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# Using optical remote sensing to evaluate changes in greenness and evapotranspiration in riparian vegetation in response to the Minute 319 environmental pulse flow to Mexico

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During the spring of 2014, 130 million cubic meters of water were released from the United States' Morelos Dam on the lower Colorado River to Mexico, allowing water to reach the Gulf of California for the first time in 13 years. Our study assesses the effects of water transfer or ecological environmental flows from one nation to another. We use remote sensing and spatial applications for water resource evaluation is important for integrated, binational, integrated water resources management and planning for the Colorado River which includes seven basin states in the U.S. plus two states in Mexico. This study examined the effects of the historic binational experiment (the Minute 319 agreement) on vegetative response along the riparian corridor. We used 250 m Moderate Resolution Imaging Spectroradiometer (MODIS) and 30 m Landsat 8 satellite imagery to track evapotranspiration (ET) and the normalized difference vegetation index (NDVI). Our analysis showed an overall increase in NDVI and ET in the year following the pulse (2014), which reverses a decline in those metrics since the last major flood in 2000. NDVI and ET levels decreased in 2015, but were still significantly higher than pre-pulse (2013) levels. Preliminary findings show that this decline persisted into 2016 and 2017. We continue to analyze results for 2018 in comparison to short-term (2013-2018) and long-term (2000-2018) trends. Our results support the conclusion that these environmental flows from the U.S. to Mexico via the Minute 319 "pulse" had a positive, but short-lived, impact on vegetation growth in the delta.