



Symbiosis of Ornamental Plants and Bird Habitats in Urban Parks: FRIM, Malaysia

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Abstract

Rapid and unpredicted rate of urbanization have negatively impacted the lowland tropical forests. Introduced species and destruction are activities that bring harm to the sensitive yet precious wildlife and cause them habitats loss; bird family. This research aims to review the role of ornamental plant in providing food and shelter for urban birds in urban park. The research is conducted by the reviewing of literature and questionnaire survey analysis. It hoped that the review will contribute to the knowledge of landscape architecture on consideration as opportunity for birds in urban parks.

Keywords: Bird habitats; ornamental plant; urban park; birds' food and shelter.

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1.0 Introduction

The massive bird species decline is the habitat loss effecting from the introduction of exotic species and habitats destruction (BirdLife International, 2008; Sekercioglu et al., 2004; Malaysia National Biodiversity Policy, 1998). Vitousek et al. (1997) observed that almost half of land surface has been transformed, and this represent a dominant influence by a human for the loss of biodiversity. There are four elements of bird habitats including continuously food resource, nesting place, cover and water (Heaton, 2000).

In urban environments, man has created islands of natural habitats as an effort to compensate habitat destruction, but, many of which fail to fulfill the needs of birds followed by introduction and competition from exotic species (Heaton, 2000). According to Scott et al. (1991), bird habitats dominated with exotic plant suspected to cause a low harbour for insect preys and insects, which bring to low food resource especially for the young one (for growth) and adult (continue survive).

Limited spaces are the challenge for landscape architects for the past years. Fortunately in Malaysia, with higher awareness of open spaces such recreation park, garden, nature reserve, green network, and more, planners and practitioners start to conserve more spaces to becoming greenish with wildlife.

Unfortunately, more exotic plant becomes a part of local plants scheme. Findings and observed indicate more ornamental plants that unable to fulfill the habitat function for birds' requirement were planted compared to food plants (Nik Hanita, 2010; Rigard, 2010). The choice of plant material for designed areas might be one of the causes that bring to the unsuccessful design towards bird conservation. For example, plant such as palm has been emphasized and be appreciated as a formal appearance and aesthetic silhouette only. The problem was identify as there is no or lack of discussion between the landscape architect with arborists, horticulturists and ecologist which their expertise on plants function toward wildlife can't be questioned (Nik Hanita, 2010).

Landscape architects, arborists, horticulturists, ecologist and other practitioners need to do more collaboration efforts towards improving the choice of plant material in enhancing the existing wildlife habitats especially birds in urban area.

Hopefully the study of ornamental plant in urban park can be a benchmark to explore the understanding of urban park function and its contribute to birds as food and shelter.

2.0 Literature review

2.1 Role of birds in urban parks

According to Dunnett, et al. (2002), open space or park is defines as a 'mixture of civic space and green space'. Urban parks are divided into three basic forms of values; recreation, ecology, and aesthetic values. Unfortunately, Davies (2007) stated, often more practical for amenity purpose, recreational use and wildlife corridor that inaccessible and contrasting with landscape elements were designed.

Fortunately, there are plenty of reviews from earlier research stated that urban park or any green spaces should be highlighted as a key of ecological services providers including a habitat for urban wildlife (Gairola & Noresah, 2010).

Donnelly and Marzluff (2004) observed that birds function as biological indicators for wildlife and to overall ecosystem health (healthy preserves). Some birds eat small carnivores and help in controlling the population of pest. For large carnivores, the birds help keep down the populations of mice and squirrels.

According to Schwartz et al. (2008), there were four categories of urban birds; alien species, urban adaptors, urban exploiters, and migrants. Alien species are bird that intentionally or accidentally releases in estrange place, while urban adaptors are native species that belong to the area. They can utilise some urban resources such ornamental plant as food or shelter. Urban exploiters are species that will take advantage of the urban environment and frequently reaching their maximum densities in urban areas such as crows. Last are migrant birds that only pass through some places during long-distance migration. For this research, bird species of urban adaptors will be focus as the number of this bird species are facing a major decrease with the current global rate of native habitat loss for birds is 1.1 per cent /year (Jenkins, 2003). There are three categories to indicate bird function; ecological, psychological and social.

