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Full Length Research Article

Rapid Assessment of Trees and Shrubs in Sifaran Watershed, Maguindanao Island, Philippines: Implications for Watershed Conservation

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ABSTRACT

The Sifaran Watershed is a vital resource for local communities, serving as a water source that flows through the Ligawasan marsh in the Philippines. Despite its critical role, the watershed remains severely understudied. This lack of baseline data has been a major constraint to enacting effective conservation, ensuring the region's ecological and socio-economic stability. This study focuses on assessing the trees and shrubs thriving in the Sifaran Watershed, as well as their conservation and distribution status. A stratified sampling approach was employed, establishing quadrats across different streams. The study recorded 77 plant species (55 trees and 22 shrubs) across lower, middle, and upper streams, which were largely diverse, with most species categorized as native and of Least Concern by the International Union for Conservation of Nature (IUCN). The presence of native species classified as Vulnerable species (*Dracontomelon dao*), Near Threatened (*Ficus gigantifolia* and *Macaranga grandifolia*), and Endangered (*Mangifera odorata*, *Pterocarpus indicus*, and *Vitex parviflora*) highlights the potential risks from habitat degradation and other threats. While most species exhibit stable populations, conservation efforts are necessary to protect those at risk and maintain the ecological balance of the watershed. The data gathered were utilized as baseline data to provide actionable recommendations for immediate conservation measures and sustainable management, protecting the invaluable natural heritage from threats such as deforestation, land conversion, and climate change. Moreover, initiatives such as habitat reforestation, responsible land use, and the conservation and protection of different species of trees and shrubs, particularly native species, are key to maintaining a balanced and sustainable watershed.

1. Introduction

A watershed is a land area where all surface water from rain, streams, and tributaries drains into a common outlet, such as a river, lake, or reservoir (DENR-FMB 2018). Beyond their role in water collection and distribution, watersheds play a vital role in environmental conservation. They help regulate water flow, reduce soil erosion, support biodiversity, and maintain ecological balance. Healthy watersheds ensure clean water supplies, enhance climate resilience, and sustain both human communities and wildlife, making their protection essential for long-term environmental sustainability and ensuring ecological balance (DENR-FMB 2018; Flotemersch et al. 2016). However, biodiversity loss, particularly the decline of native plant species, can weaken these functions, threatening water quality, soil fertility, and the long-term sustainability of ecosystems (Rathoure 2024).

Globally, the International Union for Conservation of Nature (IUCN) identifies over 8,000 plant species as threatened (IUCN 2024). The Philippines harbors over 10,199 plant species, comprising approximately 9,581 native, 4,907 endemic and 585 naturalized (non-native) species (Pelser et al. 2025). Despite efforts to mitigate biodiversity loss, gaps in law enforcement leave many species and habitats at continued risk, with nearly 1,000 threatened species listed, ranging from Other Threatened Species (OTS) to Critically Endangered (CR), as recorded by the Department of Environment and Natural Resources (DENR) Administrative Order (DAO 2017).

Among the sub-watersheds in the Philippines, the Sifaran Watershed remains understudied, resulting in limited data not only on species composition but also on physical characterization, which limits conservation efforts in the area. This lack of baseline data has been a great constraint for conservation strategies in the area. The Sifaran Watershed is a locally recognized sub-watershed and one of the primary sources of water flowing through the Ligawasan marsh, a highly biodiverse wetland ecosystem in the Philippines, situated in Barangay Sifaran, Datu Odin Sinsuat (DOS), Maguindanao del Norte, Philippines (PhilAtlas 2025; Tanalgo et al. 2024). According to the 2020 Philippine census, Sifaran has a total population of 1,396, accounting for approximately 1.20% of the entire population of DOS. Despite its relatively small population, the area holds ecological and socio-economic significance, as it was believed to be the home to diverse flora and fauna and serves as a vital resource area for local communities that supports agriculture, water supply, and livelihoods, making its conservation essential for ensuring sustainable development and environmental stability in the region (PhilAtlas 2025; Tanalgo et al. 2024).

Several watersheds, including the Sifaran Watershed, have faced significant threats due to anthropogenic activities such as habitat destruction, land conversion, illegal logging, and other environmental changes beyond human control (Agduma et al. 2023; Perez et al. 2020; Raganas et al. 2025). Despite the ecological and socio-economic importance, these challenges continuously pose risks to water availability, biodiversity, and the overall health of the ecosystem. To minimize threats and improve conservation efforts, ecological and biological studies related to sustainable land management, conservation measures, and community engagement are crucial for ensuring the long-term protection and resilience of this critical watershed (Hamabata et al. 2019). Thus, this rapid floral assessment in the Sifaran Watershed will contribute to biodiversity conservation, sustainable land management, and ecological stability in the region. Basically, this study aims to assess the trees and shrubs thriving in the Sifaran Watershed supporting the biodiversity conservation and land management through: a) identifying and documenting the species of trees and shrubs present in the area; b) evaluating the conservation status and distribution status of the trees and shrubs in the watershed; and c) providing recommendations for the conservation and sustainable management of the Sifaran Watershed. The results will also serve as the baseline data contributing to the informed conservation planning and policymaking, and ensuring the long-term ecological stability and sustainability of the watershed.

