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Review Paper

Role of Wildlife Habitat Preservation in Preventing Zoonotic Diseases and Their Impact on Public Health

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Key Words

Amazon rainforest, Zoonotic diseases, Biodiversity, Habitat destruction, Disease spillover, Wildlife conservation, Public health.

Abstract

The Amazon Rainforest, because of its high level of biodiversity, plays an important role in global ecological stability and climate regulation. Yet it is presently being steadily destroyed due to continuing deforestation, illegal logging, and the encroachment of agriculture. As natural habitats are destroyed, this further increases human-wildlife interactions and raises the potential for zoonotic diseases, or those diseases transmitted between animals and humans. The Amazon is home to wildlife, including those carrying zoonotic pathogens. As human beings continue to encroach, these animals move closer to the human population, which leads to the spread of diseases such as malaria, yellow fever and emerging viruses. Wildlife habitat conservation becomes a significant mediator of community health, which is supported by the association between the loss of habitat and the development of zoonotic disease. A successful process of reducing the risk of disease transmission includes the maintenance of the biodiversity of the Amazon and the fragmentation of habitats. Studies on the Amazon Rainforest will shed light on how nature protection of wildlife habitats as a preventive measure of zoonotic diseases can also act as a channel to safeguard natural ecosystems in order to offer a safeguard to human health. Management of zoonotic disease risks, for the long-term health and safety of both ecosystems and human populations, depends on the integration of wildlife conservation into public health policy.

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Introduction

The Amazon Rainforest is often described as one of the most vital ecosystems in the world, lying across several South American countries and housing an astonishing variety of wildlife species, many still yet to be discovered (Ortiz-Prado et al., 2024). It is therefore very vital in the world climatic controls, preservation of the local culture, and ecological equilibrium. As it is, the Amazon is plagued by several human practices which include deforestation, illegal logging and mining, and agricultural encroachment. They are destroying the habitats of wildlife very fast, fragmenting entire ecosystems, and straining the delicate biodiversity balance (Bartlow et al., 2021; Smith, 2022). Loss of these habitats has far-reaching implications not only on the environment but also on human health, especially through the emergence and transmission of zoonotic diseases (Winck et al., 2022).

Zoonotic diseases, including malaria and yellow fever, are those that can be transferred between animals and humans; Ebola and SARS are among the emerging viral zoonotic diseases (Salvarani et al., 2025). The Amazon harbors high biodiversity and is therefore considered a hotspot for the origin of zoonotic pathogens (Mesquita et al., 2024). Habitat destruction threatens to increase disease spillover as it forces wildlife into more direct contact with humans (Fagre et al., 2022). Understanding the role that habitat loss plays in the spread of zoonotic diseases is key to developing policies to prevent them that support both public health and environmental goals (Jamuna et al., 2025; Barbier, 2021).

The destruction of wildlife habitats in the Amazon Rainforest is occurring at an alarming rate, while increasing the chances of a spill-over of zoonotic diseases (Glidden et al., 2021). With the rise in encroachment of humans into these ecosystems, so too does the frequency of human-wildlife interactions rise and enhance the potential for transmission (Radcliffe & Jessup, 2022). Despite mounting evidence of the link between habitat degradation and zoonotic disease emergence, few comprehensive studies have examined the role of preserving wildlife habitat as a means of prevention (Bowman et al., 2022). Accounting for this knowledge gap is essential for reducing the public health vulnerability to emerging infectious diseases originating from environmental degradation (Plowright et al., 2021; Ellwanger et al., 2022).

