

# Human Health and Sustainability Depend on Diverse Ecological Environments- Monitoring of Flora and Flowering Phenology in Huajiang Wildduck Natural Park

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## ABSTRACT

This research was carried out by the monitoring volunteers of the Huajiang Wetland Guardian Alliance. The Huajiang Wild Goose Natural Park and Moon Lake were used as the survey area. In the long grass area, there are a total of 6 sample stations; once a month, the species and quantity changes of flowering plants are investigated. The plants that bloom throughout the year are 6 species of Asteraceae, *Youngia japonica*, *Eclipta prostrata*, *Bidens pilosa* var. *radiata*, *Ageratum conyzoides*, *Ageratum houstonianum*, *Wedelia triloba* and *Oxalis corniculata* of Oxalidaceae. The rarer orchids, *Spiranthes sinensis*, *Zeuxine strateumatica*, and *Eulophia graminea*, are only found in artificial grasslands, and the flowering season is between March and April.

**Keywords:** Huajiang Wildduck Natural Park; Flora; Flowering Phenology; Ecological Monitoring; Monitoring Volunteers

## Introduction

With the expansion of cities, the rise of power plants, and the improvement of living standards, many people can sit in well-air-conditioned and elegantly decorated restaurants and eat delicious food made with ingredients from afar, but there is another group of people in the world facing poverty, hunger and disease. Their humble homes cannot resist natural disasters, and they do not have good job opportunities. They can only cultivate barren or contaminated farmland, or overwork in dangerous mines and factories. According to the United Nations' Sustainable Development Goals (SDGs), 15 items are terrestrial ecology, emphasizing the importance of biodiversity. Human health and sustainability depend on diverse

ecological environments Huajiang Wild Goose and Duck Nature Park" is located under the Huajiang Bridge in Wanhua District in the southwestern corner of Taipei City. The total area is about 28 hectares. It belongs to the category of Dahan-Xindian Wetland. In 1991, the Taipei City Industrial Development Bureau set up interpretive facilities in this area and set up the "Goose Duck Park" to introduce conservation concepts into the park's management [1-4].

It was officially renamed "Huajiang Wild Goose Natural Park" in 1996. The Huajiang Wetland Conservation Alliance started its environmental monitoring activities in 2007, so that more people

who love ecology and value the environment will come to participate in wetland ecological monitoring and protection activities and build knowledge of the local environment through the process of participation. Improve emotional recognition of Huajiang Wetland.

### Research Location

With Huajiang Bridge as the boundary, it is divided into north and south regions, and then divided into artificial grassland, short grass region, and long grass region according to the difference of the flora of the north and south regions, for a total of 6 sample stations. Artificial grassland: There are often human activities and regular artificial weeding. The vegetation is more complex, with low herb plants such as gooseberry, water centipede, and nightshade. The Moon Pond in Huajiang Wild Goose Natural Park has been completed since December 2012. The ecological island of the pond has been deserted. The area has been investigated and monitored without human intervention.

### Methods

Before 2011, the survey method of the flora group was to set a crossing line and select a survey plot of 5m x 5m on the sample line. However, this kind of survey method is very hot in the unshaded wetland. After one or two times, no volunteers are willing to come. In response to this problem, the first author modified the plant sample area survey into plant phenology monitoring. After the operation, I found that the phenological survey is still too complicated for volunteers, so I had to simplify it and only focus on the species that bloom every month. The survey method is to survey once a month, dividing the Huajiang Bridge into two areas in the north and south, and then dividing it into artificial grassland, short grass area, and long grass area according to the plant phase. The crossing line through these three areas is used as the survey scope. Beginning in May of 2005, the species and quantity of plants will be recorded until 2019. From 2011 to the end of 2019, it will

