# The Impacts of Anthropogenic Disturbance on Wildlife Habitats: A Global Review

**Gokul Prasad Sahu[1*],Laxmikant[2], P. Visvanathan[3]**
[1*]Assistant Professor, Faculty of Science, ISBM University, Gariyaband, Chhattisgarh, India.
[2]Assistant Professor, Faculty of Science, ISBM University, Gariyaband, Chhattisgarh, India.
[3]Associate Professor, Faculty of Science, ISBM University, Gariyaband, Chhattisgarh, India.
*Corresponding Author:
gokul.prasad@isbmuniversity.ac.in

**Abstract**

This paper reviews the impacts of anthropogenic disturbances on wildlife habitats globally. Anthropogenic activities such as urbanization, agriculture, industrial activities, and infrastructure development lead to habitat loss, fragmentation, pollution, and resource depletion, profoundly affecting terrestrial and aquatic ecosystems. Case studies from the Amazon rainforest, Great Barrier Reef, and African savannas highlight specific impacts and conservation challenges. The review also discusses conservation and mitigation strategies, including protected areas, sustainable development, and restoration ecology, alongside policy frameworks like the Convention on Biological Diversity and national wildlife protection laws. Future research needs focus on emerging threats, technological advancements, and interdisciplinary approaches to enhance conservation efforts.



**Keywords:** Anthropogenic disturbance, wildlife habitats, biodiversity loss, habitat fragmentation, conservation strategies, protected areas, sustainable development, restoration ecology, policy and legislation, climate change, invasive species.

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## I. Introduction

### A. Overview of Anthropogenic Disturbances

Anthropogenic disturbances refer to alterations in the natural environment caused by human activities. These activities include urbanization, agriculture, industrialization, and infrastructure development, all of which significantly alter ecosystems and biodiversity. Urbanization leads to habitat loss and fragmentation, directly impacting wildlife populations by reducing available habitats and creating isolated patches that hinder species movement and gene flow (Aronson et al., 2014). Agricultural practices, such as deforestation and pesticide use, further exacerbate habitat degradation and pose risks to various species through habitat conversion and chemical exposure (Tilman et al., 2017). Industrial activities contribute to pollution and resource extraction, leading to contamination and depletion of natural habitats, thereby affecting species' survival and reproductive success (Foley et al., 2005). Infrastructure development, including road construction and dam building, fragments landscapes and disrupts ecological processes, often resulting in altered water flow and increased human-wildlife conflicts (Laurance et al., 2014).

### B. Importance of Studying Their Impacts on Wildlife Habitats

Understanding the impacts of anthropogenic disturbances on wildlife habitats is crucial for several reasons. Firstly, it helps identify the specific threats posed by human activities to biodiversity and ecosystem functions

(Newbold et al., 2015). By recognizing these threats, conservationists and policymakers can develop targeted strategies to mitigate negative effects and promote sustainable practices. Secondly, studying these impacts provides insights into the resilience and adaptability of different species and ecosystems, which is essential for predicting future biodiversity scenarios in the face of ongoing environmental changes (Pereira et al., 2012). Moreover, it highlights the interconnectedness of human activities and natural systems, emphasizing the need for integrated approaches to conservation that consider socio-economic factors alongside ecological ones (Folke et al., 2016). Lastly, understanding these impacts is vital for achieving global biodiversity targets and fulfilling international conservation commitments, such as the Convention on Biological Diversity (CBD) and the Sustainable Development Goals (SDGs) (Tittensor et al., 2014).

**C. Purpose of the Review**

The purpose of this review is to synthesize current knowledge on the impacts of anthropogenic disturbances on wildlife habitats worldwide, providing a comprehensive overview of how different human activities affect various ecosystems and species. This review aims to highlight key findings from recent studies, identify gaps in the existing literature, and suggest directions for future research and conservation efforts. By collating and analyzing data from diverse geographical regions and ecological contexts, this review seeks to enhance our understanding of the global patterns and trends in habitat disturbances and their ecological consequences (Dirzo et al., 2014). Furthermore, it intends to inform policymakers, conservation practitioners, and the general public about the urgent need for effective conservation strategies and sustainable development practices to safeguard wildlife habitats and biodiversity in the face of increasing anthropogenic pressures (Ceballos et al., 2015). Through this review, we hope to contribute to the ongoing discourse on biodiversity conservation and support evidence-based decision-making for the protection of our planet's natural heritage (Mace et al., 2014).



