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# VEGETATION RICHNESS AND ROLE IN PRESERVING AVIAN BIODIVERSITY AT CITY OF ELMINA VALLEY CENTRAL PARK, SHAH ALAM, SELANGOR

Fatimah Az Zahra Che Salim<sup>1</sup>, Noralizawati Mohamed<sup>2\*</sup>  
& Noraini binti Bahari<sup>3</sup>

**\*Corresponding**

<sup>1,2,3</sup>*Studies of Landscape Architecture, College of Built Environment,  
Universiti Teknologi Mara, Cawangan Selangor, Malaysia*

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## ABSTRACT

*Amidst the urban hustle, birds silently contribute to the interconnectedness between cities and the natural world, playing pivotal roles in pest control, pollination, and seed dispersal. Serving as a bridge between communities and nature, birds offer therapeutic, recreational, and educational benefits. This study assesses Elmina Valley Central Park in Shah Alam, Selangor, focusing on its landscape design to preserve and enhance the local ecosystem, particularly for bird habitat and biodiversity. The park, a sustainable township by Sime Darby Developer, covers 42.4 acres and incorporates ecological principles. Utilizing qualitative methods, including tree and bird species identification, the study aims to identify plant categories, vegetation hierarchy, and species attracting bird communities. The research also analyzes the role of planting in preserving bird communities and overall biodiversity. Bird surveys, employing point counts and time survey methods, document species abundance and presence. Initial findings showcase the significance of vegetation diversity and structures in influencing bird habitat. The study provides valuable insights for enhancing urban parks as sanctuaries for avian biodiversity, fostering sustainable coexistence between wildlife and human development.*

**Keywords:** Avian, Vegetation richness, Park biodiversity, Plants function

## INTRODUCTION

In the bustling heart of our cities, amidst towering structures and bustling streets, there exists a silent and often overlooked connection to the natural world and birds. Birds make significant contributions to urban environments and biodiversity in various ways, enriching both the ecological and human aspects of cities. According to case study done by Bichi et al., 2025; Bitani et al., 2023; Jasmani et al., 2017 and Fontana et al., 2011 integrating birds into urban environment have numerous benefits for biodiversity and human connection with nature. However, several challenges must be considered. Research has shown that habitat loss and fragmentation have reduced the chance for birds to find suitable places to nest, forage, and breed (Bitani et al., 2023; Nursyamin et al., 2023). Other challenges highlighted by (Isaksson et al., 2018), such as the overuse of chemicals and pesticides in public parks and light pollution from artificial lights at night have reduced bird populations. Several studies have confirmed that climate change has affected bird habitats and migration patterns. Lack of plant richness and tree coverage suitable for birds has also affected the presence and diversity of bird communities in public parks (Buckley.,2018) too. Based on these challenges, landscape architects and park managers need to systematically identify key factors for public parks to become more effective sanctuaries for bird species, contributing to the preservation of avian biodiversity in urban environments.

Malaysia has 831 species of bird species, in which 62 of these species are endangered (Peh et al., 2006). Study on ornithology in related to nature habitat highlighted that birds are consistent and inventive builder which they can occupy nature in the most functional way. Bird categories can be divided into 5 group such as granivores (seed eaters), insectivores (insect eaters), frugivores (fruit eaters) carnivores (meat eaters) and omnivores (both plant and animal sources). For certain birds such as Weaver bird, Tailor bird and Sociable Weaver, they are known as architect when it comes to build the nest with different unique nest design and structures tailored to their needs.

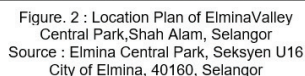
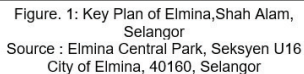
This study was carried out at 42.4 acres of Elmina Valley Central Park, Shah Alam on October 2023. Landscape design at Elmina Park comprises of tropical forest, wetland and native tree species that could support bird habitat as well as other wildlife conservation. The park is characterized by

native tree planting, green network, water features and natural topography that are essential for a successful park design. In understanding the landscape architecture design and roles to meet avian needs, an assessment of the overall characteristics of the park is needed. The objectives of the present study were: i) to identify category of plants and hierarchy of vegetation at Elmina Park, ii) to identify vegetation species that attract bird communities and iii) to analyse planting role in preserving bird communities and overall biodiversity.

