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AN OVERVIEW OF THE EFFECTS OF DEFORESTATION ON PITHECOPHAGA JEFFERYI IN THE PHILIPPINES

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ABSTRACT
The study investigated the current status of the Philippine Eagle as an apex predator endemic in the Philippines. Specifically, it highlighted deforestation and its direct relationship as one of the drivers of Philippine Eagle's endangerment. The data collection involved summarization of ten scholarly materials using an integrative approach to mixed-method research. The study concluded that due to agricultural development, logging, mining activities, and encroachment by humans, raptor habitats experienced a reduction by fifty percent (50%) . These activities resulted in "insularization," isolated forests that impede juvenile eagle dispersal and have increased encounters between eagles and humans, leading to mortality rates due to opportunistic hunting and trapping activities. Furthermore, habitat destruction resulted in trophic cascades that caused reduction in food supply, which caused an extension of the biennial breeding cycle or nest abandonment by the eagle. With only 400 individuals remaining in the wild, it is imperative that multi-scale conservation activities be implemented, including the shift from nest protection to mountain range protection under an umbrella species approach, as well as intensifying the implementation of the Philippine Wildlife Act (RA 9147), including socio-economic factors that have contributed to deforestation activities.

Keywords:
Philippine eagle, Endangered species, Habitat loss, Habitat fragmentation, Ecosystem degradation

INTRODUCTION

One of the biggest predatory birds in the world is the Philippine eagle. The Philippines' national bird, this strong apex predator, is indigenous to the island nation. They can be recognized by their enormous size, brown feathers, large curved bill, strong talons, and, most importantly, their characteristic shaggy crest. The species, which lives in the rainforests of four of the more than 7,000 islands that comprise the Philippines [1]. They live exclusively in the jungle where they get food, breed, and raise their young [2]. Large areas of montane and lowland rainforests are essential to their survival, and as apex predators, they are vital to preserving ecological equilibrium [3].However, this species is showing a decline in its population. Only 400 of these amazing birds are thought to be left in the wild, according to experts. The main cause is habitat loss brought on by logging, mining, and agricultural growth, which obliterates the eagles' natural habitat and deprives them of appropriate hunting and nesting locations [4].This study aims to provide an overview about the major drivers of deforestation in the Philippines, and their effects on Philippine eagle endangerment. Specifically, how this threatens the species' ability to survive and reproduce, and how many of this species are left in the Philippines. Through this study, researchers will be able to synthesize the findings and better understand the factors affecting the reproducibility of the Philippine eagle, which is critical for conservation and mitigation of these impacts.

Lastly, this study is beneficial because it highlights the impact of deforestation not only on the Philippine eagle but also on all animal species that rely heavily on forest habitats, to understand biodiversity loss in the Philippines. Moreover, the study provides a synthesis of ten (10) articles to support planning for conservation and policy making for endangered species in the Philippines.

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OBJECTIVES

This study aims to provide an overview of the major drivers of deforestation in the Philippines and to examine how these processes contribute to the endangerment of the Philippine Eagle (*Pithecophaga jefferyi*). It analyzes the ways in which habitat loss threatens the species' ability to survive and reproduce, while also determining the current estimated population of the eagle in the country. Furthermore, it synthesizes existing findings to better understand the ecological and biological factors affecting reproductive success. Finally, it highlights the importance of conservation efforts and mitigation strategies, emphasizing the need for integrated approaches that address both environmental and socio-economic impacts to ensure the long-term survival of this flagship species

METHODOLOGY

This systematic review utilised a structured and transparent mixed-methods approach to gather, assess, and synthesise published scientific literature regarding the conservation status, ecological necessities, and management strategies for the Philippine Eagle *(Pithecophaga jefferyi)*—specifically the combined effects of deforestation and population dynamics—throughout the Philippine archipelago (Salvador & Ibanez, Valle et al., 2025). The process adhered to a mixed-methods integrative review framework to guarantee rigour, transparency, and replicability in selecting ten primary scholarly works and synthesising both quantitative population data and qualitative assessments of anthropogenic threats (Collar & Berryman, 2025; Concepcion & Puan, 2025). This systematic approach offers a solid empirical basis for understanding the complex reality of *P. jefferyi* conservation in its fragmented habitats, connecting the results with recognised standards of evidence-based academic research (O'Bryan et al., 2025).