## II. Types of Anthropogenic Disturbances

**Table 1: Summary of Anthropogenic Disturbances and Their Impacts on Wildlife Habitats**

| Anthropogenic Disturbance | Impacts on Wildlife Habitats |
|---|---|
| Urbanization | Habitat loss, Fragmentation |
| Agriculture | Deforestation, Pesticide use |
| Industrial activities | Pollution, Resource extraction |
| Infrastructure development | Roads and highways, Dams and waterways |

**A. Urbanization**

Urbanization is a major driver of environmental change, causing significant impacts on wildlife habitats.

**Habitat Loss**

Urban expansion often leads to the destruction of natural habitats as land is cleared for housing, commercial buildings, and infrastructure. This process drastically reduces the area available for wildlife, leading to population declines and even local extinctions (Seto et al., 2012). Urban sprawl particularly affects species that require large, continuous habitats and cannot thrive in fragmented environments (McKinney, 2006).

**Fragmentation**

Habitat fragmentation occurs when large habitats are divided into smaller, isolated patches due to urban development. This process not only reduces the total habitat area but also isolates populations, making it difficult for individuals to find mates and access resources (Haddad et al., 2015). Fragmentation can lead to genetic isolation, increased mortality rates, and reduced resilience to environmental changes (Fahrig, 2017).

**B. Agriculture**

Agricultural practices have profound effects on natural ecosystems and biodiversity.

**Deforestation**

Agriculture is the leading cause of deforestation, particularly in tropical regions. Forests are cleared to create space for crops and livestock, resulting in the loss of biodiversity and disruption of ecosystem functions (Gibbs et al., 2010). Deforestation not only removes trees but also destroys the habitats of countless species, leading to significant ecological imbalances (Laurance et al., 2014).

**Pesticide Use**

The widespread use of pesticides in agriculture has detrimental effects on non-target species, including beneficial insects, birds, and aquatic organisms (Geiger et al., 2010). Pesticides can contaminate soil and water bodies, leading to bioaccumulation and biomagnification in food chains, ultimately affecting entire ecosystems (Morrissey et al., 2015).

**C. Industrial Activities**

Industrial activities contribute to environmental degradation through pollution and resource extraction.

**Pollution**

Industrial processes often release pollutants into the air, water, and soil, causing widespread contamination. Air pollution from factories and vehicles can lead to acid rain, which harms terrestrial and aquatic ecosystems (Manisalidis et al., 2020). Water pollution from industrial waste discharges can devastate aquatic habitats, reducing water quality and harming species that depend on clean water (Schwarzenbach et al., 2010).

**Resource Extraction**

Mining, drilling, and logging are examples of resource extraction activities that directly impact wildlife habitats. These activities not only remove essential resources but also cause habitat destruction, soil erosion, and pollution (Sunderlin et al., 2005). The alteration of landscapes can have long-term ecological consequences, making it difficult for ecosystems to recover (Sonter et al., 2017).

**D. Infrastructure Development**

Infrastructure projects, such as roads and dams, significantly alter natural landscapes.

**Roads and Highways**

The construction of roads and highways leads to habitat fragmentation, creating barriers that disrupt animal movement and migration patterns (Forman et al., 2003). Roads can also introduce invasive species and increase wildlife mortality due to vehicle collisions (Laurance et al., 2014).

**Dams and Waterways**

Building dams and altering waterways for hydroelectric power and irrigation can significantly impact aquatic and riparian ecosystems. Dams obstruct fish migration, alter water flow, and change sediment and nutrient distribution, affecting both upstream and downstream habitats (Nilsson et al., 2005). These changes can lead to declines in fish populations and other aquatic species (Winemiller et al., 2016).

**III. Impacts on Terrestrial Habitats**

**A. Forest Ecosystems**

Forest ecosystems are particularly vulnerable to anthropogenic disturbances.

**Biodiversity Loss**

Deforestation and habitat fragmentation lead to significant biodiversity loss in forest ecosystems. Species that depend on large, contiguous forest areas are particularly at risk, as their habitats are increasingly fragmented and degraded (Haddad et al., 2015). The loss of biodiversity can disrupt ecological interactions and lead to the decline of ecosystem services that humans rely on, such as carbon sequestration and water purification (Thompson et al., 2011).

**Altered Ecosystem Services**

Anthropogenic disturbances can alter the ecosystem services provided by forests, such as carbon storage, water regulation, and soil fertility. Deforestation and forest degradation reduce the capacity of forests to sequester carbon, contributing to climate change (Pan et al., 2011). Changes in land use can also affect

water cycles, leading to altered water availability and quality (Ellison et al., 2017).