Given the significant watershed's role in providing essential ecosystem services, such as water regulation and climate resilience, understanding its biodiversity status and identifying potential threats is vital for developing proper and effective conservation strategies. Moreover, the present findings may support resource management and enhance biodiversity protection efforts, resulting in a healthy environment and sustainable livelihoods in the region.

2. Materials and Methods

2.1. Study Area

Sifaran is one of the vital barangays in the municipality of Datu Odin Sinsuat, Maguindanao del Norte, Philippines. Geographically, the area features a moderate elevation of approximately 141.6 meters (464.6 feet) above mean sea level, positioned at 7.0457° N and 124.2590° E, which influences its climate (type IV), vegetation, and hydrological characteristics. The Sifaran Watershed spans an estimated area of 8,000 hectares, featuring a diverse topography that includes gently rolling hills, lowland plains, and riverine ecosystems. It is primarily drained by the Sifaran Falls, which serve as a vital water source for local communities. As for the land use of the area, it was primarily occupied by agricultural land, followed by forests, settlements, and water. As part of a watershed system, the area plays a crucial role in supporting biodiversity, regulating water flow, and maintaining ecological balance (PhilAtlas 2025).

2.2. Sampling Area

A stratified sampling approach was employed, establishing quadrats across different streams to assess flora and capture vegetation variations within the Sifaran Watershed. Three (3) quadrats with a dimension of 20 m × 20 m were systematically placed in every stream (upper, middle, and lower streams) of the watershed, ensuring a minimum 250-meter interval between plots (**Fig. 1**). A total of nine (9) quadrats were established. Within each quadrat, 5 m × 5 m sub-quadrats were purposely established to document tree saplings and shrubs. Regardless of their proximity to rivers or tributaries, quadrats were positioned to represent a diverse range of vegetation types. Overall, the establishment of the quadrats in this study was carried out following the protocols of DENR-FMB (2018) and Coracero and Malabrigo (2020).

Identification and characterization of trees and shrubs were conducted systematically. All trees and shrubs within the quadrats were documented and identified. The common name, scientific name, family, conservation status and distribution status of recorded species were evaluated using multiple botanical databases and references, including Co's Digital Flora of the Philippines (Pelser et al. 2025), IUCN Red List of Threatened Species (IUCN 2025), and DAO 2017-11 (DAO 2017).

3. Results and Discussion

3.1. Floral Assessment

With a forest filled with relatively diverse plant species, the Sifaran Watershed stands out as a vital refuge for biodiversity, characterized by towering hardwood trees and smaller plants that contribute to essential processes such as water filtration, soil stabilization, carbon sequestration, and nutrient cycling. Understanding the distribution and ecological significance of plant species in the Sifaran Watershed is crucial for developing sustainable management and conservation measures that benefit not only the environment but also the communities that depend on it. Moreover, the present study recorded a total of 77 plant species in the Sifaran Watershed across the lower, middle, and upper streams, comprising 55 tree (**Table 1**) and 22 shrub (**Table 2**) species, along with their conservation and distribution status.

