Oxfordshire Churchyard Biodiversity: A Data-Driven Assessment

Based on National Biodiversity Network (NBN) Atlas occurrence data
April 2026

About Wild Systems Lab

Wild Systems Lab is an independent research and technology group working at the intersection of ecology, open data, and passive monitoring technology. Our work focuses on building scalable tools for biodiversity assessment - combining open geographic datasets, acoustic sensing, and automated species identification to support conservation decision-making. This white paper forms part of our ongoing programme of county-level biodiversity analysis in partnership with wildlife trusts and local recording groups across England.

Executive Summary

Oxfordshire's churchyards represent a network of 369 sites that collectively harbour at least 1,178 species across plant, animal, and fungal kingdoms - recorded from 10,396 occurrence records spanning 1972 to 2026. These sites function as refugia for flora and fauna increasingly displaced from the wider agricultural landscape, with several churchyards supporting nationally notable species including Great Crested Newt (Triturus cristatus), Glow-worm (Lampyris noctiluca), Swift (Apus apus), and no fewer than eight bat species confirmed under roost survey conditions.

Despite this ecological value, 48% of sites have no occurrence records whatsoever, revealing a profound gap in baseline monitoring across the county. The south of the county - the Vale of White Horse and Chilterns fringe - is particularly under-represented. Acoustic monitoring of birds and bats remains almost entirely absent as a methodology, with existing records deriving almost exclusively from Natural England roost visit surveys rather than passive detection. There is strong evidence that the true biodiversity value of this network is substantially underestimated.

Critically, much of what we do know about these sites comes from citizen science - voluntary recorders submitting to iRecord, the BSBI, and local environmental record centres. This paper argues that structured citizen science, combined with low-cost passive acoustic monitoring, represents the most practical and cost-effective route to filling the gaps that remain.

This paper presents a systematic analysis of existing NBN Atlas data, identifies spatial and taxonomic gaps, flags conservation priority species, and makes targeted recommendations for monitoring investment.

1. Introduction

1.1 Churchyards as conservation habitats

English churchyards occupy a unique ecological niche. Many enclose grassland that has been neither ploughed nor fertilised for centuries, supporting plant communities - including rare herbs, orchids, and ancient bryophyte assemblages - that have largely disappeared from the surrounding countryside. Ancient Yew trees (Taxus baccata), a defining feature of many Oxfordshire churchyards, may predate the churches they surround by centuries and provide irreplaceable roosting habitat for bats. Stone walls and grave monuments support lichen communities of national importance. The combination of undisturbed soil, mature trees, and low-intensity management makes churchyards disproportionately valuable per unit area compared to most other semi-natural habitats.

Oxfordshire sits at the intersection of two major biogeographical zones - the calcareous limestone of the Cotswold fringe to the north and west, and the chalk of the Chilterns to the south - giving its churchyards a particularly diverse potential flora. The county is also a nationally important stronghold for Mistletoe (Viscum album), a species closely associated with old orchards and churchyard Lime and Apple trees.

1.2 Deriving the church network

The starting point for this analysis was a comprehensive enumeration of Oxfordshire's places of worship using OpenStreetMap (OSM), which provides the most complete and openly licensed dataset of its kind in England. An OSM query for amenity=placeofworship within the Oxfordshire administrative boundary returned over 700 candidate sites spanning all faiths and denominations.

These sites were then reviewed individually to determine ecological eligibility. The selection criterion was straightforward: a site was included only if it had a demonstrable green space component - specifically a churchyard, graveyard, or contiguous green land parcel with a reasonable likelihood of supporting semi-natural vegetation. In practice, the vast majority of qualifying sites are Christian churches; non-Christian places of worship in Oxfordshire rarely have an associated burial ground or substantive green space, and very few were retained. This excluded urban churches with no surrounding ground (those entirely surrounded by hardstanding or built fabric), redundant churches converted to other uses where the churchyard had been lost, and chapels and meeting houses with no associated burial ground.

This manual review process reduced the candidate list to 369 sites considered likely to hold ecological interest. Each waypoint was georeferenced to the approximate centroid of the church or its associated green space and used as the query origin for NBN Atlas occurrence retrieval.

