Research on the Relationship between Sunlight Exposure & Turf Growth

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Summary

We utilized the functions available on the GLOBE website to collect climate data by recording temperature and humidity changes during different seasons. We found that these changes were somewhat related to the quality of the turf growth we observed at school.
Further discussion revealed that the turf growth was also influenced by sunlight. Finally, we compared the photos and observation data to obtain our final results.

Research Motivation

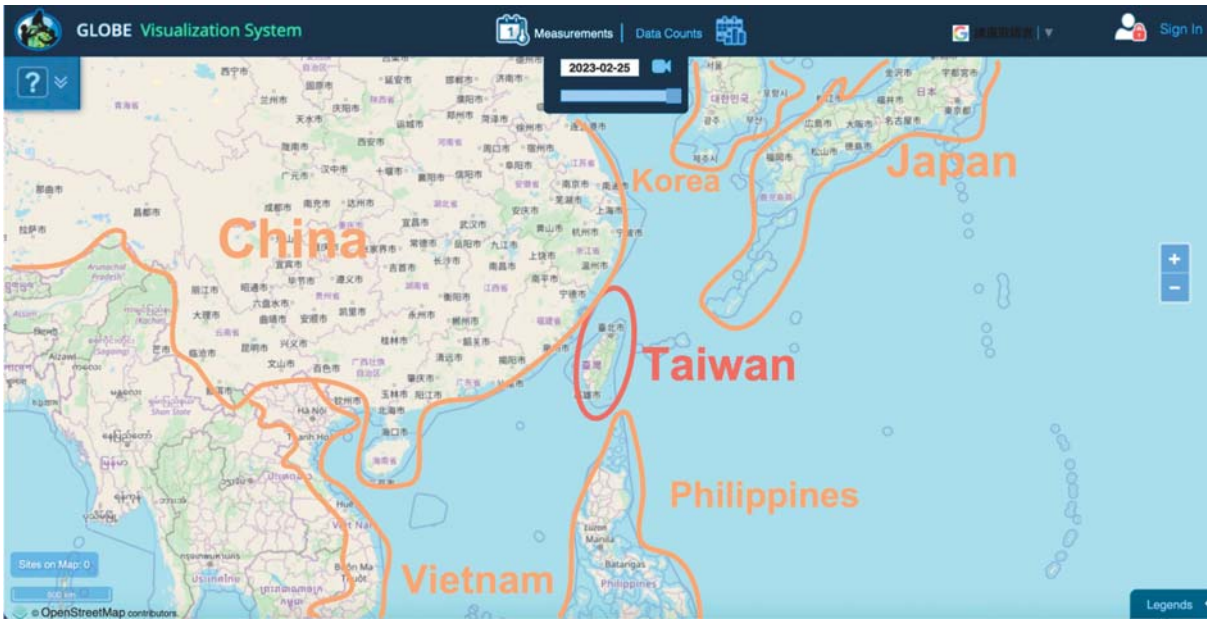
In our spare time in high school, we developed an interest in meteorological observation and joined the observation team. While conducting weather observations near the ecological pool or participating in grass-related activities, we noticed differences in the appearance of the turf, such as changes in color and density due to seasonal changes in temperature and humidity. This sparked our interest to investigate the factors influencing turf growth.