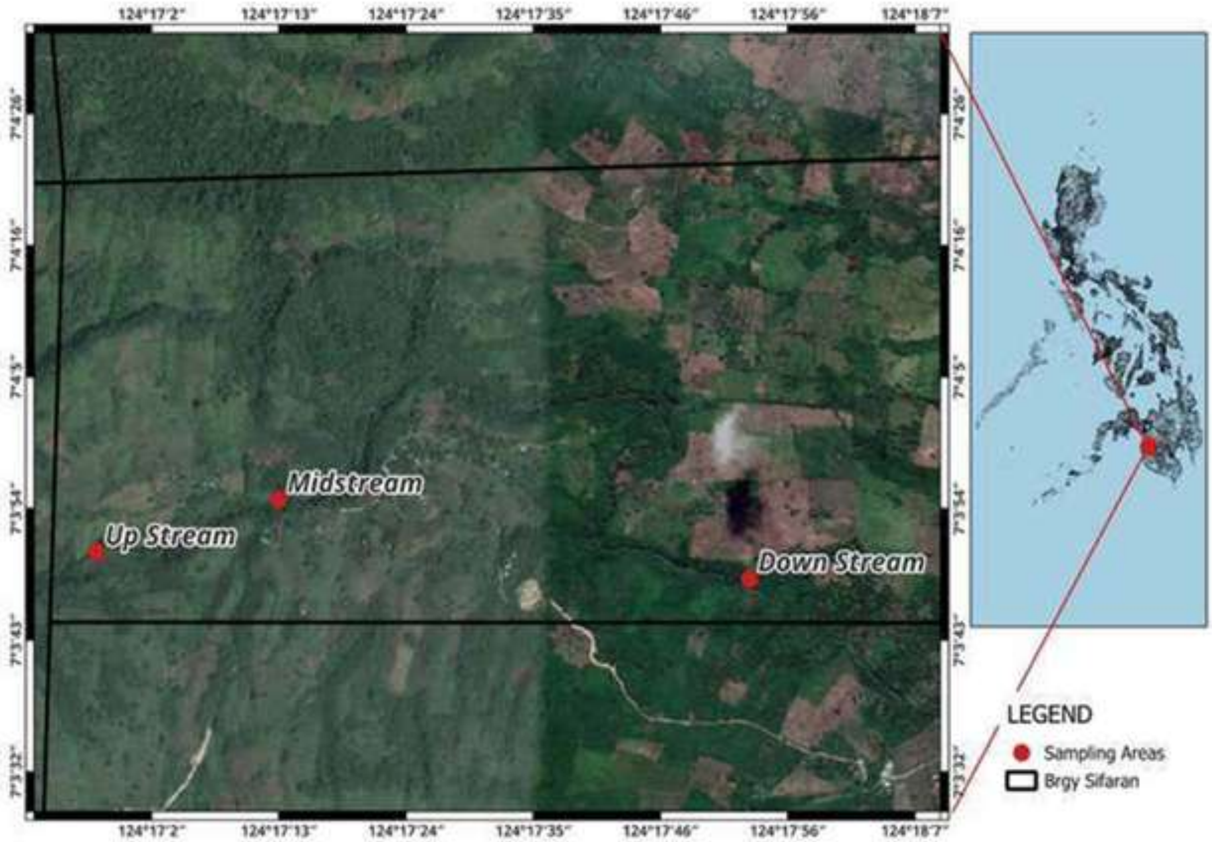

Fig. 1. The location map of the three sampling areas (lower, middle, and upper streams) in Sifaran Watershed.

Table 1. List of identified tree species in the Sifaran Watershed

Family Names	Common Names	Scientific Names	Conservation Status	Distribution Status
Anacardiaceae	Balinghasai	*Buchanania arborescens*	LC*, OWS**	Native
	Dao	*Dracontomelon dao*	LC*, VU**	Native
	Manga Huani	*Mangifera odorata*	DD*, EN**	Native
Annonaceae	Atis	*Annona squamosa*	LC*	IN and NA
Apocynaceae	Lanete	*Wrightia candollei*	LC*, OWS**	Native
Araliaceae	Malapapaya	*Polyscias nodosa*	LC*, OWS**	Native
Bignoniaceae	African Tulip	*Spathodea campanulata*	LC*	IN and NA
Burseraceae	Bogo	*Garuga floribunda*	LC*	Native
Cannabaceae	Anabiong	*Trema orientalis*	LC*, OWS**	Native
	Philippine hackberry	*Celtis philippensis*	LC*	Native
Clusiaceae	Bitanghol	*Calophyllum blancoi*	LC*	Native
Clusiaceae	Paguringon	*Cratoxylum sumatranum*	LC*, OWS**	Native
Combretaceae	Kalumpit	*Terminalia microcarpa*	LC*, OWS**	Native
Cordiaceae	Anonang	*Cordia dichotoma*	LC*, OWS**	Native

Family Names	Common Names	Scientific Names	Conservation Status	Distribution Status
Dombeyaceae	Kulatingan	*Pterospermum obliquum*	LC*, OWS**	PE
Euphorbiaceae	Alim	*Melanolepis multiglandulosa*	LC*, OWS**	Native
	Banato	*Mallotus philippensis*	LC*, OWS**	Native
	Binunga	*Macaranga tanarius*	LC*, OWS**	Native
	Hinlaumo	*Mallotus mollissimus*	LC*	Native
Fabaceae	Bani	*Pongamia pinnata*	LC*, OWS**	Native
	Ipil-Ipil	*Leucaena leucocephala*	LC*	IN and NA
	Prickly narra	*Pterocarpus indicus*	EN*, VU**	Native
	Rain tree	*Samanea saman*	LC*	IN and NA
	Salingkugi	*Albizia Saponaria*	LC*	Native
Lamiaceae	Gmelina	*Gmelina arborea*	LC*	IN and NA
	Magilik	*Premna tomentosa*	LC*	Native
	Molave	*Vitex parviflora*	LC*, EN**	Native
Malvaceae	Anilau	*Colona serratifolia*	LC*	Native
	Bayok	*Pterospermum diversifolium*	LC*, OWS**	Native
	Labayo	*Melochia umbellata*	LC*	Native
	Tan-ag	*Kleinhovia hospita*	LC*, OWS**	Native
Meliaceae	Igyo	*Dysoxylum gaudichaudianum*	LC*, OWS**	Native
	Lanzones	*Lansium domesticum*	LC*	Native
	Santol	*Sandoricum koetjape*	LC*	Native
	Big leaf mahogany	*Swietenia macrophylla*	EN*	IN and NA
Moraceae	Alangas	*Ficus heteropoda*	LC*	Native
	Antipolo	*Artocarpus blancoi*	LC*, OWS**	PE
	Anubing	*Artocarpus ovatus*	DD*, OWS**	PE
	Eared fig	*Ficus aurita*	LC*	Native
	Giant-leaved fig	*Ficus gigantifolia*	NT*	PE
	Hagimit	*Ficus minahassae*	LC*	Native
	Hauili	*Ficus septica*	DD*, OWS**	Native
	Himbabao	*Broussonetia luzonica*	LC*, OWS**	Native
	India Rubber	*Ficus elastica*	LC*	Introduced
	Kalukoi	*Ficus callosa*	LC*, OWS**	Native
	Langka	*Artocarpus heterophyllus*	LC*	IN and NA
	Paper Mulberry	*Broussonetia papyrifera*	LC*	IN and NA
	Salisi	*Ficus benjamina*	LC*, OWS**	Native
	Tangisang Bayawak	*Ficus variegata*	LC*, OWS**	Native
Myrtaceae	Guava	*Psidium guajava*	LC*	IN and NA
Rubiaceae	Bangkal	*Nauclea orientalis*	LC*, OWS**	Native
Rutaceae	Matang Araw	*Melicope triphylla*	LC*, OWS**	Native
Phyllanthaceae	Binayuyo	*Antidesma ghaesembilla*	LC*	Native
	Bignay-pugo	*Antidesma montanum*	LC*, OWS**	Native
	Subiang	*Bridelia insulana*	LC*	Native
Total		**55**		

