

Biodiversity Indicators for Quarrying and Mining Sites

2024 Data Report

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Executive summary



INTRODUCTION: MEASURING BIODIVERSITY TO SUPPORT BETTER MANAGEMENT

FOR THE FIRST TIME, THE SECTOR HAS A HARMONISED EUROPEAN BASELINE TO MAKE ITS BIODIVERSITY EFFORTS MORE VISIBLE, MEASURABLE AND BETTER UNDERSTOOD.

Quarrying and mining sites are more than operational areas. Throughout their life cycle, they can create and maintain a diverse mosaic of terrestrial and aquatic habitats, providing ecological conditions for a wide range of plant and animal species, including species of conservation interest.

Across Europe, the sector is already investing in biodiversity management, monitoring and restoration. Yet demonstrating the value of these efforts requires robust evidence: a common approach capable of transforming biodiversity information into meaningful, measurable and aggregated results at European level.

This is the ambition behind the biodiversity indicator framework developed within the European [ROTATE Project](#) funded by the [European Commission](#) and co-ordinated by [ANEFA](#) in collaboration with [Aggregates](#)

[Europe \(AE\)](#) and the [Spanish Aggregates Federation \(FdA\)](#). Specifically adapted to quarrying and mining sites, the [University of Liège \(ULiège\)](#), [ANEFA](#) and [Fundación Tormes-EB](#) jointly developed the methodology, bringing together scientific expertise and practical knowledge of quarrying and mining operations.

Designed specifically for the extractive sector, the framework provides a scientifically robust, practical and harmonised approach to collecting biodiversity information across different ecological and operational contexts. From site characteristics and management practices to habitats, species and monitoring, it creates a structured evidence base to understand biodiversity across the sector better and track its evolution over time.

For this first reporting cycle, 2024 biodiversity data were collected during 2025–2026, with 191 Level 1 responses from 12 European countries and detailed Level 2 and 3 information from 121 sites across 14 countries. All results are analysed and reported in aggregated form, maintaining the confidentiality of individual site data.

The ecological value identified across quarrying and mining sites is not simply the result of chance or passive land management. The findings presented in the *Guide to Biodiversity Indicators for Quarrying and Mining Sites: 2024 Data Report* reflect a clear shift in the sector's approach, moving beyond impact mitigation towards the implementation of biodiversity conservation and restoration practices aimed at enhancing ecosystem functionality.

European quarrying and mining sites are increasingly being recognised not merely as areas for resource extraction, but as important components of Europe's green infrastructure. At a time when biodiversity loss demands urgent action, the aggregates sector demonstrates a distinctive capacity to create, manage and maintain habitats of high ecological value alongside ongoing industrial activities.

OBJECTIVES & METHODOLOGY

OUR OBJECTIVES “MEASURING BIODIVERSITY, SUPPORTING PROGRESS”

Develop robust and practical indicators

Provide a practical and scientifically sound tool to assess and monitor biodiversity across quarrying and mining sites.

Build a harmonised European framework

Develop a scalable and harmonised set of biodiversity indicators applicable across different European contexts.

Track progress over time

Establish annual survey campaigns to build a consistent, aggregated evidence base and monitor biodiversity progress over time.

