# Regional Water Quality NEWSLETTER

**DATE: Report for January 2007**
**Samples Collected on January 9, 2007**
**From the Phoenix, Tempe, Peoria, CAP, SRP – ASU Regional Water Quality Partnership**

**http://enpub.fulton.asu.edu/pwest/tasteandodor.htm**

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## SUMMARY: EVALUATION AND RECOMMENDATIONS

1. SRP is releasing nearly 100% Verde River water into the SRP canals.
2. This is good for WTPs in the SRP system because this water has lower DOC than the Salt River or CAP systems.
3. ZEBRA MUSSELS found in Lake Havasu – has anyone started looking in the CAP canal or SRP canal? Resources for zebra mussels are enclosed.
4. Taste and odor compounds are present at low levels in the reservoirs.
5. If you have research needs for 2007 – please email them to our team.

## Table 1 Summary of WTP Operations

| | Union Hills | 24th Street WTP | N.Tempe J.G. Martinez | Deer Valley | Greenway WTP | Val Vista | South Tempe | Chandler WTP |
|---|---|---|---|---|---|---|---|---|
| Location | **CAP** | **Arizona Canal System** | | | | **South Canal System** | | |
| PAC Type and Dose | None | | Plant shut down for routine maintenance & canal dryup | Plant shut down for routine maintenance & canal dryup | None | None | None | Plant shut down for routine maintenance |
| Copper Sulfate | None | | | | None | None | None | |
| PreOxidation | no | | | | No | 0-0.3 ppm chlorine | No | |
| Alum Dose<br>Alkalinity<br>pH | 2.9[1]<br>128<br>7.9 | | | | 27<br>226<br>8.05 | 10+30<br>245<br>7.75 | 26.6[3]<br>210<br>8.05 | |
| DOC removal | 8% DOC removal | | | | | 14% DOC removal<br><br>28% TOC removal reported by plant (TTHM = 30 ppb) | 7% DOC removal | |

**[1] Ferric chloride instead of alum**
[2] Calculated based upon influent and filtered water DOC
[3] also adding 1.4 ppm floc aid

**Table 2 - Water Treatment Plants – January 8, 2006**

| Sample Description | DOC (mg/L) | UV254 (1/cm) | SUVA | TDN |
|---|---|---|---|---|
| 24th Street WTP Inlet | | | | |
| 24th Street WTP Treated | | | | |
| Deer Valley Inlet | | | | |
| Deer Valley WTP Treated | | | | |
| Val Vista Inlet | **1.74** | **0.0480** | **2.8** | **0.221** |
| Val Vista WTP Treated –East | **1.49** | **0.0228** | **1.5** | **0.205** |
| Val Vista WTP Treated -West | **1.44** | **0.0185** | **1.3** | **0.2** |
| Union Hills Inlet | **2.55** | **0.038** | **1.5** | **0.43** |
| Union Hills Treated | **2.34** | **0.023** | **1.0** | **0.434** |
| Tempe North Inlet | | | | |
| Tempe North Plant Treated | | | | |
| Tempe South WTP | **1.79** | **0.0493** | **2.8** | **0.205** |
| Tempe South Plant Treated | **1.65** | **0.0367** | **2.2** | **0.218** |
| Chandler WTP Inlet | | | | |
| Chandler WTP Treated | | | | |
| Greenway WTP Inlet | | | | |
| Greenway WTP Treated | | | | |

