

The Agmon lake-wetland complex: A Mediterranean example of land use change from farming to ecotourism

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ABSTRACT

The alteration of freshwater wetlands to farming in the 1950s have resulted in higher loading of C, N, P and suspended material to downstream waterways. This alteration also induced rapid oxidation of organic matter and rapid peat soil subsidence and loss of soil fertility enhanced by the dry climate of the Mediterranean basin. To reverse some of the negative consequences of the drainage, a reconstruction project was implemented in the mid 1990s which replaced the marginal farm land with shallow lake-wetland complex and enabled partial recolonization of the extinct wetland habitat while retaining the economic utilization of the land through a shift from conventional agriculture to ecotourism. The reconstruction project consists of reflooding of 1.1 km², rerouting and renewal of the entire drainage system, elevating groundwater levels (~ 0.6 m below surface) around the reflooded area and introducing native plant species and animals. Currently, the project aims at maintaining the economical viability of the farming and ecotourism industries, minimizing nutrient loadings to downstream water resources and conserving and studying the newly emerged ecosystem. Current research in this lake-wetland complex encompasses the biogeochemistry of nutrients, groundwater hydrogeology, agro-forestry along waterways, dynamics of terrestrial and aquatic plants, avian species behavior, nesting and diversity, and economical aspects of ecotourism. Decadal monitoring program suggests that N loading to waterways has decreased significantly but P loadings may have slightly increased. The number of birds such as golden cranes, pelicans, cormorants, herons, kites and others has increased dramatically attracting large number of visitors providing a boost to the ecotourism industry and compensates for the loss of farm land. The huge flocks of the golden cranes (> 35,000 individuals) descending on the lake-wetland complex and the nearby cultivated fields have created a major strain on the joint agro-eco-management of this area and necessitates a better sustainable solution in the future.

Figure 1: The Hula altered Wetland (Present & Past)

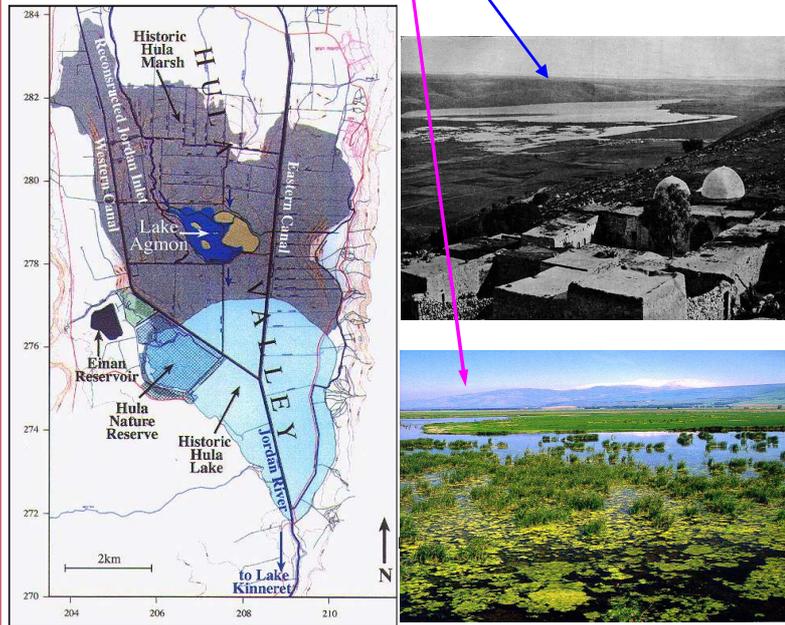


Figure 2. Output yields (in red) of TP & TSS are correlated and significantly larger than input (in blue). Input loads of SO₄ and TN are smaller than output. The reconstructed Agmon wetland is a very efficient N sink and N remover.

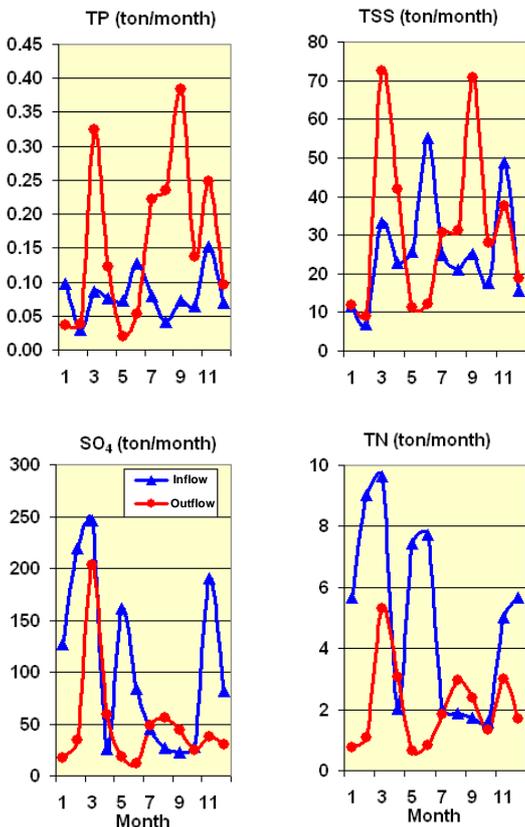


Figure 3. The transformation of the least fertile land to a lake produced a huge center to migratory birds and a hub of ecotourism. In 2005, a total of 208 bird species was recorded from which 27 species were water birds, 88 were passerines, 27 were raptors and 66 were rare and sensitive species. The reflooded area (Agmon Lake (Fig. 1) serves as the most significant refuge for migratory birds along their long migratory route from Europe to Africa.

However, some birds are considered agricultural pest species. For example, Eurasian Crane which peaked to 31,000 individuals daily during the peak season favor various crop fields. White Pelican which varied between 31,000 to 41,000 individuals daily and Great Cormorant (11,000 individuals daily in peak season) may destroy in few hours commercial fishing ponds.

The ever increased number of birds in the Hula Valley necessitates an increase in financial and managerial efforts. These efforts include the formation of feeding center for cranes to minimize crop destruction, stocking of non-commercialized fish in the Agmon to minimize the damage by the pelicans and other water birds in commercial fishing farms and the establishment of an eco tourist center.

The tourist center provides the means to watch an amazing spectacle at dusk and dawn when the birds arrive to roost or depart to continue their journey. The ecotourism is conducted via hiking to the roosting sites without entrance fee, rental bikes, rental golf carts, shuttle and guided tours on a specially designed tractor trailer. The number of paying visitors has increased annually to almost 200,000 last year.