Notes: Conservation Status and Distribution Status based on IUCN (2025)* and DAO (2017)** classification: CR - Critically Endangered; EN - Endangered; VU - Vulnerable; NT - Near Threatened; OTS - Other Threatened Species; LC - Least Concern; DD - Data Deficient; IN – Introduced; NA – Naturalized.

Table 2. List of identified shrub species in the Sifaran Watershed

Family Names	Common Names	Scientific Names	Conservation Status	Distribution Status
Apocynaceae	Pandakaking Gubat	*Tabernaemontana macrocarpa*	LC*	Native
Araliaceae	Umbrella Plant	*Schefflera actinophylla*	LC*	IN
Bignoniaceae	Candle Tree	*Parmentiera cereifera*	LC*	IN
Boraginaceae	Tsaang-gubat	*Ehretia microphylla*	LC*	Native
Euphorbiaceae	Angat Acalypha	*Acalypha angatensis*	LC*	Native
	Castor Plant	*Ricinus communis*	LC*	IN and NA
	Takip asin	*Macaranga grandifolia*	NT*, OWS**	Native
Fabaceae	Akapulko	*Cassia alata*	LC*	IN and NA
	Caballero	*Caesalpinia pulcherrima*	LC*	IN and NA
Lamiaceae	Alagau	*Premna odorata*	LC*, OWS**	Native
Moraceae	Is-Is	*Ficus ulmifolia*	LC*, OWS**	PE
	Kalios	*Streblus asper*	LC*, OWS**	Native
	Mulberry	*Morus alba*	LC*	IN and NA
	Niyog-niyogan	*Ficus pseudopalma*	DD*, OWS**	PE
Muntigiaceae	Datiles	*Muntigia calabura*	LC*	IN and NA
Rubiaceae	Bangkoro	*Morinda citrifolia*	LC*, OWS**	Native
Phyllanthaceae	Malabagang	*Glochidion album*	LC*, OWS**	Native
	Matang Katang	*Breynia cernua*	LC*	Native
Solanaceae	Malatalong	*Solanum verbascifolium*	LC*	IN
Sterculiaceae	Sinaligan	*Sterculia rubiginosa*	LC*	Native
Verbenaceae	Lantana	*Lantana camara*	LC*	IN and NA
Vitaceae	Mali-Mali	*Leea guineensis*	DD*, OWS**	Native
Total		**22**		

Notes: Conservation Status and Distribution Status based on IUCN (2025)* and DAO (2017)** classification: CR - Critically Endangered; EN - Endangered; VU - Vulnerable; NT - Near Threatened; OTS - Other Threatened Species; LC - Least Concern; DD - Data Deficient; PE - Philippine Endemic; IN – Introduced; NA – Naturalized.

3.1.1. Tree and shrub species

Among the tree species recorded during the survey, 22 families were identified, with the Moraceae family dominating, featuring 13 species, as shown in **Fig. 2**. This was followed by the Fabaceae family with 5 species, and the families Euphorbiaceae, Malvaceae, and Meliaceae, each with 4 species. Other notable families were also observed, including Anacardiaceae, Lamiaceae, and Phyllanthaceae (each containing 3 species), as well as Cannabaceae and Clusiaceae (represented by 2 species each). The remaining families, represented by 1 species each, were Annonaceae, Apocynaceae, Araliaceae, Bignoniaceae, Burseraceae, Combretaceae, Cordiaceae, Dombeyaceae, Myrtaceae, Rubiaceae, Rutaceae, and Sterculiaceae.

Fig. 3 shows the number of shrub species per family found in the Sifaran Watershed. A total of 15 families were recorded, with the Moraceae family obtaining the highest number of species, accounting for 4 species, followed by the Euphorbiaceae family with 3 species, and the Fabaceae and Phyllanthaceae families with 2 species each. The remaining families, namely Apocynaceae, Araliaceae, Bignoniaceae, Boraginaceae, Lamiaceae, Muntingiaceae, Rubiaceae, Solanaceae, Sterculiaceae, Verbenaceae, and Vitaceae, were found to have only 1 species each.