A 25-metre search radius was applied as a balance between capturing records genuinely associated with the churchyard and avoiding excessive bleed from surrounding land uses (roads, gardens, adjacent fields). The 25 m radius is deliberately conservative. In practice, many NBN records attributed to a churchyard will have coordinate uncertainty of 10–100 m, meaning some records within the search radius may originate from immediately adjacent land and vice versa. This is an inherent limitation of grid-referenced biological records

and does not materially affect the analysis at the network scale, but should be borne in mind when interpreting individual site totals.

1.3 Data provenance

This analysis draws on occurrence records retrieved from the NBN Atlas within a 25-metre radius of the 369 Oxfordshire church waypoints described above, queried in June 2026. Records derive from eight primary sources:

Data resource	Records
TVERC Historical Churchyard Records	4,996
BSBI vascular plant data (to 2018)	4,095
BLS Lichen Database: England churchyards 1650–2016	499
Vascular plant records via iRecord (verified)	134
Moths in Berkshire vice-county via iRecord	108
Bird records via iRecord	85
Bryophyte records via iRecord	53
Hoverfly records via iRecord	39

The TVERC and BSBI datasets together account for 87% of all records and largely reflect structured survey campaigns rather than opportunistic recording. A large proportion of TVERC records originate from a single bulk upload in 2012, and BSBI coverage is formally bounded to 2018. Both datasets are therefore temporally static: they capture a historical baseline rather than current condition. The remaining 13% of records - moths, birds, bryophytes, hoverflies - represent the ongoing contribution of citizen science through iRecord, and demonstrate both the reach and the unevenness of voluntary recording effort.

2. Biodiversity Overview

2.1 Taxonomic summary

The 10,396 occurrence records represent 1,178 distinct species from three kingdoms:

Kingdom	Species	Records	% of records
Plantae	753	9,307	90%
Animalia	304	585	6%
Fungi (incl. lichens)	120	503	5%

The plant-dominated picture reflects both the genuine ecological character of churchyards - which are fundamentally grassland, scrub, and woodland-edge habitats - and the recording effort available. Botanical recording is substantially more accessible than specialist taxa such as invertebrates, bats, and fungi, which require targeted survey methodology. The 304 animal species and 120 fungal species are almost certainly underestimates of true richness at these sites.

2.2 Vascular plant flora

The vascular plant community is dominated by species characteristic of ancient, unimproved, and semi-improved grassland. The ten most frequently recorded species across the network are:

Species	Records
Yew (Taxus baccata)	127
Ground-ivy (Glechoma hederacea)	123
Ribwort Plantain (Plantago lanceolata)	121
Ivy (Hedera helix)	120
Daisy (Bellis perennis)	115
Cow Parsley (Anthriscus sylvestris)	113
Germander Speedwell (Veronica chamaedrys)	112
Common Nettle (Urtica dioica)	112
Elder (Sambucus nigra)	110
Cleavers (Galium aparine)	110

The prevalence of Yew across 127 records is ecologically and historically significant. As a species rarely planted in any context other than churchyards in England, its frequency is a direct proxy for site age and the continuity of low-intensity management that sustains the associated flora.

Cowslip (Primula veris) was recorded at 21 churches (50 records) and Primrose (Primula vulgaris) at 40 sites - both reliable indicators of ancient, unfertilised grassland. Cuckooflower (Cardamine pratensis), recorded at 55 sites, similarly indicates damp, unimproved conditions. These species are absent from most modern agricultural grasslands in the county.

The leading plant families - Asteraceae (1,335 records), Poaceae (1,047), Rosaceae (526), Lamiaceae (492) - are consistent with a mosaic of managed grassland, hedgerow edge, and disturbed ground typical of churchyard conditions.

2.3 Orchids

Orchids are among the most sensitive indicators of ancient calcareous grassland and their presence in churchyards is significant. Three species were confirmed across the network:

- Pyramidal Orchid (Anacamptis pyramidalis) - 3 records at 2 churches (2020–21)
- Common Spotted-orchid (Dactylorhiza fuchsii) - 1 record
- Common Fragrant-orchid (Gymnadenia conopsea) - 1 record (Saint Lawrence, 1992)

Given the limestone and chalk geology underlying much of the county, and the documented presence of suitable grassland conditions, the scarcity of orchid records almost certainly reflects under-recording rather than true absence. Targeted spring and early summer surveys at sites with appropriate soil conditions should be prioritised.