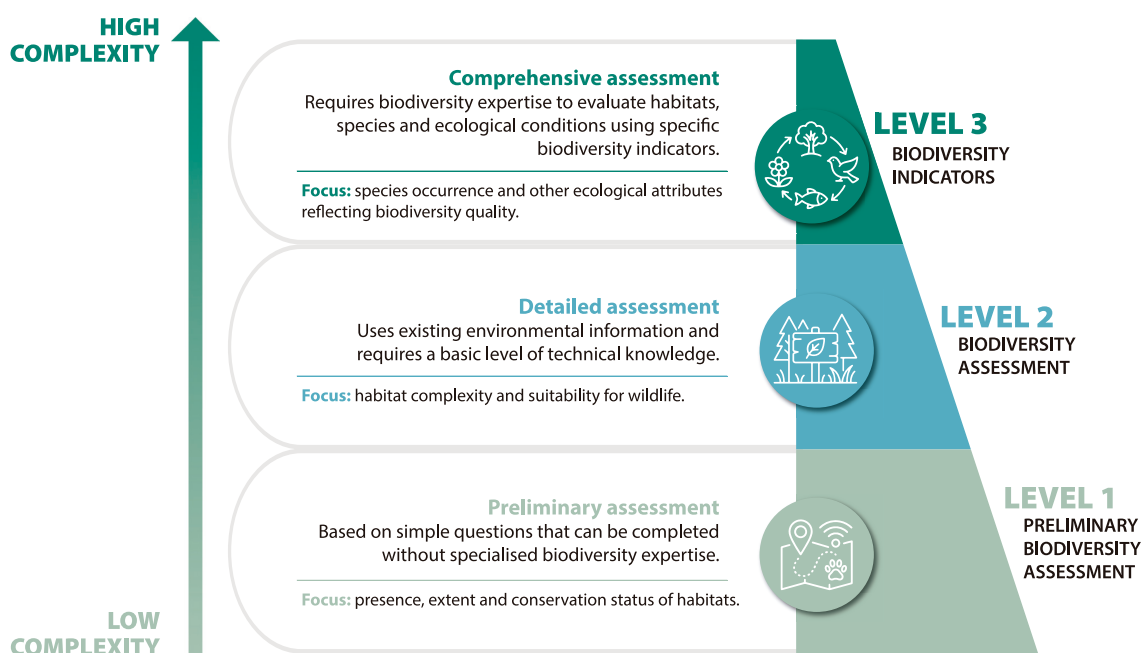
Support biodiversity improvement

Develop guidance and good practices to strengthen biodiversity monitoring, management and continuous improvement.

METHODOLOGY: “A PROGRESSIVE FRAMEWORK: FROM BASIC INFORMATION TO BIODIVERSITY INDICATORS”

The methodology follows three progressively more detailed levels, moving from basic site information to in-depth biodiversity assessment and, ultimately, the calculation of biodiversity indicators.

FRAMEWORK OF BIODIVERSITY INDICATORS BY LEVEL OF COMPLEXITY



Biodiversity indicators are organised according to increasing levels of complexity, from basic information on spatial characteristics to the evaluation of functional aspects related to biodiversity quality.

TWO COMPLEMENTARY QUESTIONNAIRE-BASED SURVEYS

Data were collected through two complementary questionnaires designed to capture biodiversity management practices and biodiversity information at progressively greater levels of detail.

Support for Survey 1 (Level 1)

The first questionnaire acts as a data inventory and context definition, requiring no specialised biodiversity expertise. It captures baseline information on site characteristics, biodiversity management practices, regulatory compliance, restoration planning and stakeholder engagement, while identifying strengths and gaps in the biodiversity information available.

Support for Surveys 2 and 3 (Levels 2 and 3)

The second questionnaire provides a more comprehensive biodiversity assessment, combining qualitative characterisation of habitats and taxonomic groups with quantitative data on species counts and habitat surfaces. Particular attention is given to protected species, the IUCN European Red List, invasive alien species and habitats of conservation interest. It therefore requires greater technical expertise and access to existing biodiversity inventories and monitoring data.

COMBINED AND ANALYSED AT EUROPEAN LEVEL, THE DATA PROVIDE A HARMONISED AND AGGREGATED OVERVIEW OF BIODIVERSITY MANAGEMENT AND AVAILABLE BIODIVERSITY INFORMATION ACROSS THE SECTOR, HELPING TO IDENTIFY OVERALL STRENGTHS, KNOWLEDGE GAPS AND OPPORTUNITIES FOR IMPROVEMENT AND SUPPORTING THE DEVELOPMENT OF COMMON BIODIVERSITY INDICATORS.