Each species perform a function either directly or indirectly which give benefits to the environment and human. For example, some bird disperse seeds from the ground and insectivore birds help plants by controlling the quantity of insects living on bark, leaves and branches.

For psychological aspect, spending time in a hospital as patient, visitor, or member of staff can be can confuse and feel unfamiliar causing stressful experience. Therefore, nature is a positive distraction which can stimulates all the senses to be more familiar and relaxing (Smith, 2001).

In term of social, there are two subdivisions which aesthetic and real estate values. Aesthetic or visual of plants with flowers, fruits and greenish leaves associated with friendly wildlife such birds give a pleasing quality of peacefulness, relaxation and a sense of pleasure. For real estate values, improving wildlife habitat in open space often increased soil moisture, improving water quality and reduced soil erosion. The land value of a housing area is often pricey than housing area that lacking open spaces.

2.2 Role of ornamental plant as food and shelter for urban birds

Ornamental plant typically grown in the flower garden and most commonly grown for a display of its' physical. For plants to be considered as ornamental, they may require specific work and activity by a gardener, known as aesthetic plants, planted in urban areas. Ornamental plant has its own contribution towards birds especially for the habitat element including food resource, deciduous or evergreen, the size of mature tree, and nesting (Mel, 2006). Observation and data documentation analysis had been made and found more ornamental plants that don't have the attraction towards birds' requirement were planted.

Generally, birds are one of the species that have specific habitat, food resources, barrier between human and themselves and water. Mostly, birds in urban area comprise generalize species, the most abundant and able to tolerate human disturbances (Rodgers et al, 1991).

Their adaptability in the alternative way of finding nest and food enables the generalists to be successful under diverse conditions.

Generalist species often comprise omnivores (feed on both plants and small animals), insectivores (feed only insects), granivores (grains diet) and frugivores (fruit diet). For example, *Artocarpus bilimbi* [Belimbing Besi] is food plant for frugivores and granivores birds while *Gardenia carinata* [Kembang Cina] as a food plant for nectar eater. Yellow Vented Bulbul [*Pycnonotus goiavier*] and Magpie Robin [*Copsychus saulari*] are attracted to insects as their diet, but, Bulbul able to eat other food resource such as fruits and nectars. Roughly, it seems to be balance and no competition. Species such as *Passer montanus*-grain eater, *Geopelia striata* -grain eater, *Streptopelia chinensis*-grain eater live in the same space and fight for food because of the limited food resource. This cause a long-term of rapid declination of bird populations (Amar-Singh, 2009; Department of Wildlife and National Parks of Malaysia, 1999).

Often, more selection and variety of exotic ornamental plant species are planted based on the beauty appearance only. In a new habitat, this exotic plant species may have fewer natural pests or predators and climate conditions which kept the plants in check bring to uncontrollable growth.

According to Scott et al (1991), the low correlation between bird densities in urban area is expected when substantial percentage of exotic plants is dominant and brings to the less of available resources. Supporting the statement, Walker (2004) discussed, habitats dominated by exotic plant are suspected to harbor low levels of insect prey which interrupt insectivorous food chain. He also added, in order for birds to success in breeding season in urban, optimal nesting option are the best for birds.

