



Qairawn Watershed Management Plan

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Prepared by: Eng. Ahmad Uleimat & Refaat Bani-Khalaf



Abstract

Title: Jordan Experience in Watershed Management (Qairwan Spring at Jarrash Governorate Case)
Co-Author: ULEIMAT, AHMED ALI, Director, Water Quality Resources Protection Department, Refaat Bani-Khalaf, watershed specialist- Water Authority of Jordan, P.O BOX 2412 Code 11183, Amman – Jordan. Fax 00962-6-5825275, e.mail: ulimat_ior@yahoo.com.

In this poster, I will present Jordan experience as a developing country in watershed management, Jordan has very limited renewable water resources and water is becoming an increasingly scarce resource and planners are forced to consider any source of water which might be used economically and effectively to promote further development. One of the major challenges facing the government is the protection of precious water resources by instituting sound principles of watershed management. The water resources dilemma in Jordan is two-dimensional. A growing population requires more water. However, more human activities result in increasing ground water pollution. Jordan's water resources quality is deteriorating as evidenced by: elevated nitrate levels, salinity in the ground water and microbiological contamination. Deteriorating water quality requires sophisticated treatment technology. This increases the need for capital investment to build new water treatment facilities. Protection of water quality at the source through watershed management can reduce the requirements and costs of building and operating drinking water treatment systems throughout the kingdom. MWI/WAJ has highlighted the severe water scarcity with the international donors to balance the goals of providing services and source protection and regulatory enforcement. one of these agencies is the U.S. Agency for International Development (USAID) through the project entitled Pollution Prevention for Environmental Health Protection (Jordan's Water Quality Management Program). Jordan water quality management program funded by USAID has begun in 2002 and CDM, Inc has been implementing this program in partnership with several national agencies including the Ministry of Water and Irrigation (MWI)/Water Authority of Jordan(WAJ). Together these agencies work to improve water resources management and thereby protect public health and the environment

This poster will show the different stages of the program (2002-2008) including the main activities.

Phase I (2002):
 Development of preliminary watershed management plans for catchments supplying treatment facilities at Wadi Es-sir, Qairawan, Qantara, Deek and Salti;
 Improvement of water quality monitoring by building partnerships between WAJ and MOH.

Phase II(2003-2005):
 Implementation of the watershed management concept on a pilot scale in the Qairwan watershed.

Phase III (2006-2009):
 To implement the solutions building on the first two phases and the best management practices previously identified.

Establishing a Joint Stakeholders group to discuss findings of the technical work and endorse solutions to protect the water resources;
 Directing the community participation program, including six stakeholder focus groups based on common interests;
 Developing an extensive public awareness program to bring understanding of the importance of watershed protection to the residents of the watershed;
 Conducting extensive field surveys of the watershed to describe the environment and identify and characterize potential pollution sources;
 Developing groundwater vulnerability maps (and concurrently groundwater protection zones) using a methodology recommended by previous MWI/WAJ studies (EPIK, Doerflinger *et al.*, 1998), in concert with technical staff at MWI by applying this karst technique for the first time in Jordan;
 Establishing a list of compatible activities to match groundwater protection zoning, while considering on-going work of the Committee;
 Creating an extensive geographic information system (GIS) data structure from existing WAJ files, a satellite image taken for the project, and extensive field studies; and
 Developing, in conjunction with the community, a prioritized list of actions (programmatic watershed measures and best management practices [BMPs]) to seek funding to continue implementation of source water protection.

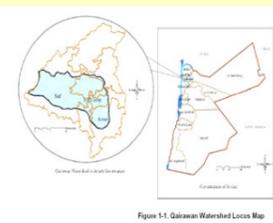


Figure1.Qairawan Watershed Location Map

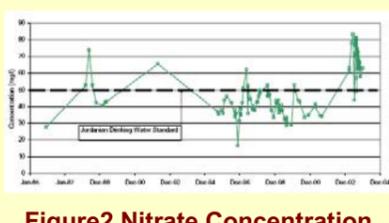


Figure2.Nitrate Concentration for Qairawan Spring (1985-2004)

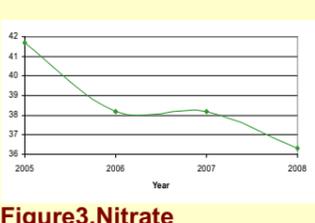


Figure3.Nitrate Concentration for Qairawan Spring (2005-2008)

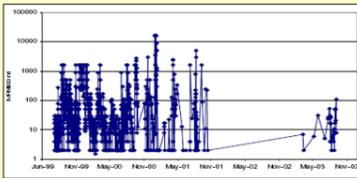


Figure4. Fecal Coliform (MPN/100ml) In Raw Water (1999-2004)

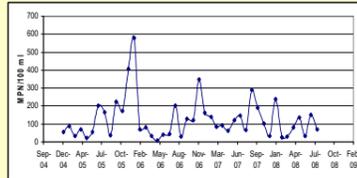


Figure5. Fecal Coliform (MPN/100ml) In Raw Water (2004-2008)

Introduction

Qairawan watershed, located in the Jerash Governorate (Figure 1), represents a hydrogeologically typical watershed in the northern highlands of Jordan. Other characteristics of the watershed contributing to its selection as a pilot project include: the watershed's rapid growth and gradual loss of fertile, open land, which has led to deteriorating groundwater quality; periodic interruptions in the water supply due to poor water quality and, recognition of the town of Jerash as an important tourist destination, with special status for conservation and future expansion. The watershed is a classic alluvial valley with two main wadis. It includes three main settlements: Jerash, Suf and Suf Camp.