The present results indicate a floristic composition dominated by species from the Moraceae family, with a minor representation of other families. This pattern is consistent with findings from other secondary tropical forests (Chazdon 2014; Corlett 2017; Raganas et al. 2025). The success of Moraceae species in such contexts might be attributed to their efficient seed dispersal by various volant and non-volant fauna, rapid growth rates, symbiotic relationships, and high resilience to environmental stressors. These are likely the combined factors that both favored and hindered the number of species that thrived in the area. Though the present study did not directly examine these mechanisms, the observed pattern aligns with common ecological traits known to confer a competitive advantage in such environments.

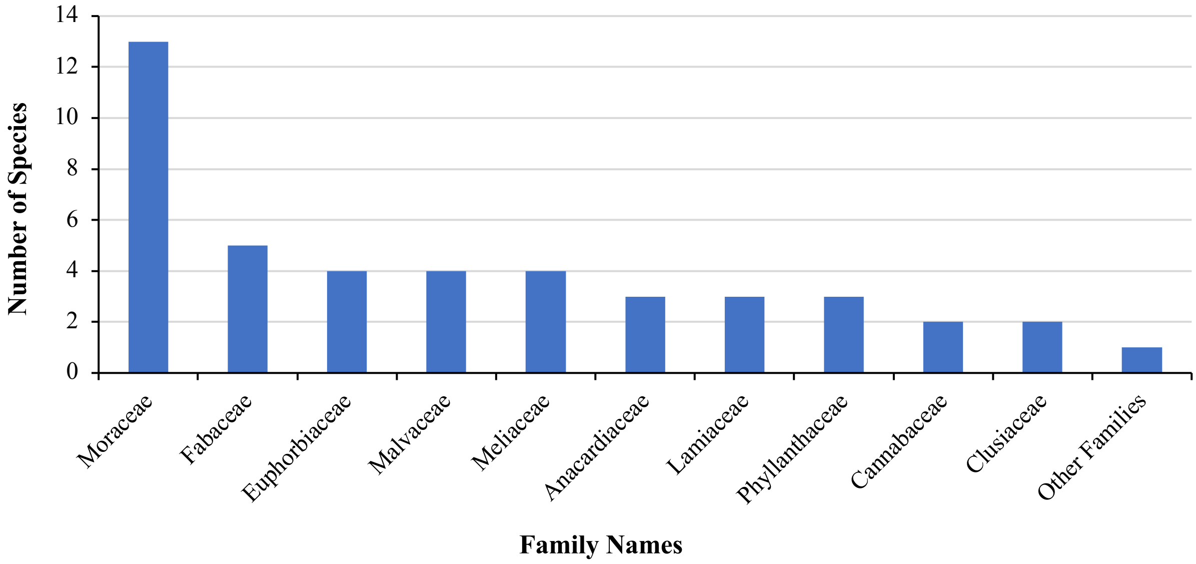

Fig. 2. Number of tree species per family found in Sifaran Watershed.

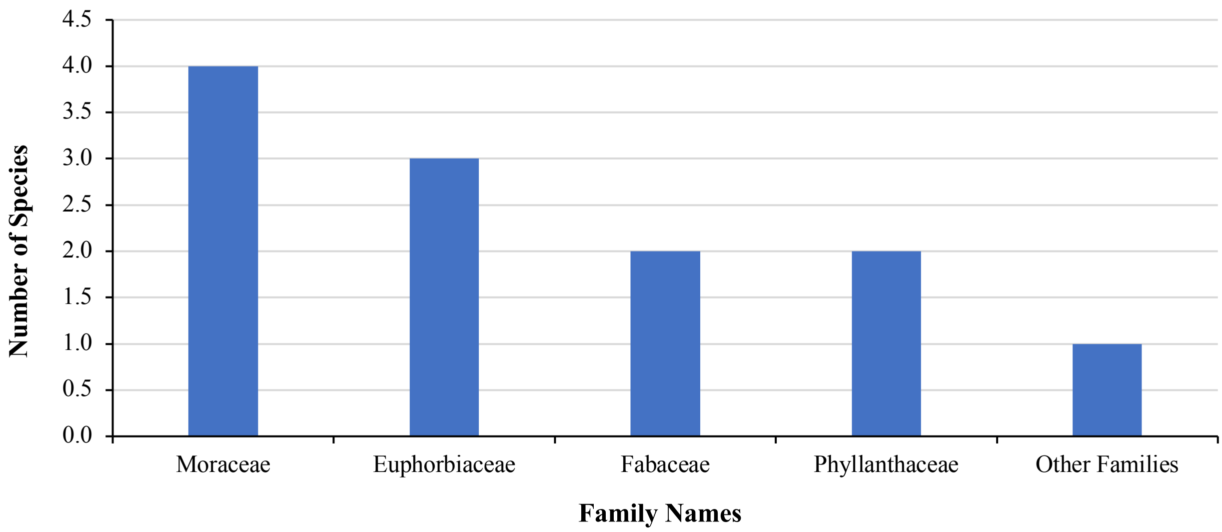

Fig. 3. Number of shrub species per family found in Sifaran Watershed.

