奥加拉拉蓄水层的枯竭

The vast grasslands of the High Plains in the central United States were settled by farmers and ranchers in the 1880’s. This region has a semiarid climate, and for 50 years after its settlement, it supported a low-intensity agricultural economy of cattle ranching and wheat farming. In the early twentieth century, however, it was discovered that much of the High Plains was underlain by a huge aquifer (a rock layer containing large quantities of groundwater). This aquifer was named the Ogallala aquifer after the Ogallala Sioux Indians, who once inhabited the region.

19 世纪 80 年代，在美国中部北美大平原的广阔草原上定居着农民和农场主们。这里有着半干旱的气候，在人们定居 50 年后，它支撑了一个以畜牧业和小麦种植为主的低密度农业经济。然而，在 20 世纪初，人们发现北美大平原的大部下面是巨大的蓄水层（含有大量地下水的岩层）。这个蓄水层因曾经在这里定居过的奥加拉拉苏族印第安人而得名，被称作奥加拉拉蓄水层。

The Ogallala aquifer is a sandstone formation that underlies some 583,000 square kilometers of land extending from northwestern Texas to southern South Dakota. Water from rains and melting snows has been accumulating in the Ogallala for the past 30,000 years. Estimates indicate that the aquifer contains enough water to fill Lake Huron, but unfortunately, under the semiarid climatic conditions that presently exist in the region, rates of addition to the aquifer are minimal, amounting to about half a centimeter a year.

奥加拉拉蓄水层属于砂岩结构，在从德克萨斯州西北到南达科塔州的地下绵延了583000 平方公里。雨水和融雪自 30000 年前便开始在奥加拉拉蓄积。据估计，奥加拉拉蓄水层的含水量足以填满休伦湖，但不幸的是，在目前该地区半干旱的气候条件下，奥加拉拉蓄水层的蓄水能力极低，每年仅半厘米左右。

The first wells were drilled into the Ogallala during the drought years of the early 1930’s. The ensuing rapid expansion of irrigation agriculture, especially from the 1950’s onward, transformed the economy of the region. More than 100,000 wells now tap the Ogallala. Modern irrigation devices, each capable of spraying 4.5 million liters of water a day, have produced a landscape dominated by geometric patterns of circular green islands of crops. Ogallala water has enabled the High Plains region to supply significant amounts of the cotton, sorghum, wheat, and corn grown in the United States. In addition, 40 percent of American grain-fed beef cattle are fattened here.

20 世纪 30 年代初，奥加拉拉正处于干旱时期，人们打出了第一口井。灌溉农业的迅速扩张，特别是 20 世纪 50 年代之后，改变了这一地区的经济。目前人们已经在奥加拉拉地区共开凿了 100000 多口井。日喷水量达到 4500000 升的现代灌溉设备，形成了一个圆形绿岛作物为主的景观。奥加拉拉蓄水层支撑了北美大平原地区美国棉花、高粱、小麦、玉米的灌溉需求。此外，美国百分之四十谷饲养的肉牛在这里被育肥。

This unprecedented development of a finite groundwater resource with an almost negligible natural recharge rate—that is, virtually no natural water source to replenish the water supply—has caused water tables in the region to fall drastically. In the 1930’s, wells encountered plentiful water at a depth of about 15 meters; currently, they must be dug to depths of 45 to 60 meters or more. In places, the water table is declining at a rate of a meter a year, necessitating the periodic deepening of wells and the use of ever-more-powerful pumps. It is estimated that at current withdrawal rates, much of the aquifer will run dry within 40 years. The situation is most critical in Texas, where the climate is driest, the greatest amount of water is being pumped, and the aquifer contains the least water. It is projected that the remaining Ogallala water will, by the year 2030, support only 35 to 40 percent of the irrigated acreage in Texas that is supported in 1980.

考虑到几乎没有补充率（实质上没有自然水资源进行补充），这种有限地下水资

源前所未有的发展已经引起了该地区地下水位的急剧下降。在 20 世纪 30 年代，井下 15 米就有丰富的水资源，而现在，必须挖掘到 45 米到 60 米甚至更深的地方才行。有的地方地下水位的下降速度甚至达到了每年 1 米，迫使人们周期性的加深水井并使用更有力的的水泵。按现今的下降速度来估计，大部分地下蓄水将在 40 年内耗尽。这种现象在气候最干旱的德克萨斯州尤为严重。大量的水被从地下抽起，蓄水层含水量最少。据估计，到 2030 年，德克萨斯州余下的奥加拉拉含水只能支持 1980 年灌溉面积的 30%到 40%。

The reaction of farmers to the inevitable depletion of the Ogallala varies. Many have been attempting to conserve water by irrigating less frequently or by switching to crops that require less water.█ Other, however, have adopted the philosophy that it is best to use the water while it is still economically profitable to do so and to concentrate on high-value crops such as cotton.█ The incentive of the farmers who wish to conserve water is reduced by their knowledge that many of their neighbors are profiting by using great amounts of water, and in the process are drawing down the entire region’s water supplies.█

农民们对无法避免的奥加拉拉蓄水层枯竭的反应各不相同。很多人已经开始尝试通过降低灌溉频率或者改种需水较少的庄稼来节约水资源。而另外一些人却抱着趁水资源还能产生经济效益就应抓紧利用的想法，继续种植高价值的棉花等农作物。当那些想节水的农民得知邻居们通过大量耗水的种植而盈利的时候，他们的热情降低了，从而导致了整个区域的供水量的减少。

In the face of the upcoming water supply crisis, a number of grandiose schemes have been developed to transport vast quantities of water by canal or pipeline from the Mississippi, the Missouri, or the Arkansas rivers. █Unfortunately, the cost of water obtained through any of these schemes would increase pumping costs at least tenfold, making the cost of irrigated agricultural products from the region uncompetitive on the national and international markets. Somewhat more promising have been recent experiments for releasing capillary water (water in the soil) above the water table by injecting compressed are into the ground. Even if this process proves successful, however, it would almost triple water costs. Genetic engineering also may provide a partial solution, as new strains of drought-resistant crops continue to be developed. Whatever the final answer to the water crisis may be, it is evident that within the High Plains, irrigation water will never again be the abundant, inexpensive resource it was during the agricultural boom years of the mid-twentieth century.

在即将到来的水资源供应危机面前，人们提出了一些宏伟的供水计划，比如将密西西比河、密苏里河或者阿肯色河的水通过运河或管道运到需要用水的地方。不幸的是，通过以上任何一种方式获得水资源都会将抽水的成本提高十倍以上，进而导致这一地区的灌溉农产品成本在国内和国际市场上都毫无竞争力。最近一些有希望获得成功的试验试图通过向土壤中注入压力，释放水层上方土壤中的毛细管水。即使这样行之有效，抽水成本会变到原来的三倍。基因工程也会通过继续研发抗旱作物新品种，帮助解决部分难题。无论这次水资源危机的最终结果如何，显然，北美大平原地区灌溉水资源再也不会像 20 世纪中期农业繁荣时期的那样充足并且廉价了。