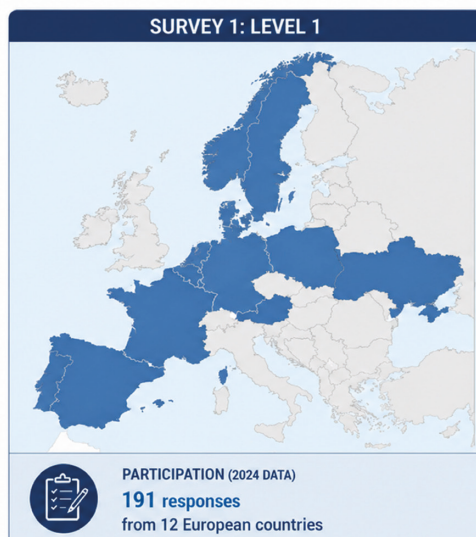
KEY RESULTS

A strong European response to building biodiversity data across Europe

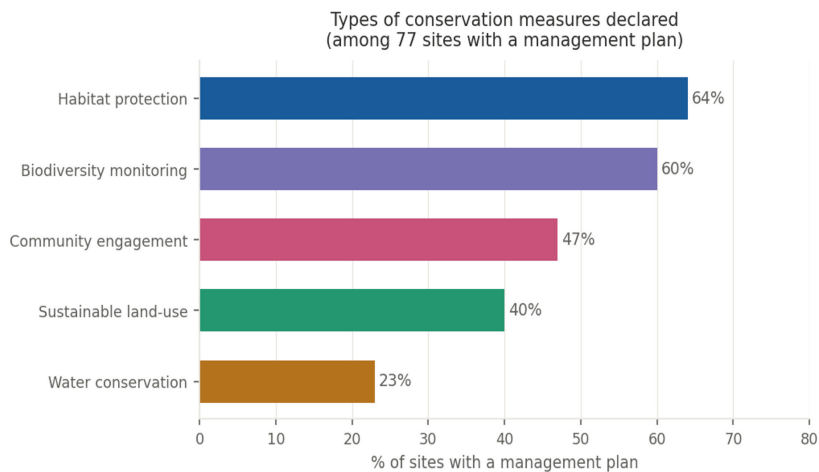
Broad participation across Europe provides a solid foundation for monitoring biodiversity and tracking progress through future assessments.

