

Wildlife Conservation: A Bibliometric Analysis

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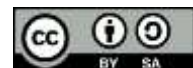
VOSviewer

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ABSTRACT

This study presents a bibliometric analysis of wildlife conservation research to identify its intellectual structure, thematic evolution, influential publications, and collaboration patterns. A total of 1,997 documents published between 2000 and 2026 were retrieved from the Scopus database and analyzed using VOSviewer through keyword co-occurrence, overlay, and density visualizations, as well as co-authorship analysis at the author, institution, and country levels. The results show that the field is organized around three main thematic clusters: ecological and biodiversity assessment, conservation management and human dimensions, and animal biology and health. Core themes such as conservation, wildlife conservation, nature conservation, and biodiversity dominate the literature, while recent studies increasingly focus on artificial intelligence, learning systems, local livelihoods, and less-studied taxa such as invertebrates. The most cited documents address machine learning, climate-change adaptation, population genomics, and human–wildlife relationships. Co-authorship networks among authors and institutions display chain-like and partially fragmented structures, whereas the United States, the United Kingdom, Australia, India, and China emerge as the main hubs of international collaboration. The study highlights a transition from species- and habitat-oriented research toward interdisciplinary, technology-supported, and socially informed approaches to wildlife conservation.

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1. INTRODUCTION

Wildlife is a fundamental component of global biodiversity, supporting ecosystem functioning, cultural identity, and the livelihoods of millions of people. Yet populations of many wild species continue to decline under the combined pressure of habitat loss, overexploitation, disease, and climate change. Political instability and armed conflicts can accelerate this decline by

weakening governance, disrupting protected area management, and increasing illegal resource use [1]. Deforestation and landscape fragmentation further reduce the area and connectivity of suitable habitats, isolating populations and increasing their vulnerability to local extinction [2]. Climate change adds another layer of pressure by shifting species distributions, which requires adaptive wildlife management strategies [3], while anthropogenic noise disturbs animal behavior

and communication across terrestrial and aquatic habitats [4]. These pressures have positioned wildlife conservation as a central concern in environmental science and sustainable development agendas, and have encouraged scholars to rethink the relationship between people and nature in the Anthropocene [5].

Protected areas have long served as the cornerstone of conservation strategies, providing refuges where wildlife can persist under reduced human disturbance. However, the establishment of protected areas often imposes costs on neighboring communities, raising questions about the balance between conservation outcomes and local welfare [6]. Conflicts between local people and protected area authorities, crop raiding, livestock depredation, and restrictions on resource access frequently shape local attitudes toward wildlife and determine the long-term legitimacy of conservation interventions [7], [8]. Resolving these tensions requires attention to the social and relational roots of conflict rather than only to the mitigation of wildlife damage [9].

Beyond habitat protection, conservation practice must address the direct use and health of wildlife populations. Illegal and unsustainable wildlife trade, driven by consumer demand and limited conservation awareness, remains a major threat to many species [10]. Regulated trophy hunting has been debated as a potential instrument for generating economic incentives for conservation in regions where alternative land uses compete with wildlife [11]. Emerging infectious diseases and parasites affect wildlife populations, domestic animals, and human health simultaneously [12]. At the same time, population genomics supports the management of genetic diversity in threatened populations [13], and host-associated microbiota is increasingly recognized as a component of wildlife health and resilience [14].

Wildlife-based tourism and ecotourism have also been promoted as mechanisms linking conservation with local economic benefits. Local attitudes toward conservation are closely associated with how

tourism benefits are distributed around protected areas [15], and community-based models such as homestays can support both wildlife protection and sustainable livelihoods [16]. Social science concepts further help explain how human values, beliefs, and behaviors shape public support for wildlife conservation [17]. These developments illustrate that wildlife conservation is no longer viewed purely as a biological problem but as a socio-ecological challenge involving economic, cultural, and governance considerations.