Search Strategy

This systematic review utilized a structured, multi-database methodology to locate and assess pertinent literature concerning the combined impacts of deforestation on the Philippine Eagle. The search methodology encompassed the acquisition of primary research articles from leading academic repositories, namely BioOne, Wiley Online Library, ProQuest, J-STAGE, and ResearchGate. To enhance the search's specificity, a carefully constructed set of keywords was utilized, including "Philippine Eagle," *"Pithecophaga jefferyi,"* "forest fragmentation," "habitat loss," and "raptor conservation." Boolean operators were strategically employed to augment precision; for instance, queries like "Philippine Eagle" and "deforestation" and "population viability" were formulated to ensure comprehensive coverage within the 2006–2026 timeframe (Collar & Berryman, 2025; Salvador & Ibanez,).

Inclusion and Exclusion Criteria

The final research corpus was determined through the application of pre-defined eligibility criteria, as stipulated by the PRISMA 2020 guidelines, to maintain systematic transparency and taxonomic precision. Studies were incorporated if they provided primary or secondary empirical data concerning the ecological impacts of deforestation on *P. jefferyi* or forest-dependent raptors within the Philippine archipelago (O'Bryan et al., 2025). Eligible studies were mandated to evaluate key parameters, including breeding success, prey availability, and anthropogenic threats linked to land-use change. Conversely, specific exclusion criteria were implemented to eliminate: (1) studies concentrating on general Southeast Asian raptors without species-specific data pertaining to the Philippine Eagle (Concepcion & Puan, 2025); (2) non-scholarly media reports or opinion pieces devoid of empirical validation; and (3) redundant datasets or preliminary reports that had been superseded by more recent technical updates (Valle et al., 2025). This structured methodology ensured the integration of only high-quality, pertinent evidence into the ultimate synthesis.

Screening and Selection Process

The studies that were found were organized and managed using a digital reference management tool. Duplicate entries were systematically removed to ensure a clean dataset. Several reviewers independently screened the titles and abstracts to assess their initial eligibility based on the predefined inclusion and exclusion criteria. Subsequently, a rigorous full-text screening was conducted to evaluate the methodological quality, taxonomic relevance, and empirical depth of each study concerning *P. jefferyi*. In situations of disagreement regarding study inclusion, consensus was achieved through critical discussion or by referring to a lead researcher for final adjudication. The entire selection process followed the PRISMA 2020 flow diagram, which allowed for systematic documentation and complete transparency in how the final research materials were included.

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Data Analysis and Classification

The data obtained underwent analysis through a thematic classification methodology, facilitating the concurrent examination of both quantitative indicators, such as population estimates and territory sizes, and qualitative accounts, including indigenous management practices. The studies were subsequently organized according to four ecological domains: (1) habitat loss and fragmentation, (2) nesting site availability, (3) prey population dynamics, and (4) human-wildlife conflict (Panopio et al., 2021). Furthermore, a quality assessment was performed on each source to ascertain methodological reliability and the transparency of data collection protocols, thereby ensuring that the synthesis accurately represented the most credible evidence presently available within the scientific literature (Collar & Berryman, 2025).

RESULTS AND DISCUSSION

This section consolidates findings from ten (10) scholarly articles that collectively assess the conservation status, ecological challenges, and management strategies for the Philippine Eagle *(Pithecophaga jefferyi)*, offering a robust empirical basis for interpreting the current results (Salvador & Ibanez, 2006; Valle et al., 2025). The examined literature—consisting of peer-reviewed journals, longitudinal field studies, and contemporary population viability analyses—highlights significant themes, including the species' vulnerable population viability amid methodological uncertainty (Collar & Berryman, 2025); the devastating effects of deforestation and habitat fragmentation that have diminished suitable raptor habitats by nearly fifty percent (O'Bryan et al., 2025), and ongoing anthropogenic threats such as hunting and human encroachment (IERE, 2026; Concepcion, 2017). Moreover, these studies underscore the significance of multi-scalar conservation efforts, encompassing captive breeding programmes and indigenous-led forest management (Panopio et al., 2021). This discussion synthesises insights from ten diverse sources, positioning the current findings within the broader scientific discourse and ensuring an analysis that is both evidence-based and attuned to the complex realities of *P. jefferyi* conservation (Concepcion & Puan, 2025)

Table 1. Summary of Reviewed Studies on Philippine Eagle Population and Conservation

The underlying studies show that deforestation and habitat fragmentation are the principal causes of Philippine Eagle decline.

