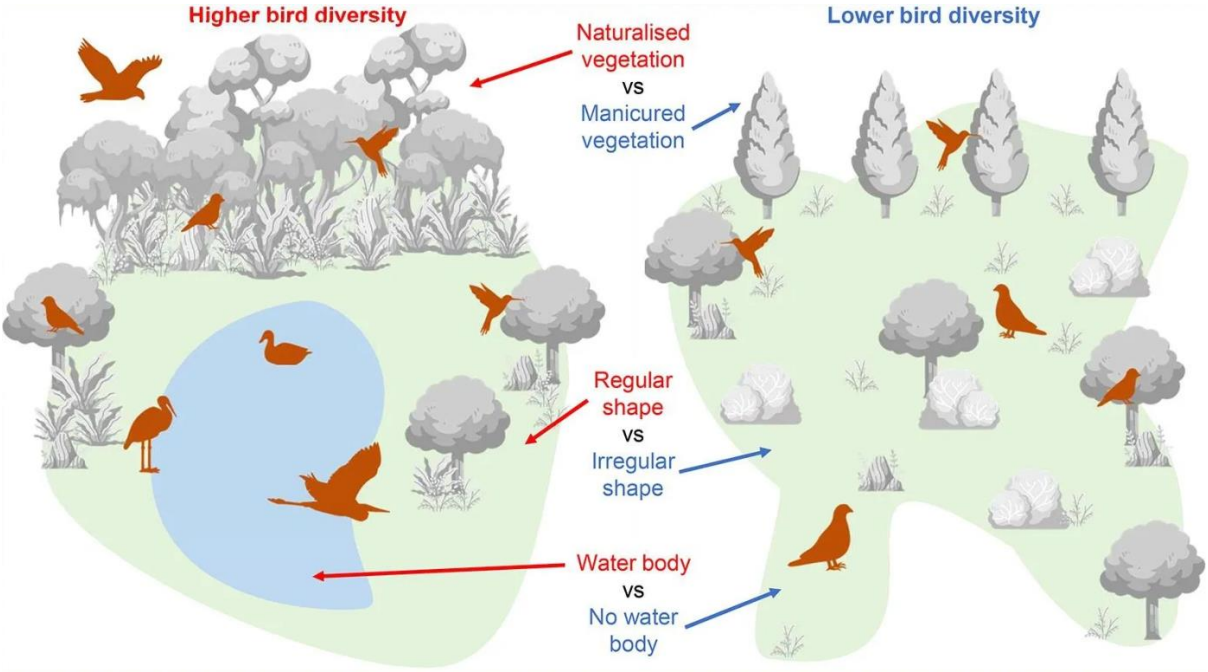
ANNEX – Study on bird diversity which tapped on citizen science data from NParks' Garden Bird Watch



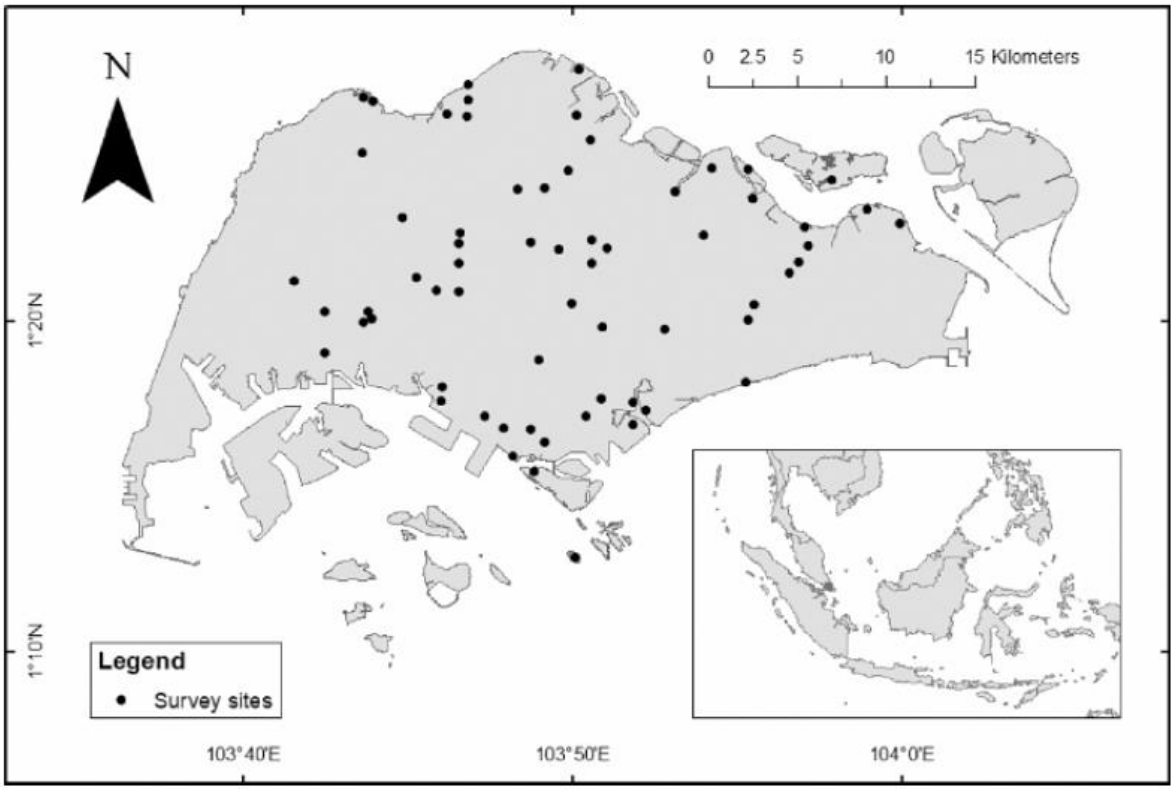
Graphical abstract of the study findings

(Image credit: NParks)

Details of study

From 2015 to 2019, under the Garden Bird Watch programme, 384 points across 64 sites were surveyed. These sites comprised urban green spaces, including managed urban parks and nature parks with secondary lowland tropical rainforests on mainland Singapore.