## **Significance of Ornamental Vegetation for Birds**

The Native and naturalistic vegetation significantly outperforms in supporting bird populations, offering advantages in habitat maintenance, food provision, and shelter quality. Besides, flowering plants, fruit-bearing plants, trees, and shrubs in providing essential resources for birds. Additionally, the focus on urban bird species categories alien species, urban adaptors, urban exploiters, and migrants offers insights into the diverse relationships between birds and urban environments. Green spaces, diverse vegetation offers a wealth of food sources like fruits, seeds, and insects, along with nesting sites and protection from predators and harsh weather. It emphasizes that the type and structure of vegetation within parks play a pivotal role in shaping the composition of bird species, with mature trees, diverse understory vegetation, and water features attracting a more varied avian community. Beyond their aesthetic appeal, these plants contribute significantly to avian life by providing diverse food sources such as fruits, seeds, nectar, and insects. The dense foliage of trees and shrubs also acts as shelter and nesting sites, affording protection from predators, adverse weather, and human disturbances. Additionally, ornamental plants contribute to improved air quality by filtering pollutants, while the shade provided by trees aids in temperature regulation during hot weather. Strategic planting enhances connectivity, creating corridors for birds to move between habitat patches, fostering biodiversity. However, it's essential to choose bird-friendly plants, favoring native species, ensuring a variety of heights and textures, avoiding invasive plants, and minimizing pesticide use to create a thriving for Avian habitat.

The research design employed in this study is using qualitative method, that is observation in terms of identifying the tree species in the area, identifying the bird species and understanding the role that affects the attraction of birds in the park area.



This study adopted a approach suggested by (Birkhead et al., 1987; Peh et al., 2006; Sulaiman et al., 2013) to identify human perception and birds assessment at park. The data collected was conducted through site observation and inventory of vegetation and bird appearance at Elmina Valley Central Park. The data were recorded into an existing masterplan that divided into three main zone which is zone 1,zone 2 and zone 3.Each zone represent different type of spatial arrangement that could influences bird habitat and preferences on certain type of tree species and morphology. The result were analysed and compared to achive the goal of the study.

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a temperature range of 27-34 °C. The observation procedure was reiterated from the start of the following day to maintain data consistency.

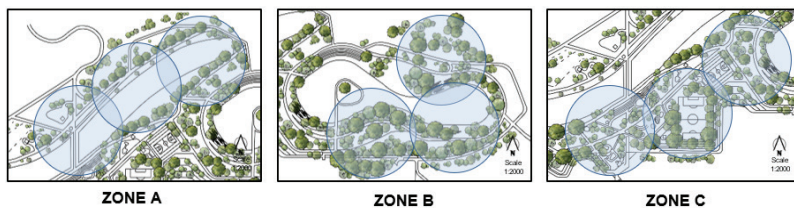


**Figure 3. Zone A, Zone B, and Zone C at Elmina Valley Central Park, Shah Alam, Selangor**

Source: Author,(2023)

## Bird Surveys

Bird species and abundance were documented twice daily during the aforementioned periods. For bird observation, we employed 40 m to 50 m radius point counts (three points in each Zone)(Fig.3). Birds observed within this radius were documented, while those merely flying overhead without any interaction with the study area (such as feeding or perching on trees or structures) were disregarded. To maximize the identification of bird species, we employed the time survey method, wherein observers extensively explored the park, focusing on areas with dense vegetation and suitable habitats for various bird species. The observed birds were photographed using high-resolution phone cameras (Iphone 11 promax, Iphone 11), and the species were identified through Google Lens and cross-referenced with field guides. Bird abundance was quantified as the mean number of individuals and the frequency of species presence in each zone. To assess bird abundance, we used a scale ranging from 1 to 10; (1–2 = very low), (3–4 = low), (5–6 = medium), (7–8 = high), (>10 = very high). Scale ranging was based on the observation supported by (Jasmani et al., 2017; AH Perera.,2011).



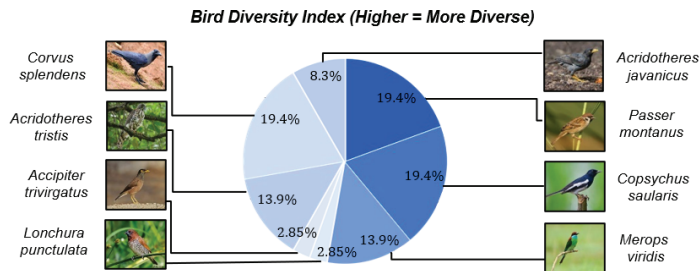
**Figure 4.Positioning of three observation points and the observation radius set at 40–50 meters**

Source: Author.,(2023)

## METHODOLOGY

### Presence of Birds in Urban Parks

Throughout the observation, approximately 8 bird species were documented. The avian species encountered in the parks were primarily insect-eating and omnivorous.) The most prevalent bird species were *Passer montanus* (Eurasian Treesparrow), followed by *Copsychus saularis* (Oriental Magpie-robin) and *Corvus splendens* (House Crow). The individual attributes of the birds, their ecological characteristics, adaptability in the urban setting, and human perception of the birds are presented in Table 1. Most are resident species, indicating they breed or are known to have bred in Malaysia. While the majority of the birds are generalist species and adept at urban living, the presence of passage migrant bird such as *Merops viridis* (Bluethroated Bee-eater) was also observed. Birds of prey such as *Accipiter trivirgatus* (Crested Goshawk) were also spotted perched on a branch with dense foliage. In this investigation, bird occurrence is more pronounced during the morning and afternoon and diminished in the evening.