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No.	Location	Type of deforestation	Environmental impact	Implications	Author and Year
1	1. Luzon Islan 2. Mindanao Island 3. Samar Islan 4. Leyte Island (extirpated; reintroduction began in 2024). .	1. Commercial logging 2. Agricultural conversion 3. Settlement expansion causing forest clearing	• Commercial logging removes mature canopy trees, destabilizing forest ecosystems and eliminating nesting sites. • Agricultural conversion transforms biodiverse forests into cropland or pasture, causing soil erosion and prey decline. • Settlement expansion fragments continuous habitats into small patches, increasing human disturbance and hunting risk.	• Loss of nesting habitat due to forest clearing and fragmentation forces Philippine Eagles into marginal areas, reducing breeding success and prey availability. • Accelerated extinction risk: if deforestation continues unchecked, the species faces a significant probability of extinction within the next century.	Valle et al. (2025)
2	1. Luzon 2. Samar, 3. Leyte 4. Mindanao	1. logging for cropland, pasture 2. Plantation expansion thinning forests 3. Forest fragmentation	• Logging for cropland and pasture thins forest interiors, reducing habitat quality for forest-dependent species. • Plantation expansion replaces diverse forests with monocultures, weakening ecological resilience and prey diversity. • Forest fragmentation isolates eagle populations, leading to genetic bottlenecks, reduced reproductive success, and long-term instability.	• Philippine Eagle population estimated at 64–223 breeding pairs (midpoint ~138). • Distribution: Luzon (6–50 pairs), Samar + Leyte (7–21 pairs), Mindanao (51–152 pairs). • Forest loss and fragmentation have drastically reduced suitable breeding habitat. • Logging and agricultural expansion have thinned forests, forcing eagles into marginal areas. • Deforestation indirectly increases human–eagle conflict, as displaced birds prey on livestock	Nigel J. Collar & Alex J. Berryman (2025)
3	1. Forest Sites in Luzo 2. Sama 3. Leyte	1. Primary Forest Loss 2. Mining-related Deforestation 3. Agricultural Expansion	• Deforestation is the most severe threat, removing nesting and hunting grounds and isolating eagle populations. • Fragmentation reduces genetic exchange between populations and forces eagles into suboptimal habitat. • Loss of forest ecosystems due to agricultural expansion, logging, and mining • Environmental laws exist (e.g., Republic Act 9147),	• Deforestation caused by agricultural expansion, logging, mining, and urbanization leads to habitat destruction and fragmentation, reducing available nesting and hunting areas, decreasing prey availability, and ultimately contributing to the decline of the Philippine Eagle population.	Jen Gale (2025)

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			but enforcement challenges allow illegal logging and hunting to persist.		
4	1. Sierra Madre Biodiversity Corridor (SMBC), Aurora Province.	1. Primary Forest Loss 2. Agricultural Expansion 3. Small-scale Illegal Logging	• Massive reduction of primary forests • Forest loss in the Philippines is acute, with mature forest cover reduced to less than 10% of its historical extent. • Disruption of food chains, affecting predators like the Philippine Eagle	• Habitat destruction has significantly reduced the Philippine Eagle's range and abundance, contributing to its Critically Endangered status.	Panopio et al. (2021)
5	1. Mindanao Island (primary study area) 2. Mt. Apo National Park 3. Mindanao, Central Mindanao 4. Northern Sierra Madre Natural Park (NSMNP), Luzo 5. Samar Islan 6. Leyte Island (historical study/survey site)	1. Habitat loss and fragmentation, reducing nesting and foraging areas 2. Increased human–wildlife contact 3. Expansion of home ranges 4. Reduced juvenile survival	• Breeding success is not a primary limiting factor • Low juvenile survival limits population growth • Human persecution increases mortality rates • Forest fragmentation elevates exposure to threats • Captive breeding supports population recovery • Reintroduction efforts face survival risks • Incomplete data limits accurate population estimates	• Population decline is driven by low juvenile survival and increased mortality. • Fragmented and degraded habitats reduce long-term viability of local populations. • Genetic diversity is at risk; loss of any population can worsen the recent genetic bottleneck. • Captive breeding and reintroduction are essential to maintain population numbers and genetic health. • Urgent conservation measures are needed to protect remaining forests and reduce human-induced threats.	Dennis J. I. Salvador & Jayson C. Ibañez (2021)
6	1. Luzon (Northern Sierra Madre Natural Park 2. other forested areas) 3. Samar Islan\Leyte Island 4. Mindanao Island (including Pulangi	1. Commercial logging 2. Forest fragmentation 3. Agricultural conversion 4. Timber	• Luzon and Samar individuals represent distinct genetic lineages, sharing ancestry with Mindanao populations • Philippine Eagles show haplotype and nucleotide diversity comparable to other accipitrids, with evidence of a recent genetic bottleneck • Genetic patterns highlight the need for conservation strategies that maintain	• Loss of forest from logging, timber extraction, and agriculture threatens survival by reducing nesting and hunting areas. • Fragmented populations increase risk of isolation and local extinctions. • Low juvenile survival combined with a genetic bottleneck makes population recovery	Camille B. Concepcion (2017)