2.4 Lichens

The 499 lichen records (120 species) derive almost entirely from the British Lichen Society (BLS) Churchyard Database, which covers records from 1650 to 2016. Lichen assemblages on old limestone and sandstone monuments can be of national importance, with certain churchyards in calcareous areas supporting communities not found elsewhere in the landscape. Dominant taxa recorded include Myriolecis dispersa, Physcia adscendens, Flavoplaca flavocitrina, and Phaeophyscia orbicularis - typical of calcareous stone communities in central England.

2.5 Vertebrates

Birds

Ninety-eight bird records were retrieved across the network. Swift (Apus apus) is the most frequently recorded species, with 22 records at 18 churches - confirming the network's importance as a nesting substrate for this UK Red List species, which has declined by over 60% nationally since 1995. Other records include Blackbird, Robin, Jackdaw, Woodpigeon, Blue Tit, Goldfinch, Blackcap, and Collared Dove.

A single Barn Owl record is notable; this Schedule 1 species shows strong association with old church towers and ruins and is likely present at more sites than current records indicate. All bird records in this dataset derive from iRecord submissions by volunteer observers - an illustration of both the value and the incompleteness of citizen science coverage across the network.

Bats

Forty-nine bat records were returned, covering eight confirmed species from roost survey data:

Species	Records	Notes
Common Pipistrelle (Pipistrellus pipistrellus)	16	Widespread; commonest churchyard bat
Brown Long-eared Bat (Plecotus auritus)	13	Strongly associated with old buildings
Eurasian Serotine (Eptesicus serotinus)	4	Southern England specialist
Natterer's Bat (Myotis nattereri)	2	Old buildings and woodland forager
Daubenton's Bat (Myotis daubentonii)	2	Water-associated; may use church towers
Soprano Pipistrelle (Pipistrellus pygmaeus)	3	Often confused with Common Pipistrelle
Noctule (Nyctalus noctula)	1	Tree-roosting; may use old Yew
Pipistrelle spp. (unresolved)	~8	Identification to species not confirmed

All UK bat species have full legal protection under the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2017. The low record count reflects the nature of the data source - Natural England roost visit surveys are triggered by specific planning or management applications, not systematic monitoring - rather than true bat density. This is particularly relevant in the context of church buildings: unlike domestic or commercial properties, most rural churches undergo very little structural alteration from decade to decade, meaning the planning trigger for a roost survey rarely arises. A church may support significant bat populations for generations without ever generating a formal roost record. Passive acoustic monitoring is the only practical route to understanding bat use of these sites at network scale.

Amphibians and other fauna

Great Crested Newt (Triturus cristatus) was recorded at four separate churches. As a European Protected Species, any confirmed presence within or adjacent to a site triggers significant legal obligations and warrants immediate reporting to the relevant Local Planning Authority. Common Toad (Bufo bufo), a UK Biodiversity Action Plan species showing significant national decline, was recorded at two sites.

Glow-worm (Lampyris noctiluca), a species strongly associated with ancient grassland and now uncommon across much of Oxfordshire, was recorded at a single church with three records - strongly suggesting a resident colony. Hedgehog (Erinaceus europaeus), classified as Vulnerable on the GB Red List, was recorded at four churches.

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3. Spatial Analysis

3.1 Geographic distribution of records

Records fall across two Ordnance Survey 100 km grid squares: SP (north and central Oxfordshire) accounts for 5,661 records and SU (southern Oxfordshire) for 4,733. At a coarser scale, the county can be divided into four zones:

Area	Churches	Species	Records
Central (Oxford and environs)	79	663	4,418
North (Banbury / Chipping Norton)	45	644	3,160
Mid-North (Woodstock / Bicester)	61	620	2,397
South (Vale of White Horse / Chilterns)	8	261	421

The southern zone is a clear outlier. Only 8 churches have any records, despite the area encompassing chalk downland geology that would be expected to support some of the county's most species-rich calcareous grassland communities. This is a survey effort gap, not a reflection of ecological poverty.