Methodological innovation has transformed the way wildlife is studied and monitored. Camera traps have become a widely used tool for detecting elusive species, although their application requires careful study design to produce reliable data [18]. Drones enable surveys of large or inaccessible areas with reduced disturbance [19], and their combination with artificial intelligence is revolutionizing wildlife monitoring [20]. Artificial intelligence and machine learning increasingly support automated species identification, population estimation, and threat detection [21], [22], while tracking technologies link movement ecology with practical wildlife management [23]. As a result, research on wildlife conservation has expanded rapidly and now spans ecology, genetics, veterinary science, social science, tourism, and computer science.

The growing volume and diversity of publications make it increasingly difficult to obtain a comprehensive view of how the field has developed. Bibliometric analysis offers a quantitative approach to evaluating scientific literature by mapping publication patterns, influential works, collaboration networks among authors, institutions, and countries, and the thematic structure of a research domain [24]. Compared with narrative reviews, bibliometric mapping reveals the intellectual structure of a field and traces its evolution over time, making it suitable for synthesizing a broad and interdisciplinary topic such as wildlife conservation.

Although numerous studies have examined specific aspects of wildlife conservation, such as protected area

management, human–wildlife conflict, wildlife tourism, or monitoring technologies, the literature remains dispersed across disciplines, regions, and methodological traditions. Limited attention has been given to mapping the field as a whole, including its dominant themes, the evolution of research priorities, its most influential contributions, and the structure of scientific collaboration. This fragmentation makes it difficult for researchers and policymakers to distinguish established knowledge from emerging directions and under-represented areas. Therefore, this study conducts a bibliometric analysis of wildlife conservation research to map its intellectual structure, thematic evolution, most cited publications, and collaboration patterns at the author, institutional, and country levels.

2. METHODS

This study employed a bibliometric analysis approach to examine the scientific development of wildlife conservation research. Bibliographic data were retrieved from the Scopus database, which provides broad coverage of peer-reviewed literature across the natural and social sciences and is widely used in bibliometric studies. The search targeted documents whose titles contained the terms “wildlife” and “conservation,” ensuring that the retrieved records explicitly addressed wildlife conservation as their main subject. The final dataset, exported in RIS format, consisted of

1,997 documents published between 2000 and 2026, comprising 1,291 articles, 221 book chapters, 179 reviews, 102 conference papers, 50 books, and a smaller number of notes, editorials, letters, and other document types. Each record contained the title, abstract, author and indexed keywords, author names, affiliations, publication year, source title, and citation count. Annual output increased from 32 documents in 2000 to 187 documents in 2025, indicating steadily growing research interest in the field.

Bibliometric mapping was performed using VOSviewer (version 1.6.20), a software program designed for constructing and visualizing bibliometric networks [25]. Keyword co-occurrence analysis was used to identify the main thematic clusters and was presented in three modes: network visualization to display clusters and their linkages, overlay visualization to show the average publication year of each keyword, and density visualization to highlight the most intensively studied topics. Co-authorship analysis was conducted at the author, institution, and country levels to examine collaboration structures, while citation counts recorded in Scopus were used to identify the most influential documents in the dataset.