**B. Grasslands and Savannas**

Grasslands and savannas are also affected by human activities.

**Species Displacement**

Agricultural expansion and overgrazing can lead to species displacement in grasslands and savannas. Native species are often replaced by invasive species or domesticated livestock, leading to changes in community composition and ecosystem function (Bond & Parr, 2010). Displacement can result in the loss of native biodiversity and the degradation of ecosystem services (Hobbs et al., 2009).

**Soil Degradation**

Overgrazing and agricultural practices can cause soil degradation, reducing the productivity and health of grassland ecosystems. Soil erosion, compaction, and nutrient depletion are common issues that result from unsustainable land use (Briske et al., 2015). Degraded soils are less capable of supporting diverse plant and animal communities, leading to further ecological decline (Reynolds et al., 2007).

**C. Deserts**

Desert ecosystems are particularly sensitive to anthropogenic disturbances.

**Habitat Degradation**

Human activities, such as off-road vehicle use and military training exercises, can cause habitat degradation in desert environments. These activities disturb the soil and vegetation, leading to increased erosion and loss of habitat for desert species (Lovich& Bainbridge, 1999). Habitat degradation can have long-lasting effects on the delicate balance of desert ecosystems (Belnap et al., 2001).

**Invasive Species**

Invasive species pose a significant threat to desert ecosystems, where they can outcompete native species for limited resources. The introduction of invasive plants, such as cheatgrass, can alter fire regimes and change the structure and function of desert habitats (Brooks et al., 2004). Managing invasive species is crucial for preserving the integrity and biodiversity of desert ecosystems (D'Antonio&Vitousek, 1992).

**IV. Impacts on Aquatic Habitats**

**A. Freshwater Ecosystems**

Freshwater ecosystems, including rivers, lakes, and streams, are particularly vulnerable to anthropogenic disturbances, which can significantly alter their ecological balance and biodiversity.

**Water Pollution**

Water pollution is one of the most critical threats to freshwater ecosystems. Industrial discharge, agricultural runoff, and untreated sewage introduce harmful pollutants, including heavy metals, pesticides, and nutrients, into freshwater bodies. These pollutants can lead to toxic conditions for aquatic life, causing declines in species diversity and abundance (Schwarzenbach et al., 2010). Nutrient pollution, especially nitrogen and phosphorus from agricultural runoff, can cause eutrophication, leading to algal blooms that deplete oxygen levels and create dead zones where most aquatic life cannot survive (Smith et al., 1999).



**Habitat Fragmentation**

The construction of dams, weirs, and other barriers can fragment freshwater habitats, disrupting the natural flow of rivers and streams. This fragmentation prevents the free movement of aquatic species, such as migratory fish, and alters sediment and nutrient transport, which can negatively impact habitat quality downstream (Nilsson et al., 2005). Fragmented habitats also isolate populations, reducing genetic diversity and increasing the vulnerability of species to environmental changes and stochastic events (Fagan, 2002).

**B. Marine Ecosystems**

Marine ecosystems are facing significant pressures from human activities, leading to profound changes in their structure and function.

**Overfishing**

Overfishing is a major threat to marine ecosystems, depleting fish stocks and disrupting food webs. The removal of key species can lead to cascading effects throughout the ecosystem, altering predator-prey relationships and reducing biodiversity (Pauly et al., 2002). Overfishing also impacts the livelihoods of communities that depend on fisheries for food and economic activity, highlighting the need for sustainable management practices (Hilborn et al., 2003).

**Coral Reef Destruction**

Coral reefs are among the most biodiverse marine ecosystems, but they are highly susceptible to anthropogenic disturbances. Climate change, leading to ocean warming and acidification, is causing widespread coral bleaching and mortality (Hoegh-Guldberg et al., 2007). Additionally, destructive fishing practices, coastal development, and pollution further degrade coral reefs, reducing their ability to provide essential services, such as coastal protection, habitat for marine species, and tourism opportunities (Hughes et al., 2003).

**C. Wetlands**

Wetlands are critical ecosystems that provide numerous ecological services, but they are under severe threat from human activities.

**Drainage and Conversion**

The drainage and conversion of wetlands for agriculture, urban development, and other land uses are leading causes of wetland loss. These activities destroy wetland habitats, displacing or eliminating species that depend on them (Zedler&Kercher, 2005). Wetland drainage also disrupts hydrological processes, reducing water storage capacity and increasing the risk of floods and droughts (Mitsch&Gosselink, 2000).