**Table 3 - Canal Sampling – January 8, 2006**

| System | Sample Description | DOC (mg/L) | UV254 (1/cm) | SUVA | TDN |
|---|---|---|---|---|---|
| CAP | Waddell Canal | 2.67 | 0.0370 | 1.4 | 0.489 |
| | Union Hills Inlet | 2.55 | 0.0380 | 1.5 | 0.43 |
| | CAP Canal at Cross-connect | | | | |
| AZ Canal | Salt River @ Blue Pt Bridge | 3.64 | 0.0801 | 2.2 | 0.238 |
| | Verde River @ Beeline | 1.75 | 0.0489 | 2.8 | 0.224 |
| | AZ Canal above CAP Cross-connect | 1.94 | 0.0498 | 2.6 | 0.273 |
| | AZ Canal below CAP Cross-connect | | | | |
| | AZ Canal at Highway 87 | 2.03 | 0.0514 | 2.5 | 0.223 |
| | AZ Canal at Pima Rd. | 1.92 | 0.0519 | 2.7 | 0.192 |
| | AZ Canal at 56th St. | 1.99 | 0.0549 | 2.8 | 0.209 |
| | AZ Canal - Inlet to 24th Street WTP | | | | |
| | AZ Canal - Central Avenue | 2.09 | 0.0563 | 2.7 | 0.246 |
| | AZ Canal - Inlet to Deer Valley WTP | | | | |
| | AZ Canal - Inlet to Greenway WTP | | | | |
| South and Tempe Canals | South Canal below CAP Cross-connect | 1.70 | 0.0487 | 2.9 | 0.240 |
| | South Canal at Val Vista WTP | 1.74 | 0.0480 | 2.8 | 0.221 |
| | Head of the Tempe Canal | 1.76 | 0.0489 | 2.8 | 0.226 |
| | Tempe Canal - Inlet to Tempe's South Plant | 1.79 | 0.0493 | 2.8 | 0.205 |
| | Chandler WTP – Inlet | | | | |

**Table 4 - Reservoir Samples – January 8, 2006**

| Sample Description | Location | DOC (mg/L) | UV254 (1/cm) | SUVA | TDN |
|---|---|---|---|---|---|
| Lake Pleasant | Eplimnion | 3.03 | 0.0482 | 1.6 | 0.347 |
| Lake Pleasant | Hypolimnion | 3.22 | 0.0479 | 1.5 | 0.358 |
| Verde River @ Beeline | | 1.75 | 0.0489 | 2.8 | 0.224 |
| Bartlett Reservoir | Epilimnion | 2.39 | 0.0552 | 2.3 | 0.339 |
| Bartlett Reservoir | Epi-near dock | | | | |
| Bartlett Reservoir | Hypolimnion | 2.42 | 0.0558 | 2.3 | 0.332 |
| Salt River @ BluePt Bridge | | 3.64 | 0.0801 | 2.2 | 0.238 |
| Saguaro Lake | Epilimnion | 5.00 | 0.1058 | 2.1 | 0.458 |
| Saguaro Lake | Epi - Duplicate | 5.39 | 0.1089 | 2.0 | 0.535 |
| Saguaro Lake | Epi-near doc | | | | |
| Saguaro Lake | Hypolimnion | 5.60 | 0.1091 | 1.9 | 0.533 |
| Verde River at Tangle | | 0.78 | 0.0170 | 2.2 | 0.128 |
| Havasu | | 2.60 | 0.0367 | 1.4 | 0.448 |

## Table 5 - Water Treatment Plants – January 8, 2007

| Sample Description | MIB (ng/L) | Geosmin (ng/L) | Cyclocitral (ng/L) |
|---|---|---|---|
| 24th Street WTP Inlet | | | |
| 24th Street WTP Treated | | | |
| Deer Valley Inlet | | | |
| Deer Valley WTP Treated | | | |
| Val Vista Inlet | **<2.0** | **<2.0** | **2.6** |
| Val Vista WTP Treated –East | **<2.0** | **<2.0** | **<2.0** |
| Val Vista WTP Treated -West | **<2.0** | **<2.0** | **<2.0** |
| Union Hills Inlet | **<2.0** | **<2.0** | **<2.0** |
| Union Hills Treated | **<2.0** | **<2.0** | **<2.0** |
| Tempe North Inlet | | | |
| Tempe North Plant Treated | | | |
| Tempe South WTP | **2.1** | **<2.0** | **<2.0** |
| Tempe South Plant Treated | **<2.0** | **<2.0** | **<2.0** |
| Tempe South Plant Treated (Lab) | | | |
| Chandler WTP Inlet | | | |
| Chandler WTP Treated | | | |
| Greenway WTP Inlet | | | |
| Greenway WTP Treated | | | |