Table 1: Contribution of plant to birds in urban parks

Characteristic	Native and Naturalistic Plants	Exotic Plants
Origin	They are the foundation of our native ecosystems, or natural communities.	Bring from outside
Condition	The natural balance keeps each species in check, allowing it to thrive in conditions where it is suited, but preventing it from running amok.	Conquer surrounding as the natural pests, diseases or climate conditions which kept the plants in check in their homeland is absent here.
Contribution	Member of a community includes other plants, animals and microorganisms. Improves water quality and help to enrich the soil. Their root systems help rainfall percolate into the soil, reducing erosion and runoff.	Native community gets nothing from these species.
Food and Shelter	Provide food and shelter for birds, butterflies and other desirable wildlife	Some provide shelter.
Pest and Disease	Resistant to most pests and diseases	Some disease cannot be prevented by local climate or pest control.
Maintenance Level	Need "low-maintenance" gardening and landscaping-matured plant no need fertilizer,	High maintenance due to fertilizer, watering and cost to buy.

According to Hirst (2010), the best selection of ornamental plant species is the one that helps to provide birds with food and shelter. The plant species should be able to produce food supply all-year-round as natural food sources are the best dietary. The selection of plant especially in urban areas should offered all-year-round needs, including able to produce a variety of seeds, nuts, berries or other fruits, or nectar and some attract insects (Slattery et al., 2003). Stanley Smith Horticultural Trust (2012) emphasize on native plant (trees, shrubs, and vines) as the most likely plant species that provide the right mix, size, and nutritional value for native birds. Hirst (2010) suggest selecting an evergreen plant species help the improvement of bird habitat.

Table 2: Comparison between native and exotic plants

Category		Example of Plants Species
Food Plants	Fruits (Frugivorous bird species)	Artocarpus bilimbi (Belimbing Besi)
	Nectars (Nectarivores bird species)	Spathodea campanulata (Pancut-pancut)
	Grains (Granivores bird species)	Sandorium koetjape (Sentol)
	Attract Insect (Omnivores bird species)	Psidium guajava (Jambu Batu)
Shelter	Multi-stem plants	Adenanthera pavonina (Pokok Saga)
	Single-stem plants	Cananga odorata (Kenanga)
	A dense canopy	Cinnamomum iners (Kayu Manis)
	A thin canopy	Cerbera odollam (Pong-pong)
	Evergreen	Cinnamomum iners (Kayu Manis)
	Deciduous	Alstonia angustiloba (Pulai)

Table 2 shows the significant of preserving native plant in environment. Based on the finding of basic comparison, native and naturalistic plant significantly offer more benefit in maintenance and providing more food and better shelter for wildlife.