Research Purposes

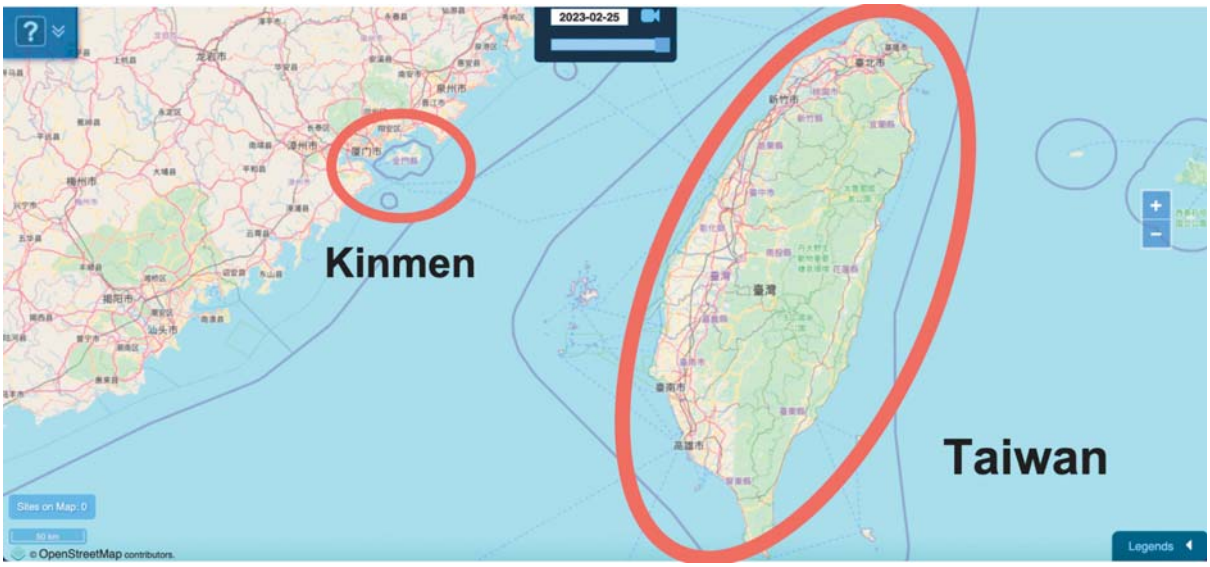
1. To observe and record the influence of sunlight exposure angles on the growth state of turf in different seasons
2. To discuss the Influence of changes in humidity and rainfall on turf growth
3. To discuss the influence of tree shade on the growth and density of the turf
4. To analyze the factors affecting the turf growth status

Introduction to the Campus and Accessing Information

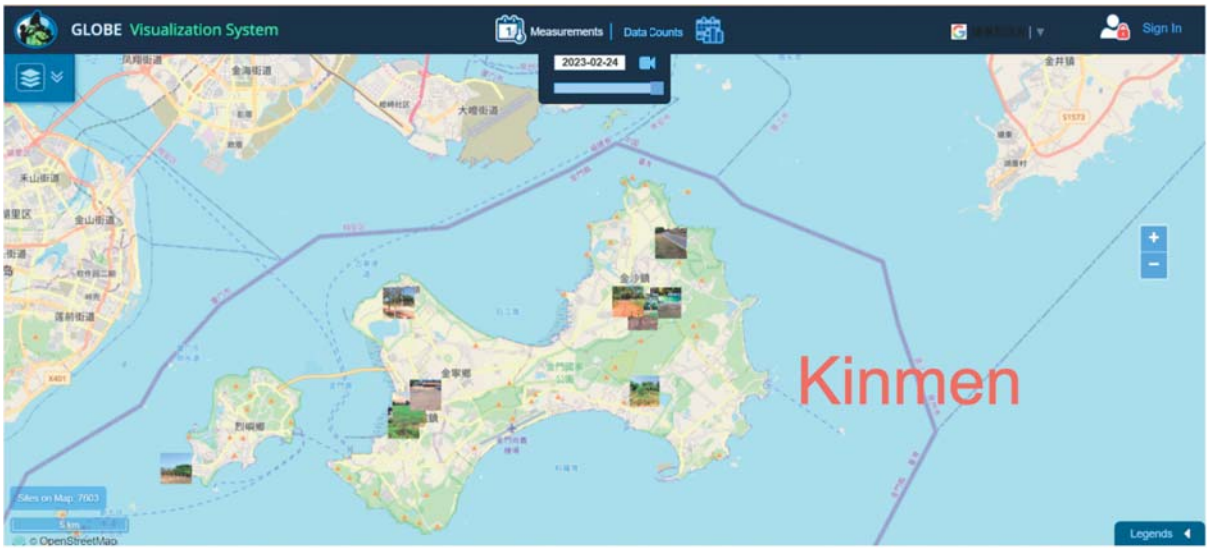
The following images are from the GLOBE website (https://vis.globe.gov/GLOBE/)