**Figure 5. Bird Diversity Index at Elmina Valley Central Park,Shah Alam,Selangor**

Source: Author.,(2023)

Bird presence in urban parks shows the importance of maintaining and enhancing biodiversity within these green spaces. The documented species like *Passer montanus* (Eurasian Tree-sparrow), *Copsychus saularis* (Oriental Magpie-robin), and *Corvus splendens* (House Crow), highlights the vital role of urban parks as habitats for both resident and migratory bird species. The observed temporal pattern of bird occurrence throughout the day provides valuable insights for park management strategies and visitor experiences. Additionally, the moderate plant diversity, with Zone B, signifies the potential for strategic planting to further enrich the urban ecosystem. The selection of specific large trees, such as *Hopea odorata* (Merawan siput jantan), *Pteleocarpa lamponga* (Tembusu tikus), and *Ficus racemose* (Ara Cedung), for their aesthetic value reflects an intentional effort to create visually. These findings collectively emphasize the significance of urban parks in fostering biodiversity, supporting bird habitats, and contributing to the overall well-being of urban environments.

**Table 1. Species and Ecological Traits of Bird Species Found within the Studied Parks**

| Birds Species                                                                                                                                    | Bird Diversity Index                          | Nesting                                             | Adaptability          | Natural Behaviour of the Species                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>CN : <i>Passer montanus</i><br>SN:(Eurasian Tree-sparrow) | Feeding Guild :<br>Granivores<br>(7–8 = high) | Status:<br>Resident<br>Birds<br>Secondary<br>Cavity | Adapter/<br>Exploiter | <div>These sparrows are social birds that typically form small flocks. They are known for their gregarious nature and are often seen foraging or roosting together.</div> <div>They feed on food provided by humans, such as bird feeders or food scraps.</div> |

|                                                                                                                                                                    |                                                     |                                                                                                    |                       |                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>CN: <i>Copsychus saularis</i><br/>SN: (Oriental Magpie-robin)</p>             | Feeding Guild :<br>Insectivores<br>(7–8 = high)     | Status:<br>Resident<br>Birds<br>Secondary<br>Cavity                                                | Adapter               | Male magpie-robins are known for their melodious and varied songs. They have a repertoire of whistles, clicks, and musical phrases. Their vocalizations are used for communication, especially during the breeding season.                 |
|                                                                                                                                                                    |                                                     |                                                                                                    |                       | Their flight is generally direct and low over the ground. They may fly from a perch to catch insects in mid-air or forage on the ground.                                                                                                   |
|  <p>CN : <i>Corvus splendens</i><br/>SN: (House Crow)</p>                         | Feeding Guild :<br>Omnivores<br>(5–6 = medium)      | Status:<br>Feral Birds<br>Tree                                                                     | Adapter/<br>Exploiter | House Crows can be territorial, especially around nesting sites or valuable food sources.                                                                                                                                                  |
|                                                                                                                                                                    |                                                     |                                                                                                    |                       | House Crows use a variety of vocalizations for communication. These can include calls indicating alarm, aggression, or communication within a group.                                                                                       |
|  <p>CN: <i>Merops viridis</i><br/>SN: (Bluetheated Bee-eater)</p>                 | Feeding Guild :<br>Insectivores<br>(1–2 = very low) | Status:<br>Resident,<br>Migrant/<br>passage<br>migrant Birds<br>Burrow<br>nesting<br>(underground) | Adapter               | These bee-eaters are often seen in small groups or colonies, particularly during the breeding season. They may engage in cooperative behaviors, such as foraging together or defending nesting sites collectively.                         |
|  <p>CN: <i>Accipiter trivirgatus</i><br/>SN: (Crested Goshawk)</p>                | Feeding Guild :<br>Carnivores<br>(1–2 = very low)   | Status:<br>Resident<br>Birds<br>Tree                                                               | Avoider               | Bird of prey, preferred to perched on the tree crowns with dense foliage.                                                                                                                                                                  |
|  <p>CN: <i>Acridotheres javanicus</i><br/>SN: (Javan Myna)<br/>Status: Feral</p> | Feeding Guild :<br>Omnivores<br>(5–6 = medium)      | Status:<br>Feral Birds<br>Secondary<br>Cavity                                                      | Adapter               | Javan Mynas are social birds that often form large flocks. They are known for their loud and varied vocalizations, including whistles, squawks, and mimicry of other bird species. Their social nature extends to communal roosting sites. |
|  <p>CN: <i>Acridotheres tristis</i><br/>SN: (Common Myna)</p>                   | Feeding Guild :<br>Omnivores<br>(7–8 = high)        | Status:<br>Resident<br>Birds<br>Secondary<br>Cavity                                                | Adapter               | Common Mynas are highly social birds that often form large and noisy groups. They are known for their vocalizations, which include a mix of whistles, squawks, and a variety of calls.                                                     |
|                                                                                                                                                                    |                                                     |                                                                                                    |                       | Common Mynas typically nest in tree cavities, buildings, or other suitable structures.                                                                                                                                                     |

|                                                                                                                                                        |                                              |                             |         |                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>CN: <i>Lonchura punctulata</i><br/>SN: (Scaly-breasted Munia)</p> | Feeding Guild :<br>Granivores<br>(3–4 = low) | Status:<br>Resident<br>Tree | Adaptor | These finches build cup-shaped nests in bushes or trees using grass and other plant materials. The female is primarily responsible for incubating the eggs, while both parents participate in feeding the chicks. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Source: Author.,(2023)