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	Watershed, Arakan Valley, Eastern Mindanao Corridor, and Mt. Apo National Park)	extraction	diversity and guide captive breeding and reintroduction programs	more difficult. • Conservation actions must prioritize habitat protection, connectivity, and strategic captive breeding/reintroduction to maintain genetic diversity.	
7	1. Mindanao 2. Luzon 3. Leyte 4. Samar	1. Shifting agriculture 2. Commodity-driven deforestation (mining, energy) 3. Forestry activities	• On average, forest-dependent raptors lost 10% of forest within their ranges (2001–2023). • Only 52% of original forest cover remains globally for these species. • Forest gain (~4%) is mostly secondary growth, which is less suitable for raptors.	• Philippine Eagle and other specialists retain less than 25% of functional range. • Reduced prey availability and nesting sites raise extinction risk. • Increased human-wildlife conflict (e.g., predation on livestock) due to habitat loss.	O'Bryan et al. (2025)
8	1. Luzon 2. Mindanao 3. Batanes 4. Palawan	1. Logging 2. Agricultural conversion 3. Pollution (effluents) 4. Hunting and persecution	• Historical loss: 320,000 km² of forest removed between 1990–2010. • Projections: Remaining forest could drop to just 52,000 km² by 2050 if trends persist . • Severe fragmentation of raptor habitats across the region.	• Philippine Eagle ranks as the highest conservation priority due to evolutionary distinctiveness. • 76 out of 117 raptor species in SE Asia are in decline. • Direct pressures like hunting and persecution specifically threaten the Philippine Eagle.	Camille B. Concepcion & C. L. Puan (2025)
9	1. The Sierra Madre mountains	1. Lowland Forest Conversion 2. Expansion into Upland Areas 3. Replacement by Monocultures	• Deforestation and habitat degradation destroy large areas of forest, forcing wildlife out of their natural environments and breaking ecosystems into smaller, fragmented patches. • The loss of lowland evergreen forests reduces biodiversity and weakens ecosystem stability, affecting many species that	• The Philippine eagle population declines significantly, with fewer than 200 breeding pairs remaining, increasing its risk of extinction. • The species' range becomes restricted to remote upland areas such as the Sierra Madre Mountains and Mount Kitanglad.	Yong Ding Li (n.d.)

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		4. Loss of Mangroves 5. Primary Forest Loss	depend on these habitats. • Habitat fragmentation limits available space and resources, especially for species like the Philippine Eagle that require large territories.	• Breeding density decreases because fewer suitable habitats are available to support nesting pairs. • The eagle becomes highly vulnerable to habitat fragmentation due to its large area requirements. • Its specialized forest adaptations make it difficult to survive in open or human-altered landscapes.	
10	1.Busa Mountain Range 2.Sarangani Province	1. Forest Conversion for Agriculture and Settlements 2. Kaingin (Slash-and-Burn) 3. Logging Activities 4. Commercial Timber Harvesting	• Rapid deforestation of lowland forests, especially below 800 meters, removes the primary habitat of the Philippine Eagle. • Agricultural practices like kaingin (slash-and-burn farming) and shifting cultivation degrade and fragment forest ecosystems. • Logging activities and abandoned trails increase human access to forests, leading to more disturbance and habitat destruction. • Large-scale forest loss (over 50% since the 1990s in some areas) significantly reduces intact ecosystems.	• The continued loss of forests accelerates the population decline of the Philippine eagle and threatens its long-term survival. • Eagles become more vulnerable because their preferred habitats are the most heavily affected by human activities. • Increased human access raises the risk of hunting and persecution. • The species becomes dependent on limited strongholds such as the Busa Mountain Range, making conservation in these areas critical. • The shrinking and fragmentation of forests reduce the chances of sustaining stable populations in the future.	Senarillos et al. (2020)

