THE RISK OF FLOODING SITUATION TO TERRESTRIAL VEGETATION IN TRAM CHIM NATIONAL PARK, THE MEKONG DELTA, VIETNAM

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1. INTRODUCTION

Tram Chim National Park (TCNP) is located in the Mekong Delta of Vietnam (Figure 1). It was designed as a 'Sarus Crane Reserve' by Dong Thap Provincial People's Committee in 1986 for the protection of *Sarus Crane Grus antigone* (Buckton et al. 1999). Presently, with total area approximately 8,000ha, it is the largest remnant of the Plain of Reeds (PoR) floodplain ecosystem protected for biodiversity conservation (Van der Schans 2006). The vegetation in the TCNP comprises a mixture of seasonally inundated grassland, regenerating *Melaleuca cajiputi* forests, and open swamp. These plant communities provide habitat for a wide diversity of bird species (Buckton et al. 1999). As other tropical floodplain ecosystems; hydrological situation is recognized as by far the single most important driving factor related to living of organisms in the site. Recently, due to anthropogenic hydrological alteration, structures including dikes, sluice gates, and canals were constructed in the TCNP to restore original annual hydrological cycles. It is observed that the fluctuation of managed water levels is strongly effected on biodiversity in this ecosystem. However, the challenge is that what water levels should be operated because observed data on hydrology and ecology before anthropogenic alteration is not available in the studied area. Therefore, supporting for better ecosystem conservation and restoration, or designing hydraulic structures; this study focuses on to predict the potential risk of flooding scenarios on plant keystone species.

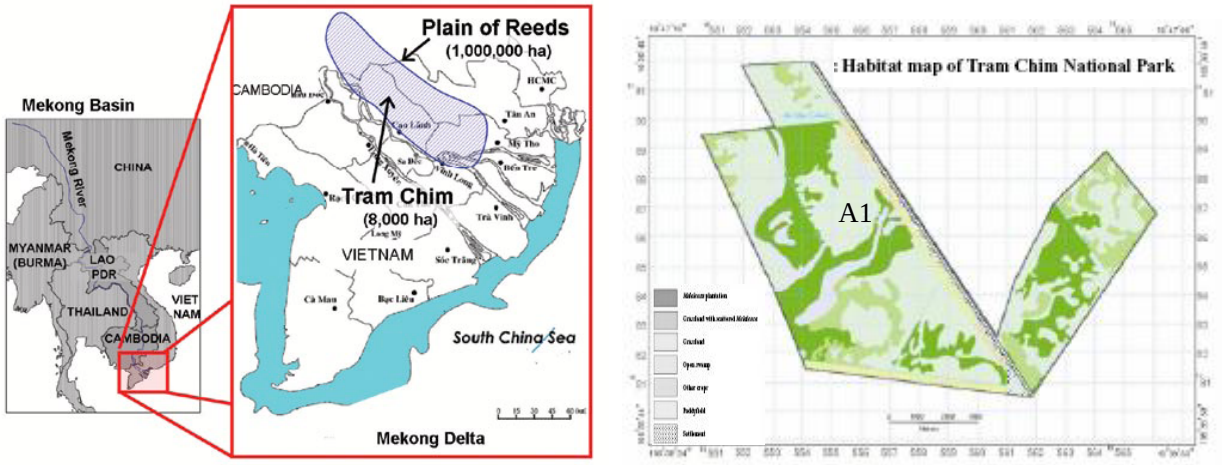

Figure 1: Location of Tram Chim National Park (Sources: Van der Schans, 2006)

2. METHODS AND RESULTS

It is hard to forecast exact hydrological cycles (e.g. water level hydrograph) in future. In practices, probabilistic theory is common used for hydrologic design. Even though wetland plant can adapt to inundation, however, it could be damaged at flooding situation higher than its maximum tolerant capacity. Therefore, each design water level hydrograph is predicted with an exceedance probability. To success this goal, firstly, cumulative distribution functions (CDFs) of percent exceedance event are individually derived for averaged monthly inundated water level inside studied area by using the data set observed from 1990 to 2005 in zone A1. The steps to achieve are: (1) ranking the water level data in descending; (2) estimation of exceedanced probabilities (P) by Weibull formula (P = i/n+1; where i is order of data in ranking; n is total number of data); (3) finding the function best fit with data basing on the maximization of R^2 value.