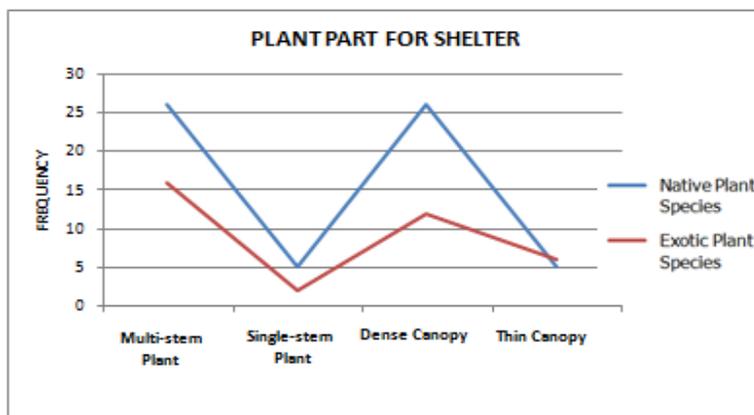


Fig 1: Frequency contribution of plant part from native and exotic plant

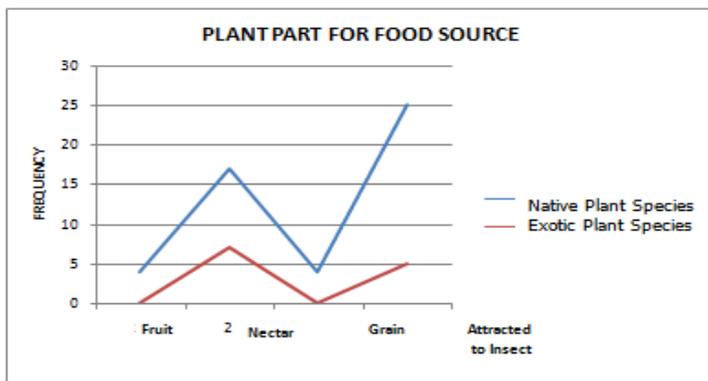


Fig 2: Frequency contribution of plant part from native and exotic plant

Findings in Fig. 1 and 2 indicate that most native plant provide more benefits for birds' need in food source and shelter, while exotic plant give less benefit (Idilfitri & Nik Hanita, 2013). This shows that native plant always giving the best and most deal to any native wildlife and human. This was expected as native plant spent centuries adapting to local climate. They only take less work in management such as fertilizing and watering, and rarely become invasive as there is natural predator keeping them in check.

3.0 Methodology

A case study was used for this research. This required the development of a site selection, survey method, and sample.

3.1 Case Study

Forest Research Institute Malaysia in Kepong was selected as the case study. Evolutions of space from forest reserve to remnant of dipterocarp forest and from nature environment to urban park are the major factor this case study was chosen.

FRIM Kepong was also selected based on several factors. These are as followed a) plant categories for native, naturalistic and exotic species; c) unique biodiversity of birds and d) it is a large area of urban park with the most disturbances level by human (common traffic vehicles, water activities and on foot human disturbances). The researcher only focuses on ornamental plant species within FRIM Kepong and according to documented data by FRIM botanist.

3.2 Sampling Method and Size

In this research, the selection of respondents was based on their knowledge and experience on the field. Local authorities' officers, academicians, and environmental organization are the group that can support in this study.

Total respondents of 72 comprise 14 officers from local authorities within urban cities in Malaysia, 40 academicians in related department and 18 environmental organisations

officers in Malaysia (FRIM, JLN, PERHILITAN, PKNS, nongovernment organization: MNS and WWF Malaysia) were selected. This group was chosen to respond to the questionnaire as their expertise will not be questioned.

4.0 The Survey Results and Findings

Out of 72 survey questionnaires distributed, 49 (68.05%) of the respondents responded by email and post. The majority group of respondents were academicians (55.1%), officers from local authorities (28.6%), and 36.74% were officers from environmental organizations.

4.1 Basic Knowledge on Bird Species

Table 3: Urban bird species in FRIM, Malaysia

Statements	N	Mean	Std. Deviation
<i>Passer montanus</i> (Eurasian Tree-sparrow/Ciak Rumah)	49	2.73	1.716
<i>Oriolus chinensis</i> (Black-naped Oriole)	49	2.63	1.716
<i>Aplonis panayensis</i> (Asian Glossy Starling)	49	2.47	1.556
<i>Copsychus saularis</i> (Magpie Robin/Murai)	49	2.43	1.472
<i>Acridotheres tritis</i> (Common Myna/Gembala Kerbau)	49	2.41	1.567
<i>Corvus splendens</i> (House Crow/Gagak)	49	1.80	1.354

This list of urban bird species was developed according to secondary data from Ong (2003). Table 5 reveals the list of common urban bird species according to their appearance in urban parks. The majority of the respondents believed that the most common bird species in urban parks is *Passer montanus* while the lowest is *Corvus splendens*.

Preference towards Urban Park Values

The majority of respondents (73.5%) agreed that recreational is a type of activities often seen in urban parks in Malaysia. It may be due to its significance in providing space for active or passive activities to urban dwellers. Then, the question on the most preferred urban park was asked. The respondents were given six options to choose the most preferred by them.

Table 4: Value of urban park most preferred

Values of Urban Parks	Findings (%)
Utility	36.7%
Functional	51%
Contemplative	30.6%
Recreational	34.7%
Ecological	44.9%
Aesthetic	24.5%

The respondents chose functional values as the most preferred urban park (51%) followed the ecological values (44.9%). In this research, the functional values is based on activities that urban park offer for elderly, youth, and children. This results highlighted the significant values of urban park in positively contribute to a good quality of environment by preserving the nature for urban dwellers.