Vegetation Characteristics and Ecosystem Functions

A total of 13 different plant species (large trees) were observed, and the quantity has been documented (Table 2,3 and 4). Across all examined areas, plant diversity is moderate, with Zone B exhibiting the highest no of vegetation lowest has observed in Zone A. Trees that provide aesthetic such as *Hopea odorata* (Merawan siput jantan), *Pteleocarpa lamponga* (Tembusu tikus) and *Ficus racemose* (Ara Cedung) not only contribute to the aesthetic appeal of the environment but also play a crucial role in providing habitat and resources for birds. These specific tree species offer not only visual beauty but also serve as potential sites for nesting and foraging, thereby enhancing the overall ecosystem functions within the observed zones. However, understanding how many different types of trees are in an area and their characteristics is crucial for figuring out how the ecosystem works there. Usually, if there are more types of trees, the vegetation becomes more complex with different heights and textures. This complexity creates different homes for plants and animals. The various nooks and crannies formed by the different trees offer homes for a variety of plants and animals.

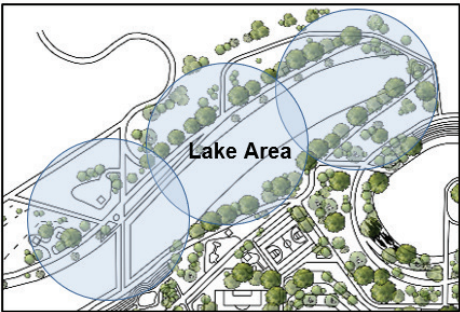


Figure 6. ZONE A with positioning of three observation points and the observation radius set at 40–50 meters

Source: Author., (2023)

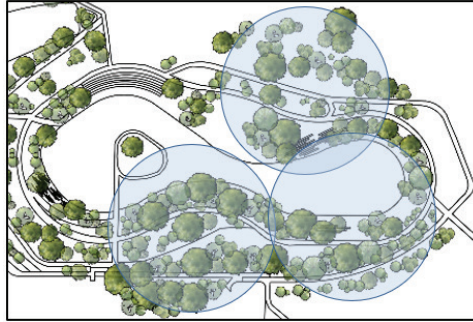
**Table 2. This Table Illustrates the Planting Role and the Types of Birds that Come to these Zones**

| Tree Species                                                                                                                                                                    | Tree characteristics                                                                                                                                                                                                                                                                                                                                                                                          | Planting roles                                                                                                                     | Bird species                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|  <p>SN : <i>Hopea odorata</i><br/>CN : Merawan siput jantan<br/>PD : Oct 2017<br/>Nos : 14</p> | <p>Large tree that can reach heights of up to 60 meters (about 200 feet).<br/>It has a straight and cylindrical trunk with a diameter of about 1 to 2 meters. The tree has a well-developed crown with spreading branches.</p>                                                                                                                                                                                | Nesting Sites                                                                                                                      | <i>Passer montanus</i><br>(Eurasian Tree sparrow)                                                   |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    | <i>Copsychus saularis</i><br>(Oriental Magpie-robin)                                                |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    | <i>Accipiter trivirgatus</i><br>(Crested Goshawk)                                                   |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    | <i>Acridotheres javanicus</i><br>(Javan Myna)                                                       |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    | <i>Acridotheres tristis</i><br>(Common Myna)                                                        |
|  <p>SN : <i>Pteleocarpa lamponga</i><br/>CN : Tembusu tikus<br/>PD : Oct 2017<br/>Nos : 5</p>  | <p>The tree has a straight and tall trunk with a relatively large crown.<br/>Mature specimens may attain heights of up to 40 meters (about 130 feet) or more.<br/>The tree produces small, inconspicuous flowers. The flowers are usually arranged in panicles.</p>                                                                                                                                           | Nesting Sites                                                                                                                      | <i>Passer montanus</i><br>(Eurasian Tree sparrow)                                                   |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               | Canopy Structure<br>Fruit Production                                                                                               | <i>Copsychus saularis</i><br>(Oriental Magpie-robin)<br><br><i>Corvus splendens</i><br>(House Crow) |
|  <p>SN : <i>Samanea samans</i><br/>CN : Rain tree<br/>PD : Oct 2017<br/>Nos : 7</p>           | <p>Fast-growing trees that can reach heights of up to 25 meters (80 feet) or more.<br/>The crown of the tree is wide and umbrella-shaped, providing extensive shade.</p>                                                                                                                                                                                                                                      | The tree supports various forms of wildlife, including birds and insects, by providing shelter, food resources, and nesting sites. | <i>Passer montanus</i><br>(Eurasian Tree sparrow)                                                   |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    | <i>Copsychus saularis</i><br>(Oriental Magpie-robin)                                                |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    | <i>Accipiter trivirgatus</i><br>(Crested Goshawk)                                                   |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    | <i>Corvus splendens</i><br>(House Crow)                                                             |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    | <i>Acridotheres javanicus</i><br>(Javan Myna)                                                       |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    | <i>Acridotheres tristis</i><br>(Common Myna)                                                        |
|  <p>SN : <i>Eugenia polyantha</i><br/>CN : Salam<br/>PD : Oct 2017<br/>Nos : 3</p>           | <p>Medium-sized evergreen tree that typically reaches heights of about 10 to 15 meters (30 to 50 feet).<br/>The tree has a dense and rounded crown with glossy foliage.<br/>Grumichama produces small, fragrant, white flowers with prominent stamens.<br/>The fruit is a berry that resembles a small cherry. The berries are typically dark purple to black when ripe and have a sweet and tart flavor.</p> | Fruit Production                                                                                                                   | <i>Passer montanus</i><br>(Eurasian Tree sparrow)                                                   |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               | Food Source for Birds                                                                                                              | <i>Copsychus saularis</i><br>(Oriental Magpie-robin)                                                |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               | Habitat and Nesting Sites                                                                                                          | <i>Acridotheres javanicus</i><br>(Javan Myna)                                                       |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               | Enhancement of Bird Diversity<br>Support for Migratory Birds                                                                       | <i>Acridotheres tristis</i><br>(Common Myna)                                                        |
|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    | <i>Corvus splendens</i><br>(House Crow)                                                             |