Moreover, Moraceae species, such as figs (*Ficus* spp.), are regarded as keystone resources whose effective reproductive strategies, including prolific fruiting and efficient seed dispersal by animals, enable widespread propagation and remarkable adaptability across diverse environments (Corlett 2017; Raganas et al. 2025; Wijaya and Defiani 2021). This enhances their ability to develop functional characteristics, such as tree height, diameter, canopy size, leaf structure, and fruiting habits, thereby allowing them to survive and vegetate across different habitats (Dimara and Auri 2023). Competition for available resources, such as light, water, nutrients, or minerals, is expected in various ecosystems as part of the plant survival process, and species with limited dispersal mechanisms or low reproductive rates usually occur at lower frequencies within a given area (Heriyanto et al. 2023). This is also influenced by how certain plant species effectively utilize the resources available in the area and how they adapt to micro-climate differences (Dimara and Auri 2023; Heriyanto et al. 2023).

The findings of this study corroborate those of Zapanta et al. (2019) in a highland forest ecosystem in Mt. Apo, Mindanao, where the Moraceae family was represented the most at the study site. Among the genera under the Moraceae family, *Ficus* is reported to be one of the most common and diverse in lowland rainforests, which is also true for the present study. This genus comprises semi-epiphytic to dioecious figs that have diversified into various niches and possess an efficient long-distance pollination system, enabling them to breed at low densities (Raganas et al. 2025; Wijaya and Defiani 2021). Additionally, *Ficus* is ranked 9th for the largest vascular plant genus in the Philippines (Pelser et al. 2025).

On the other hand, Fabaceae is considered the third-largest family of flowering plants and is well-represented in tropical forests, due to its numerous subfamilies, including Caesalpinioideae, Mimosoideae, and Faboideae (Félix et al. 2019; Vargas et al. 2015). Meanwhile, Balandier et al. (2022), Deng et al. (2023), and Landuyt et al. (2019) emphasized the essential roles of understory species in soil protection, moisture retention, and nutrient cycling. They also highlight that their presence indicated a healthy forest floor with sufficient light and resources for growth. The coexistence of climbers and understory species, alongside dominant trees and palms, demonstrates a balanced and functioning ecosystem that manifests high resilience and biodiversity (Coritico et al. 2020; Deng et al. 2023). Overall, their limited abundance and distribution reflect a minor structural contribution; yet, they can still contribute to the ecosystem's resilience, sustainability, and genetic diversity.

3.1.2. Conservation and distribution status of trees and shrubs

The conservation status of the flora (trees and shrubs) species identified in Sifaran Watershed was shown in **Fig. 4**. In contrast, their distribution status was shown in **Fig. 5**. Some of the notable trees and shrubs species found in the Sifaran Watershed were presented in **Fig. 6**. Based on the International Union for Conservation of Nature (IUCN) Redlist of Threatened Species (IUCN 2025), majority of the identified tree species in the area were classified as Least Concern (LC) species with 49 counts (89%), while the other species accounted only 2 counts each (3.63%) namely; not evaluated, Near Threatened (NT), and Endangered (EN). Likewise, most of the identified shrub species were classified as LC, with 19 species (86%), followed by 2 species (9%) classified as not evaluated, and 1 species (5%) classified as Vulnerable (VU).

The conservation status results indicated that the majority of the tree and shrub species in the Sifaran Watershed were classified as LC, facing no threat of extinction at a global scale. Despite their stability and national-level abundance, these species remain critically underutilized, indicating a reservoir of untapped potential that is not being put to its best advantage commercially due to limited information on their functional traits, economic value, and sustainable management strategies (IUCN 2025). However, some native species were also classified as VU (*Dracontomelon dao*), NT (*Ficus gigantifolia* and *Macaranga grandifolia*), and EN (*Mangifera odorata*, *Pterocarpus indicus*, and *Vitex parviflora*), denoting a potential for threat from diverse factors, and relatively high risk of extinction if proper conservation and management are neglected (IUCN

2025). The loss of these native species would cause the watershed's functional imbalance, as they often play indispensable roles in various ecological services.