Then, respondents were given five options to determine the type of elements that they preferred and think should be in an urban park (Fig 4). The highest preferred element is for natural beauty (32.7%), as more individuals are attracted to environment natural setting as it offers the most fitting surrounding for each space and it has its own significant.

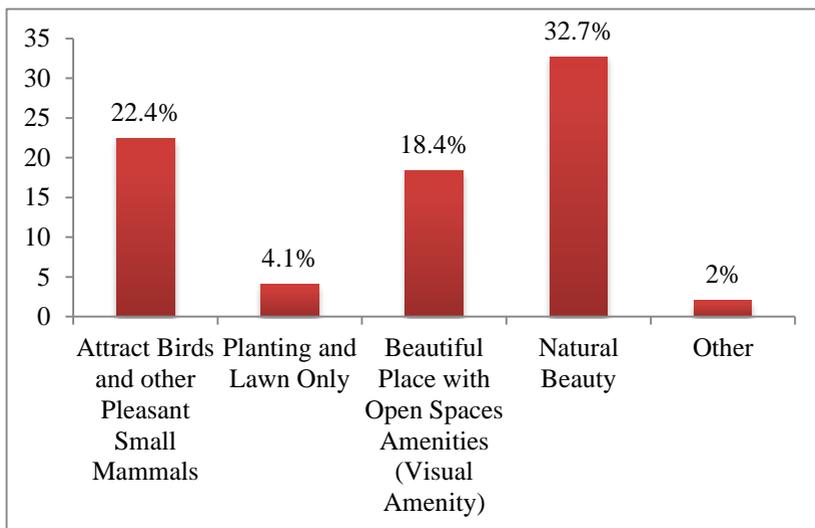


Fig 4: Elements of urban park most preferred

4.2 Attitude of Respondents toward Urban Bird Habitats and Plant in FRIM Kepong

Table 5. Types of urban habitats for bird in FRIM, Kepong

Bird Habitats	Most Frequently Seen	Frequently Seen	Occasionally Seen	Less Seen
Forest / Edge		/		
Garden / Park		/		
Open Space / Field			/	
Wetland			/	

Table 5 indicates two types of habitats that frequently seen in FRIM Kepong, forest / edge and garden / park. For open space / field and wetland, these two habitats are occasionally seen. This statement shows that there is significance of the research on why research on open space / field should be studied in term of giving opportunity to bird as habitat as well as due to high awareness of preserving open area / field and avoiding any activities in reserve areas (wetland).

One of identified why forest / edge and garden / park frequently seen as bird habitat in urban area is ability to provide play area, food, and shelter for birds with the impressive numbers of plant in the most variety species, vary of volume and height.

Plant species are the most important factor to bird either as bird food or shelter and in order to conserve them. The highest plant species is the high producing of fruits and flowery trees and such least shrubs and ground covers is the lowest (Table 6).

Table 6. Plant significant for birds' food

Variable	Most Abundant	Abundant	Average	Scarce	None
Fruits and flowering trees as birds' food resource	61.2	14.3	16.3	2.0	6.1
Flowering shrubs as birds' food resource	8.2	20.4	24.5	38.8	8.2
Native and forest tree as birds' food resource	4.1	23.6	38.8	22.4	6.1
Plants that attract insects	14.3	28.6	26.5	26.5	4.1
Low shrubs and ground covers	12.2	20.4	-	20.4	46.9

Although this bird species are well adapted to any landscape changes, in order to maintain and preserve urban bird species, question on providing opportunities for bird in urban parks was asked (Table 7).