**Eutrophication**

Eutrophication in wetlands, caused by excessive nutrient inputs from agricultural runoff and wastewater, leads to the overgrowth of algae and aquatic plants. This process depletes oxygen levels in the water, causing hypoxic conditions that can kill fish and other aquatic organisms (Carpenter et al., 1998). Eutrophication also alters the structure and function of wetland ecosystems, reducing their biodiversity and the quality of the services they provide, such as water purification and habitat for wildlife (Smith, 2003).

**V. Case Studies**

**A. Amazon Rainforest**

The Amazon rainforest, the world's largest tropical rainforest, is a vital global resource with immense biodiversity.

**Deforestation Impact on Biodiversity**

Deforestation in the Amazon is primarily driven by agricultural expansion, logging, and infrastructure development. This loss of forest cover has severe consequences for biodiversity. The Amazon is home to approximately 10% of the world's known species, many of which are endemic. Habitat destruction leads to species decline and extinction, disrupts ecological processes, and diminishes genetic diversity (Haddad et al., 2015). Studies have shown that deforestation fragments habitats, isolates wildlife populations, and reduces the forest's capacity to support its rich biodiversity (Laurance et al., 2006).



**Socio-economic Factors**

Socio-economic factors, such as poverty and the demand for land, drive deforestation in the Amazon. Local communities often rely on deforestation for agriculture and logging to sustain their livelihoods (Bebbington et al., 2013). Furthermore, global demand for commodities like soy and beef has intensified land conversion (Nepstad et al., 2014). Balancing socio-economic development with conservation efforts is crucial to mitigate the adverse impacts of deforestation on biodiversity.

**B. Great Barrier Reef**

The Great Barrier Reef, the world's largest coral reef system, faces significant threats from climate change and human activities.

**Coral Bleaching Events**

Coral bleaching is a major issue affecting the Great Barrier Reef. Rising sea temperatures, driven by climate change, cause corals to

expel the symbiotic algae living in their tissues, leading to bleaching and often coral death (Hoegh-Guldberg et al., 2007). Severe bleaching events in 1998, 2002, and 2016-2017 have resulted in widespread coral mortality, threatening the reef's biodiversity and ecosystem services (Hughes et al., 2018).

**Conservation Efforts**

Conservation efforts for the Great Barrier Reef include establishing marine protected areas (MPAs), implementing sustainable fishing practices, and reducing land-based pollution. The Great Barrier Reef Marine Park Authority manages the reef, enforcing regulations to minimize human impact (Day, 2002). Additionally, restoration projects, such as coral gardening and breeding programs, aim to enhance reef resilience and recovery (Edwards & Gomez, 2007).

**C. African Savannas**

African savannas, characterized by vast grasslands and diverse wildlife, face challenges from human activities and environmental changes.

**Wildlife Corridors**

Wildlife corridors are critical for maintaining ecological connectivity in fragmented landscapes. In African savannas, corridors enable the movement of species like elephants and large carnivores, ensuring access to resources and genetic exchange (Caro et al., 2009). Successful implementation of corridors requires collaboration between conservation organizations, governments, and local communities to secure and manage these critical habitats (Newmark, 2008).

**Human-Wildlife Conflict**

Human-wildlife conflict in African savannas arises when wildlife, such as elephants and predators, come into contact with human activities, leading to crop damage, livestock predation, and threats to human safety. Strategies to mitigate conflict include compensation schemes, community-based conservation, and the use of deterrents like electric fencing and guardian animals (Woodroffe et al., 2005). Effective conflict mitigation requires integrating local knowledge and ensuring community participation in conservation efforts (Dickman, 2010).

**VI. Conservation and Mitigation Strategies**

**A. Protected Areas and Reserves**

Protected areas and reserves are essential for conserving biodiversity and natural habitats.

**Effectiveness and Challenges**

Protected areas can effectively conserve biodiversity by providing safe habitats for species and preserving ecological processes. However, challenges such as insufficient funding, inadequate enforcement, and socio-economic pressures can undermine their effectiveness (Geldmann et al., 2013). Integrating protected areas into broader landscape management and addressing the needs of local communities are critical for their success (Watson et al., 2014).