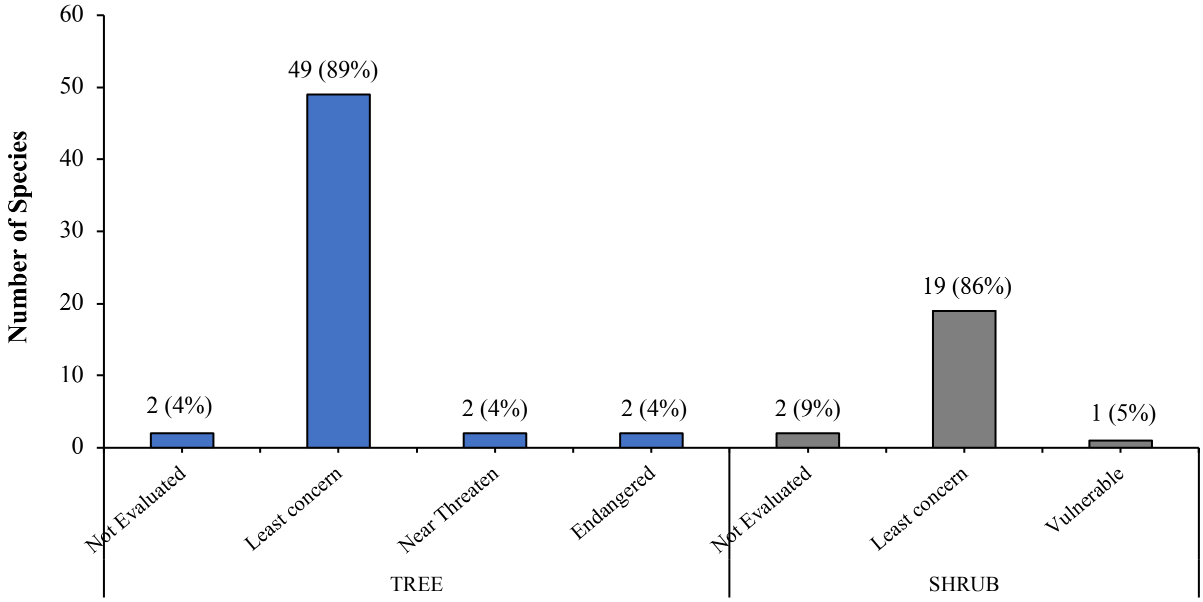

Fig. 4. Conservation status of trees and shrubs in Sifaran Watershed.

In the year 2007, the DENR officially reported 526 threatened plant species, with 99 classified as Critically Endangered (CR). After a decade, the number of threatened species has increased to 948, with 179 CR, 254 EN, and 406 VU species reported. It is disheartening to note that, from 2007 to 2017, the number of threatened flora species in the country increased from 526 to 948, respectively (DAO 2017). It can be said that there is a continuous decline due to certain factors, including both anthropogenic and natural factors. Generally, despite various research studies on the floral and faunal species in the Philippines, threats to biodiversity due to anthropogenic activities are still escalating, thus placing the country among the world's biodiversity hotspots (Amoroso et al. 2019; Vidal et al. 2018; Zapanta et al. 2019). It dictates the need to perform activities related to the conservation and rehabilitation of the Philippine forests (Coracero and Malabrigo 2020). In the local context, this action may also take place in the Sifaran Watershed, estabilizing the entire watershed ecosystem. Hence, a regular and comprehensive survey is necessary to validate the status and number of trees and shrubs in the Sifaran Watershed and its adjacent areas, considering the promotion of the area as one of the tourist spots in the province.

In comparison to other ecosystem studies in Mindanao Island, the present study recorded fewer threatened species than those of Amoroso and Aspiras (2011) in Mt. Hamiguitan Range (26 species), Lillo et al. (2019) in Dinagat Island (22 species), Zapanta et al. (2019) in Mt. Apo Natural Park, Sta. Cruz (19 species), Coritico et al. (2020) in Mt. Tago Range, Bukidnon (11 species), Coritico et al. (2022) in Mt. Pantaron Range (41 species), and Raganas et al. (2025) in Swamp Forest, Tagum City (9 species). The varying number of threatened species recorded implies variability in species composition and conservation status across various ecosystems, denoting ecological diversity of these areas. However, the present study in the Sifaran Watershed was conducted only at three sampling sites (lower, middle, and upper streams), which is a much smaller sampling size compared to the aforementioned studies.

Relative to distribution status, the study recorded that majority of the trees and shrubs grown in the area were native species, thriving naturally in the area (**Fig. 5**). There were 45 (82%) species of trees and 14 (64%) species of shrubs that are found as native, while 10 (18%) species (trees) and 8 (36%) species (shrubs) were found as introduced species.