3. RESULTS AND DISCUSSION

3.1 Keyword Co-Occurrence Network Visualization

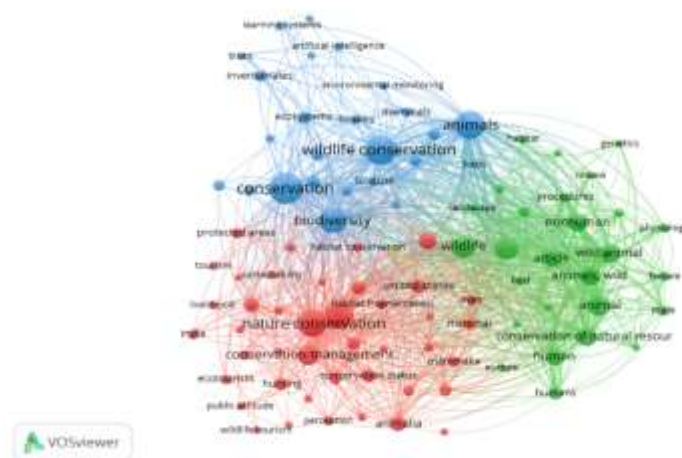


Figure 1. Network Visualization

Source: Data Analysis, 2026

Figure 1 presents the keyword co-occurrence network of wildlife conservation research. The most prominent nodes are conservation, wildlife conservation, nature conservation, biodiversity, animals, and wildlife, indicating that the literature is organized around the protection of wild species and the broader goal of maintaining biodiversity. The dense web of links among these nodes shows that the field is highly integrated, with ecological, managerial, and biological perspectives frequently combined in the same studies. Three major clusters can be distinguished, together with a very small fourth cluster (yellow) located near the center of the map.

The blue cluster represents the ecological and biodiversity-oriented dimension of the field. It is anchored by wildlife conservation, conservation, biodiversity, and animals, and includes terms such as ecosystems, forestry, land use, mammals, birds, invertebrates, and biotic. The presence of environmental monitoring, artificial intelligence, and learning systems at the upper edge of this cluster shows that technological approaches to biodiversity monitoring have become attached to this ecological core.

The red cluster reflects the management and socio-ecological dimension

of wildlife conservation. Dominated by nature conservation and conservation management, it includes protected areas, habitat conservation, habitat fragmentation, conservation status, hunting, tourism, ecotourism, wildlife tourism, livelihood, sustainability, public attitude, and perception. This cluster also contains geographic terms such as United States, India, and Europe, and taxonomic descriptors such as mammalia, aves, and animalia, suggesting that much of this research consists of place-based and taxon-specific studies on how conservation policies interact with the human use of wildlife and landscapes.

The green cluster captures the organism-level and biological dimension. Terms such as wildlife, wild animal, animal, nonhuman, human, humans, physiology, genetics, male, female, and conservation of natural resources are typical of life-science indexing and indicate studies on the physiology, genetics, health, and behavior of wild animals and their relationships with humans. Overall, the network shows a field structured around three complementary perspectives: ecological and biodiversity assessment (blue), conservation management and human dimensions (red), and animal biology and health (green)

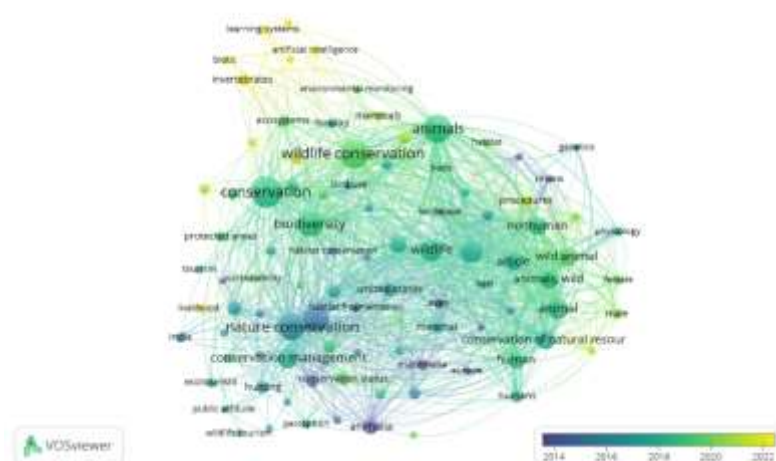


Figure 2. Overlay Visualization

Source: Data Analysis, 2026

Figure 2 displays the overlay visualization, in which node colors indicate

the average publication year of each keyword, ranging from approximately 2014 (purple) to

2022 (yellow). The core terms wildlife conservation, conservation, biodiversity, animals, and wildlife appear in green tones corresponding to around 2018–2020, confirming that they have remained central throughout the study period.