|                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                               |                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>SN : <i>Shorea roxburghii</i><br/>CN : Temak nipis<br/>PD : Oct 2017<br/>Nos : 3</p> | <p>Large and can reach heights of up to 30 to 35 meters (100 to 115 feet) or more.<br/>The trunk is typically straight and cylindrical.</p>                                                                                                                                                                                                                                                                                                                                                                 | <p>Habitat for Nesting Site</p> <p>Shelter and Protection</p> <p>Migration Stopover</p>                                                       | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p>                                                                                                                                                                    |
|  <p>SN : <i>Tamarindus indica</i><br/>CN : Asam jawa<br/>PD : Oct 2017<br/>Nos : 7</p>   | <p>Large and can reach heights of up to 30 to 35 meters (100 to 115 feet) or more.<br/>Tamarind tree is a large, slow growing tree that can reach heights of up to 25 meters (82 feet) or more.<br/>Tamarind trees produce small, yellow flowers with five petals. The flowers are often inconspicuous and are borne in clusters.<br/>The fruit of the tamarind tree is a pod-like structure known as a "tamarind pod."<br/>The pulp has a sweet and tangy flavor and is used in culinary applications.</p> | <p>Fruit Production</p> <p>Foraging Opportunities</p> <p>Nesting Sites</p> <p>Shade and Shelter</p>                                           | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p> <p><i>Acridotheres javanicus</i><br/>(Javan Myna)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p> <p><i>Corvus splendens</i><br/>(House Crow)</p> |
|  <p>SN : <i>Anisoptera scuphula</i><br/>CN : Tengar<br/>PD : Nov 2016<br/>Nos : 5</p>   | <p>Large and can reach heights of up to 30 to 35 meters (100 to 115 feet) or more.<br/>The crown of the tree is wide and umbrella-shaped, providing extensive shade.<br/>The tree has a well-developed crown with spreading branches.</p>                                                                                                                                                                                                                                                                   | <p>Nesting Sites</p> <p>Canopy Structure</p>                                                                                                  | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p>                                                                                                                                                                    |
|  <p>SN : <i>Cinnamomum verum</i><br/>CN : Kayu Manis<br/>PD : Nov 2016<br/>Nos : 3</p> | <p>The crown of the tree is wide and umbrella-shaped, providing extensive shade.<br/>The tree has a well-developed crown with spreading branches.</p>                                                                                                                                                                                                                                                                                                                                                       | <p>Nesting Sites</p> <p>Canopy Structure</p> <p>Shade and Shelter</p> <p>Enhancement of Bird Diversity</p> <p>Support for Migratory Birds</p> | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p> <p><i>Accipiter trivirgatus</i><br/>(Crested Goshawk)</p> <p><i>Corvus splendens</i><br/>(House Crow)</p>                                                          |

SN - Scientific Name,CN- Common Name PD- Planting Date,Nos - Number of Species.