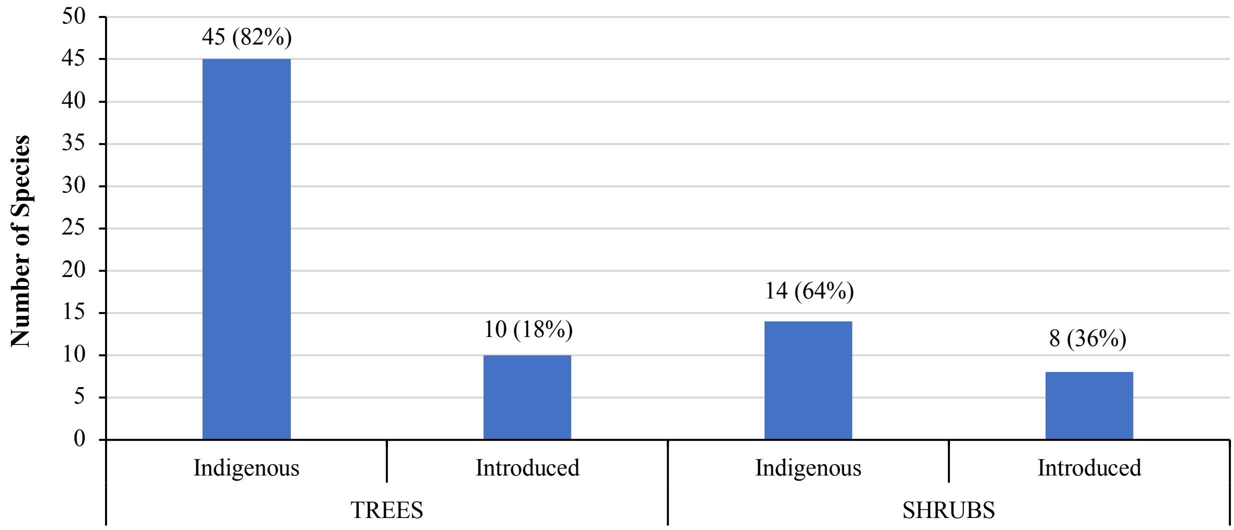

Fig. 5. Distribution status of tree and shrub species in Sifaran Watershed.

Essentially, native species are those that naturally thrive or are found in an area without human intervention. In contrast, introduced species are those that are transported or established in an area outside their natural range due to human intervention (intentionally or accidentally) (IUCN 2025). Considering the higher number of native species in the Sifaran Watershed compared to the introduced species, it may signify that the area is still in good condition and naturally diverse. Better adaptation of native trees to their local environmental conditions leads to a higher survival rate, amidst critical seasons. They also contributed to a more diverse, balanced and healthy ecosystem. This adaptation rate of these trees and shrubs might include tolerance to drought, resistance to pests and diseases, or efficient resource utilization strategies (Raha 2023). Despite the continued development and land use changes in the Sifaran Watershed and its nearby communities, it is reassuring to know that a higher number of native tree and shrub species still thrive in the area, playing a significant role in sustaining the ecosystem.

The study area supports a substantial number of native and LC species across trees and shrubs (**Fig. 6**). Interestingly, the forest also harbors numerous Philippine endemic species, as well as species classified as NT, VU, and EN. Their presence is indispensable for site conservation, as they face a high risk of extinction in the future.

On the other hand, introduced species are known for their ability to become a nuisance due to their rapid growth, although they also provide some economic benefits. However, if these plants can grow and thrive in an area, there is a very high chance that they could outgrow the native plants, take over the soil, and alter the normal ecosystem's functions, causing not only ecological disturbance but also social and economic losses (Handayani et al. 2023; Weidlich et al. 2020). These species are considered one of the most serious threats to native ecosystems, directly limiting the growth of native species saplings, as well as increasing competition in the regeneration layer through self-sowing (Brundu and Richardson 2016; Handayani et al. 2023).

Fig. 6. Native Trees and Shrubs Grown in Sifaran Watershed, Maguindanao del Norte, BARMM. Anubing (*A. ovatus*) (a), Tsaang-gubat (*E. microphylla*) (b), Salingkugi (*A. Saponaria*) (c), Philippine hackberry (*C. philippensis*) (d), Niog-niogan (*F. pseudopalma*) (e), Alangas (*F. heteropoda*) (f), Giant-leaved fig (*F. gigantifolia*) (g), Bangkal (*N. orientalis*) (h), and Kulatingan (*P. obliquum*) (i).

The present floral results of the study suggest that the Sifaran Watershed is in good condition. However, with the community's negligence and continued consumption, the future Sifaran Watershed will be at high risk. Sustaining a stable population of trees, shrubs, and other associated plant species is crucial for the well-being of ecosystems and watersheds, as they underpin ecological balance, water regulation, and climate resilience. Initiatives such as reforestation, responsible land use, and conservation are key to maintaining this balance. According to Isbell et al. (2015) and Wagg et al. (2022), the stability of ecosystems often correlates with the diversity of the plants and/or the number of trees. A diverse ecosystem can better withstand environmental changes and disturbances, as it has a greater variety of species with different ecological roles and functions.

4. Conclusions

The floral characterization of the watershed revealed its critical role in hydrological and agricultural systems. The study recorded a total of 77 plant species in the Sifaran Watershed across the lower, middle, and upper streams, comprising 55 tree and 22 largely diverse shrub species, with most species categorized as LC and native by the IUCN. However, the presence of native species classified as VU species (*D. dao*), NT (*F. gigantifolia* and *M. grandifolia*), and EN (*M. odorata*, *P. indicus*, and *V. parviflora*) highlights the potential risks from habitat degradation and other threats. While most species exhibit stable populations, conservation efforts are necessary to protect those at risk and maintain the ecological balance of the watershed. The results of this study could be utilized as a line factor for immediate conservation measures to protect this invaluable natural heritage from threats such as deforestation, land conversion, and climate change. Moreover, initiatives such as habitat reforestation, responsible land use, and the conservation and protection of different species of trees and shrubs, particularly native species, are key to maintaining a balanced and sustainable watershed. Additionally, conducting regular biodiversity assessments to track the conservation and distribution status of plants in the area is vital for both present and future benefits.

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Conflict of Interest

The authors declare no conflict of interest.

Declaration of Generative AI And AI-Assisted Technologies in the Manuscript Preparation

During the preparation of this work, the authors used Turnitin and chat.deepseek.com to provide a more comprehensive and organized discussion. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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