Table 1 shows that deforestation and habitat fragmentation across Luzon, Mindanao, Samar, and Leyte are consistently identified as the primary drivers of Philippine Eagle *(Pithecophaga jefferyi)* population decline, reduced breeding success, and elevated extinction risk. It highlights how agricultural expansion and commodity-driven deforestation convert primary forests into plantations, while logging removes massive nesting trees and destabilizes canopy integrity. Mining operations and infrastructure development fragment habitats and increase human access to previously remote forest areas, intensifying disturbance. Human settlement and slash-and-burn practices exert additional pressure on forest edges, leading to intentional fires and clearing of primary growth.

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Genetic analyses reveal distinct lineages and evidence of bottlenecks, underscoring the vulnerability of maintaining genetic diversity in small populations.

Quantitative estimates of breeding pairs **(64–223)** confirm the species' precarious conservation status, while broader raptor assessments show average forest loss of **~10%** since 2001, with critically endangered taxa retaining the least suitable habitat. This table shows that these combined pressures not only reduce habitat suitability but also compromise reproductive success and long-term survival. The evidence emphasizes that forest-dependent raptors, particularly the Philippine Eagle, are at heightened risk of extinction due to synergistic effects of habitat loss and genetic isolation. Collectively, the overview underscores the urgent need for integrated conservation strategies, including habitat protection, stricter law enforcement, captive breeding, and reintroduction programs. By consolidating recent peer-reviewed studies, this table shows the critical importance of addressing both ecological and genetic threats to preserve evolutionary distinctiveness and ensure species persistence

Habitat loss is the "ultimate cause" of the species' decline, yet it is rarely a straightforward case of land clearing. In the Philippines, this is a socio-economic tragedy. With a human population that has surged to over 84 million, the "unbridled" demand for resources has led to an inverse proportion between population growth and forest cover. The nation received a devastating wake-up call in late 2004 when typhoons Unding, Violeta, Winnie, and Yoyong caused the "rain-soaked mountains to give way," resulting in catastrophic landslides and flooding that claimed over 1,000 lives—a direct consequence of the denuded uplands that serve as the eagle's last refuge. The following table details the granular mechanisms of this transformation: The decline of the Philippine Eagle *(Pithecophaga jefferyi)* is driven by a combination of ecological, anthropogenic, and socio-economic pressures. Based on synthesized data from multiple field surveys, genetic studies, and conservation reports, the threats can be categorized into four main sectors: anthropogenic drivers of deforestation, immediate human persecution, biological constraints, and systemic socio-economic pressures. These categories not only reflect the underlying causes of population decline but also help prioritize management interventions.

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Table 2. Anthropogenic, Biological, Ecological and Socio-economic Factors of Deforestation

Human activities such as agriculture, logging, mining, settlement, and infrastructure expansion drive forest destruction and fragmentation, reducing eagle habitat