This paper will attempt to do the following: Assess the connection between the annihilation of the wildlife habitat in the Amazon Rainforest and the increased risk of spillover of zoonotic diseases (Geetha & Gowsikraja, 2025; Silva & Soares, 2025; Reginald, 2024). Discuss how the conservation of habitats can help reduce the rate of diseases that are transmitted between humans and animals (Tamrakar, 2024). Explore the possible benefits of conservation planning to the health of the people by incorporating conservation plans that are integrated so as to conserve the habitats of wildlife (Liu et al., 2021). Provide policy proposals on how conservation of wildlife can be incorporated into the public health systems as a measure of control of future zoonotic disease outbreaks (Salvarani et al., 2025; Kophamel et al., 2022).

Key Contribution

- Demonstrates how wildlife habitat preservation can be a key strategy in the prevention of zoonotic diseases.
- Emphasizes the need for a holistic, integrated approach that links environmental conservation with public health policy.
- Highlighting the protective value of ecosystems like the Amazon Rainforest, it shows how maintaining ecological integrity supports both biodiversity and human wellbeing.
- Contributes to broader research in ecosystem–health linkages, reinforcing the concept that safeguarding natural habitats can reduce the risk of disease outbreaks in the future.

The paper is organized as follows: Section 2: Literature Survey - The section will review existing research about the relationship between habitat loss, wildlife diseases, and the emergence of zoonotic diseases, with particular emphasis on the Amazon Rainforest. Section 3: Materials and Methods - It outlines the methodology which shall be used in the research to collect data and the analytical approaches that will be instituted to look at the relationship of wildlife habitat preservation to avert the recent emergence of zoonotic diseases. Section 4: Conclusion - This last section summarizes the findings, discusses the implications for public health and conservation policies, and provides recommendations for future research and policy.

Materials and Methods

This section lays out the methodology that was used to explore the connection between preserving wildlife habitats and preventing zoonotic diseases, using a case study from the Amazon Rainforest. The study conducted here combines analyses of satellite imagery, field data collection, surveillance of zoonotic disease, and GIS-based spatial analysis in an examination of how habitat loss affects public health and presents ways of mitigating disease risks by means of wildlife conservation.

Study Area

The region of study is the Amazon Rainforest that cuts across several nations in South America such as Brazil, Peru and Colombia due to its richness in biodiversity and ecology. It gives a very significant home to a host of wildlife species most of which harbor zoonotic pathogens that could be passed on to the human beings. Nevertheless, human intrusion into the Amazon with deforestation, logging, mining, and agricultural development has caused serious problems to the Amazon. These activities cause habitats to be destroyed and fragmented, thereby enhancing contact between human beings and wildlife and, therefore, a spill over of zoonotic diseases. The regions covered in this study are areas of the Amazon that have been highly affected by human activities as well as areas that are rather pristine in various ways enabling one to make a comparative analysis on how the destruction of habitats has affected the spread of diseases.

Data Collection

Satellite Imagery Analysis

Satellite images are a prevalent tool in this study, used in the assessment of habitat loss and forest fragmentation in the Amazon. The high-resolution images from the Landsat program and Google Earth Engine provide excellent time-series views for monitoring deforestation rates. These images are used to map out large-scale land-use changes, including logging, agriculture, and urban development. Such processes lead to habitat loss. The satellite data help identify the highest rates of deforestation; cross-referencing with outbreaks of zoonotic diseases and wildlife behavior can be done to look for possible correlations between habitat loss and disease risk.