BIODIVERSITY INDICATOR SURVEYS – GEOGRAPHICAL COVERAGE

Participation – 2024 data



DATA REFERENCE YEAR:
2024

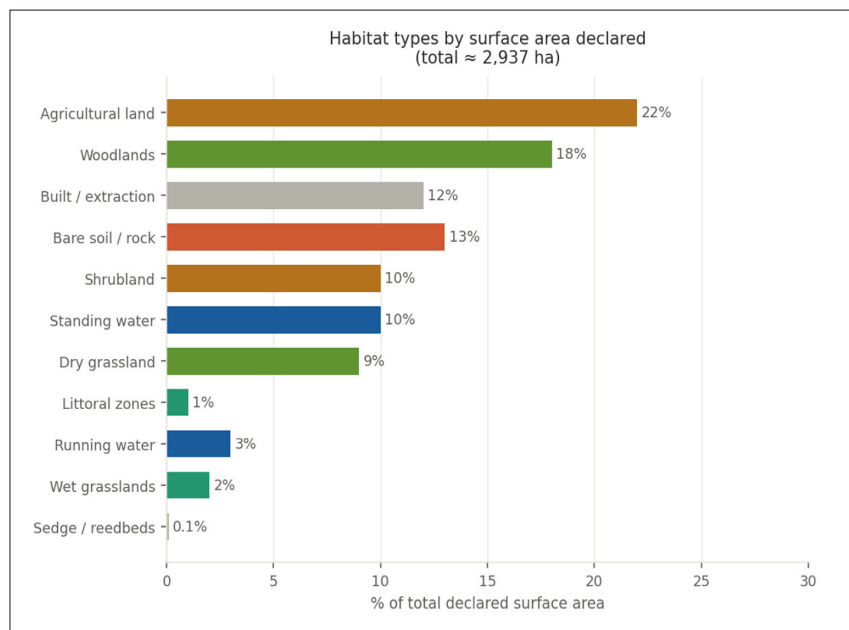


From planning to action: a diverse range of measures is supporting biodiversity conservation

At site level, the Level 2 and Level 3 assessments (121 sites) show a similar pattern of active engagement. Among the 77 sites reporting a management plan, a diverse range of conservation measures is being implemented, reflecting the progressive integration of biodiversity into site management.

A diverse mosaic of habitats across participating sites

The results reveal a heterogeneous landscape in which a wide variety of terrestrial and aquatic environments coexist, highlighting the range of habitats and ecological settings represented across participating quarrying and mining sites.

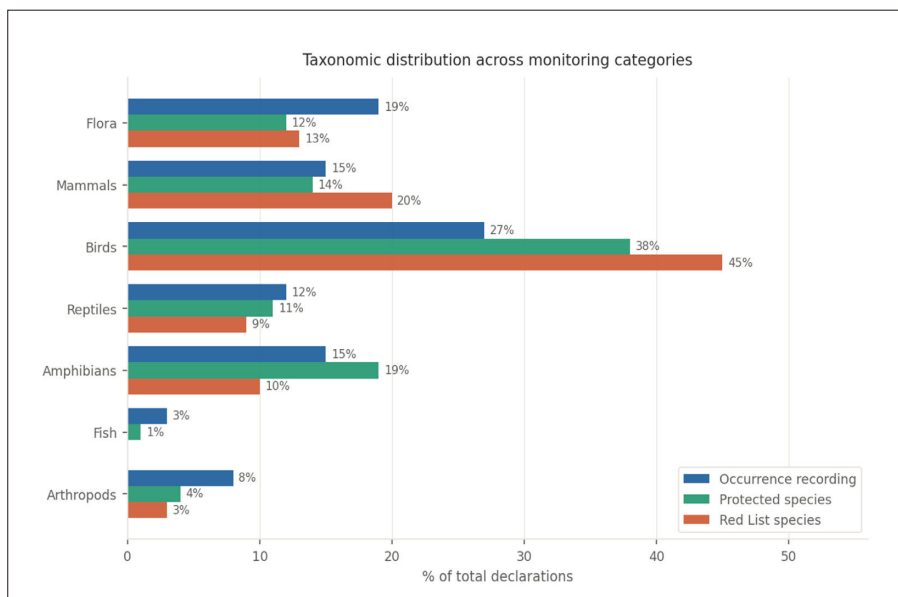
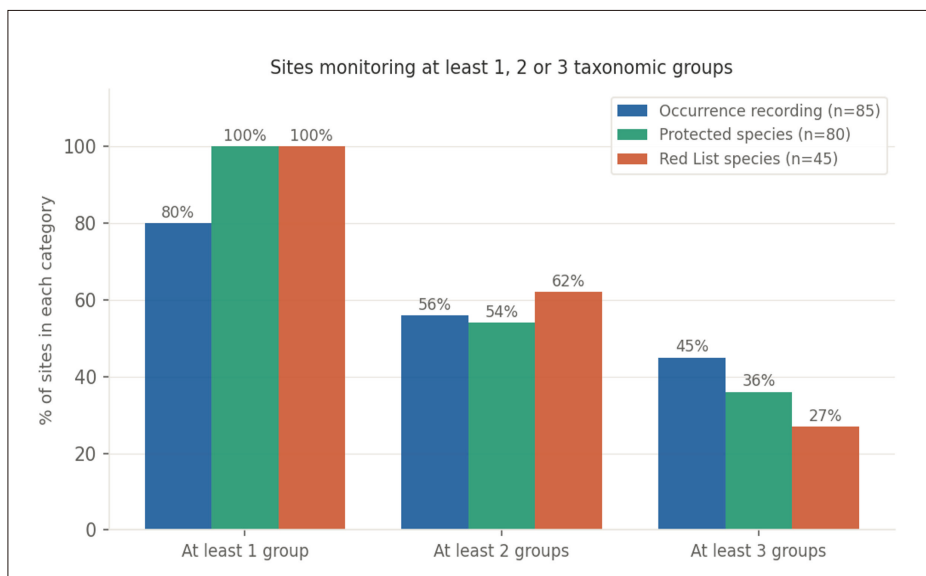


