Reclamation Funds Western Basins Studies

In September, the U.S. Bureau of Reclamation announced the implementation of a new basin study program to better define options for future water management of western river basins, where climate change, record drought, population increases, and environmental needs have heightened competition for scarce water supplies. The Colorado River basin was among three selected (out of 24 proposals) for the first phase of the project; others may be selected in subsequent years.

Each study, expected to take about two years, will include projections of future water supply and demand on a basin-wide scale, including an assessment of the impacts of climate change on water resources, analysis of how the basin's existing water and power operations and infrastructure will perform in the face of changing water realities, and recommendations on how to optimize operations and infrastructure to supply adequate water and power in the future while taking into account environmental considerations. Reclamation will provide a 50-percent cost-share contribution to state, local, and tribal partners to implement the studies.

The Colorado River Basin Water Supply and Demand Study will receive $1 million from Reclamation, matched by the seven basin states and Southern Nevada Water Authority. The other two basin studies funded include the Yakima River Basin in Washington ($1.3 million) and the Milk and St. Mary river systems in Montana ($350,000).

Visit www.usbr.gov/wci/basin.html.

Intersex Bass Widespread

U.S. Geological Survey researchers have found widespread occurrence of intersex smallmouth and largemouth bass in river basins throughout the United States.

The study, published online in *Aquatic Toxicology*, examined 16 fish species from 1995 to 2004, and found intersex to be most common in the two types of bass. One-third of all male smallmouth bass and one-fifth of all male largemouth bass were intersex, a condition primarily revealed in male fish that have immature female egg cells in their testes, but occasionally female fish have male characteristics as well.

Scientists found intersex fish in about a third of all sites examined from the Apalachicola, Colorado, Columbia, Mobile, Mississippi, Pee Dee, Rio Grande, Savannah, and Yukon river basins.

The occurrence of intersex was much more widespread than expected. However, the study did not attempt to establish causality. At least one site with a high prevalence of intersex—the Yampa River at Lay, Colorado—did not have obvious sources of the endocrine-active compounds associated with intersex in fish in previous studies.

Visit www.usgs.gov. See Hinck, J., V.S. Blazer, C.J. Schmitt, and others, 2009. Widespread occurrence of intersex in black basses (Micropterus spp.) from U.S. rivers, 1995-2004, Aquatic Toxicology, 94(4).

Parkinson's May Have Well-Water Link

Consumption of well water presumably contaminated with pesticides may play a role in development of Parkinson's disease, scientists reported in July. The research, published online in *Environmental Health Perspectives*, utilized a GIS-based model to estimate potential well-water contamination from agricultural pesticides. No well water was actually tested; pesticide application and other records were used to evaluate pesticide use, water supply from private wells, and confirmed cases of Parkinson's disease.

The results indicated that people with Parkinson's disease were more likely to have consumed private well water and on average consumed it 4.3 years longer than those without the condition. Wells potentially contaminated with methomyl, chlorpyrifos, and propargite increased the risk of Parkinson's by 70 to 90 percent.

According to *Environmental Health News*, nearly one million people in the United States have Parkinson's disease. Private well water is not regulated, and due to their generally shallow depths, private

wells are at high risk for contamination from pesticides seeping into the groundwater. Because the private wells in this study were not tested, the researchers cannot say for sure if the wells were contaminated. Therefore, while the study provides a strong link between pesticides and Parkinson's, it cannot show causality. The goal of the study was to identify specific pesticides for further investigation.

The study of over 700 people took place in an agricultural region of California—Fresno, Kern, and Tulare counties—with pesticide use documented since 1974.

Visit www.environmentalhealthnews.org. See Gatto, N.M., M. Cockburn, J. Bronstein, and others, 2009. Well water consumption and Parkinson's disease in rural California, Environmental Health Perspectives. doi: 10.1289/ehp.0900852.

Mojave Solar May Need Extra Water

Solar photovoltaic developers in southern Nevada's Mojave Desert may be underestimating the amount of water they need for their plants, reported the *Las Vegas Sun* in September.

Dust on solar panels can decrease efficiency by up to three percent, reported the paper, but developers plan to wash their arrays only a couple of times a year—the industry standard. Other systems in the area are washed anywhere from monthly to three times a year because of prevalent dust.

Not only is the Mojave Desert dusty in general, notes the paper, but the Bureau of Land Management is planning a solar array located in the middle of an existing off-road raceway that will be rerouted around the plant. This development has plans to truck in 6.8 million gallons of water for the planned semiannual cleanings.

Visit www.lasvegassun.com.

New Technology Speeds Superfund Cleanup

The Visalia Pole Yard Superfund site in California was deleted from the U.S. EPA's Superfund list at the end of September, thanks in part to two new technologies developed by Lawrence Livermore National Laboratory.

The first technique, dynamic underground stripping (DUS), is a steam-cleaning technology that was proven by cleanup of an underground gasoline spill at Livermore Lab in 1993, in which DUS removed contaminants 50 times faster than the traditional pump-and-treat process. Livermore scientists also developed a second technique, hydrous pyrolysis/oxidation (HPO), that introduces heat and water and converts contaminants in the ground to benign products such as carbon dioxide, chloride ions, and water. This process effectively destroyed all petroleum and solvent contaminants for which laboratory testing was performed.