The linear functions are found for the studied area. Then, each designed hydrologic cycle is monthly water levels predicted from CDFs with the same probabilistic occurrence in every month. The figure 2 shown the results predicted by various probabilities. These results are used as input data for ecological impact assessment.

Even without precise definition, keystone species concept is widely applied to conservation or restoration of ecosystem. The TCNP is the habitat for rare Sarus Crane specie, *Grus antigone sharpii*, which come to this site during dry season for feeding. The tuber of *Eleocharis* grassland is the favorite food of Sarus Crane. The *Eleocharis* species are also dominant vegetation with approximately 30% total land area. Therefore, this grassland species can be considered as keystone species for biodiversity conservation of the site. In Tram Chim, at least three species of *Eleocharis* were found including *E. dulcis*, *E. atropurpurea* and *E. ochrostachys* (Triet 2006). Due to less common than the other two species, *E. ochrostachys* is neglected in the assessment process. The **R**elative **L**oss of **G**ross **T**uber **P**roduction (RLGTP) is selected as end-point assessment in comparison with potential production harvested in optimal hydrological condition. The optimal hydrological requirements for the dominant vegetation communities in Tram Chim can be found in paper of Triet (2006). The figure 3 shows the results of perdition. The procedure of estimation is following steps.

1. Using GIS data on elevation in contour line model and vegetation map, the areas of target-species distributed among the ranges of ground elevation are estimated;
2. In combination between designed monthly water levels, spatial area and timing of inundation are determined for each range of ground elevation;
3. The RLGTP value of each scenarios of monthly water level is estimated for individual specie by the formula, $RLGTP = \sum_{1}^{n} RA_i * RL_i$ (where: n is number of sub-zones divided by contour lines of ground elevation, in the TCNP n = 8; RA_i is relative area of i^{th} zone in comparison with total area of target specie in term of percentile; RL_i is relative maximum effected area that plant can not produce tubers due to inundation, in comparison with area of target specie in sub-zone i^{th}. The used assumption is that the *Eleocharis* can not produce tuber when it is inundated one month during the period required dry for reproduction.

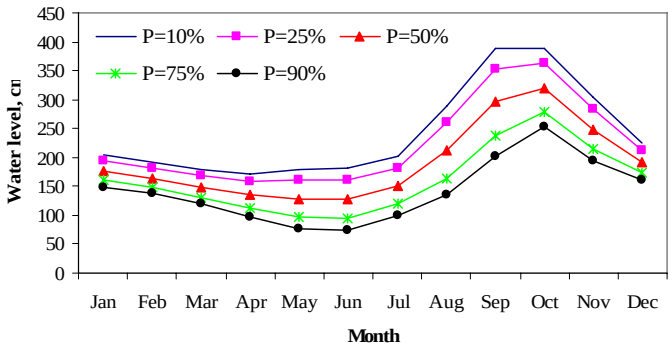

Figure 2: The designed annual water level hydrograph

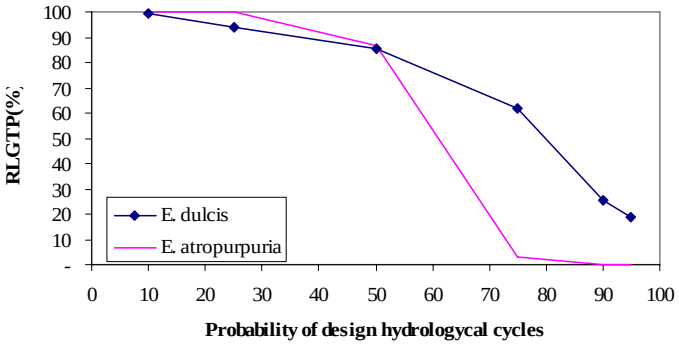

Figure 3: Percentile loss of gross tuber production

3. CONCLUSION

In combination between practical hydrologic designs with potential damage model, the risk of inundated scenarios to *Eleocharis* species is assessed for zone A1 of the TCNP, the Mekong Delta, Vietnam.

REFERENCES

Buckton et al. 1999: *"The conservation of key wetland sites in the Mekong delta"*. HCMC: BirdLife Vietnam.

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