Source: Author



**Figure 7. ZONE B with Positioning of Three Observation Points and the Observation Radius set at 40–50 Meters**

Source: Author.,(2023)

**Table 3. This Table Illustrates the Planting Role and the Types of Birds that Come to these Zones**

| Tree Species                                                                                                                                                                 | Tree characteristics                                                                                                                                                                                                                                                                                                                         | Planting roles                                                                                                                                    | Bird species                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>SN : <i>Samanea samans</i><br/>CN : Rain tree<br/>PD : Oct 2017<br/>Nos : 9</p>         | <p>Fast-growing trees that can reach heights of up to 25 meters (80 feet) or more. The crown of the tree is wide and umbrella-shaped, providing extensive shade.</p>                                                                                                                                                                         | <p>The tree supports various forms of wildlife, including birds and insects, by providing shelter, food resources, and nesting sites.</p>         | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)<br/><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)<br/><i>Accipiter trivirgatus</i><br/>(Crested Goshawk)<br/><i>Acridotheres javanicus</i><br/>(Javan Myna)<br/><i>Acridotheres tristis</i><br/>(Common Myna)<br/><i>Lonchura punctulata</i><br/>(Scaly-breasted Munia)<br/><i>Corvus splendens</i><br/>(House Crow)</p> |
|  <p>SN : <i>Eugenia polyantha</i><br/>CN : <i>Salam</i><br/>PD : Oct 2017<br/>Nos : 7</p> | <p>Medium-sized evergreen tree that typically reaches heights of about 10 to 15 meters (30 to 50 feet). The tree has a dense and rounded crown with glossy foliage. Grumichama produces small, fragrant, white flowers with prominent stamens. The berries are typically dark purple to black when ripe and have a sweet and tart flavor</p> | <p>Fruit Production<br/>Food Source for Birds<br/>Habitat and Nesting Sites<br/>Enhancement of Bird Diversity<br/>Support for Migratory Birds</p> | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)<br/><i>Acridotheres javanicus</i><br/>(Javan Myna)<br/><i>Acridotheres tristis</i><br/>(Common Myna)<br/><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p>                                                                                                                                                               |