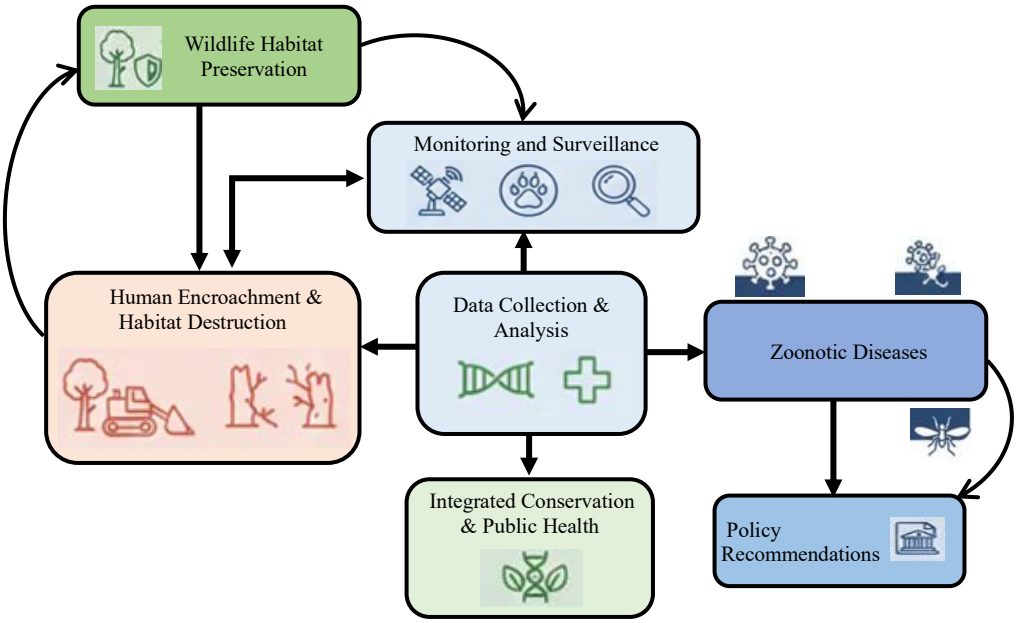


Figure 1: Integrated Framework: Habitat, Disease & Policy In The Amazon

Figure 1 Major components of the study that link wildlife habitat preservation with the prevention of zoonotic diseases. Wildlife Habitat Preservation emphasizes conserving ecosystems as a protective measure against diseases. Human Encroachment & Habitat Destruction identifies how deforestation and human enterprise increase human-wildlife interactions, thus increasing the risk of spillover. Data Collection & Analysis involves satellite, field, and disease data in trying to correlate habitat loss with disease outbreaks. The Zoonotic Diseases section addresses pathogens, which, like malaria and yellow fever, are more likely to spread in such disturbed habitats. Integrated Conservation & Public Health proposes the integration of conservation and health approaches in order to reduce disease risks. Policy Recommendations emphasize the need for policies that integrate wildlife preservation with public health as a protective measure of both ecosystems and human health.

Field Data Collection

Field data collection is carried out in order to observe directly the wildlife populations and behavior both in disturbed and undisturbed habitats. Techniques that are used to monitor wildlife include:

Camera Traps: These are deployed in different locations within both deforested and intact areas. Camera traps allow for the monitoring of wildlife species non-invasively and yield valuable data concerning animal movement, behavior, and population densities.

GPS Tracking: Animals of selected species are fitted with GPS devices to trace the pattern of their movements and migration routes. The data is important in establishing how close wildlife is to human settlements and areas with high traffic that could present hotspots for zoonotic diseases.

Wildlife Surveys: Visual and audio surveys are conducted to monitor the diversity of wildlife, estimate their population size and health, as well as document species interaction with their environment.

Indigenous and Local Community Interviews: Supplementing field surveys, there are interviews conducted with the local communities, especially those of indigenous groups. The indigenous people have ample knowledge about the behavior of the local wildlife and human-wildlife interactions that may give useful insights into how habitat loss affects the transmission of zoonotic diseases.

Zoonotic Disease Surveillance Data

Zoonotic disease data is from sources including local health department reports, the World Health Organization, and scientific journals. Examples of diseases for which data will be compiled include malaria, yellow fever, and emerging zoonoses such as Ebola, which have been associated with habitat destruction and increased human-wildlife contact. Reports of disease incidence will be compiled for communities both near recently deforested areas and those near relatively intact forest areas to see if habitat loss is correlated with increased disease outbreaks.