3.2 Species richness at individual sites

The ten churchyards with the greatest species richness are:

Church	Species	Records
Saint Mary's, Launton	210	210
Saint Peter ad Vincula, South Newington	194	293
St Mary the Virgin, Buscot	187	236
Saint James the Great, Fulbrook	175	222
Saint Michael, Begbroke	174	221
St Peter and St Paul, Shiplake	168	176
Saint Mary and Saint Edburga	167	170
Holy Trinity	161	166
Holy Trinity Church	157	157
Pishill Parish Church	147	153

Saint Peter ad Vincula at South Newington has the highest total record count (293) and the second highest species richness (194), making it the most comprehensively documented churchyard in this dataset. Its location on the Cotswold limestone escarpment is consistent with its floristic richness.

3.3 Unsurveyed sites

176 of 369 churches (48%) have zero occurrence records in the NBN Atlas. This does not mean these sites are ecologically barren - it means they have not been visited by recorders submitting to NBN-aggregated datasets. Many will hold significant biodiversity, particularly older rural churches on heavy soils or limestone where unimproved grassland is more likely to have persisted.

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4. The Role of Citizen Science

The biodiversity picture presented in this paper is, in large part, a citizen science achievement. The TVERC Historical Churchyard Records and BSBI vascular plant data - which together account for 87% of all records - were assembled by volunteer botanical recorders working systematically across the county over decades. The remaining records, covering birds, moths, hoverflies, bryophytes, and bats, were submitted through iRecord by individual observers who chose to document what they found and share it publicly.

This voluntary recording effort is not a supplement to professional survey: for many taxa and many sites, it is the only evidence that exists. The 557 species recorded at just a single church in this dataset represent knowledge held by individual recorders - knowledge that, without the infrastructure of the NBN Atlas and the recording groups that feed into it, would simply not exist in any accessible form.

The incompleteness of the current dataset is equally a citizen science story. The 176 unsurveyed churchyards are not awaiting professional ecologists; they are awaiting recorders. A single volunteer with a morning to spare and a working knowledge of common plants could meaningfully extend the dataset at any one of these sites. Local recording groups - the BSBI Oxfordshire vice-county recorder network, Oxfordshire Flora Group, Oxfordshire Bat Group, and BBOWT's volunteer survey teams - are the most efficient mechanism for expanding coverage at scale.

The iRecord platform and its partner apps (including BirdNET for automated bird sound identification) have substantially lowered the barrier to participation. Species that previously required specialist expertise to identify - many moths, hoverflies, and common bat species - can now be reliably logged by engaged non-specialists using smartphone-based tools. This democratisation of recording represents a significant opportunity for the churchyard network, where church communities, local history groups, and school parties can all contribute meaningfully to the evidence base.

Recommendation 8 (see Section 5) sets out a framework for mobilising this capacity through structured bioblitz events and ongoing citizen science engagement.

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5. Monitoring Gaps and Recommendations

5.1 Survey coverage

Recommendation 1: Prioritise baseline surveys of the 176 unsurveyed churchyards. A tiered approach is suggested: first prioritise churches in the south of the county (Vale/Chilterns) where the ecological potential is high and the recording gap is most acute; second, rural churches on calcareous geology in the Banbury and Chipping Norton areas where orchid and ancient grassland flora are most likely.

A standardised rapid-assessment protocol - a 30-minute plant list combined with a habitat condition assessment - would allow a large number of sites to be screened cost-effectively. The Plantlife/CPRE Living Churchyards methodology provides a suitable template.

Recommendation 2: Commission dedicated orchid surveys across calcareous sites in May–July. Given the limestone and chalk geology underpinning much of Oxfordshire and the confirmed presence of three orchid species in the existing data, systematic spring surveys are likely to substantially increase the recorded orchid flora.

5.2 Acoustic monitoring

Passive acoustic monitoring represents the most significant methodological gap in the current dataset. Both bats and birds produce diagnostic sounds that can be recorded automatically and identified with increasing accuracy using machine learning classifiers - yet neither group has been systematically monitored across the churchyard network using this approach.