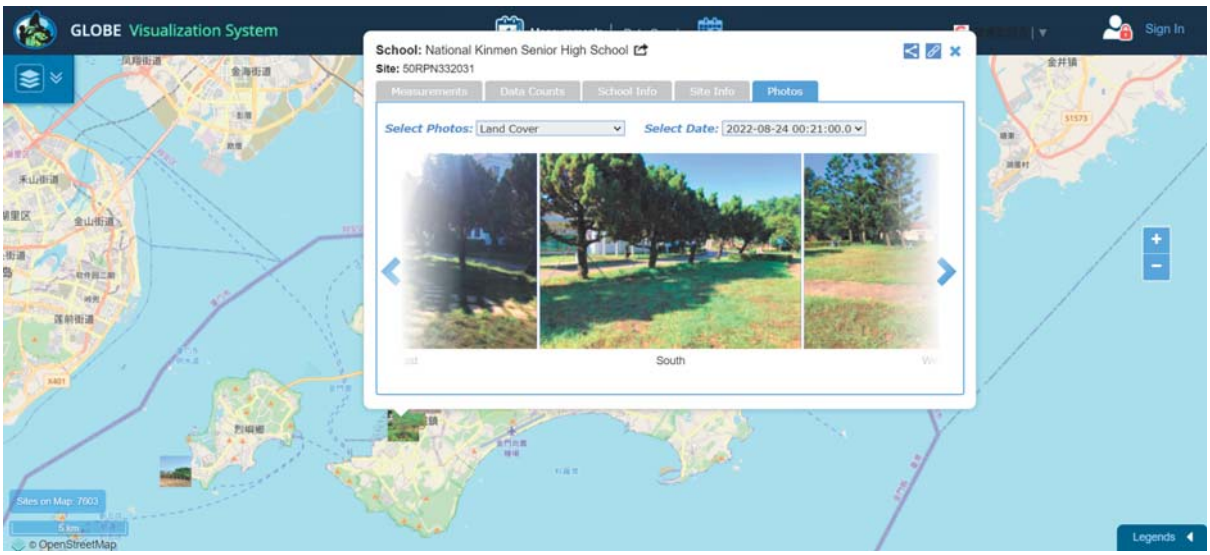
Location of Taiwan



Taiwan's relative location with Kinmen



The appearance of Kinmen Island



Its historical records are displayed on the LAND COVER system.

Research method

Latitude	24.434816°
Longitude	118.313968°
Elevation	22.2m
Location Source	GPS

Below are photos near our 2021 and 2022 campus eco-pools

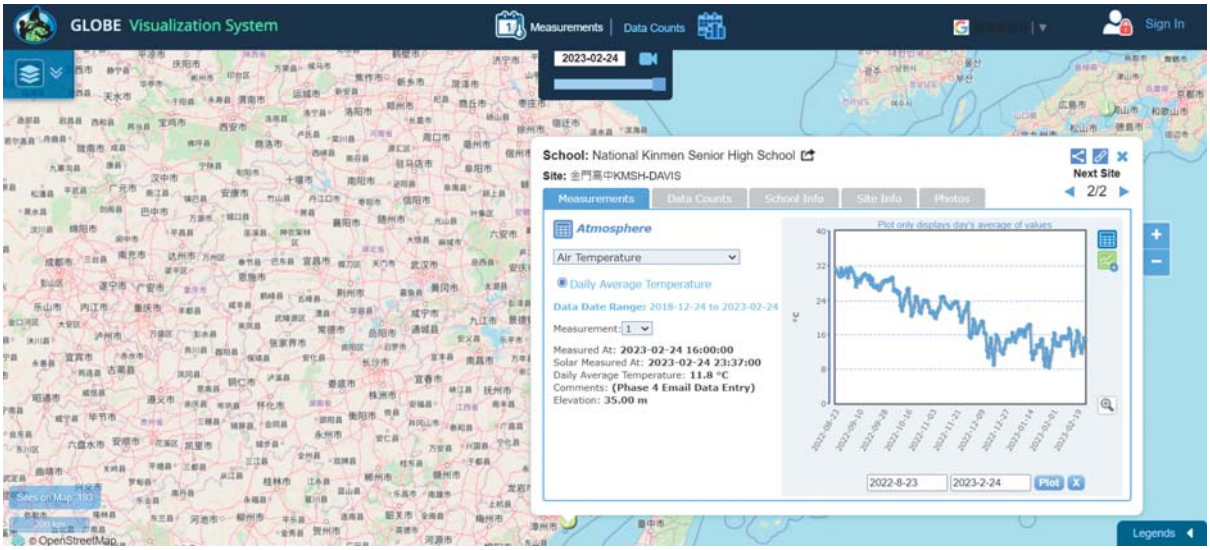
		Eco-pool direction (shaded)	Louver box direction (shadeless)
Jan.	2021. 1.19		
	2022. 1.3		
Mar.	2021. 3.7		
	2022. 3.22		

