Cienega de Santa Clara unchanged after pilot run of Yuma Desalting Plant

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This photo of a Yuma Clapper Rail, taken only three weeks after 80 percent of the Ciénega de Santa Clara burned in late March 2011, shows that the marsh vegetation is already growing back. The Yuma Clapper Rail, Rallus longirostris yumanensis, is listed in the U.S. as a federally endangered species and in Mexico is listed as threatened Credit: Francisco Zamora, Sonoran Institute

Mexico's Ciénega de Santa Clara has not changed since the 2010-11 pilot run of the Yuma Desalting Plant, according to a new report from a University of Arizona-led binational team of researchers.

The 15,000-acre ciénega, the largest wetland in the Colorado River Delta, is home to several endangered species and is a major stopover for birds migrating north and south along the Pacific Flyway. It lies within Mexico's Biosphere Reserve for the Upper Gulf of California and Colorado River delta.

The Mexican community of Ejido Johnson operates a small ecotourism business at the wetland. Birdwatchers are attracted by the birds found there, including the Yuma Clapper Rail, listed as an endangered species by the U.S. and as a threatened species in Mexico.

How running the desalting plant would affect the water quality, vegetation and birdlife of the ciénega was not known. The ciénega receives its water primarily from Arizona's Wellton-Mohawk irrigation district –- water that is used by the desalting plant when it operates.

When the plant is running, the water it desalinates is returned to the Colorado River. The remainder, a smaller amount of saltier water, does flow to the ciénega.

Some scientists predicted that having a smaller and saltier portion of water flow to the ciénega would alter the ecosystem, said Karl W. Flessa, the UA geosciences professor who leads the U.S.-Mexico team of researchers that has been studying the ciénega since 2006.

To ensure that the ciénega would continue receiving the same amount and quality of water as before, U.S. and Mexican government agencies and non-governmental organizations from both sides of the border worked together to provide replacement water to the ciénega during the May 2010 to March 2011 pilot run of the Yuma Desalting Plant.

The international agreement was added to the 1944 water treaty between the U.S. and Mexico and represents the first time that water was

allocated across the border for environmental purposes.

Chuck Cullom, Colorado River Programs Manager for the Central Arizona Project, said, "This unique and fruitful collaboration exemplifies the new spirit of binational cooperation and collaboration in monitoring and evaluating different environmental resources in the Colorado River system."

As part of the agreement, the researchers monitored conditions in the ciénega before, during and after the plant's pilot run.

"There was no significant change to the ciénega's hydrology, water quality, vegetation and marsh birds," said Flessa. He and his colleagues reported the team's findings in a report released by the International Boundary and Water Commission on June 25.

Cullom said, "The report really represents the most comprehensive monitoring effort to date of the cienega wetland system. It's good work that adds to the body of knowledge about the cienega."

The replacement water was delivered to the ciénega over the period of October 2009 through July 2011. The U.S. contribution was delivered before the pilot run started and another large portion of replacement water was delivered after the pilot run, said Cullom.

"There was fluctuation in water quality and salinity during the pilot run," he said. "However over the course of the monitoring there were no lasting adverse impacts to the ciénega."

Francisco Zamora, who managed the monitoring team, said the times when the plant was running and no replacement water was delivered, the vegetation seemed less healthy. However, it recovered once more water was delivered. He said it's not possible to tell from the monitoring

program how long a dry spell the ciénega can recover from.

"The fact the replacement water came at a different time than when the desalting plant ran allowed us to see these short-term changes and learn that the cienega is resilient," said Zamora, director of the Sonoran Institute's Colorado River Delta Legacy Program. "The fact that the cienega can handle these short-term changes is good."

Flessa, who is also director of UA's School of Earth and Environmental Sciences, said, "This tells us they can run the plant and little will happen -- so long as they find replacement water for the ciénega."

However, he had expected changes from the April 4, 2010 earthquake, which occurred just before the pilot run started, and the three-day wildfire that burned about 80 percent of the ciénega in late March 2011.

In both cases, he was wrong – neither the earthquake nor the fire made harmful changes. If anything, the fire burned away accumulation of dead vegetation and returned nutrients to the soil, he said.

"It turned out to be a great way to find out the beneficial effects of fire. The bird populations this year were unaffected, productivity is up, and the ciénega is greener than ever," he said.

The team's report said, "The Ciénega de Santa Clara appears to be an ecosystem that is resilient in the face of short-term disturbances."

The agencies and organizations that forged the agreement to operate Yuma Desalting Plant's pilot run, provide replacement water and to support researchers to monitor the ciénega are: the Central Arizona Water Conservation District, the Southern Nevada Water Authority, Metropolitan Water District of Southern California, U.S. Bureau of Reclamation, the environmental organizations Pronatura, Sonoran

Institute and Environmental Defense Fund, CONAGUA, Mexico's national water commission, SEMARNAT, Mexico's ministry of the environment, and the International Boundary and Water Commission.

To assess whether running the desalting plant affected the ciénega, the scientists placed instruments to record water quality and water level every 30 minutes at 20 locations all over the ciénega -- some in open water, some along the edges of the marsh, and others deep in cattail thickets.

Every month, the researchers used small boats to visit every instrument and download the information stored in it. The team also measured water flow into the ciénega from its main sources of water.

The researchers also assessed the bird populations during the breeding season and during the spring and fall migrations. The team used satellite images to measure the extent and health of the vegetation.

The team found the biggest factors affecting the ciénega's water budget are the inflow of water, the evaporation of water, and loss of water from the plants themselves, Flessa said.

During summer months, plants and evaporation consume more water than flows into the ciénega, increasing its salinity. In the winter, about half the inflow water drains through the ciénega to the lower basin. That flushing keeps salinity within the range tolerated by the plants.

During the plant's pilot run, salinity went up when water was diverted to the plant but no replacement water was being supplied. Salinity returned to normal levels when the replacement water was supplied and when the pilot run concluded, the report said. Other aspects of water quality were largely unaffected by the plant's operation.

"This story has a happy ending, and here's why," Flessa said. "It doesn't appear that there's been any lasting harm to the ciénega, and it demonstrates that by working together we can find solutions to tough environmental problems even across international boundaries."

He credits the scientific success of the project to cross-border interactions among scientists that were fostered by the National Science Foundation-funded Lower Colorado River Delta Research Coordination Network that began in 2005.

"It would have been really hard to put this team together on short notice had we not already had a respectful and collaborative atmosphere among the scientists," he said.

Provided by University of Arizona