**Community Involvement**

Community involvement in conservation efforts is crucial for the long-term success of protected areas. Community-based conservation approaches empower local people to manage and benefit from natural resources, fostering stewardship and sustainable practices (Brooks et al., 2013). Participatory management and benefit-sharing mechanisms can enhance the effectiveness of protected areas while improving the livelihoods of local communities (Berkes, 2004).

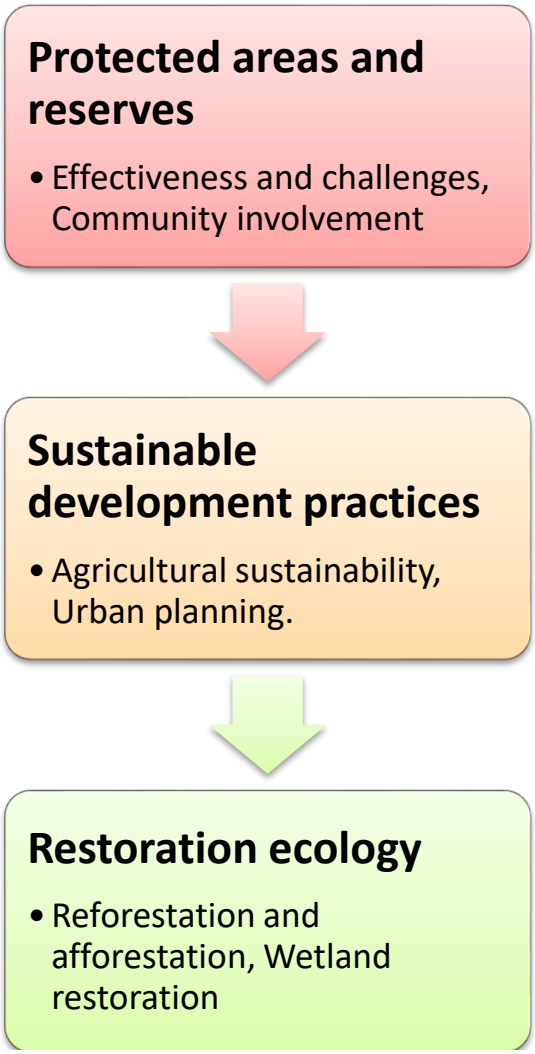




**Figure1: Conservation and Mitigation Strategies for Wildlife Habitats**

**B. Sustainable Development Practices**

Sustainable development practices aim to balance environmental conservation with socio-economic development.

**Agricultural Sustainability**

Promoting sustainable agricultural practices can reduce the negative impacts of agriculture on wildlife habitats. Techniques such as agroforestry, conservation tillage, and organic farming help maintain soil health, reduce pesticide use, and enhance biodiversity (Pretty, 2008). Implementing sustainable practices requires support from policies, education, and incentives to encourage farmers to adopt environmentally friendly methods (Tilman et al., 2002).

**Urban Planning**

Sustainable urban planning integrates green spaces, reduces habitat fragmentation, and minimizes pollution. Designing cities with green corridors, parks, and sustainable infrastructure can mitigate the impacts of urbanization on wildlife (McKinney, 2002). Smart growth strategies, such as compact development and mixed land use, help preserve natural areas and reduce the ecological footprint of urban areas (Ewing et al., 2015).

**C. Restoration Ecology**

Restoration ecology focuses on repairing damaged ecosystems and restoring their functions and services.

**Reforestation and Afforestation**

Reforestation and afforestation efforts aim to restore degraded forest ecosystems and

increase forest cover. These practices enhance biodiversity, sequester carbon, and improve soil and water quality (Chazdon, 2008). Successful reforestation projects involve selecting native species, ensuring genetic diversity, and engaging local communities in planning and implementation (Holl& Aide, 2011).

**Wetland Restoration**

Wetland restoration involves rehabilitating degraded wetlands to restore their ecological functions, such as water filtration, flood control, and habitat provision. Techniques include re-establishing natural hydrology, planting native vegetation, and removing invasive species (Zedler&Kercher, 2005). Effective wetland restoration requires a comprehensive understanding of wetland ecology and active monitoring and management to ensure long-term success (Mitsch&Gosselink, 2000).

**VII. Policy and Legislation**

**A. International Agreements**

International agreements play a crucial role in coordinating global conservation efforts and establishing common standards for biodiversity protection.

**Convention on Biological Diversity (CBD)**

The CBD is an international treaty aimed at conserving biological diversity, promoting sustainable use of its components, and ensuring the fair and equitable sharing of benefits arising from genetic resources. It provides a framework for national biodiversity strategies and action plans, encouraging countries to integrate biodiversity considerations into their development processes (Secretariat of the Convention on Biological Diversity, 2010).