Apr.	2021. 4.14		
	2022. 4.7		
May	2021. 5.11		
	2022. 5.22		

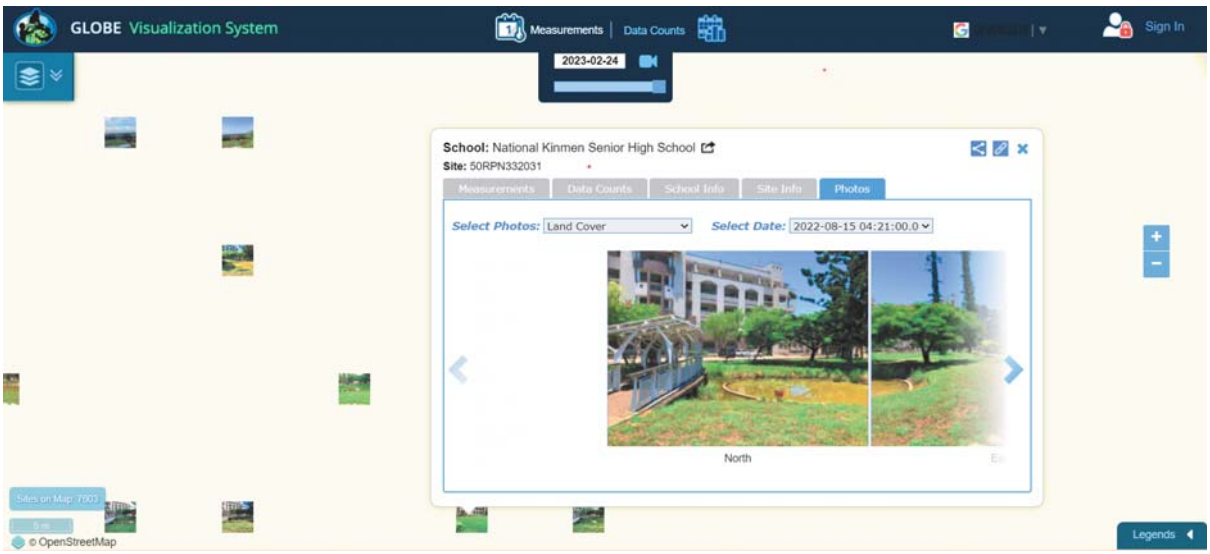
Jul.	2021.7.13		
	2022.7.22		
Aug.	2021.8.26		
	2022.8.23		

Sept The turf color is different in the same month	2021. 9.23		
	2022. 9.20		
Oct.	2021. 10.19		
	2022. 10.18		

Nov.	2021. 11.16		
	2022. 11.22		
Dec. The turf color is different in the same month	2021. 12.16		
	2022. 12.17		



Download campus weather data



Download LAND COVER data

Discussion

First, the angle of sunlight in different seasons

The latitude of Kinmen is located at 24° 25', and the four seasons are illuminated at 24.1 degrees in spring, 0.7 degrees in summer, 24.1 degrees in autumn and 47.6 degrees in winter.

Therefore, the smaller the angle of sunlight and the drier the winter, the better the growth of turf in summer, while the growth of turf in winter is hindered the most.