Extractive activities generate distinct geomorphological and microclimatic conditions that can replicate natural disturbance processes. The resulting heterogeneity of landforms, rocky cliffs, water bodies and exposed soils can make quarrying and mining sites valuable refuges for species that may find fewer suitable habitats in highly homogenised agricultural or urban landscapes.



Species monitoring as foundation

Species monitoring is already well established across participating sites, providing a strong foundation for biodiversity assessment. The results also highlight an opportunity to broaden taxonomic coverage, as monitoring across multiple groups remains less widespread, particularly for protected and Red List species. Expanding this coverage would provide a more comprehensive understanding of biodiversity across the sector.



Birds show the strongest representation

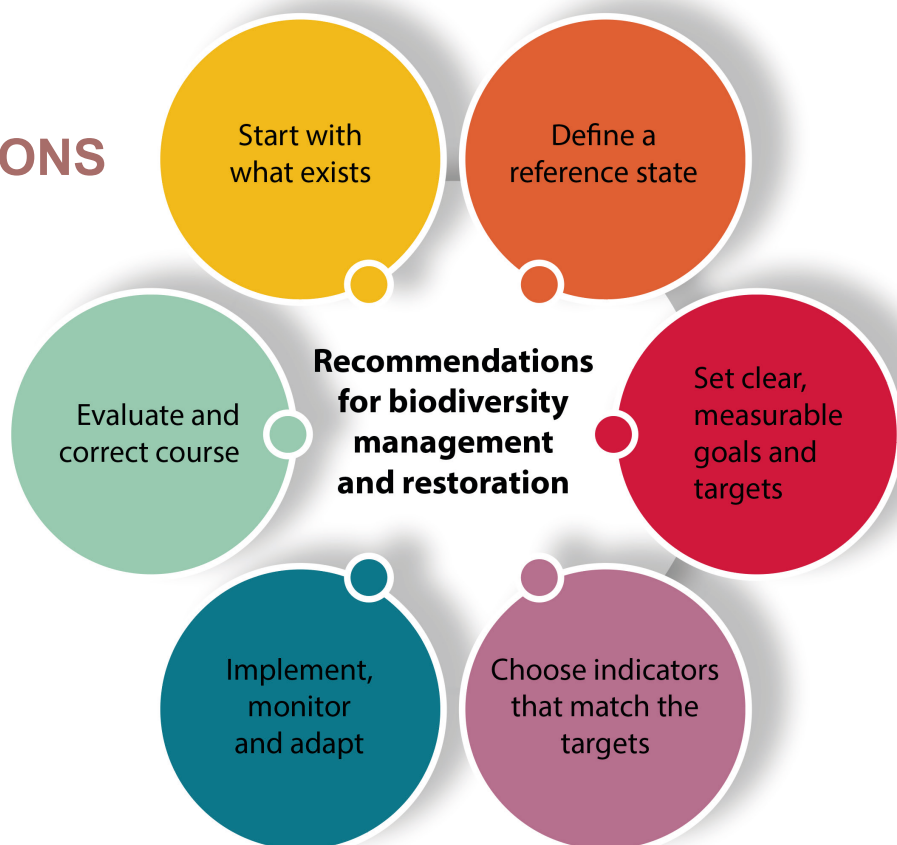
Monitoring data show a distinct taxonomic pattern across occurrence records, protected-species records and European Red List records. Birds are consistently the most represented group and become increasingly prominent in conservation-related records, while flora is more strongly represented in general occurrence data. Mammals, amphibians and reptiles maintain a relevant presence across categories, whereas fish and arthropods remain comparatively underrepresented, indicating scope for broader taxonomic coverage in future assessments.