Table 7. Awareness on providing opportunities for bird habitat in urban parks

Statement	Findings (%)
Yes	95.9%
No	4.1%

The respondents highly (95.9%) agreed that it is important to offer opportunities for urban bird species in urban parks. The majority and highest answer based on keyword are a) to preserve and maintain biodiversity as food chain and promote a place for endangered bird species as habitat; b) to support and balance the biodiversity ecological value for environmental health, germination of plants and attraction to urban dweller as psychological

therapy; and c) to create as an alternative space for birds and to protect our native bird species as in line with government vision to become a garden nation.

Highly support on opportunity for birds, the respondents agreed to a proposal of providing guideline for bird habitats in urban open spaces (Table 8). The majority (91.8%) respondents agreed towards providing a guideline for bird habitat in urban open spaces.

Table 8. Providing guideline for bird habitats in urban open spaces

Statement	Findings (%)
Yes	91.8%
No	8.2%

This is due to a) no design guideline available on the type of plants that attract birds; b) to balance and maintain ecological processes in communities; and c) to ensure selected plant material species do not give any problems to the urban dweller later on.

5.0 Discussion

This research identified that ornamental plant should be considered as one of importance factor in selecting the plant material in urban parks as to increase the quality of environment by enhancing the role of urban bird species. In order to improve urban bird habitats in urban parks, maintaining the native plant methods shall be applied.

According to Scott e. al. (1991), they discovered that native plant is the most available resource of food and better shelter for native birds. This is due to the ability that native plant has in producing continuously food source and all-year-round as a better shelter for birds. In order to improve conservation of bird habitats, evergreen plant with broadleaf and multi-stemmed will offer a better shelter throughout climatic changes and predators. Mixing of vary height and various plant species will help enhancing the space and become attraction to birds for a long-residents (Hirst, 2010).

Findings from questionnaire indicate high awareness toward the role of ornamental plant in urban park. Professionals agreed that in order to improvement urban bird habitat, there should be the main factor in creating or balancing ecology in urban park which is the selection of plant material as ornamental plant. Professionals were listing the crucial method to provide the opportunities for bird in urban parks are by preserving and maintaining biodiversity as food chain and promoting a new place for endangered bird species as habitats with their basic needs.

Majority of respondents have high interest in suggestion of a guideline for bird habitats in urban open spaces. They are aware of the low accessibility of design guidelines especially on plant species that can attract birds and to ensure selected plant species do not give any harm to the urban dweller later on. This also stated by Woolley et al., (2003) that urban parks have the significant of recreation, ecology, and aesthetic values which effects by how that space perceived and utilized.

They also interest in human safety when it come to setting up the standard in planting design at landscape areas besides to consider the maintenance, safety and health of the place as well as bring bad impact to the development.

6.0 Conclusion

Urban areas are created and further developed by the process of urbanization. In order to survive, urban birds need to adapt to the urban resources. In designing an urban park, ecological planning including native plant data is a must in order to design an urban park that capable to maintain and balance the native biodiversity. Native plant is important in designing an outdoor space because there are ability and availability in producing food all-year-round.