|                                                                                                                                                                                  |                                                                                                                                                                                                                                                                     |                                                                                                                                             |                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>SN : <i>Shorea roxburghii</i><br/>CN : Temak nipis<br/>PD : Oct 2017<br/>Nos : 6</p>        | <p>Large and can reach heights of up to 30 to 35 meters (100 to 115 feet) or more.<br/>The trunk is typically straight and cylindrical.</p>                                                                                                                         | <p>Habitat for Nesting Site<br/>Shelter and Protection</p> <p>Migration Stopover</p>                                                        | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Accipiter trivirgatus</i><br/>(Crested Goshawk)</p> <p><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p>                                                          |
|  <p>SN : <i>Anisoptera scuphula</i><br/>CN : Tengar<br/>PD : Nov 2016<br/>Nos : 4</p>           | <p>Large and can reach heights of up to 30 to 35 meters (100 to 115 feet) or more.<br/>The crown of the tree is wide and umbrella-shaped, providing extensive shade.<br/>The tree has a well-developed crown with spreading branches.</p>                           | <p>Nesting Sites</p> <p>Canopy Structure</p>                                                                                                | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p> <p><i>Acridotheres javanicus</i><br/>(Javan Myna)</p> <p><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p> <p><i>Lonchura punctulata</i><br/>(Scaly-breasted Munia)</p> |
|  <p>SN : <i>Cinnamomum verum</i><br/>CN : Kayu Manis<br/>PD : Nov 2016<br/>Nos : 4</p>         | <p>The crown of the tree is wide and umbrella-shaped, providing extensive shade.</p> <p>The tree has a well-developed crown with spreading branches.</p>                                                                                                            | <p>Nesting Sites</p> <p>Canopy Structure<br/>Shade and Shelter</p> <p>Enhancement of Bird<br/>Diversity<br/>Support for Migratory Birds</p> | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p> <p><i>Accipiter trivirgatus</i><br/>(Crested Goshawk)</p> <p><i>Corvus splendens</i><br/>(House Crow)</p>                                                                       |
|  <p>SN : <i>Pteleocarpa lamponga</i><br/>CN : Tembusu tikus<br/>PD : Oct 2017<br/>Nos : 7</p> | <p>The tree has a straight and tall trunk with a relatively large crown.<br/>Mature specimens may attain heights of up to 40 meters (about 130 feet) or more.<br/>The tree produces small, inconspicuous flowers. The flowers are usually arranged in panicles.</p> | <p>Nesting Sites</p> <p>Canopy Structure</p> <p>Fruit Production</p>                                                                        | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Lonchura punctulata</i><br/>(Scaly-breasted Munia)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p> <p><i>Corvus splendens</i><br/>(House Crow)</p> <p><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p>       |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>SN : <i>Sterculia</i> spp<br/>CN : Kelumpang<br/>PD : Nov 2016<br/>Nos : 5</p>            | <p>Medium-sized evergreen tree that typically reaches heights of about 10 to 15 meters (30 to 50 feet). The size of <i>Sterculia</i> trees can vary, but they are generally medium to large-sized trees.</p> <p><i>Sterculia</i> trees produce unique and often showy flowers.</p> <p>The flowers are usually unisexual, meaning individual trees may have either male or female flowers.</p> <p>The large fruits and seeds..</p>                                                                                                                                                                                 | <p>Food Source</p> <p>Nesting Sites</p> <p>Habitat</p> <p>Diversity</p> <p>Ecological Interactions</p>       | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Accipiter trivirgatus</i><br/>(Crested Goshawk)</p> <p><i>Acridotheres javanicus</i><br/>(Javan Myna)</p> <p><i>Corvus splendens</i><br/>(House Crow)</p> <p><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p>         |
|  <p>SN : <i>Ficus racemosa</i><br/>CN : Ara Cedung<br/>PD : Nov 2016<br/>Nos : 4</p>          | <p>It can grow up to significant heights, with a spreading crown and a trunk that may have buttresses.</p> <p>The leaves of <i>Ficus racemosa</i> are simple, alternate, and usually elliptical or ovate in shape. They are dark green and glossy, providing a dense canopy.</p> <p>The unique feature of <i>Ficus racemosa</i> is its fig-like fruits, which are arranged in clusters along the trunk and branches.</p> <p>These figs are technically syconia, a specialized type of fruit structure characteristic of fig trees. The figs are small and develop in dense spherical clusters called syconia.</p> | <p>Food Source</p> <p>Nesting Sites</p> <p>Habitat</p> <p>Habitat Diversity</p> <p>Ecosystem Health</p>      | <p><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p> <p><i>Merops viridis</i><br/>(Bluethroated Bee-eater)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p> <p><i>Acridotheres javanicus</i><br/>(Javan Myna)</p> <p><i>Lonchura punctulata</i><br/>(Scaly-breasted Munia)</p> |
|  <p>SN : <i>Melaleuca leucadendron</i><br/>CN : Kayu Putih<br/>PD : Nov 2016<br/>Nos : 4</p> | <p>This tree is a medium-sized evergreen tree. It typically reaches heights of 20 to 30 meters (66 to 98 feet). The bark of <i>Melaleuca leucadendron</i> is papery and peels away in thin layers. The color of the bark can range from white to gray or brown.</p> <p>The leaves are narrow, lance-shaped, and aromatic when crushed. They are arranged alternately along the branches.</p> <p>The fruit of <i>Melaleuca leucadendron</i> is typically small, woody capsules that contain numerous tiny seeds. These capsules are often persistent on the tree.</p>                                              | <p>Canopy Structure</p> <p>Shade and Shelter</p> <p>Nesting Sites</p> <p>Habitat</p> <p>Ecosystem Health</p> | <p><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p> <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p>                                                                                                                    |

SN - Scientific Name, CN- Common Name PD- Planting Date, Nos - Number of Species.

Source: Author



**Figure 8. ZONE C with Positioning of Three Observation Points and the Observation Radius Set at 40–50 Meters**

Source: Author.,(2023)

**Table 4. This Table Illustrates the Planting Role and the Types of Birds that Come to these Zones**

| Tree Species                                                                                                                                                                     | Tree characteristics                                                                                                                                                                                                                     | Planting roles                                                                                                                            | Bird species                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>SN : <i>Samanea samans</i><br/>CN : Rain tree<br/>PD : Oct 2017<br/>Nos : 8</p>             | <p>Fast-growing trees that can reach heights of up to 25 meters (80 feet) or more.</p> <p>The crown of the tree is wide and umbrella-shaped, providing extensive shade.</p>                                                              | <p>The tree supports various forms of wildlife, including birds and insects, by providing shelter, food resources, and nesting sites.</p> | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p> <p><i>Acridotheres javanicus</i><br/>(Javan Myna)</p> <p><i>Lonchura punctulata</i><br/>(Scaly-breasted Munia)</p> |
|  <p>SN : <i>Hopea odorata</i><br/>CN : Merawan siput jantan<br/>PD : Oct 2017<br/>Nos : 6</p> | <p>Large tree that can reach heights of up to 60 meters (about 200 feet).</p> <p>It has a straight and cylindrical trunk with a diameter of about 1 to 2 meters.</p> <p>The tree has a well-developed crown with spreading branches.</p> | <p>Nesting Sites</p>                                                                                                                      | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p> <p><i>Acridotheres javanicus</i><br/>(Javan Myna)</p> <p><i>Acridotheres tristis</i><br/>(Common Myna)</p>         |