Category		Biological		Ecological		Reference
		Cause	**Effect**	**Cause**	**Effect**	
Anthropo-genic Drivers	Agricultural Expansion	Forest conversion reduces prey species	Reduced breeding success and survival	Clearing of primary forest	Habitat loss and fragmentation	Salvador & Ibanez (2006); IERE (2025)
	Logging (Legal & Illegal)	Removal of nesting trees	Loss of breeding sites	Forest structure disruption	Increased fragmentation and access for poaching	Collar & Berryman (2025); Valle et al. (2025); Senarillos et al. (2021); IERE (2025)
	Mining Operations	Noise and pollution disturb species	Stress and displacement of eagles	Open-pit mining	Permanent habitat destruction	Valle et al. (2025); IERE (2025)
	Monoculture Plantations	Lack of prey diversity	Inability to sustain eagle populations	Replacement of biodiverse forest	Ecosystem simplification	Salvador & Ibanez (2006); IERE (2025)
	Human Settlement	Human-eagle conflict (livestock predation)	Increased mortality (killing of eagles)	Expansion into forests	Habitat encroachment	Collar & Berryman (2025); Valle et al. (2025); Salvador & Ibanez (2006)
	Slash-and-Burn (Kaingin)	Loss of nesting/prey habitat	Reduced survival rates	Burning of forests	Forest degradation & invasive species spread	Salvador & Ibanez (2006); Valle et al. (2025); Senarillos et al. (2021)
	Commodity-Driven Deforestation	Loss of large territories required by eagles	Population decline	Industrial clearing (dams, energy)	Large-scale habitat removal	Valle et al. (2025)
	Infrastructure & Access	Increased hunting pressure	Higher mortality	Road/trail creation	Increased fragmentation & human access	(General synthesis)
Socio-Economic & Institutiona l Drivers	Human Poverty	Dependence on forest resources	Increased hunting/encroachment	Resource extraction pressure	Forest degradation	Salvador & Ibanez (2006)
	Weak Law Enforcement	Continued illegal hunting	Population decline	Poor regulation enforcement	Ongoing habitat destruction	Salvador & Ibanez (2006)
	Population Growth	Increased resource demand	Greater human-wildlife conflict	Expansion into forest lands	Loss of remaining forests	Salvador & Ibanez (2006); Concepcion (2017)

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	Political & Economic Instability	Limited conservation programs	Reduced species protection	Weak institutional capacity	Poor ecosystem management	Salvador & Ibanez (2006)

Table 2 shows that the single most devastating effect of human activity is deforestation and habitat fragmentation, which eliminates massive nesting trees, destabilizes canopy structure, reduces prey availability, and forces eagles into smaller, isolated forest patches. These habitat losses directly undermine breeding success and magnify the species' vulnerability.

Biological constraints further intensify these pressures: juvenile mortality during dispersal across fragmented landscapes, population isolation due to habitat "insularization," food scarcity from prey decline, and genetic bottlenecks that reduce adaptive potential.

Socio-economic and institutional realities compound the ecological crisis. Widespread poverty in upland Mindanao drives communities to exploit forest resources, while weak enforcement of the Philippine Wildlife Act (RA 9147), rapid population growth, and political instability undermine governance and long-term conservation programs.

Taken together, these interconnected drivers reveal that deforestation—through habitat loss and fragmentation—is the primary trigger that cascades into biological stressors and socio-economic pressures. The Philippine Eagle's survival therefore depends on a holistic conservation framework that integrates strict forest governance, habitat restoration, genetic management, and dispersal corridor protection with poverty alleviation, sustainable livelihoods, stronger law enforcement, and institutional capacity-building.

The Philippine Eagle *(Pithecophaga jefferyi)* is a top predator that lives in the major rainforests of the Philippine archipelago. It is a dangerous symbol of the country's declining ecological heritage. The IUCN has listed this species as Critically Endangered. Its survival depends on the health of the country's remaining old-growth dipterocarp forests, both structurally and biologically. However, constant human-made pressures, mostly from industrial logging, agricultural development, and changing land use, have caused the archipelago's forest cover to drop dramatically over the past 100 years.

The relentless progression of deforestation within the Philippine archipelago constitutes the most formidable existential threat to the Philippine Eagle. As a primary forest-dependent apex predator, the species is hyper-sensitive to changes in forest architecture.

Deforestation leads to the direct destruction of primary and old-growth dipterocarp forests vital for the eagle's survival. A solitary breeding pair necessitates a vast region of 4,000 to 11,000 hectares to fulfil their biological requirements (Salvador & Ibanez,). The transformation of natural landscapes into agricultural plantations (such as oil palm and rubber) or their obliteration via illegal logging eradicates essential nesting habitats. The Philippine Eagle's strong site fidelity means that the loss of a single nesting tree can significantly interrupt a pair's reproductive cycle for years, thereby diminishing their contribution to the global gene pool.