Older themes, shown in purple and blue, include animalia, mammalia, aves, conservation status, habitat conservation, habitat fragmentation, Europe, and nature conservation, reflecting earlier studies that focused on species status assessments, habitat protection, and taxon-based descriptions. In

contrast, the most recent themes, displayed in yellow, are concentrated in the upper-left part of the map and include artificial intelligence, learning systems, invertebrates, biotic, and mammals, together with livelihood, procedures, male, and female. This pattern indicates a shift from descriptive and status-oriented research toward data-driven monitoring, broader taxonomic coverage beyond charismatic vertebrates, and closer attention to the livelihoods of communities living alongside wildlife.

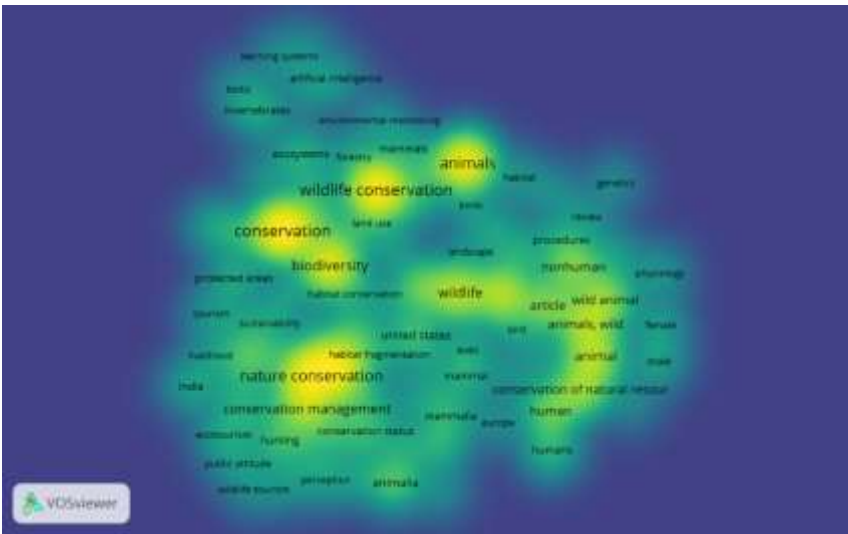


Figure 3. Density Visualization
Source: Data Analysis, 2026

Figure 3 shows the density visualization of keyword occurrences. The brightest areas are located around conservation, wildlife conservation, animals, nature conservation, and wildlife, indicating that these topics represent the most mature and intensively studied areas of the field. Other high-density zones surround biodiversity, habitat fragmentation, conservation management, and the group of terms wild animal and animal, reflecting a strong concentration of research on habitat change, management practice, and the biology of wild animals.

3.2 Citation Analysis

Table 1. Top Cited Documents

Lower-density areas appear at the periphery of the map, including learning systems, artificial intelligence, genetics, physiology, public attitude, perception, wildlife tourism, and Europe. These topics are either more specialized or still emerging. Read together with the overlay visualization, the low density of technology-related terms combined with their recent average publication year suggests that artificial intelligence and learning systems are developing research frontiers with considerable room for growth.

Citations	Author and Year	Title
656	[22]	Perspectives in machine learning for wildlife conservation
647	[5]	Wildlife in the anthropocene: Conservation after nature
570	[3]	A review of climate-change adaptation strategies for wildlife management and biodiversity conservation
551	[13]	Population genomics for wildlife conservation and management
496	[4]	A framework for understanding noise impacts on wildlife: An urgent conservation priority
441	[20]	Unmanned aerial vehicles (UAVs) and artificial intelligence revolutionizing wildlife monitoring and conservation
422	[9]	Conservation's blind spot: The case for conflict transformation in wildlife conservation
392	[17]	Who cares about wildlife?:Social science concepts for exploring human-wildlife relationships and conservation issues
376	[14]	Conservation biology needs a microbial renaissance: A call for the consideration of host-associated microbiota in wildlife management practices
375	[23]	Linking movement ecology with wildlife management and conservation

