Automated Monitoring to Support Adaptive Management of Actively Managed Riparian Restoration Areas

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Through implementation of the Lower Colorado River Multi-Species Conservation Program (MSCP), the United States Bureau of Reclamation is tasked with creating nearly 6,000 acres of cottonwood-willow land cover to create and maintain habitat for threatened and endangered species. Successful restoration of these obligate phreatophytes requires maintenance of shallow groundwater and low soil and groundwater salinity. Additionally, creating successful avian nesting habitat for target species such as the Southwestern Willow Flycatcher (SWFL) also requires maintenance of saturated and/or moist surface soils. As part of the adaptive management phase of MSCP restoration activities, 55 groundwater and 90 soil monitoring stations were installed within eight restoration areas to monitor groundwater depth, soil moisture, and groundwater and soil salinity in real time. These data are used to optimize irrigation schedules, determine if irrigation schedules are being followed by irrigators, and for identifying inefficiencies.

Data from the first five years of monitoring were analyzed to determine whether groundwater depth and salinity were maintained within plant tolerance thresholds during the period of peak evapotranspirative demand, and whether moist surface soils were maintained during the avian nesting season. Vegetation health was assessed using publicly available remote sensing vegetation indices for the region, which allow for rapid and inexpensive analysis of seasonal and annual changes in vegetation greenness at restoration sites. Results indicated that careful irrigation management was an essential predictor of relative interannual changes in vegetation health, particularly in areas where groundwater was deep or salinity was high. Maintenance of moist surface soils was highly dependent on soil type and irrigation frequency. At most sites, soil and groundwater conditions were maintained within vegetation tolerance thresholds. Vegetation greenness declined annually at many sites during the five-year monitoring period and may indicate declining vegetation health or changes in species composition over time.

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