Bats

The existing bat data represents a snapshot from triggered roost surveys rather than systematic passive monitoring. The NBN Atlas contains records for eight species, but detection probability under roost-survey conditions is heavily influenced by survey timing, access, and the specific management question being addressed. The true bat assemblage across the churchyard network is almost certainly richer.

Recommendation 3: Deploy passive bat acoustic recorders across a stratified sample of churchyards. Devices such as the AudioMoth or purpose-built recorders like Demeter deployed overnight at a representative sample of churches - stratified by size, age, tree cover, and proximity to water - would provide high-resolution data on species composition, activity levels, and seasonal patterns at minimal cost per site. Recordings can be processed automatically using the BTO's automated identification pipeline, with manual verification of ambiguous detections by Oxfordshire Bat Group volunteers. This approach is particularly well-suited to detecting species rarely encountered in roost surveys, including Noctule, Nathusius's Pipistrelle, and Barbastelle, all of which have been recorded in the wider county.

Existing confirmed multi-species roost sites - St Mary the Virgin (5 species), St Mary's Church and St John the Baptist (4 species each) - should be treated as priority sites for ongoing monitoring and formally notified to Oxfordshire Bat Group.

Recommendation 4: Establish a county-wide bat roost register for churches. Bat roost data from Natural England roost visit surveys is currently held in disparate records. Aggregating confirmed roost sites into a single, shared spatial layer would allow wildlife trusts and local planning authorities to identify cumulative pressures on the most important sites.

Birds

Bird recording across the network is almost entirely dependent on casual observer visits logged to iRecord. No systematic point count, transect, or passive acoustic monitoring has been applied to the churchyard network, meaning that species with low detectability to the casual observer - Barn Owl, Spotted Flycatcher, Turtle Dove, Lesser Whitethroat - are almost certainly under-recorded.

Recommendation 5: Pilot automated bird acoustic monitoring at a subset of sites. Passive acoustic recorders running during dawn chorus periods (April–June) can now be processed using open-source neural network classifiers such as BirdNET, which achieves species-level identification across most common UK species with high accuracy. A pilot programme deploying recorders at 20–30 churches spanning the county's geographic range would provide the first systematic data on the bird assemblage of the churchyard network, and would be directly comparable with similar programmes being run by wildlife trusts elsewhere in England.

This approach also provides an accessible entry point for citizen science engagement: recorders can be deployed and collected by volunteers with minimal training, and the automated outputs provide immediate, shareable species lists that engage church communities in the results.

5.3 Great Crested Newt

Recommendation 6: Follow up all four Great Crested Newt records with targeted eDNA surveys. GCN presence within or adjacent to a church site has material implications for any proposed building works or vegetation management. The four confirmed records should be cross-referenced with Natural England's District Level Licensing scheme coverage and reported to the county GCN officer where not already captured.

5.4 Temporal data currency

The two largest datasets - TVERC (largely 2012 upload) and BSBI (to 2018) - are now between 8 and 14 years out of date. Habitat condition and species composition in churchyards can change substantially over such periods, particularly where management regimes have shifted or where invasive species (e.g., Cotoneaster, Cherry Laurel) have encroached.

Recommendation 7: Establish a rolling re-survey programme for high-richness sites. The ten highest species-richness churchyards identified in this analysis should be re-surveyed on a five-year cycle to detect trends. This would also provide an opportunity to record taxa - particularly invertebrates and fungi - that are poorly represented in the current dataset.

5.5 Invertebrate recording

Insects account for 350 records (roughly 3% of the total), with coverage dominated by moths and hoverflies submitted via iRecord. Specialist invertebrate groups - saproxylic beetles associated with ancient Yew and veteran trees, solitary bees and wasps using south-facing stonework, and grassland Orthoptera - are almost completely absent from the current data.

Recommendation 7: Partner with BENHS, Buglife, and local invertebrate recording groups to conduct targeted invertebrate surveys at sites with confirmed veteran Yew, south-facing banks, and mature grassland turf. The Glow-worm colony identified at one site warrants immediate follow-up to characterise extent and inform management.