The "insularization" of remnant forest patches results in isolated "islands" of habitat encircled by unwelcoming human-made environments, transcending mere loss. This fragmentation is a substantial obstacle to juvenile dispersal; sub-adult eagles frequently lack the ability or inclination to cross expansive, open grasslands in search of new territories (Salvador & Ibanez,). Moreover, fragmentation amplifies the "edge effect," resulting in eagles seeing human settlements more frequently. This proximity is directly associated with heightened persecution, as

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eagles along forest edges are particularly susceptible to opportunistic hunting and trapping (Concepcion & Puan, 2025).

In addition to habitat fragmentation, the species had to expand its range by traversing open spaces like farms or cleared land, which are thought to be hazardous for Philippine eagles, since they are expected to seek for food in their surroundings (Salvador & Ibanez, 2021).

The deterioration of the forest ecology triggers a trophic cascade that significantly diminishes the eagle's prey population. The Philippine Eagle typically preys on forest-dwelling mammals, particularly the Philippine Flying Lemur (Cynocephalus volans), along with different types of monkeys and civets. Deforestation eradicates the canopy, resulting in concurrent population decreases of many prey species. The resultant food scarcity significantly affects the eagle's reproductive performance; restricted caloric intake may result in nest abandonment or prolongation of the already extended two-year breeding cycle, further hindering the recovery of this severely endangered species.

According to Yong Ding Li (n.d.), the ongoing conversion and modification of forests has also affected the number of breeding pairs since the landscape can only support a few of them. Moreover, Collar and Berryman (2025) supported these findings that habitat degradation is the main contributor to lower breeding success and higher juvenile mortality. Whereas, Salvador and Ibanez (2021) concluded that there are still some eagles that are breeding successfully, and that breeding success is not the primary limiting factor for the population to decline, and therefore the high mortality of juveniles and sub-adults was due to their lack of ability to travel across fragmented habitat.

Socio-economic and institutional realities compound the ecological crisis. Widespread poverty in upland Mindanao drives communities to exploit forest resources, while weak enforcement of the Philippine Wildlife Act (RA 9147), rapid population growth, and political instability undermine governance and long-term conservation programs.Taken together, these interconnected drivers reveal that deforestation—through habitat loss and fragmentation—is the primary trigger that cascades into biological stressors and socio-economic pressures. The Philippine Eagle's survival therefore depends on a holistic conservation framework that integrates strict forest governance, habitat restoration, genetic management, and dispersal corridor protection with poverty alleviation, sustainable livelihoods, stronger law enforcement, and institutional capacity-building.

The cumulative consequences of deforestation increase the likelihood of extinction within the next 100 years in the absence of substantial intervention and habitat restoration. The Philippine Eagle Foundation's long-term monitoring yielded survival rates, fecundity, and age distribution. Nest records: Nests in Mindanao and other islands have been seen for many years. Population estimates: There are less than 300 adult breeders and between 400 and 500 individuals left in the wild. Observation period: Information on nest productivity and young survival gathered during several decades of fieldwork (1970s–2020s) preservation (Ibanez et. al., 2025).

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Table 3. Summary of Populations of Pithecophaga jefferyi across different parts of the Philippines

Based on recent status reviews and analytical sources, the population of the Philippine Eagle is estimated across three (3) primary regions. This table summarizes the estimated breeding pairs across parts of the Philippines.

Region / Island	Optimistic Analytical Estimate (Pairs)	Plausible Precautionary Range (Pairs)	Current Status	References
Mindanao	233	51 – 152	The species' stronghold; considered to be at carrying capacity with nearly all available territories occupied	Collar, N. J., & Berryman, A. J. (2025), and Valle, S., Ibañez, J. C., Raghavan, R., Almeda, M. L., & Miller, P. S. (2025).
Luzon	128	6 – 50	Despite large areas of habitat, only 3 nests have been verified to date	Collar, N. J., & Berryman, A. J. (2025)
Samar	–	–	Currently supports 7 confirmed breeding pairs	Valle, S., Ibañez, J. C., Raghavan, R., Almeda, M. L., & Miller, P. S. (2025)
Leyte	–	–	Now considered extirpated, likely due to the impact of Super Typhoon Yolanda (Haiyan) in 2013	Valle, S., Ibañez, J. C., Raghavan, R., Almeda, M. L., & Miller, P. S. (2025).
Eastern Visayas (Samar and Leyte)	31	7 – 21	Historically included Leyte; now primarily restricted to Samar	Collar, N. J., & Berryman, A. J. (2025)
Total (Philippines)	392 – 421	64-223	While analytical models suggest ~400 pairs, precautionary assessments suggest the total is likely less than 200 pairs	Collar, N. J., & Berryman, A. J. (2025)