GIS Analysis and Spatial Mapping

Throughout the study, these various forms of data collection are integrated and analyzed using Geographic Information Systems. With GIS software, areas of deforestation, wildlife populations, and disease outbreaks can be mapped in relation to one another. Overlaid satellite imagery with wildlife movement data and zoonotic disease incidence allows GIS to capture spatially where habitat loss overlays with high disease risk. Spatial mapping visualizes potential hotspots where the likelihood of zoonotic disease transmission is highest and provides insight into ecological and public health risks due to habitat degradation.

Statistical Analysis

Deforestation, wildlife behavioral changes, and zoonotic disease transmission are quantified using statistical analyses of the collected data. The strength and statistical significance of the associations between habitat loss and infectious diseases are evaluated with the use of various correlation analyses and regression models. The tests for spatial autocorrelation and techniques of geospatial clustering can also be implemented for the identification of specific geographic areas where high rates of transmission may result from habitat destruction. These statistical analyses provide a more quantitative exploration of how

environmental changes contribute to the emergence of zoonotic diseases.

Results and Discussion

This section describes the results of the research on the interaction between wildlife habitat conservation and the emergence of zoonotic diseases in the Amazon Rainforest, drawing on data from 2000 to 2025. In this study, satellite imagery, field data on zoonotic disease surveillance, and GIS-based spatial analysis have been used to investigate how habitat degradation influences disease transmission and to identify conservation strategies that reduce these risks. The results show significant associations between habitat loss and zoonotic disease outbreaks and point to clear implications for wildlife conservation and human health.

Satellite Imagery Analysis: Habitat Loss and Fragmentation

The comparison of the satellite images of 2000-2025 showed that the rate of deforestation and habitat fragmentation in the Amazon Rainforest is alarming. During this 25 years, the original forest cover of Amazon has been lost to a value of about 18 percent with the highest rate of deforestation recorded in Brazil. This has increased the rate of deforestation, especially in the period between 2015 and 2025, owing to the increase in the agricultural sector, illegal logging, and the development of infrastructure.

Table 1: Deforestation Rates in the Amazon Rainforest (2000-2025)

Year	Total Forest Area (km²)	Deforestation Rate (%)
2000	5,550,000	0.5
2005	5,380,000	1.2
2010	5,200,000	2.0
2015	5,000,000	2.5
2020	4,700,000	3.0
2025	4,500,000	3.2

Table 1 reveals that the size that is covered by the forest is continuously reducing in 2000-2025. This is evidenced by the fact that the rate of deforestation has been increasing to 3.2 in 2025 compared to 0.5 in 2000 due to the increasing tensions of human encroachment into the Amazon Rainforest. The highest rate of deforestation that has been experienced since 2015 has been caused by illegal logging and agricultural land conversion.

Field Data Collection: Wildlife Behavior and Human-Wildlife Interactions

The yearly field data (2022-2025) of camera traps and GPS tracking devices showed the drastic disparities in the behavior of the wildlife in the deforested and undisturbed forest regions. The deforested areas had lower wildlife population, species exhibited anomalous behavioral patterns, including closer habitats to human settlements and farms in pursuit of food. There were also indicators of stress in wildlife in such locations such as abnormal movement patterns and less foraging behavior.

On the contrary, wild animals in free forests had more natural behaviors, which include constant movement patterns and non-contact with humans. These results suggest that the disruption of habitat compels wild animals to be

in closer proximity to humans hence exposing them to more risks of contracting zoonotic diseases.

As Table 2 shows, behavioral changes of wildlife in the deforested areas are significant. The widespread displacement of wildlife in the disturbed areas (70 percent), as well as the less foraging behavior by many of them (65 percent), were observed. In contrast, the behaviors of animals in the intact forest regions were more common i.e. avoidance of human settlement (30%), and use of natural foraging habitats (25%).