Objectives

The Qairawan pilot project has the dual purpose of guiding implementation of source water protection for the Qairawan watershed and piloting a watershed model for Jordan that could be used by Government of Jordan (GOJ) agencies in future watershed management projects. The project's specific objective is to develop the methods, procedures and routines that GOJ personnel will need to replicate watershed management in other watersheds in Jordan. To facilitate GOJ's capacity building

Project Approach

The overall project approach combines technical work with community participation and has included: (1) Developing a comprehensive understanding of the problematic situation of the Qairawan spring and other springs in the watershed; (2) Understanding the practices/activities in the watershed that contribute to water quality problems, and their spatial distribution through both physical surveys and targeted community meetings; (3) Working with community groups to develop applicable solutions that can foster sustainable co-existence of the many human and economic activities within the Qairawan watershed; and (4) Identifying solutions based on the contributions of stakeholders.

Project Activities

Major activities of the project have included:
 Facilitating coordination with primary agencies (MWI, WAJ and MOH) to define roles and responsibilities for implementing watershed protection for other watersheds;
 Working with ministry personnel to develop their long-term capabilities;
 Providing expert consultancy and facilitating debate on regulatory feasibility for the Committee for Water Resources Protection (the Committee), a national-level committee establishing a by-law for developing groundwater protection zones for Jordan;

Results

Contaminants of Concern: Microbiological parameters (fecal Coliform bacteria and *E. coli*) and nitrates are the major contaminants of concern in the watershed; levels in the raw water of these parameters have periodically exceeded the Jordanian water quality standards in the Qairawan spring and in other springs throughout the watershed. All mitigation measures that are defined and implemented for Jerash watershed, lead to improvement in the water quality represented by NO₃, E.Coli as shown from figure (2-5).

Domestic wastewater - A house-to-house survey of residents and businesses – performed to characterize wastewater disposal practices – identified 4,622 properties that had cesspits on the premises; 2,605 of these properties had connected to the sewer but 23% had not properly decommissioned their cesspits. Of the remaining cesspits, 1,854 were confirmed to still be active, while 163 could not be determined. Over two-thirds of the active cesspits have never been pumped in over 20 years, and 244 residences reported that their cesspit was originally a natural cave. Overflowing sewers and illegal septage disposal were smaller sources.

Intensive crop agriculture – A representative group of crop farmers were surveyed to characterize the crops grown and their irrigation, fertilizer and pesticide practices. Microbiological contamination can result from applying fresh manure. The farmers apply more nitrogen than is actually required by the crops that are grown, usually as quick-release chemical fertilizers. While most pesticides degrade quickly or bind to soil, they were reported used in 2003. Further, the farmers rely on instinct and historical practices, rather than scientific principles, when applying irrigation water, fertilizer, and pesticides.

Establishment of Groundwater Protection Zones
 Zone 1 for Wells and Springs -Zone 1 for Main Wadis -Zone 2 -Zone 3

Qairawan Watershed Characteristics	
■	Area: 36 km ²
■	Population: 39,000
■	Public water supply: Qairawan spring (125 m ³ /hr) and 4 groundwater wells (50-100 m ³ /hr)
■	9 other major, permanent springs (totaling 180 m ³ /hr) used for irrigation and domestic supply
■	Karst limestone geology



Figure4.Satellite Image for Qairawan Watershed

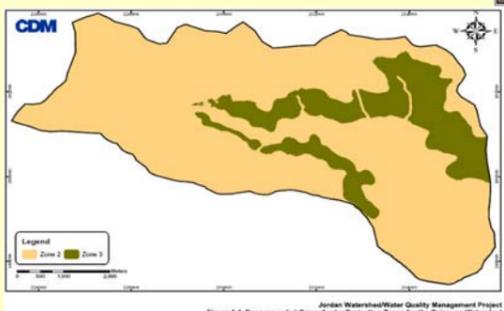


Figure Recommended Groundwater Protection Zones for Qairawan Watershed

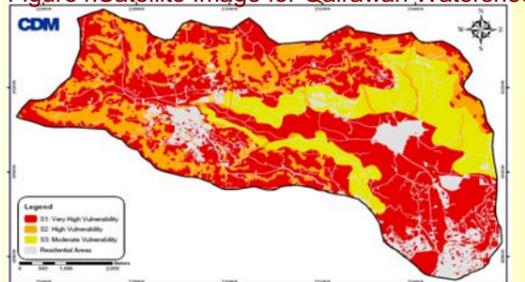


Figure Groundwater Vulnerability Map for Qairawan Watershed