5.6 Citizen science mobilisation

Recommendation 8: Establish an annual churchyard bioblitz programme across Oxfordshire. A coordinated bioblitz - ideally coinciding with national events such as the Wildlife Trusts' 30 Days Wild or the RSPB's Big Garden Birdwatch - would direct recording effort to unsurveyed sites and engage church communities directly. Working with the Diocese of Oxford and the Caring for God's Acre network, each participating church could be paired with a volunteer recorder or local natural history group responsible for submitting records through iRecord.

This model has been demonstrated successfully in other counties: Shropshire Wildlife Trust's churchyard recording programme and Kent Wildlife Trust's Living Churchyards project both show that sustained volunteer engagement at the parish level can produce ecologically significant datasets within two to three years of programme launch.

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6. Conservation Significance and Policy Context

Oxfordshire's churchyards sit within a county-level biodiversity framework that includes the Oxfordshire Local Nature Recovery Strategy (LNRS), the Oxfordshire Wildlife Sites system, and the BBOWT (Berks, Bucks and Oxon Wildlife Trust) Nature Recovery Network. Many individual churchyards are likely to qualify as Local Wildlife Sites under existing criteria, and several may merit consideration for Biological Notification under county-level mechanisms.

The confirmed presence of European Protected Species (all bat species; Great Crested Newt) at multiple sites means that any proposed works to church buildings, boundary walls, or veteran trees within these churchyards must be assessed against EPS legislation before consent is granted.

The Church of England's Caring for God's Acre initiative, and equivalent programmes for non-Anglican denominations, provides an existing engagement framework for working with individual church communities on wildlife-sensitive management. This analysis provides the evidential foundation for making the case to individual parishes that their churchyard warrants active ecological stewardship.

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7. Conclusions

Oxfordshire's churchyard network is ecologically significant at county scale. The 1,178 species recorded across 193 surveyed sites represent a substantial proportion of the county's total biodiversity, concentrated in a habitat type that is legally unprotected, management-dependent, and poorly monitored. The data presented

here is best understood as a minimum estimate: systematic survey gaps, outdated baseline records, and the near-complete absence of acoustic monitoring for both bats and birds all ensure that the true figure is higher.

The priority actions are clear: expand baseline survey coverage to the 176 unsurveyed churches; introduce passive acoustic monitoring for bats and birds as a cost-effective complement to traditional survey methods; commission targeted orchid and Great Crested Newt follow-up at high-potential sites; and establish a structured citizen science programme that connects local recording groups with the church communities who manage these sites.

The churchyard network is one of the most tractable conservation opportunities in the county. It involves a willing and organised network of site custodians, an established voluntary recording community, habitats that respond rapidly to appropriate management intervention, and a growing toolkit of low-cost automated monitoring technology. The gap between what we know and what is almost certainly present is wide - but it is closeable.

Appendix: Data and Methods

Church network derivation: Candidate sites were identified from an OpenStreetMap query for Christian places of worship within the Oxfordshire administrative boundary, returning over 700 results. Each site was reviewed individually; only those with a confirmed churchyard, graveyard, or contiguous green land parcel were retained, yielding a final network of 369 georeferenced waypoints.

Data source: NBN Atlas occurrence records (https://nbnatlas.org), retrieved June 2026 via a 25 m radius query around each of the 369 waypoints.

Taxonomic notes: Species counts are based on the scientificName field in the NBN Atlas response. Where vernacular names only were available, records were included in counts but not mapped to species. Bat records listed as 'Pipistrelle' or 'Bat' without species resolution are counted separately and not assigned to species totals.

Verification: 97% of records carry an acceptance status of "Accepted – considered correct", "Accepted – correct", or "Accepted". 154 records are flagged "Unconfirmed – not reviewed" (bird records via iRecord) and 34 as "Unconfirmed"; these are included in the analysis but are noted where they underpin specific claims.

Grid references: SP (north/central Oxfordshire) and SU (south Oxfordshire) 100 km squares account for all records. Spatial zone boundaries used in Section 3 are approximate and based on decimal latitude thresholds rather than administrative boundaries.