**Grand Canyon Sandbars Disappear Quickly**

Sandbars in the Grand Canyon created by a man-made flood eroded more quickly than expected, reported the AP in September.

U.S. Department of Interior officials generated the flood as part of an experiment to rebuild sandbars in the Grand Canyon and improve the river for wildlife and visitors (see *Southwest Hydrology*, Jul/Aug 2008). Sandbars serve as habitat for plants and animals, provide beaches for river runners, and protect archaeological sites.

The three-day, 41,500 cubic-foot-per-second flood occurred in March and was two to five times the normal streamflow. However, one month after the flood, Lake Powell reached its highest water level in six years due to an unusually wet winter. This activated a requirement under the Law of the Colorado River to release extra water from Lake Powell to Lake Mead. The resulting 20-percent increase over normal flow from April to September washed away the new sandbars, said the AP report.

Grand Canyon National Park Superintendent Steve Martin told the AP that there are still benefits from the flood and that controlled floods should be repeated every one to two years, or whenever there is enough sediment. The release was part of an effort to develop long-term, science-based adaptive management.


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**Impact of Trace Organic Compounds Analyzed**

The presence of trace organic compounds (TOrCs) in wastewater treatment plant effluents is no cause for alarm, according to a new technical brief published by the Water Environment Research Foundation (WERF). The brief reviewed data on 720 TOrCs, and a WERF newsletter said the data show “no definitive evidence of harm to human health.” However, the research suggests “watchful caution.”

Researchers report that detection and measurement of TOrCs is challenging but critical. Wastewater treatment plant processes currently reduce the concentrations of TOrCs, but do not fully remove them.

Advanced treatment processes could help, suggests the study, but the characteristics of each TOrC determine how much of it can be removed.

Because TOrCs typically occur in wastewater treatment plant effluents in a mixture, researchers have trouble linking ecological effects to specific TOrCs. Biological changes associated with TOrCs have been observed downstream of treatment plants, but scientists still need to evaluate the interactions between the different organisms affected and ecological system functions.

The brief also notes that current EPA analytical methods focus on common industrial chemicals and are insufficient for all TOrCs; new methods must be developed and improved. Meanwhile, regulations are being developed and implemented for source reduction of TOrCs.

WERF is a nonprofit scientific research organization dedicated to wastewater and stormwater issues.

See www.informz.net. The full report can be viewed for a fee at www.werf.org.

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**Dams Serve as Invasion Hubs for Zebra Mussels**

Not only are aquatic invasive species more likely to occur in impoundments than in natural lakes, but impoundments also increase the number of natural lakes vulnerable to invasion, reported scientists in a study published in September.

Researchers at the universities of Colorado, Washington, and Wisconsin compiled data for 1,080 sampled water bodies across Wisconsin and the Upper Peninsula of Michigan. The data included water-body physiochemistry, boater behavior (the number of boat landings per water body), and distribution for five invasive species: Eurasian watermilfoil, zebra mussels, rusty crayfish, spiny water fleas, and rainbow smelt.

The results, published in *Frontiers in Ecology and the Environment*, show that impoundments are 2.5 to 7.8 times more likely than natural lakes to have established populations of aquatic invasive species. Although differences between lakes and impoundments—such as in water clarity, conductivity, and surface area—contribute to the differences in likelihood of the presence of invasive species, models show that impoundment status is still a significant explanatory variable for all the invaders except for zebra mussels, which are highly limited by conductivity. In fact, inclusion of additional explanatory variables strengthens the impoundment effect for the other four species, increasing the odds of occurrence up to 300 times over natural lakes.

In addition, 189 water bodies were sampled for the mussels, watermilfoil, and crayfish species, and impoundments were significantly more likely than natural lakes to support multiple invaders. The authors hypothesize that “the strong association between impoundments and nonindigenous species results from the young age, increased niche availability, and high disturbance regime characteristic of most impoundments.”