Beginning in 1997, both DUS and HPO were used by commercial licensees to clean up the four-acre Visalia site. During the first six weeks of operation, the team removed or destroyed approximately 300,000 pounds of contaminants, a rate of about 46,000 pounds per week. For nearly 20 years, Southern California Edison had been removing contaminants from the subsurface using the standard cleanup method—pump-and-treat—at a rate of just 10 pounds per week. The amount of hydrocarbons removed or destroyed in place in those six weeks was equivalent to 600 years of pump-and-treat remediation, about 5,000 times the previous removal rate. Over the course of the next two years, more than one million pounds of contaminants were removed.

In the DUS process, 14 wells were used to inject steam into the ground at depths of 80 to 100 feet, forcing groundwater, creosote, diesel oil, and hydrocarbon vapors toward central extraction wells for recovery. In addition, some contaminants were broken down below ground using HPO. This process uses elevated subsurface temperatures to oxidize residual chemicals not removed or destroyed by DUS.

Southern California Edison had used the Visalia site for 80 years to treat utility poles by dipping them into creosote or pentachlorophenol, which by the 1970s

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had seeped into the subsurface soil and groundwater to depths of approximately 100 feet. The Visalia pole yard bore the distinction of being one of the first Superfund sites. Original estimates suggested a virtually permanent pump-and-treat operation would be required to prevent migration of the contaminated water, at a cost of greater than $100 million. The new processes shortened the total cleanup time to 10 years, at a cost of $14 million.

Visit www.llnl.gov and www.epa.gov.

Feds Neglect Mercury Mine Dangers

In September an *Associated Press* investigation found the federal government has cleaned up only 10 mercury mines in California out of more than 550 that are no longer operating. These abandoned mines pollute water and contaminate fish.

According to the investigation, at least 100,000 people who eat Sacramento-San Joaquin Bay-Delta-area fish are consuming fish with mercury levels much higher than those recommended by the U.S. EPA. However, the article noted that most of the mine sites have not been assessed for pollution, and the government has not studied long-term effects on human health from consumption of mercury-laden fish.

Bacteria convert mercury from mines into methylmercury, which can damage the brain and nervous system and is a possible carcinogen. It is bioretained, and so travels up the food chain and could harm people who consume the fish.

Mines often avoid cleaning up their operations by filing bankruptcy or changing ownership, reported *AP*, and the federal government risks litigation if it attempts to clean up a site and fails.

Visit www.ap.org.

New Desal Technique Tested

A new deep-sea desalination device is being tested in the San Joaquin Reservoir in Newport Beach, California, reported the *Orange County Register* in September. According to the paper, a small version of the device, called Demwax, will purify treated wastewater in the reservoir to test its maintenance needs. However, the purified water will not be used in the county water supply.

DXV Water Technologies, designer of Demwax, claims the system uses 70 percent less energy than traditional membrane desalination processes. In addition, process chemicals are not required for water treatment, minimal brine disposal will be required, and lack of open intakes means no impingement or entrainment of aquatic species will occur.

Demwax consists of vertically aligned flat sheets of membranes spaced to allow a large amount of source water to flow past unimpeded. The membrane cartridges will be submerged approximately 850 feet in seawater or 40 feet in fresh water to use natural hydrostatic pressure to drive the process; a venting tube communicates atmospheric pressure to the membrane pockets to create the necessary pressure differential. A submersible pump then sends purified water to shore.

According to the *Register*, a full-scale deep-sea plant would cost about the same—$300 million—as Poseidon Resources' proposed Carlsbad facility, and use the same amount of space. The company estimates a plant of that scale is 10 to 15 years in the future; however, it hopes that smaller versions will be used to purify freshwater much sooner.

Visit greenoc.freedomblogging.com and dxvwater.com.

Asian Clams Invade Lake Tahoe

While the march of zebra and quagga mussels across the western United States has been steadily documented in the news, a different type of aquatic invasive species—the Asian clam—is now threatening Lake Tahoe.

The clam was observed in Lake Tahoe as early as 2002, when its numbers were low enough to preclude concern. But in early 2008, researchers observed clamshells onshore at Tahoe beaches; follow-up investigations revealed large

beds of clams at very high densities (up to 280 per square foot) at depths of 12 to 30 feet below the lake surface.

Asian clams can degrade water quality by causing increases in algal blooms and decreases in phytoplankton and zooplankton populations. Green algal blooms correlated with the presence of the clams have already impacted water quality and swimming areas. Asian clams also outcompete native clams and snails. Additionally, concentrations of dead shells can increase calcium levels in the lake, a condition favorable to quagga mussels, which are not currently present in Lake Tahoe.

Scientists have developed a summary of the ecological impacts of Asian clams in order to help develop an effective control strategy.

Visit 169.237.166.248/research/aquaticinvasives.html. See the report: Wittmann, M., J. Reuter, G. Schladow, and others, 2008. Asian clam (Corbicula fluminea) of Lake Tahoe: Preliminary scientific findings in support of a management plan, 169.237.166.248/research/AsianClam2009.pdf.

Critical Zone Research Funded in AZ and NM

How do lithology, slope, elevation, vegetation, and seasonality affect energy, water, and carbon cycles in the "critical zone," that region from the top of the vegetation canopy down to the soil and groundwater?

In September, the National Science Foundation funded the Jemez River Basin and Santa Catalina Mountain Critical Zone Observatory (JRB-SCM CZO). The observatory consists of extensively monitored field sites in the Jemez Basin of northern New Mexico and the Santa Catalina Mountains in southern Arizona. University of Arizona scientists in the fields of hydrology, soils, biogeochemistry, and ecology will lead the research and coordinate efforts with those of five other CZOs in the United States and similar sites worldwide. Ultimately, the research may help resource managers address climate- and land-cover change issues. ■

Visit www.czo.arizona.edu.