References

- Amar-Singh HSS. (2009). *A Friendship with Birds*. Publish by desktop system.
- Davies L. (2007). *Urban Design Compendium: Creating the Urban Structure*. English Partnership. London. pp.53–58
- Donnelly, R. & Marzluff, J. M. (2004). Important of Reserve Size and Landscape Context to Urban Birds Conservation. *Conservation Biology*, 18(3), 733–745.
- Dunnett, N., Swanwick, C. & Woolley, H. (2002). *Improving Urban Parks, Play Areas and Green Spaces*. Publications Sales Centre.
- Gairola, S. & Noresah M.S. (2010). Emerging Trends of Urban Green Space Research and the Implications for Safeguarding Biodiversity: A Viewpoint. *Nature and Science*, 8 (7), 43-49.
- Heaton, D. (2000, April). Conserving Local Habitat for Declining Grassland Birds. *Bird Conservation Network*. Retrieved undated, from http://www.bcnbirds.org/greenpapers_files/GPgrassland.html
- Hirst, B.(2012). Ornamental Plants That Improve Bird Habitats. Article Garden. Retrieved undated from, <http://www.articlegarden.com/Article/Ornamental-Plants-That-Improve-Bird-Habitats/3040>
- Howes, J. (2009, February 23). On Green Agenda: The Bees, Birds, Flowers and Trees. The Edge. Retrieved undated, from <http://www.theedgemalaysia.com/sports/1613-gabirdsbees.html>.
- Jabatan Landscape Negara. (2008). *Garis Panduan Landskap Negara Edisi 2, Kuala Lumpur, Malaysia*, Jabatan Perancang Bandar & Desa: Author.
- Kemp, D. D. (2004). *Exploring Environmental Issues: An Integrated Approach*. Routledge, London.
- Larsen, L., Adams, J., Deal, B., Kweon, B. & Tyler, E. (1998). Plants in the Workplace: The Effects of Plant Density on Productivity, Attitudes, and Perceptions. *Environment and Behaviour*, 30, 261–282.
- Mills, G. S., Dunning, J. B., Jr & Bates, J. M. (1991). The Relationship between Breeding Bird Density and Plant Volume. *Wilson Bulletin*, 103, 468-479.

- Ministry of Science, Environment and Technology. (1998). Malaysia's National Policy on Biological Diversity, Kuala Lumpur, Malaysia, April 16, 1998. Malaysia's National Biodiversity Policy: Author.
- Nik Hanita, N.M. (2010). *Landscape Design and Neighbourhood Green Spaces as Urban Wildlife Habitats in the Klang Valley*, Universiti Teknologi MARA, Peninsula Malaysia.
- Ong, T. (2003). Forest Research Institute Malaysia Kepong. *Birds of FRIM*. Ampang Press Snd. Bhd.
- Rigard, S. (2010). Critique of a Wildlife Habitat Evaluation Method Applied to Residential Open Space.
- Rodgers, J. A. Jr. (1991). *Minimum Buffer Zone Requirements to Protect Nesting Bird Colonies From Human Disturbance*, Bureau of Wildlife Research Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.
- Rosli, R. (2004). Green Areas and Avian Species Richness in the University Malaya Campus, Peninsula Malaysia. *Malaysian Journal of Science*, 23, 73-78.
- Idlifitri, S., & Nik Hanita, N. M. (2013). Unpublished thesis.
- Sekercioglu, C. H., Gretchen, C. D., & Paul, R. E. (2004). Ecosystem Consequences of Bird Declines. *Conservation Biology*, 101, 18042-18047.
- Smith, A. (2009). *Improving Office Users' Workplace Perceptions Using Plants*. Liverpool Conference in Built Environment and Natural Environment, Liverpool.
- Smith, J. (2007). Health and Nature: The Influence of Nature on Design of the Environment of Care. *Environmental Standards Council of the Center for Health Design*. Retrieved undated, from <http://www.healthdesign.org/sites/default/files/NaturePositionPaper.pdf>.
- Stanley Smith Horticultural Trust. (2012). *Trees and Shrubs That Attract Birds*
Retrieved undated, from <http://www.mortonarb.org/tree-plant-advice/article/868/trees-and-shrubs-that-attract-birds.html>
- State of the World's Birds: Indicators for Our Changing World. (2008). *The importance of birds and biodiversity*. Cambridge, U.K. (No. 1042125). BirdLife International: Author.
- Vitousek, P. M., Mooney, H. A., Lubchenco J., & Melillo, J. M. (1997). Article: Human Domination of Earth's Ecosystem. *Science*, 277, 494 – 499.
- Walker, C. (2004). The Public Value of Urban Parks. *The Urban Institute*. 1-8.
- Woolley, H., Rose, S., Carmona, M. & Freedman, J. (2003). The Value of Public Space: How high quality parks and public spaces. Retrieved undated, from <http://webarchive.nationalarchives.gov.uk/20110118095356/http://www.cabe.org.uk/files/the-value-of-public-space.pdf>.