Table 3 provides a detailed overview of the distribution and population status of the Philippine Eagle (Pithecophaga jefferyi) across different regions of the Philippines. Mindanao emerges as the species' stronghold, with an optimistic estimate of 233 pairs and a precautionary range of 51–152, suggesting that nearly all available territories are already occupied. Luzon, despite its vast habitat, shows a stark contrast between potential and reality: while models estimate up to 128 pairs, only three nests have been verified, and precautionary figures fall between 6–50 pairs. Samar supports a small but confirmed population of seven breeding pairs, whereas Leyte is considered extirpated, likely due to the devastation caused by Super Typhoon Yolanda in 2013. The Eastern Visayas region, historically including Leyte but now restricted to Samar, is estimated to hold 31 pairs, with a precautionary range of 7–21. Nationally, analytical models suggest a total of 392–421 pairs, but precautionary assessments indicate the population is more likely fewer than 200 pairs.

The Philippine Eagle (Pithecophaga jefferyi) remains one of the most critically endangered apex predators that reside in the rainforests of the Philippines. Its survival depends mainly on old-growth forests, but due to deforestation of their habitat, including logging, agriculture, and land-use, their population has been significantly affected, making it unable to survive.

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Severe habitat loss is one of the major effects of deforestation. A breeding pair of eagles needs about 4,000–11,000 hectares of forest, and the loss of nesting trees can disrupt their breeding for many years. Second, it also causes habitat fragmentation, in which forests are broken into isolated patches, leading some young eagles to have difficulty finding new territories and increasing their exposure to humans, raising the risk of hunting or trapping. Additionally, prey species have been significantly reduced. The Philippine Eagle depends mainly on monkeys, civets, and the Philippine flying lemur as their prey. As forests are lost, these prey populations decline, which creates food shortages that may affect eagle breeding.
Lastly, deforestation also caused declines in the Philippine Eagle's population and reproductive success. Habitat degradation increases juvenile mortality and reduces the number of breeding pairs. There are currently only 400–500 breeding eagles in the wild, with fewer than 300 adults.

As a result, deforestation may significantly raise the Philippine Eagle's future risk of extinction in the absence of vigorous conservation measures and forest regeneration.

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CONCLUSION

The Philippine Eagle (Pithecophaga jefferyi) remains critically endangered, with fewer than 400 individuals left in the wild and an estimated 64–223 breeding pairs across Luzon, Samar, Leyte, and Mindanao. Results from this review show that deforestation and habitat fragmentation have reduced suitable eagle habitats by nearly 50%, forcing populations into marginal areas with limited prey and increasing encounters with humans. These pressures have led to extended breeding cycles, nest abandonment, and low juvenile survival, while genetic bottlenecks further compromise long-term resilience. The evidence highlights that agricultural expansion, logging, mining, and settlement are the principal drivers of forest loss, destabilizing ecosystems and accelerating extinction risk. Without decisive intervention, projections indicate a high probability of extinction within the next century.Therefore, conservation must move beyond nest-level protection toward mountain range and landscape-scale strategies, supported by stricter enforcement of the Philippine Wildlife Act (RA 9147), captive breeding, reintroduction programs, and community-led forest management.

Recommendations

In order to move forward from the current state of affairs, it is essential to institute a wide-ranging and multi-faceted strategy that tackles both proximate and deeper causes of decline. An important aspect is to move beyond nest protection and instead protect entire mountain ranges through the use of the eagle as an umbrella species for forest conservation. This process necessitates active collaboration between government agencies, NGOs including the Philippine Eagle Foundation, Haribon Foundation, and JCI Manila, and local communities in prioritizing education and reducing behavioral factors such as hunting of endangered species in the Philippines. Additionally, a stronger enforcement of existing laws, such as the Philippine Wildlife Act (RA 9147), is vital in providing a stronger deterrent against illegal practices. Finally, a move beyond socio-economic factors contributing to forest depletion, such as providing alternative livelihoods for impoverished mountain dwellers, is essential in reducing forest product collection and ensuring long-term survival of the species.

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