Source: Scopus, 2026

3.3 Co-Authorship Analysis

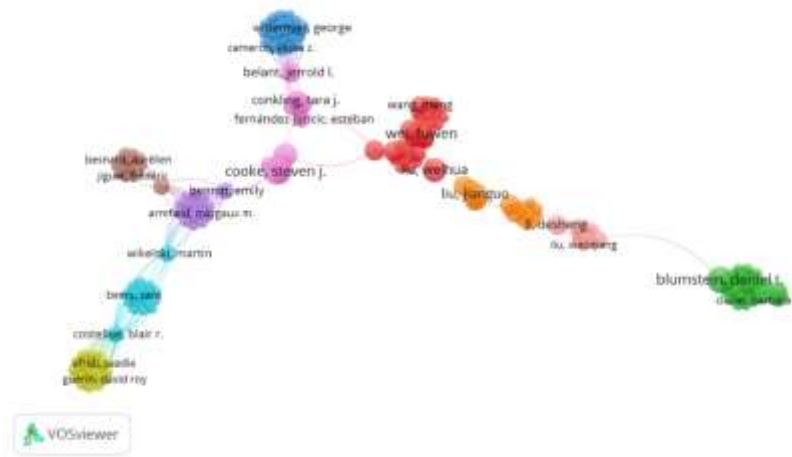


Figure 4. Author Visualization
Source: Data Analysis, 2026

Figure 4 shows the co-authorship network of authors in wildlife conservation research. The network forms a chain-like structure consisting of about ten small clusters connected by a limited number of bridging authors. The left branch is composed of groups centered on Wittemyer, George and Cameron, Elissa Z. (blue); Belant, Jerrold L., Conkling, Tara J., Fernández-Juricic, Esteban, and Cooke, Steven J. (pink); Bennitt, Emily and Armfield, Margaux M. (purple); Besnard,

Aurélien and Jiguet, Frédéric (brown); Wikelski, Martin, Beery, Sara, and Costelloe, Blair R. (cyan); and Afridi, Saadia and Guerin, David Roy (yellow). Many of these authors work on animal tracking, biologging, drones, and machine learning, which is consistent with the prominence of technology-based monitoring in the keyword analysis.

The right branch is dominated by Chinese research groups associated with Wei, Fuwen, Wang, Meng, and Xu, Weihua (red),

followed by Liu, Jianguo (orange) and Li, Desheng and Liu, Xiaoqiang (light pink), which are linked through a single connection to the group of Blumstein, Daniel T. and Clucas, Barbara (green). Cooke, Steven J. serves as a key bridge between the left and

right branches. The sparse links between clusters indicate that collaboration in the field is largely organized within relatively closed research teams, and that a few individual researchers play a disproportionate role in connecting otherwise separate communities.

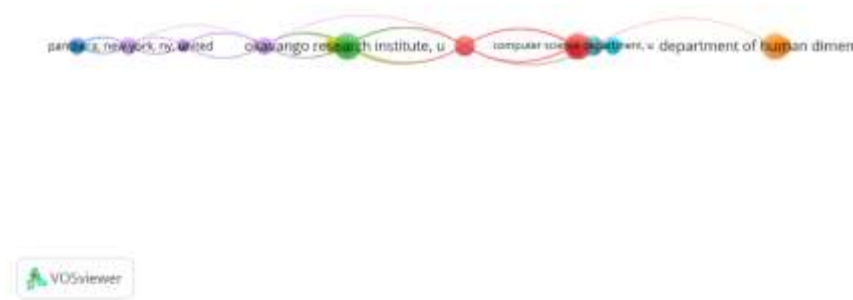


Figure 5. Institution Visualization

Source: Data Analysis, 2026

Figure 5 presents the institutional collaboration network, which forms a linear chain rather than a dense web. On the left side, Panthera (New York, United States), an international wild cat conservation organization, is connected through partner institutions to the Okavango Research Institute of the University of Botswana, one of the largest nodes in the network. The chain continues through a central node to university computer science departments and ends with the Department of Human Dimensions of

Natural Resources at Colorado State University on the right. This configuration combines a conservation NGO, a field research institute, computational units, and a human-dimensions department, illustrating how field data collection, analytical expertise, and social science perspectives are brought together. However, the small size of the connected network indicates that sustained institutional collaboration in the field remains limited.