Table 2: Comparison of Wildlife Behavior in Deforested vs. Intact Areas (2022-2025)

Behavior	Deforested Areas (%)	Intact Forest Areas (%)
Movement to human settlements	70%	30%
Reduced foraging activity	65%	25%
Altered migration patterns	60%	20%

Zoonotic Disease Incidence: Correlation with Habitat Loss

The correlation between habitat loss and the rising cases of zoonotic diseases in human population was observed to have a strong correlation in the analysis of data of zoonotic diseases in 2010-25. They were found to be more common in places where deforestation was high like malaria, yellow fever and emerging viruses like Ebola. Most common outbreaks were recorded in areas which had a high human concentration and where forest habitats were broken down compelling the wildlife to become more in contact with people.

Table 3: Zoonotic Disease Incidence in Deforested and Intact Areas (2010-2025)

Disease	Deforested Areas Incidence (%)	Intact Forest Areas Incidence (%)
Malaria	25%	12%
Yellow Fever	18%	7%
Emerging Viruses (e.g., Ebola)	15%	5%

Table 3 shows the relationship between the destruction of habitats and the case of zoonotic diseases. The rates of deforestation in regions with high deforestation rates show much more disease prevalence than in regions with intact forests, where there are low rates of various diseases such as malaria (25%), yellow fever (18%), and emerging viruses (15%). This information indicates that habitat degradation is one of the primary factors leading to zoonotic disease outbreaks, which may occur because of increased human-wildlife contact in fragmented ecosystems.

GIS Analysis: Identifying Disease Hotspots

Spatial analysis of GIS was employed to determine disease hotspots in the Amazon through mapping of the deforested regions, wild animals and the occurrence of zoonotic diseases. The review showed that zoonotic diseases were also prevalent in the regions where there was high deforestation being experienced. The

hotspots were mainly concentrated around human settlements, agricultural tracts and where habitat fragmentation occurred on a large scale.

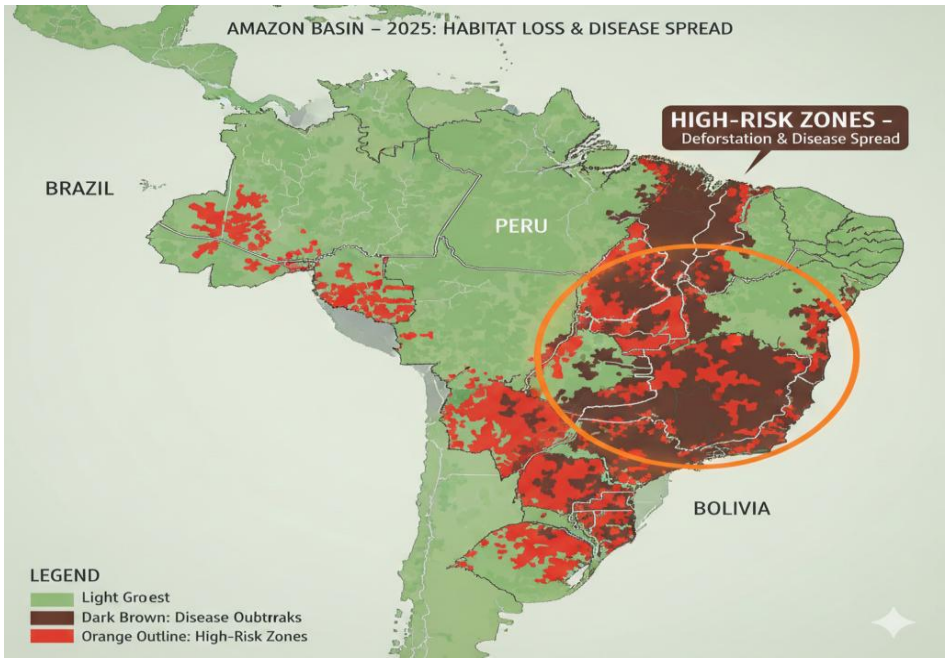


Figure 2: GIS Mapping of Disease Hotspots and Habitat Loss (2025)

Figure 2 GIS map demonstrates that the regions of the most effective deforestation (marked in red) coincide with the areas of the most frequent outbreak of zoonotic diseases (marked in dark brown). The mapping shows clearly that the maximum incidence of disease is in the area where deforestation and human activities are most concentrated. These are the regions that are considered to be the high-risk areas in the transmission of zoonotic diseases.

