

Saber Er-riyahi¹, Rhazi Laïla², Rhazi Mouhssine³, Ballais Jean-Louis¹ & Grillas Patrick⁴

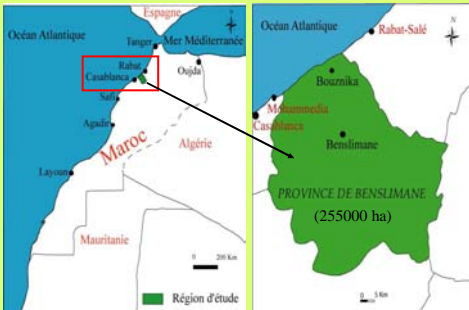
- 1. CEGA - UMR " ESPACE " and University of Provence, France. E.Mail: erriyahisaber@yahoo.fr
- 2. Hassan II University, Faculty of Sciences Ain Chock, Watery Laboratory of Ecology and Environment, LP 5366 Maarif Casablanca, Morocco
- 3. Paul Cézanne University, Faculty of Sciences and Techniques Saint Jérôme, 13397 Marseilles, France
- 4. Biological Station of the Valat Tower , Sambuc, 13200 Arles, France

Introduction

Morocco knew a demographic explosion during XXth century (the population jumped from 5 millions inhabitants at the beginning of the century to 29 millions in 2004). The rural population accounts for 45% of the total population and lives basically on exploitation of the natural resources. Although it contains significant natural resources, the province of Benslimane, located between two big towns, Casablanca and Rabat (map 1), suffers a degradation of its diversified ecosystems. Among the most affected ecosystems, are the temporary pools, that had experimented a degradation and a manifest retreat since the Fifties. This degradation is the consequence, at once, of a strong human exploitation (agriculture, pasture...) and of a prolonged dryness. The impact of the human pressure on the pools was evaluated over a 47 years period (at three dates: 1955, 1987 and 2001).

The objectives of this work were :

- 1. Mapping of the temporary pools of the Benslimane province at these three dates,
- 2. Inventorying the temporary pools of the province using space data,
- 3. Suggestions of management and conservation of these threatened ecosystems.



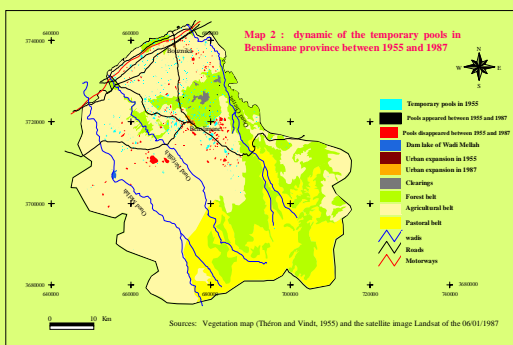
Map 1: Geographical localization of the Benslimane province

Material and method

To follow the spatio-temporal dynamics of the temporary pools in Benslimane province, the vegetation map (1955) and two Landsat images (1987/01/06 and 2001/01/20) were used. The cartography and the inventory of the pools required the selection of images recorded during the same period of the year, in particular in January when the pools are flooded. *Idrisi* software enabled us to realize the whole of the image processings. The software of Geographical Information Systems and cartographic representation *ArcView GIS*, was used for the cartography and the calculation of the number and the area of the temporary pools for the 3 dates.

Results and discussion

Cartography of the spatio-temporal dynamics of the temporary pools



Map 2 : dynamic of the temporary pools in Benslimane province between 1955 and 1987



Map 3 : dynamic of the temporary pools in Benslimane province between 1987 and 2001

Most of the disappeared pools are located in the neighbourhoods of Benslimane town, in the agricultural belt (maps 1 and 2). This is probably due to intensification of agriculture on the very fertile vertisols. A great number of pools disappeared under the effect of irrigated agriculture along Wadi Cherrat and Wadi Mellah valleys. One notes also the disappearance of some pools close to the roads, because of urban expansion and development of Benslimane. Filling, drainage and cultivation of the pools remain the principal threats which weigh on these ecosystems. The climatic factor, in particular the succession of dry years, could also accelerate the degradation of these ecosystems to which are pledged considerable faunistic and floristic scarcities.

Contribution of remote sensing to the inventory of the temporary pools

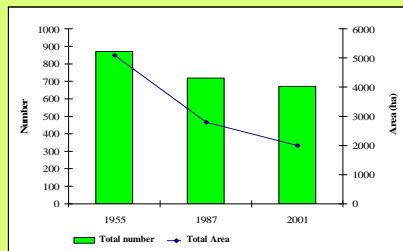


Figure 1: Evolution of number and area of the temporary pools in Benslimane province between 1955 and 2001.

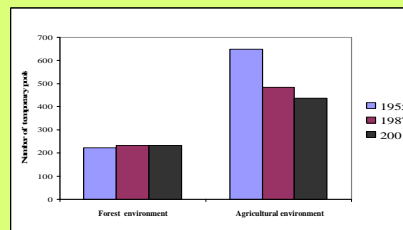


Figure 2: Evolution of the total number of the temporary pools, according to their localization, in Benslimane province between 1955 and 2001.

The analysis of figure 1 shows a clear reduction in the total number and total area of the temporary pools in Benslimane province between 1955 and 2001. Thus in 1955 the number of pools was 871 with an area of 5 086 ha, that is to say approximately 2 % of the area of this territory. In 1987, this number became 718 pools with an area of 2 789 ha, that is to say approximately 1 % of the total area of the province. In 2001, the number of temporary pools passed to 670 with an area of 1 994 ha, that is to say approximately 0,8 % of the total area of the province. On the whole, between 1955 and 2001, the extension of agricultural area and of the cities (Benslimane and Bouznika) was made to the detriment of 212 temporary pools with a total area of 3092 ha. The general assessment indicates a strong reduction of the temporary pools total number and a degradation of their ecological quality. Indeed, on average five pools disappear each year, adding up an area of approximately 67 ha. It is probable that, if no measure is taken to protect this invaluable ecosystem, these spaces will disappear within a 150 years deadline, considering the speed of current degradation.

The examination of figure 2 shows that there are more pools in agricultural environment than in forest environment . The number of pools which exist in a forest environment knew a light increase between 1955 and 1987, it moved from 222 to 233. On the other hand, in agricultural environment, the number of pools moved from 649 to 437 between 1955 and 2001. This strong regression of the temporary pools in agricultural environment would be the result of a draining and cultivation of the pools at the time of fairly rainy years.



Temporary pool protected by forest



Temporary pool located in a cultivated area

Management and conservation of the temporary pools

In front of the extent of degradations that temporary pools have experimented and always suffer, their rational management and their conservation are essential. Within this framework, we propose some following elements :

- 1. Placing under protection the most representative temporary pools in term of biodiversity,
- 2. Ensuring maintenance of the forest which is used as a protective shield for temporary pools,
- 3. Giving a financial assistance to the farmers can avoid drainage and cultivation of their own temporary pools,
- 4. Making the local population and the decision makers sensitive to the patrimonial value of the temporary pools and the need for their conservation.

Conclusion

In Benslimane province, as in other areas of Morocco, temporary pools are degraded with a high speed. This degradation is dependent mainly on the human activities, but without excluding the share of climatic warming. For the integrated management of the temporary pools, it is necessary to develop a Geographical Information System based on inventory (number and specific richness) and spatialized follow-up, in order to analyze the impact of all the threats which weigh on these ecosystems. This data base would make possible to better know the rhythms and assessments of degradation of these ecosystems and to establish a plan for their long-term management and conservation.