Prior to conducting the surveys, the volunteers underwent a training workshop to familiarise themselves with the bird species to be surveyed. Volunteers were also assigned to different sites depending on their skill level.



Location of the 64 sites surveyed under Garden Bird Watch in Singapore, with inset showing the location of Singapore within Southeast Asia
(Image credit: NParks)

Key findings

The key findings of the study are as follows:

- Regularly shaped urban green spaces, referring to those with a larger core and fewer edges, had higher bird diversity. In the study, regularly shaped urban green spaces supported more species of omnivores, carnivores, and nectarivores. This is due to such spaces having a lower proportion of edge habitats, which are associated with microclimatic differences, higher predation rates, human disturbance, and fewer resources for nesting. Hence, regularly shaped urban green spaces have a larger proportion of higher-quality habitats where the birds can live in.
    - Nonetheless, there was a variation in species' responses, as there were a few exceptions of species which preferred more irregularly shaped urban green spaces with more edge habitats. Such species were edge-adapted forest species such as the Dark-necked Tailorbird (*Orthotomus atrogularis*) and Pin-striped Tit-Babbler (*Macronus gularis*).

- The retention of semi-natural habitats within urban green spaces supported higher bird diversity and species richness of some functional groups, namely frugivores, insectivores, and understorey dwellers.
    - Semi-natural habitats include grasslands, scrublands, and young native-dominated secondary forests.

- Waterbodies within and surrounding urban green spaces also increased the variety of birds observed.
    - Carnivores such as egrets, herons and kingfishers are strongly associated with freshwater bodies as many species in this functional group depend on aquatic organisms as a source of food.
    - Aerial-flyers such as swallows also prefer the open freshwater bodies, where they frequently hunt for insects in mid-flight.

Conservation implications

The findings from this study will help urban planners and landscape architects plan and design future parks which are conducive not just to park users, but to our biodiversity as well. Urban planners aiming to enhance local bird diversity should consider allocating a regularly shaped parcel of land for an urban green space, compared to an elongated or irregularly shaped plot of land of the same area. Having patches of semi-natural vegetation, and the inclusion of water bodies can also sustain more bird species in our urban green spaces. Taken together, these findings derived with the help of citizen scientists will guide the planning and design of suitable green spaces and help avifauna thrive in our City in Nature.

NParks Garden Bird Watch programme

The Garden Bird Watch is organised as part of NParks' Community in Nature Biodiversity Watch series and has been held annually since 2015. Each volunteer for the Garden Bird Watch undergoes training on basic survey and birdwatching techniques, with a practical component, before being assigned to survey birds at a particular site.

To hone the volunteers' bird identification skills, NParks has also developed an interactive e-learning module to complement the training workshops. For citizen scientists who wish to further contribute and enhance their knowledge and skills, training workshops covering additional bird species are available. The programme provides a platform for volunteers to become more active participants in safeguarding our biodiversity, contributing to our City in Nature vision.

The total number of citizen scientists who have participated in NParks' Community in Nature initiatives has also grown significantly, from less than 500 individuals in 2015 to over 11,000 as of 2022.

Members of the public interested in participating in the Garden Bird Watch can learn more at the Festival of Biodiversity on 27 and 28 May at Heartbeat@Bedok, visit www.nparks.gov.sg/birdwatch, or write to NParks at CIN@nparks.gov.sg for more information.

Examples of birds commonly observed under the Garden Bird Watch programme	**Photo**
Oriental Magpie Robin (*Copsychus saularis*) Conservation status (under 3rd edition of the Singapore Red List): Vulnerable The Oriental Magpie Robin has a distinctive black and white plumage and can be found in various habitats including parks, gardens, as well as forest edges and mangroves. It is also primarily insectivorous, frequently foraging near or on the ground for insects and other invertebrates. (Photo credit: Bryan Lim)	
Pin-striped Tit-Babbler (*Macronus gularis*) Conservation status (under 3rd edition of the Singapore Red List): Least Concern The Pin-striped Tit-Babbler is the most widespread babbler in Singapore. It is a distinctive bird with brown upperparts and yellow underparts, with prominent dark streaks on the throat and upper	

breast. This insectivorous species is widespread across Singapore and is found in many areas of secondary growth, where it forages in the understorey and lower canopy. (Photo credit: Francis Yap)	
Collared Kingfisher (*Todiramphus chloris*) Conservation status (under 3rd edition of the Singapore Red List): Least Concern The Collared Kingfisher is the most abundant of Singapore's kingfishers. The species has a turquoise head and upperparts, while its collar and underparts are white. It is an example of a traditionally coastal species that has adapted well to Singapore's urban greenery. As a carnivore, besides fish, it also feeds on other animals such as insects, worms, and crabs. (Photo credit: Francis Yap)	

Examples of sites surveyed under Garden Bird Watch programme	Photo
Ang Mo Kio Town Garden West An example of a regularly shaped urban green space (Photo credit: NParks)	
Kranji Marshes An example of a site with semi-natural habitats (Photo credit: NParks)	
Bishan-Ang Mo Kio Park An example of an urban green space with a water body (Photo credit: NParks)