
Seasonal Groundwater Withdrawal in Southwestern Louisiana: Implications for Land Subsidence and Resource Management

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ABSTRACT

According to the U.S. Geological Survey, Vermilion, Acadia, and Jefferson Davis parishes in southwestern Louisiana withdrew more than 1.7 million m³ (450 million gallons) of ground water per day in 2000. The primary aquifer in this region is the Chicot Aquifer. Most of the groundwater withdrawn is used for irrigation of agricultural fields and the use is seasonal. During the growing season, water usage is much higher than average and water levels in wells can drop by more than 10 m (33 ft). After the growing season, water withdrawals decline and water levels in wells largely rebound to their pre-growing season levels. In addition, there has been a slow long-term decline in water levels in some parts of the Chicot Aquifer due to over pumping both for irrigation and industrial use. Surface subsidence due to groundwater withdrawal results from compaction of the aquifer as well as intervening clay layers. As water pressure levels decrease in major aquifers in response to pumping, water also drains from interbedded clay confining layers. The weight of overlying sediments causes clays to compact. The clay compaction effect on surface subsidence due to long-term groundwater level declines has been well documented in Baton Rouge, Louisiana; Houston, Texas; Las Vegas, Nevada; Sacramento Valley, California; and Venice, Italy. While water levels in aquifers due to seasonal withdrawals may recover, water levels in adjacent confining layers do not. The lower permeability of clays causes them to progressively drain with each seasonal cycle of groundwater withdrawal. Thus, permanent surface subsidence is possible by this mechanism.