

HTT006-05

Room:201A

Time:May 25 17:30-17:45

The changes in water area and wetland vegetation and water pollution in Baiyangdian, China

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Baiyangdian is the closed lake located in North China Plain, about 150 km to the south of Beijing. The lake provides domestic and industrial water to surrounding area. The lake has functions of flood mitigation, water purification, conservation of biodiversity, that is ecosystem services. However, water shortage and pollution becomes serious problem, and ecosystem services are deteriorated.

Recent economical development in China leads increase in local industries, and population is increasing in the surrounding area. Water demand is also increasing, that lead to decreased storage and dry up of Baiyangdian lake.

The study area include Baiyangdian lake extending N38:40-N39:05, E115:35-E116:10. Baiyangdian collects nine streams from Taihangshan mountains and effluent stream flows into Bohai Bay. Swamp area include about 3,700 of creeks connecting 146 water areas through channels. Total area is about 366 km² including 36 villages in the swamp area. The climate is temperate monsoon climate, which has dry and cold winter, and hot and moist summer. Average annual precipitation is 563.9 mm, and annual average pan evaporation reaches 1369 mm. About 80% of precipitation is concentrated from June to September.

Baiyangdian as natural wetland has many functions, namely ecosystem services. Proper conservation is required to maintain local agriculture and industries. The final goal of the study is conservation of ecosystem services of natural wetland. In this paper, we report the interannual and seasonal changes in water area and wetland vegetation in Baiyangdian by using satellite remote sensing. Field survey of water quality had conducted in 2010. The relationship between the condition of surface water and vegetation and water quality is investigated.

Water area and vegetated area in the lake has a decreasing tendency between 1989 and 2001. This is caused by housing and agricultural developments in the reclaimed land. Especially the upper part of Baiyangdian suffers development activities. On the other hand, it is proved that large water areas of Baiyangdian had been separated.

Field survey was carried out on April, June and September in 2010. Total nitrogen, total phosphorus, nitrate-nitrogen were measured at plural sampling points. The concentrations of the items are high at the inlet channel of Baiyangdian lake. It seems wetland vegetation (mainly reed grass) absorb the nutrients. The concentration in September is the lowest in the season. This is considered to be the absorption of the nutrients by vegetation in the growing season. It remains as the next point to discussion. Moreover, the observation months results are compared. The absorption rate of the nutrients in September is more high than it in April and June. One the reasons is that reed grass absorb the nutrients in the growing season from April to July.

In this time of the research, interannual variation of water area and wetland vegetation are clarified. Distribution of T-N, T-P, and NO₃-N are also clarified, and apparent relationship the both is recognized. In the next stage of the study, we will plan the evaluation of the function of ecosystem services.

Keywords: China, Baiyangdian, remote sensing, closed lake, ecosystem services, nitrogen and phosphorus