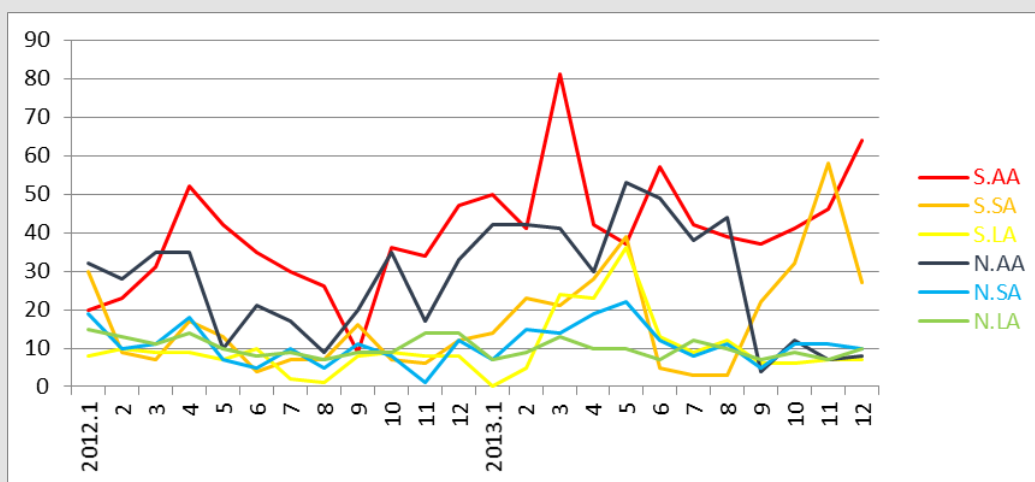
be carried out once a month by crossing the line and divided into 6 sample areas to investigate the flowering species of flowering plants.

### Results

From 2011 to the end of 2019, Huajiang Wild Goose Nature Park has recorded a total of 262 species of vascular plants in 57 families, of which 44 species of Poaceae are the most, followed by 36 species of Asteraceae. Varieties of vascular plants in Huajiang Wild Goose Nature Park have changed since 2012. In the year, there were 199 species in 45 families. In the second year, it suddenly increased to 241 species in 46 families, an increase of 42 species in 1 family, and then by the end of 2019, it increased to 262 species in 57 families, and 21 species in 11 families (Table 1). The results also show that plants bloom every month. There are more plants in the southern area of Huajiang Bridge than in the northern area. The artificial grassland is the most, and the human disturbance is the largest. On the contrary, the species is taller than the short grass and long grass areas with less human disturbance (Figure 1).

**Table 1:** Vascular plant diversity changes in Huajiang Wild Goose Natural Park.

Families/species	2012	2013	2019
Poaceae	28	42	44
Asteraceae	28	34	36
Cyperaceae	13	18	19
Polygonaceae	12	12	13
Scrophulariaceae	11	13	13
Euphorbiaceae	9	12	13
Fabaceae	9	10	11
Other families	98	100	113
Total	199 (45 families)	241 (46 families)	262 (57 families)



**Figure 1:** Monthly change of flowering plants at 6 plots in Huajiang Wild Goose Natural Park.

The rarer orchids, *Spiranthes sinensis*, *Zeuxine strateumatica*, and *Eulophia graminea*, are only found in artificial grasslands, and the flowering season is between March and April. The flowering species are unevenly distributed in the seasons. From 2012 to 2019, the most flowering seasons are 5 years in May, 2 years in April, and 1 year in March and June (Figure 2). The plants that bloom throughout the year are 6 species of Asteraceae, *Youngia japonica*,

*Eclipta prostrata*, *Bidens pilosa* var. *radiata*, *Ageratum conyzoides*, *Ageratum houstonianum*, *Wedelia triloba* and *Oxalis corniculata* of Oxalidaceae. Around Moonpond, there are regular weeding. The most species month in 2014 was June, with 22 families and 77 species. The most frequent month in 2016 was April, with 23 families and 89 species. Among them, it was recorded in April 2020 (Figures 3-5).

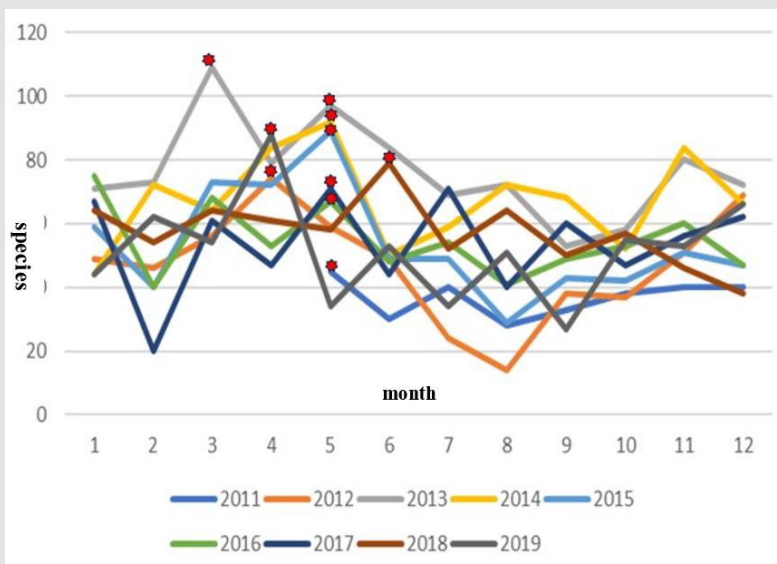


Figure 2: 2011-2019 The most flowering month in Huajiang Wild Goose Natural Park (★)