These figures highlight the sector's growing commitment to biodiversity management and reinforce the potential role of quarrying and mining sites in supporting ecological connectivity and conserving European biodiversity.



RECOMMENDATIONS

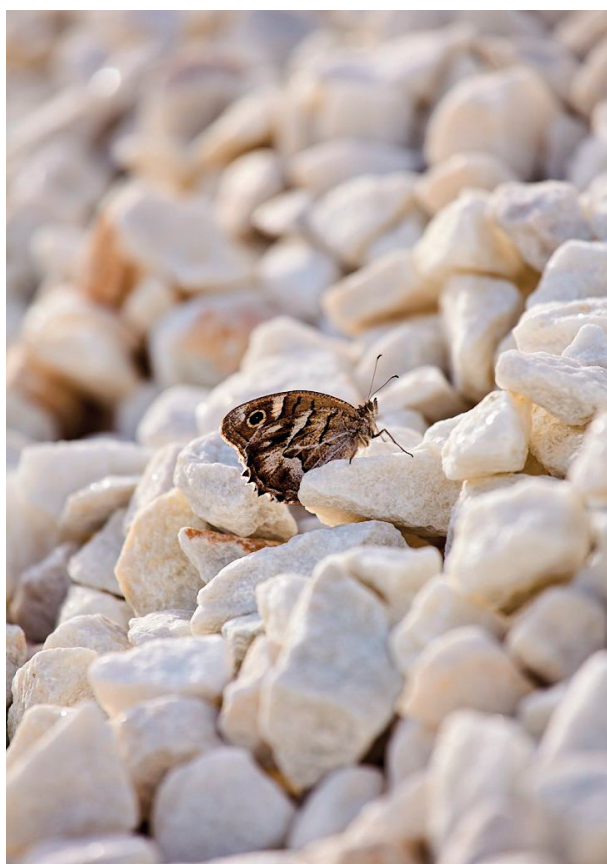
FROM KNOWLEDGE TO ACTION: A CONTINUOUS, INDICATOR-BASED APPROACH



CONCLUSIONS

TURNING KNOWLEDGE INTO MANAGEMENT: RESTORE, MEASURE, PROGRESS

This first assessment reveals a strong biodiversity foundation across participating quarrying and mining sites. The presence of protected and threatened species, the diversity of recorded habitats and the



implementation of active biodiversity measures highlight both the ecological value of these sites and the sector's growing engagement with biodiversity.

The findings also point to a clear opportunity for the years ahead: strengthening monitoring, expanding the available biodiversity information, and further integrating biodiversity into management and restoration. Repeated assessments will make it possible to track progress over time and build an increasingly robust picture of the sector's contribution to nature.

Overall, the findings indicate a shift from a primarily impact-mitigation approach towards more active biodiversity conservation and restoration. Continued use of harmonised indicators can help translate this progress into measurable evidence, guide adaptive management and support improvements in ecosystem functionality over time.



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The ROTATE project has contributed to the preparation of this document, as it supports its activities on biodiversity management and environmental sustainability in quarrying and mining sites. The report provides practical guidance and a harmonised approach for assessing biodiversity through a common set of biodiversity indicators across the extractive sector. ROTATE has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101058651.

Guide to Biodiversity Indicators for Quarrying and Mining Sites: 2024 Data Report

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