



# Sustainable Ecosystems under Land Retirement

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*There is a potential to use the retired land as wildlife habitat to improve the ecological system in the western San Joaquin valley without any serious negative consequences.*

The absence of adequate drainage due to topographic and environmental constraints has forced the western San Joaquin Valley to tackle problems of shallow water tables with high salinity in general, and specific toxic trace elements in particular. It is estimated that by 2040 approximately 160,000 to 225,000 ha (400,000 to 554,000 ac) would become unsuitable for irrigated agriculture if no actions were taken to remedy drainage problems.

Land retirement was proposed as one strategy to reduce drainage-related problems. In this approach, lands that were characterized by low productivity, poor drainage, shallow water tables, and high groundwater selenium concentrations would be removed from agriculture.

The retired agricultural lands could potentially be used as a wildlife habitat to improve the ecological systems in the valley. Other potential land uses such as grazing and dry land farming are also envisaged.

However, there is also a possibility of land retirement causing negative effects such as excessive accumulation of trace elements and salts on the land surface and the establishment of undesirable weed communities. Excessive salt accumulation might result in little or no plant growth and vegetation cover causing wind blown salt problems downwind. The results of hydrologic and soil modeling studies have indicated that without implementation of special management techniques, there is

serious danger of retired lands becoming excessively salinized and seleniferous.



A part of the Kerman ecological reserve. The nature of the natural landscape prior to massive irrigation activities changed it. 6/21/2006

With a view to study various land retirement scenarios leading to a formulation of sustainable ecosystem management strategy, the objectives of the study are to,

- a) Develop, calibrate and validate a numerical model based on a proven modeling system that can be used to simulate major processes occurring in the land phase of the hydrological cycle. The model should be able to simulate unsaturated-saturated water flow and solute transport, subject to root water uptake.
- b) Evaluate and recommend land retirement management strategies that will promote/maintain a sustainable agriculture production system in the region.

- c) Evaluate and recommend land retirement management strategies that will promote a sustainable ecosystem.

The goal is to achieve these objectives through the use of the calibrated hydro-salinity model that integrates subsurface hydrology with reactive transport to obtain initial salinity and shallow groundwater conditions. The results so far obtained have been compared with actual field measurement records.

The UNSATCHEM model is being used to evaluate the sustainability of various land uses as a function of root water intake functions, initial salinity concentration and shallow groundwater level. The use of different native plants is being investigated. Field data related to salinity and shallow groundwater level from the Bureau of Reclamation's Land Retirement Demonstration Project is being used guide the modeling effort. The results of the modeling effort will be used to recommend possible management choices as to the use of retired land. Finally the integrated regional hydro-salinity model will be used to evaluate the sustainability of the proposed ecosystem.

The preliminary results from the study indicate that under fallow land conditions, the shallow water level declines without the sustained buildup of salts in the soil profile.



Alkali sink ecological reserve along HW 180. It has a relatively lush landscape with *Allenrolfea*, a native perennial shrub. 6/21/2006

## **Collaborative Efforts**

Collaborative contribution from Stephen L. Lee, and Beatrice A Olsen of the Land Retirement Demonstration Project resulted in a site visit to the project's demonstration site in western Fresno County. Groundwater quality data and the groundwater level data from the Tranquility site for the period 1999-2004 were also provided by Stephen L. Lee.

Gerald D. Robbins Jr., Bureau of Reclamation, Project Manager, Mid-Pacific Region has provided the maps in jpg format showing the proposed land retirement area.



Native species nursery used by USBR to test the efficacy of putting different kinds of plants in the land retirement plots. 6/21/2006

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