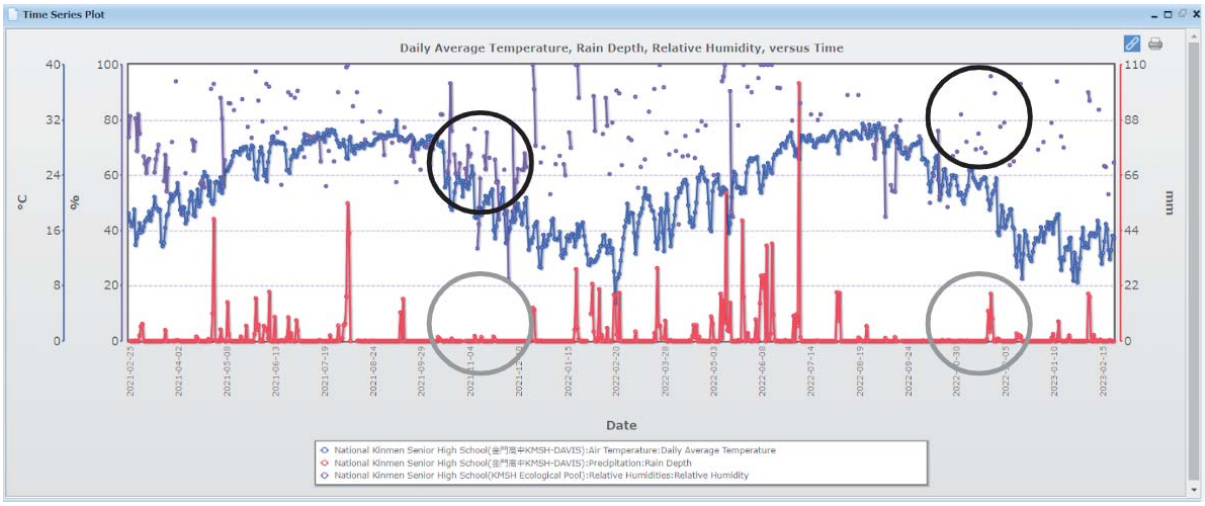
	
Feb. 25	Apr. 07
	
Jul. 01	Nov. 22

Based on observational data, the turf grows most densely in summer with a predominantly green color distribution, while in autumn, the color begins to turn yellow, and in winter, the turf appears almost entirely yellow.
Furthermore, changes in humidity in different seasons can also impact the growth of turf.

In 2022, there were different changes, with the turf appearing green in winter and yellow in summer.

green and lush	green and lush	photo
green and lush	green and lush	
2021.11.07	- withered status - The uncovered land takes on a yellow-brown hue.	

Based on past records, our school's turf has typically appeared brown and dry during winter and green during summer. Therefore, we can conclude that 2022 was an atypical year with significant differences in turf appearance throughout the seasons.



Based on the data shown in the figure above, we can observe that in 2021, winter rainfall was low and humidity was also low. In contrast, in 2022, winter rainfall was higher, and humidity increased as well. Despite no noticeable changes in temperature and sunlight, we can infer that rainfall and humidity have a significant impact on turf growth. Specifically, we can see that the turf grows noticeably well during rainfall, whereas growth is stunted during periods of insufficient rain, with most of the turf appearing dry and withered.

To discuss the influence of tree shade on the growth and density of turf

2022/11/23
In general, areas that do not receive direct sunlight for most of the day tend to have poor turf growth.

From the above figure, we can see that although the turf grows well overall, there are areas of relatively poor growth observed in shaded areas.

Poor grass growth can be found in shaded areas.

Shooting location

Conclusion

In 2021, winter rainfall and humidity were both low, whereas in 2022, there was an increase in winter rainfall and higher humidity levels. Although no significant temperature changes were noted, it is reasonable to infer that rainfall and humidity have a notable impact on turf growth. The turf flourishes during rainy periods, while struggling to grow in the absence of sufficient precipitation, often appearing dry. However, even under optimal growing conditions, turf growth can be inhibited in shaded areas, as observed during the winter of 2022.

References

GLOBE [GLOBE data visualization]