To determine the effect of impoundments on natural lakes, the researchers compared present-day (with impoundment) water body scenarios with historical (without impoundment) scenarios. For zebra mussels, the presence of impoundments reduced the mean distance between natural lakes and the nearest invaded water body by 45 percent, increasing the number of natural lakes vulnerable to invasion (through boater movement) by 50 percent. For the more established Eurasian watermilfoil,
impoundments reduced the distance by 24 percent and increased the number of vulnerable lakes by 9 percent.

The research may help with the identification and management of environments likely to be invaded by invasive species or to contribute to their spread.


More Agriculture, Less Water Use Possible in California

Farmers in California could use less water while growing more food, making more money, and helping to save the Sacramento-San Joaquin Bay-Delta, suggested the Pacific Institute in a September report.

“More with Less: Agricultural Water Conservation and Efficiency in California—A Special Focus on the Delta” evaluates four water-use efficiency scenarios against a baseline of crop use identified by the California Department of Water Resources in the 2005 California Water Plan Update. These scenarios include modest crop shifting from lower-value, high-water-use crops to higher-value, low-water-use crops; smart irrigation scheduling (using scheduling information to more precisely irrigate to meet crop water needs and boost production); advanced irrigation management; and efficient irrigation technology.

Annual water savings ranged from 0.6 million acre-feet using efficient irrigation technology to 3.4 million acre-feet using smart irrigation scheduling. Savings from advanced irrigation management and modest crop shifting would correspond almost directly to consumptive use, while smart irrigation scheduling and efficient irrigation technology result in a distribution of savings between consumptive and nonconsumptive use.

The researchers note, “Assuming that a dam yields 174,000 acre-feet of ‘new’ water, our efficiency scenarios save as much water as provided by 3 to 20 dams of this size.”

Production value could be expected to increase 40 percent with modest crop shifting and 8 percent with smart irrigation scheduling. The authors did not estimate changes in value from the other two scenarios, but assert that all four scenarios already are or could become cost-effective by implementing political, legal, and economic initiatives.

These initiatives include improved joint land and water planning, offering tax exemptions and rebates for upgrading irrigation systems, and redesigning subsidies to encourage efficiency rather than waste.

The report also notes that short-term falling of 10 percent of field crop acreage could save 1.7 million acre-feet of water per year. Retirement of 1.3 million acres with drainage problems in the San Joaquin Valley could save 3.9 million acre-feet per year.

See the full report at www.pacinst.org/reports/more_with_less_delta/.

Water Quality Impacts on Animals Studied

University of Wyoming researchers recently published a comprehensive literature review on water quality pertaining to wildlife and livestock health, the first in 30 years.

The report examined the potential effects of ten of the most common contaminants in Wyoming’s water—arsenic, barium, fluoride, molybdenum, nitrate/nitrite, pH, selenium, sodium chloride, sulfur and total dissolved solids—on animals that rely on...
wells, ponds, streams, and water produced by coal-bed methane development. The animals included cattle, horses, domestic sheep, deer, elk, and pronghorn antelope.

Researchers said in a press release that billions of gallons of groundwater have been pumped to the surface in areas of Wyoming where coal-bed methane gas is being produced, prompting concerns about water quality in relation to consumption by livestock and wildlife. This led the Wyoming Department of Environmental Quality (DEQ) to fund the study; the Wyoming Game and Fish Department was also involved.

The researchers recommended limits for short-term and chronic exposure to the contaminants to protect against impacts to health and performance factors such as growth and feed efficiency. For arsenic, the impacts are toxic effects; for fluoride, dental fluorosis; for molybdenum, secondary copper deficiency and poor performance; for nitrate/nitrite, acute death (death within two months of exposure) and abortion; for selenium, selenosis; for sodium, acute lethality or poor performance; and for sulfate, acute death. The researchers did not make recommendations for barium, pH, or total dissolved solids because of lack of data.

The *Gillette News-Record* reported in August that DEQ had used the report to help revise rules and regulations for surface-water-quality standards, and that the proposed revisions might limit the ability to obtain produced-water discharge permits. However, the newspaper added that DEQ Surface Water Standards Program Coordinator David Waterstreet said individuals and stakeholder groups, including representatives of petroleum and stock growers associations, do not believe livestock health has been impacted by the current levels of produced water discharges and were concerned that new regulations might eliminate supplies of water that have been used for years.