

# Crescent Moon Spring: A Disappearing Natural Wonder in the Gobi Desert, China

by Jiu J. Jiao

## Introduction

Yueya Spring, or Crescent Moon Spring, is a geological wonder located about 6 km south of Dunhuang city, Gansu Province, northwest China. It owes its name to the shape of the spring, or more precisely, the pond fed by the spring water, which resembles a crescent moon (Figure 1). Currently, the pond is about 200 m long in an east-west direction and about 50 m wide. The water surface in the pond is about 1134 m above sea level.

Surrounding the spring is the equally famous Mingsha Mountain, also known as Singing Sand or Echoing Sand Mountain, which is simply a giant sand dune. The dune takes its name from the sounds made by the sand as the wind sweeps across the desert. The dune stands more than 100 m above the spring (Figure 1).

This part of Gansu Province has a typical continental arid climate with extremely cold winters and scorching summers. The average yearly rainfall is less than 40 mm, whereas the potential evaporation is more than 2400 mm.

## Uniqueness of the Spring Site

The Crescent Moon Spring is a rare oasis in the desert; it is believed to have existed for at least thousands of years in the same location. This natural wonder owes its existence to a special combination of hydrogeological conditions, landforms, environment, and wind directions.

Geologically, the spring lies in a depression between two alluvial fans deposited by the Dang River, which is about 4.5 km to the west, and the Xishui River, which is 6.5 km to the east. The Dang River, which is supplied by melting snow in the Qilian Mountain to the south, is believed to be the main recharge source for the spring.

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The sand dunes are much younger wind deposits overlying the alluvial fans. The dunes have a pyramidal shape with three or four arms that radiate outward from a central peak (Figure 2). The dune arms have a gentle slope at their base but grow steeper near their peaks. The unique shape of these dunes is attributed to the multidirectional wind regimes in which they grow. Only one of these wind directions dominates the formation of the dune at any given time (Dorr 2004).

The dunes surrounding the spring channel the regional winds into an east-west oriented valley, such that the moving sand is blown uphill and over the dune crest. As a result, the sand never smothers the spring despite the enormity of the shifting sand mountains around it.

Every time a strong wind sweeps across the sands, a thunder-like but musical sound up to 85 dB can be heard from the dunes. Tourists enjoy sand-surfing down the front of the dunes. As one surfs down, at first the sand under foot just whispers, but the further one slides, the louder the sound becomes until a thunder-like sound is produced. Scientists believe that the sounds come from vibrations in the sand bed that have been excited by collisions between grains of sand (Andreotti 2004).

## History of the Spring

The spring has been known since very ancient times. Because it is in a vast desert, it was also called Sha Jing, meaning Sand Well, or a well in the desert. Numerous historical records mention the spring. The earliest description can be found in “San Qin Ji” (or Records on Three Qins) published during the Eastern Han Dynasty (25 to 220) by Xin (specific date unknown):

To the west of the river is the Sha-Jiao Mountain (old name of Singing-Sand Mountain). . . To the south of the mountain, there is a spring, which is called Sand Well (Crescent Moon Spring). The well has lasted for thousands of years and the sands do not fill it.

A similar description is found in “Yuan He Jun Xian Zhi” (or County Records of Yuan He Jun) published



**Figure 1. A general view of Crescent Moon Spring and the surrounding Singing Sand Mountain. The Crescent Moon Spring has existed in this same location for at least thousands of years and remains a tranquil sanctuary from the harsh winds and blowing sands of the surrounding dunes. The camera faces approximately west (photo taken on July 17, 2006).**

during the Tang Dynasty (618 to 917) (Li 813). This record mentions that the water was pure and sweet.

Figure 3 is a drawing of the Crescent Moon Spring and the buildings to the south reproduced from the Dunhuang County Record (Su 1830). As can be seen, there was also a small crescent-shaped pond in the left corner.

In addition to reliable scientific records, numerous legends and stories have developed about the generation and maintenance of the spring created by curious and imaginative people who were puzzled and amazed by this long-lasting feature in the middle of the desert. For example, a legend has it that in the Western Han Dynasty (206 B.C. to A.D. 24), a general called Li Guang, together with a group of soldiers, captured a powerful and swift horse from Dawan, a western state of China at that time. When passing the Singing Sand Mountain upon their return, the soldiers became too thirsty to continue their march. General Li drew his sword and thrust it into the side of the mountain causing water to spring forth and so formed the lake (Travel China Guide 2009).

Dunhuang was the center of trade along the Silk Road connecting China and its western neighbors. For thousands of years, the beauty of the oasis served as a pleasant relief to the travelers, pilgrims, and traders in the desert along the Silk Road, and the spring was a valuable source of drinking water for the thirsty visitors and their camels.