Figure 3: 2011-2019 Monthly changes of flowering phenology in Huajiang Wild Goose Natural Park (○Haikui typhoon)

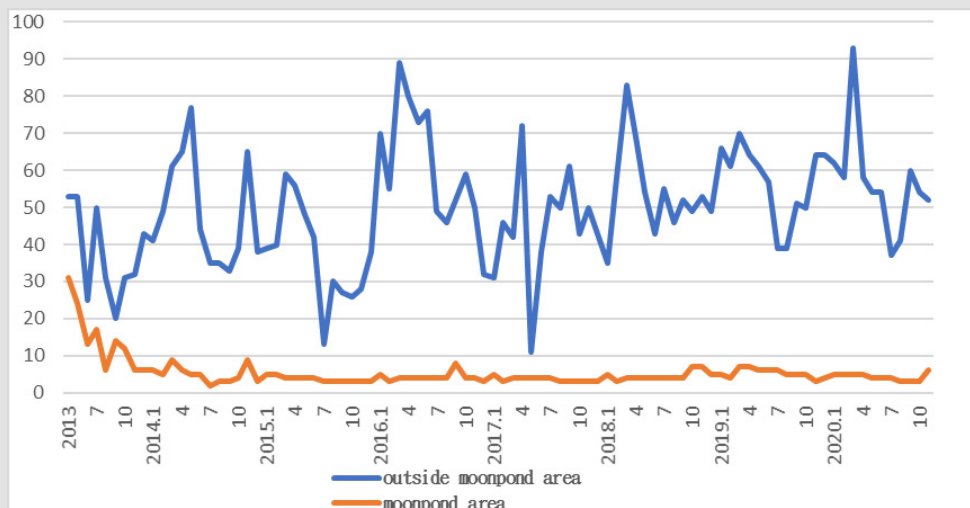


Figure 4: Monthly Variations of Flowering Plants in Moon pond of Huajiang Wild Goose Natural Park.



Figure 5: Environmental changes of Moon pond.

### Discussion

According to the survey results, March to April and November to December are the months with the most flowering plants. And the rarer orchids, *Spiranthes sinensis*, *Zeuxine strateumatica*, and *Eulophia graminea*, are only found in artificial grasslands, and the flowering season is between March and April. The competent authority should consider avoiding weeding during the months when flowering plants reproduce the most, moreover to maintain the flowering and reproduction of plants and protect the rarer plants from extinction. From 2012 to 2019, the typhoon had the greatest impact on the Huajiang Wild Goose Natural Park was the moderate Haikui typhoon on August 6, 2012, which caused the

Huajiang Wild Goose Natural Park to be flooded to a depth of 3m, and the flooding time lasted than one week. (Figure 3) And there is nearly 1m high silt cover, the impact on flowering plants is only when the number of species decreased significantly in the month, only 14 species, and then the species gradually increased. By March 2013, 109 species of plants bloomed and reached the highest peak, which is the most month.

This phenomenon is likely to be caused by the Haikui typhoon that brought many plant seeds from upstream in August 2012. The seeds gradually germinated, grew and bloomed. They reached the highest point in March 2013 and then gradually declined. The possible reason is adaptability. However, since only the Haikui

typhoon has directly affected the Huajiang Wild Goose Natural Park in the past 9 years, whether this phenomenon is the norm under the influence of typhoons remains to be verified by the next typhoon directly affected. The monitoring results of the Huajiang Wild Goose Natural Park can provide the evidence of climate change. In the future, investigations of rare plants, such as the ethnic changes of orchids, should be strengthened. Under the influence of this increasingly violent climate change, it is imperative to create a biodiversity environment. Therefore, monitoring must continue. However, in addition to the enthusiastic support and participation of volunteers, monitoring also requires government support and financial subsidies.

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### Declarations

All manuscripts must contain the following sections under the heading 'Declarations':

- **Ethics approval and consent to participate:** Not applicable
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