**CITES (Convention on International Trade in Endangered Species)**

CITES regulates international trade in endangered species of wild fauna and flora to ensure that it does not threaten their survival. By listing species in different appendices based on their conservation status, CITES provides legal protection and promotes sustainable trade practices (Favre, 1989). Enforcement and cooperation among member countries are essential for the effectiveness of CITES (Reeve, 2002).

**B. National Policies**

National policies and regulations are critical for implementing conservation measures and protecting wildlife habitats at the country level.

**Environmental Regulations**

Environmental regulations, such as the Clean Water Act and the Endangered Species Act in the United States, provide legal frameworks for protecting natural resources and habitats. These laws set standards for pollution control, habitat protection, and species conservation, ensuring that human activities do not harm the environment (Sands & Peel, 2012). Effective enforcement and regular updates to regulations are necessary to address emerging environmental challenges.



**Wildlife Protection Laws**

Wildlife protection laws aim to conserve species and their habitats by regulating hunting, trade, and habitat destruction. Examples include the Wildlife Protection Act in India and the Species at Risk Act in Canada. These laws often include provisions for creating protected areas, managing wildlife populations, and restoring degraded habitats (Bowman et al., 2010). Public awareness and community involvement are key to the successful implementation of wildlife protection laws.

**VIII. Future Directions and Research Needs**

**A. Emerging Threats**

Emerging threats pose new challenges to wildlife habitats and require proactive research and conservation strategies.

**Climate Change**

Climate change is profoundly affecting ecosystems worldwide, altering temperature regimes, precipitation patterns, and sea levels. These changes impact species distributions, migration patterns, and reproductive cycles, necessitating research to predict and mitigate these effects. Understanding species' adaptive capacities

and developing climate-resilient conservation strategies are crucial for safeguarding biodiversity (Parmesan, 2006).

**Invasive Species**

Invasive species are non-native organisms that can cause significant harm to ecosystems, outcompeting native species and disrupting ecological processes. Research is needed to identify pathways of invasion, assess the impacts on biodiversity, and develop effective management and eradication strategies. Early detection and rapid response are key components of invasive species management (Simberloff et al., 2013).

**B. Technological Advancements**

Advancements in technology offer new tools for monitoring and conserving wildlife habitats.

**Remote Sensing**

Remote sensing technologies, such as satellite imagery and drone-based monitoring, provide valuable data on habitat changes, deforestation rates, and ecosystem health. These tools enable large-scale, real-time monitoring of remote and inaccessible areas, enhancing our ability to track environmental changes and inform conservation efforts (Turner et al., 2015).

**Genetic Monitoring**

Genetic monitoring involves using molecular techniques to assess genetic diversity, population structure, and species' adaptive potential. This approach can provide insights into the effects of habitat fragmentation, inbreeding, and genetic drift. Genetic data can guide conservation strategies, such as identifying critical habitats for protection and managing genetic resources to enhance population resilience (Schwartz et al., 2007).

**C. Interdisciplinary Approaches**

Integrating diverse fields and perspectives is essential for addressing complex conservation challenges.

**Integrating Socio-economic Factors**

Effective conservation requires understanding and addressing socio-economic drivers of habitat loss, such as poverty, land-use change, and resource demands. Interdisciplinary research that combines ecological, economic, and social sciences can develop holistic strategies that balance conservation goals with human needs. Engaging local communities and stakeholders is vital for the success and sustainability of conservation initiatives (Ostrom, 2009).

**Collaboration Across Fields**

Collaboration among ecologists, economists, sociologists, and policymakers can foster innovative solutions to conservation challenges. Interdisciplinary teams can develop comprehensive approaches that consider ecological integrity, economic viability, and social equity. Collaborative efforts can also enhance knowledge sharing, capacity building, and the implementation of best practices in conservation (Campbell, 2005).

**IX. Conclusion**

Anthropogenic disturbances significantly impact wildlife habitats, causing biodiversity loss, habitat degradation, and ecosystem disruption. Understanding these impacts and implementing effective conservation strategies are crucial for preserving global biodiversity. International agreements, national policies, and innovative research are essential components of a comprehensive conservation framework. Future efforts must address emerging threats, leverage technological advancements, and promote interdisciplinary collaboration to ensure the sustainability of wildlife habitats and the well-being of human societies.



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