The spring has been one of the eight major tourist attractions in Dunhuang since the Eastern Han Dynasty (25 B.C. to 220 B.C.). Other attractions include the Mogao Grottoes and Western Thousand Buddha Cave, which contain sculptures and cave paintings from the fourth to the fourteenth centuries. Countless Chinese and foreign visitors come here to enjoy the tranquil spring-fed pond, golden sand, wondrous dunes, and beautiful sunsets.

Since the Tang Dynasty (618 to 917), more than 100 temples and pavilions have been constructed along the south side of the spring. The spring also provided inspiration to artists such as poets, painters, photographers, and even musicians, all of whom created works of art related to the spring. Strolling along the lake, tourists can appreciate the fish swimming leisurely in the water and the reflection of the standing poplars and elegant pavilions on the bank. Unfortunately, all the historical buildings were demolished in 1968 during the Cultural Revolution.

In the 1980s, the spring and the surrounding buildings were valued again after being neglected during the Cultural Revolution. The restoration and redevelopment of the Crescent Moon Spring area started in 1987, and by 1992, most of the historical buildings had been restored by the local government. Although the temples and pavilions were rebuilt relatively easily in a short period of time, the local government faces a much more challenging problem. After slaking the thirst of people for thousands of years, the spring itself has become thirsty over the last



**Figure 2.** A bird's eye view of the Crescent Moon Spring and adjacent sand dunes (source: Google Earth, image taken on August 29, 2007). The dunes grow in a pyramidal shape and have three arms that radiate outward from a central peak. The arrangement of the dunes around the spring produces an approximately east-west valley in which the pond lies. The regional winds are channeled by the local landforms into a mainly eastward direction. These local winds blow the sand uphill.

50 years. Its water level is falling and the lake is shrinking noticeably.

### The Disappearing Spring

In the Tang Dynasty (618 to 917), the spring-fed pond was so large that tourists could enjoy recreational activities such as a boat ride in the pond. The last record of such activity was in the Qing Dynasty (1644 to 1912). It is believed that the water level remained relatively constant until the 1960s. On the basis of air photos taken in 1957, the water level in the spring-fed pond was estimated to be 1141 m above sea level, about 7 m higher than the 1134 m measured in 1997. The situation continues to deteriorate. Between 1987 and 1997, the pond area shrank from 9000 to 5667 m<sup>2</sup>, and the maximum water depth dropped from 4.2 to 2 m. In 1950, the maximum depth was 7 m. The maximum depth in 2001 was only 0.18 m and the pond was essentially "bottom up" (Sangji 2005).

