land use methods that have impacted the local communities and landscapes. These cultural ties are maintained and a sense of place and identity are supported by conserving and managing limestone grasslands.
5. Ecosystem Services: Society benefits greatly from the ecosystem services provided by limestone grasslands. They aid in water filtration and management, reducing flooding and enhancing water quality. Additionally, they provide chances for visitors to engage in healthy, beneficial outdoor activities like

walking, wildlife watching, and photography. By providing grazing habitat for cattle, limestone grasslands can aid in sustainable agriculture.

6. The preservation and restoration of British limestone grasslands are crucial due to their significance on an ecological, cultural, and economic level. These ecosystems must be safeguarded against threats including invasive species, habitat loss, and agricultural intensification. These distinctive ecosystems' biological integrity and biodiversity can be preserved through the use of sustainable land management techniques, such as proper grazing schedules and the clearing of encroaching brush. For British limestone grasslands to endure and thrive over the long run, cooperation between landowners, conservation groups, and local populations is essential.

III. CONCLUSION

The British limestone grasslands are extremely important in terms of ecology, the environment, and culture. These ecosystems are essential for maintaining biodiversity, storing carbon, managing water resources, preserving the health of the soil, and offering aesthetic and cultural value. Maintaining healthy ecosystems, reducing climate change, encouraging water regulation, limiting soil erosion, and connecting communities to their natural heritage all depend on the preservation and sustainable management of British limestone grasslands. The emphasis should be on conservation strategies such as sensible land management techniques, habitat restoration, and spreading knowledge about the significance of these grasslands. We can ensure the long-term survival of rare species, aid in the mitigation of climate change, conserve priceless water resources, maintain soil fertility, and promote pride in and a connection to the UK's natural landscapes by protecting British limestone grasslands.

REFERENCES

- [1] E. T. Y. Wu, D. P. Mosquin, and R. D. Guy, "An Inventory of Bryophytes on the Summit of Pink Mountain (Peace River District, British Columbia, Canada)," *West. North Am. Nat.*, 2018, doi: 10.3398/064.078.0104.
- [2] P. A. Thomas, D. Stone, and N. La Porta, "Biological Flora of the British Isles: *Ulmus glabra*," *J. Ecol.*, 2018, doi: 10.1111/1365-2745.12994.
- [3] G. Walkden, "Promoting art, manufactures and commerce in one-the society's role in the development of a British Marble industry," *Earth Sci. Hist.*, 2018, doi: 10.17704/1944-6178-37.2.363.
- [4] S. K. Donovan and G. Hoare, "Site selection of small round holes in crinoid pluricolumnals, trearne quarry SSSI (Mississippian, lower carboniferous), North Ayrshire, UK," *Scottish J. Geol.*, 2018, doi: 10.1144/sjg2018-010.
- [5] J. D. Hudson and M. I. Wakefield, "The lonfearn member, lealt shale formation, (Middle Jurassic) of the Inner Hebrides, Scotland," *Scottish J. Geol.*, 2018, doi: 10.1144/sjg2017-015.
- [6] M. E. Johnson et al., "On the rise and fall of oceanic islands: Towards a global theory following the pioneering studies of Charles Darwin and James Dwight Dana," *Earth-Science Reviews*. 2018. doi: 10.1016/j.earscirev.2018.03.008.
- [7] C. J. Burrow and S. Turner, "Stem chondrichthyan microfossils from the Lower Old Red Sandstone of the Welsh Borderland," *Acta Geol. Pol.*, 2018, doi: 10.1515/agp-2018-0010.
- [8] M. O'Sullivan and D. M. Martill, "Pterosauria of the great oolite group (Bathonian, Middle Jurassic) of oxfordshire and gloucestershire, England," *Acta Palaeontol. Pol.*, 2018, doi: 10.4202/app.00490.2018.
- [9] J. N. Carney and K. Ambrose, "A window into the Cambrian basement and early Carboniferous sedimentation of the Hathern Shelf: The British Geological Survey borehole at Ticknall, South Derbyshire, UK," in *Proceedings of the Yorkshire Geological Society*, 2018. doi: 10.1144/pygs2017-386.
- [10] D. J. Jones, "Unlocking the Palaeozoic hydrocarbon potential in the offshore Isle of Man," in *80th EAGE Conference and Exhibition 2018: Opportunities Presented by the Energy Transition*, 2018. doi: 10.3997/2214-4609.201801087.