|                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                   |                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>SN : <i>Eugenia polyantha</i><br/>CN : Salam<br/>PD : Oct 2017<br/>Nos : 3</p>            | <p>Medium-sized evergreen tree that typically reaches heights of about 10 to 15 meters (30 to 50 feet). The tree has a dense and rounded crown with glossy foliage. Grumichama produces small, fragrant, white flowers with prominent stamens. The fruit is a berry that resembles a small cherry. The berries are typically dark purple to black when ripe and have a sweet and tart flavor.</p>                                                                                                                 | <p>Fruit Production<br/>Food Source for Birds<br/>Habitat<br/>Nesting Sites<br/>Enhancement of Bird Diversity<br/>Support for Migratory Birds</p> | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)<br/><i>Acridotheres javanicus</i><br/>(Javan Myna)<br/><i>Acridotheres tristis</i><br/>(Common Myna)<br/><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)<br/><i>Corvus splendens</i><br/>(House Crow)</p> |
|  <p>SN : <i>Pteleocarpa lamponga</i><br/>CN : Tembusu tikus<br/>PD : Oct 2017<br/>Nos : 3</p> | <p>The tree has a straight and tall trunk with a relatively large crown. Mature specimens may attain heights of up to 40 meters (about 130 feet) or more. The tree produces small, inconspicuous flowers. The flowers are usually arranged in panicles.</p>                                                                                                                                                                                                                                                       | <p>Nesting Sites<br/>Canopy Structure<br/>Fruit Production</p>                                                                                    | <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)<br/><i>Acridotheres tristis</i><br/>(Common Myna)<br/><i>Corvus splendens</i><br/>(House Crow)</p>                                                                                                              |
|  <p>SN : <i>Ficus racemosa</i><br/>CN : Ara Cedung<br/>PD : Nov 2016<br/>Nos : 5</p>         | <p>It can grow up to significant heights, with a spreading crown and a trunk that may have buttresses. The leaves of <i>Ficus racemosa</i> are simple, alternate, and usually elliptical or ovate in shape. They are dark green and glossy, providing a dense canopy. The unique feature of <i>Ficus racemosa</i> is its fig-like fruits, which are arranged in clusters along the trunk and branches. These figs are technically syconia, a specialized type of fruit structure characteristic of fig trees.</p> | <p>Food Source<br/>Nesting Sites<br/>Habitat Diversity<br/>Ecological Interactions<br/>Ecosystem Health</p>                                       | <p><i>Acridotheres tristis</i><br/>(Common Myna)</p>                                                                                                                                                                                                                  |

|                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                         |                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>SN : <i>Melaleuca leucadendron</i><br/>CN : Kayu Putih<br/>PD : Nov 2016<br/>Nos : 3</p> | <p>This tree is a medium-sized evergreen tree. It typically reaches heights of 20 to 30 meters (66 to 98 feet). The bark of <i>Melaleuca leucadendron</i> is papery and peels away in thin layers. The color of the bark can range from white to gray or brown. The leaves are narrow, lance-shaped, and aromatic when crushed. They are arranged alternately along the branches.</p> <p>The fruit of <i>Melaleuca leucadendron</i> is typically small, woody capsules that contain numerous tiny seeds. These capsules are often persistent on the tree.</p> | <p>Food Source</p> <p>Nesting Sites</p> <p>Habitat Diversity</p> <p>Ecological Interactions</p> <p>Ecosystem Health</p> | <p><i>Copsychus saularis</i><br/>(Oriental Magpie-robin)</p> <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> <p><i>Passer montanus</i><br/>(Eurasian Tree sparrow)</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

SN - Scientific Name,CN- Common Name PD- Planting Date,Nos - Number of Species.

Source: Author

## CONCLUSION

Through observation researchers, we have identified significant impact on vegetation richness and its association with bird population. The structural elements of vegetation, including canopy cover, understory density, and plant height diversity, emerge as critical factors in providing diverse habitats and foraging opportunities for avian communities. Secondly, the composition of plant species, especially the diversity of native plants and the presence of various microhabitats, plays a pivotal role in shaping vegetation richness, subsequently influencing bird species assemblages. Factors such as food availability, including fruits, seeds, and insects, and the suitability of nesting sites, such as trees and shrubs, further impact the bird-vegetation relationship. Consideration of human disturbance, climate, and topography adds additional layers of complexity to this relationship.

Moving forward, effective strategies for the conservation and enhancement of bird diversity within ecosystems should involve comprehensive management approaches. This includes the implementation of habitat restoration and conservation initiatives focused on maintaining or enhancing structural components of vegetation. Native plant species should be prioritized to promote biodiversity, and efforts should be made to create and preserve various microhabitats (Bichi e al., 2025; Nursyamin et al.,

2023). Thirdly, managing human disturbance through strategic planning and awareness campaigns, considering the impacts of climate change, and incorporating topographical features into urban planning can contribute to fostering a conducive environment for avian communities (Yang et al, 2020; Sulaiman et al., 2013 and Rajpar et al., 2011). Integrating these multifaceted factors into conservation and management strategies will be crucial for the sustained well-being and diversity of bird populations in Elmina Valley Central Park and similar ecosystems.

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