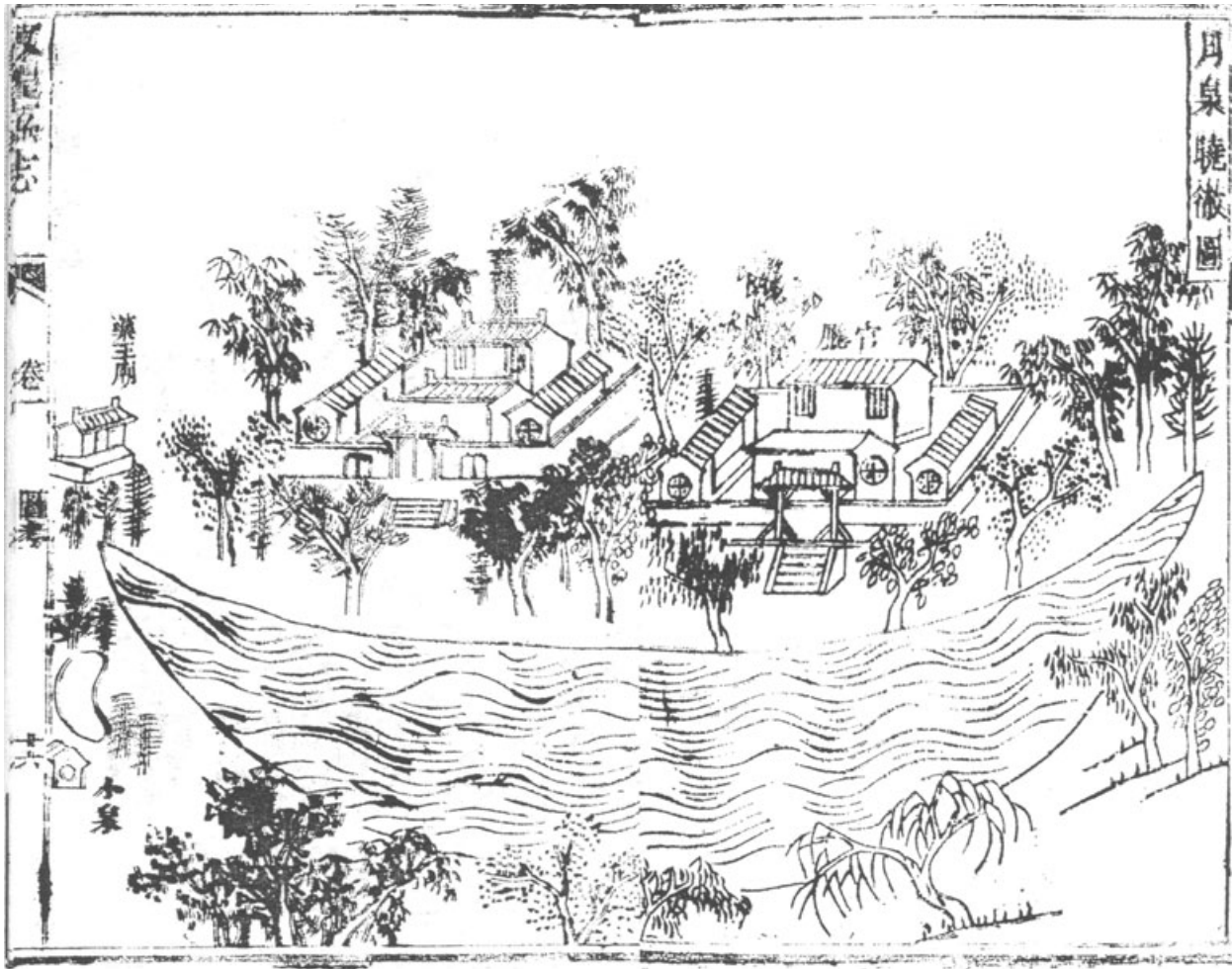
The fall of the water level led to degradation of the environment around the spring. The Chinese tamarisks on the south bank of the pond largely withered, and all trees planted on the north bank required irrigation to survive. Another adverse effect is desertification around the pond (Dong 2007).

The shrinking of the spring is caused largely by a change in the river water system and excessive use of ground water as a result of increases in population and agricultural activities. Farm areas increased from 106 km<sup>2</sup> in 1950 to 278 km<sup>2</sup> in 2007.

Before the 1960s, water from the Dang River was used for drinking and modest irrigation, but irrigation increased rapidly when the river was dammed in 1975. Because the new reservoir did not provide enough water for the expanding population and increasing agricultural activities, ground water supplies were tapped with deep wells.

By 2007, about 4000 wells were in use in Dunhuang, and the yearly ground water abstraction in Dunhuang is more than 100 million m<sup>3</sup>, which is much more than what the system can sustain. Between 1975 and 1977, water was pumped directly from the Crescent Moon Spring for irrigation. As result of overexploitation of ground water resources, the regional water table in Dunhuang has decreased by more than 10 m (Sangji 2005).

In recent years, Dunhuang city has adopted several measures to restore the water supply to the Crescent Moon Spring and protect its ecological environment. The city has banned land reclamation for cultivation, prohibited the drilling of new wells, and adopted efficient water-saving irrigation practices. These measures have helped



**Figure 3. A sketch of the Crescent Moon Spring and the buildings to the south (Su 1830). Note that there was also a small crescent-shaped pond in the left corner and trees grew on both the south and north banks.**

somewhat, but the water level in the Crescent Moon pond continues to fall year by year.

Beginning in 2002, a so-called emergency treatment project was introduced to maintain the water in the Crescent Moon Spring. Artificial recharge is conducted at four sites around the spring, with a total recharge rate of 7000 m<sup>3</sup>/d, to maintain the designated water depth of 0.3 to 1 m in the pond. As a result of these measures, the pond has maintained its current size mentioned at the beginning of this note.

The spring has essentially become an artificial pond. Although tourists can still use the background of the spring to take memorable photos, the spring will never be the same as it was before. The water is not natural ground water and, of course, not directly drinkable any more. The real spring essentially disappeared probably about 10 years ago.

The emergency treatment project can only increase the local water table in the immediate vicinity of the spring. If the regional water level continues to fall because of excessive ground water extraction in Dunhuang city,

even the emergency measures will fail to maintain the current water level in the pond.

The permanent solution seems to be to restore the regional ground water system to its condition at least prior to the 1970s. Otherwise, the Crescent Moon Spring, a marvelous spectacle of nature that survived for thousands of years in the Gobi Desert, may disappear forever as a result of overuse of ground water in the past 50 years, and this note will really be a historical note.

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