

The changes in land use change and water research in the closed water area (Baiyangdian in China as an example)

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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, which 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 leads to decreased storage and dry up of Baiyangdian Lake.

The study area includes Baiyangdian Lake extending N38o40'-N39o05', E115o35'-E116o10'. Baiyangdian collects nine streams from Taihangshan Mountains and effluent stream flows into Bohai Bay. Swamp area includes 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 area 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.

Because Baiyangdian can maintain ecosystem services function, 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 decreased successively and wetland vegetated area increased first, and then have been decreased 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 and September in 2011. 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. Moreover, the observation months results are compared. The absorption rate of the nutrients in September is higher than it in April and June. Because reed biomass shows its maximum in August or September, nitrogen and phosphorus are absorbed by reed grass. We have conducted field survey of visibility of the lake water in September 2011. On the upstream side of the Baiyangdian, visibility is low because sewage from Baoding city and surrounding domestic area flows into Baiyangdian Lake.

In this time of the research, interannual variations of water area and wetland vegetation are clarified. Distribution of T-N, T-P, and NO₃-N are also clarified, and apparent relationship is recognized. With the progress of urbanization, the discharge of daily life water will be increased. Serious deterioration of water quality of Baiyangdian Lake is estimated. In the next stage of the study, we will plan the evaluation of the water cycle in the basin.