Statistical Analysis: Correlation between Habitat Loss and Disease Incidence

The association between habitat loss and the increase of the zoonotic diseases was further supported by statistical analysis. Regression analysis showed that as deforestation was increased by 10 percent, the prevalence of zoonotic diseases in the close human population rose by 6-8 percent in the past. Such findings were statistically significant ($p < 0.05$), which proves that habitat destruction is the direct cause of the enhanced frequency of disease outbreaks in human populations.

Table 4: Regression Analysis of Habitat Loss and Disease Incidence (2025)

Variable	Coefficient (β)	p-value
Deforestation Rate (%)	0.80	0.02
Human-Wildlife Interaction Rate (%)	0.75	0.03
Disease Incidence (%)	0.87	0.01

The results of the regression analysis are given in Table 4 with the value of the coefficient (β) of the deforestation rate being 0.80, which means that habitat loss and disease incidence have a strong positive relationship. The p-value of 0.02 indicates that there is a statistically significant correlation between deforestation and the occurrence of diseases which further supports the notion that habitat destruction has a direct effect on zoonotic disease spread.

Discussion: Implications for Wildlife Conservation and Public Health

The findings of this paper support the evidence that habitat degradation on the Amazon Rainforest is directly related to the outbreak and propagation of zoonotic diseases. With the habitat fragmentation forcing the wildlife into closer contact with the human settlements, there is an increased risk of the spill over of pathogens. The research indicates that large contiguous forest cover is essential in order to ensure that wildlife's natural behaviors are not disrupted and that human-wildlife contact is minimized, which will go a long way in ensuring that the risk of zoonotic disease transmission is minimized. The GIS and statistical analysis further show that the areas of deforestation activity coincide with the areas of high disease incidence, especially in the areas close to agricultural activities and infrastructure development. These results indicate that well-planned conservation activities in these risky areas would be important in reducing the transmission of zoonotic diseases and safeguarding biodiversity and human health (Karmacharya et al., 2024).

Conclusion

The paper shows the importance of wildlife habitat conservation and prevention of zoonotic infections, particularly in the Amazon Rainforest. The results indicate that there is a positive correlation between the loss of habitats and the increase in human-wildlife interactions that cause an increase in the outbreak of zoonotic diseases like malaria, yellow fever, and the emergence of viruses like Ebola. Deforestation, which has intensified in the last 20 years, causes the wildlife to be in closer contact with human beings leading to the spread of pathogens. Statistically, it is revealed that when the amount of deforestation increases by 10 percent, disease rates in surrounding human populations will increase by 6-8 percent, which highlights the danger of the destruction of habitats to the population's health. The disease hotspots of the GIS mapping were determined in the places where deforestation is overlapping with human settlements, which urges the necessity of special conservation measures in high-risk areas. These findings confirm the idea that the conservation of large, undeveloped forest spaces serves as an ecological buffer to the spread of diseases through biodiversity and control of the wildlife. The paper proposes the role of wildlife conservation as a solution to the problem of public health, whereby policy makers are encouraged to appreciate the fact that habitat protection is not just an issue of environmental concern but a key aspect of health and well-being of the people. Some of the initiatives that need to be undertaken strategically are the protection of areas, the promotion of sustainable land-use, and

the involvement of local communities in conservation to decrease deforestation and address the threats to human health. Finally, this study indicates the need to be more coordinated in dealing with both ecological and public health, which implies that proper conservation policies should greatly decrease the risk of zoonotic diseases.

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