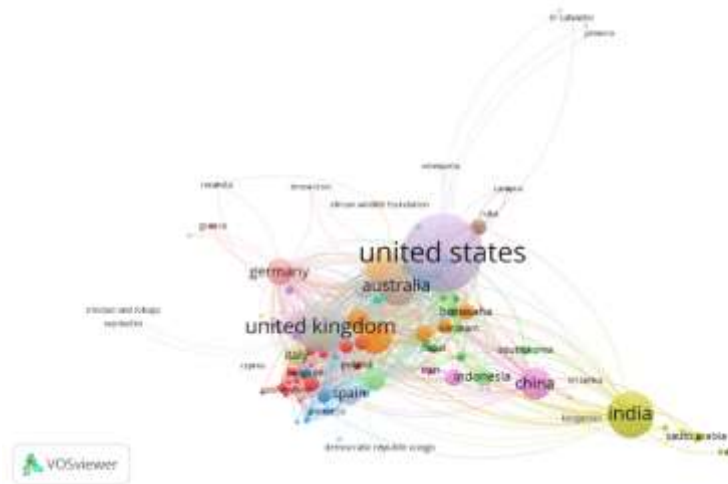


Figure 6. Country Visualization

Source: Data Analysis, 2026

Figure 6 shows the country collaboration network. The United States is the largest and most central node, followed by the United Kingdom, Australia, India, China, and Germany, indicating that these countries are the leading producers and main hubs of international collaboration in wildlife conservation research. The United States and the United Kingdom are connected to almost every region in the network, acting as bridges between research communities in Europe, Africa, Asia, and Latin America, while Botswana appears close to this core, reflecting active collaboration on African wildlife systems.

Several regional clusters can be identified. European and African countries form interlinked groups, such as Belgium with Côte d'Ivoire and Spain with Morocco; China is linked with Indonesia, Iran, and Sri Lanka; and India forms a distinct cluster with Saudi Arabia and Iraq. Viet Nam, Nepal, and South Korea are connected to the core through multiple links, whereas El Salvador, Jamaica, Venezuela, Cuba, Rwanda, Timor-Leste, Greece, Seychelles, Trinidad and Tobago, Cyprus, and the Democratic Republic of the Congo appear at the periphery with few collaborative ties. Nodes labeled campus and African Wildlife Foundation reflect inconsistencies in affiliation records rather than actual countries. Overall, research capacity remains concentrated in a few high-

income countries, while many biodiversity-rich countries in Africa, Asia, and Latin America occupy peripheral positions in the collaboration network.

4. CONCLUSION

This bibliometric analysis of 1,997 Scopus-indexed documents shows that wildlife conservation research has grown steadily since 2000 and is organized around three interconnected thematic clusters: ecological and biodiversity assessment, conservation management and human dimensions, and animal biology and health. The thematic evolution reveals a shift from species status and habitat-oriented studies toward technology-driven monitoring, including artificial intelligence and learning systems, together with greater attention to local livelihoods and broader taxonomic groups. The most cited works emphasize machine learning, genomics, climate adaptation, and the social dimensions of human-wildlife relationships. Collaboration networks at the author and institutional levels are chain-like and partially fragmented, while at the country level the United States, the United Kingdom, Australia, India, and China act as the main hubs. Future research should strengthen cross-cluster and cross-regional collaboration, particularly with biodiversity-rich countries in the Global South, and integrate emerging monitoring technologies

with socio-ecological and community-based conservation approaches.

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