## Table 6 - Canal Sampling – January 8, 2007

| System | Sample Description | MIB (ng/L) | Geosmin (ng/L) | Cyclocitral (ng/L) |
|---|---|---|---|---|
| CAP | Waddell Canal | **<2.0** | **<2.0** | **<2.0** |
| | Union Hills Inlet | **<2.0** | **<2.0** | **<2.0** |
| | CAP Canal at Cross-connect | | | |
| AZ Canal | Salt River @ Blue Pt Bridge | **<2.0** | **3.8** | **<2.0** |
| | Verde River @ Beeline | **<2.0** | **<2.0** | **3.5** |
| | AZ Canal above CAP Cross-connect | **2.9** | **2.1** | **<2.0** |
| | AZ Canal below CAP Cross-connect | | | |
| | AZ Canal at Highway 87 | **<2.0** | **<2.0** | **8.2** |
| | AZ Canal at Pima Rd. | **<2.0** | **<2.0** | **4.0** |
| | AZ Canal at 56th St. | **<2.0** | **2.4** | **<2.0** |
| | AZ Canal - Inlet to 24th Street WTP | | | |
| | AZ Canal - Central Avenue | **<2.0** | **2.6** | **2.4** |
| | AZ Canal - Inlet to Deer Valley WTP | | | |
| | AZ Canal - Inlet to Greenway WTP | | | |
| South and Tempe Canals | South Canal below CAP Cross-connect | **<2.0** | **<2.0** | **4.6** |
| | South Canal at Val Vista WTP | **<2.0** | **<2.0** | **2.6** |
| | Head of the Tempe Canal | **<2.0** | **<2.0** | **<2.0** |
| | Tempe Canal - Inlet to Tempe's South Plant | **2.1** | **<2.0** | **<2.0** |
| | Chandler WTP – Inlet | | | |

**Table 7 - Reservoir Samples – January 8, 2007**

| Sample Description | Location | MIB (ng/L) | Geosmin (ng/L) | Cyclocitral (ng/L) |
|---|---|---|---|---|
| Lake Pleasant | Eplimnion | <2.0 | 9.0 | 2.2 |
| Lake Pleasant | Hypolimnion | <2.0 | <2.0 | <2.0 |
| Verde River @ Beeline | | <2.0 | <2.0 | 3.5 |
| Bartlett Reservoir | Epilimnion | <2.0 | <2.0 | 2.3 |
| Bartlett Reservoir | Epi-near dock | <2.0 | <2.0 | <2.0 |
| Bartlett Reservoir | Hypolimnion | <2.0 | <2.0 | <2.0 |
| Salt River @ BluePt Bridge | | <2.0 | 3.8 | <2.0 |
| Saguaro Lake | Epilimnion | 6.8 | <2.0 | <2.0 |
| Saguaro Lake | Epi - Duplicate | 4.7 | <2.0 | <2.0 |
| Saguaro Lake | Epi-near doc | 7.6 | 4.6 | 3.2 |
| Saguaro Lake | Hypolimnion | 13.6 | 3.1 | 2.3 |
| Verde River at Tangle | | <2.0 | 2.0 | <2.0 |
| Havasu | | <2.0 | <2.0 | <2.0 |

**Table 8 - SRP/CAP OPERATIONS**

Values in cfs, for January 8, 2006

| System | SRP Diversions | CAP |
|---|---|---|
| Arizona Canal | 84 | 0 |
| South Canal | 339 | 0 |
| Pumping | 103 | 0 |
| Total | 526 | 0 |

**SRP is releasing water from both Verde and Salt River Systems**. Salt River release from Saguaro Lake: 8 cfs; Verde River release from Bartlett Lake: 465 cfs.

SRP is drawing down Apache Lake – and will continue to use Salt River water released from Saguaro Lake in order to achieve this. Dam repairs/construction will be taking place in Apache Lake.

Canal Dry-up season is coming:
We will be working on portions of the Southside canals from Nov. 17 to Dec. 17 and CANAL WORK STARTS IN NOVEMBER portions of Northside canals from Jan. 5 to Feb. 4. Southside and Northside canals refer to major SRP canals south and north of the Salt River, respectively.

From the SRP Waterways Newsletter
(http://www.srpnet.com/water/pdfx/WATERWAYS1006.pdf) :

Following up on earlier information sent to you today about the discovery of zebra mussels in Lake Mead, information has now been posted to the Department's Web site at www.azgfd.gov/zebramussels.

The National Park Service, the federal agency charged with management oversight for Lake Mead National Recreation Area is scheduled to issue a news release on Wednesday, Jan. 10. Larry Riley, Fisheries Branch Chief, is the designated Arizona Game and Fish Department spokesman for this issue. All media inquiries should be referred to him.

## Zebra mussels found in Lake Mead

Zebra mussels, a harmful invasive species that disrupts traditional aquatic ecosystems, was discovered living in Lake Mead along the Arizona-Nevada border on Saturday, Jan. 6, 2007.

The freshwater mussel was first spotted at the Las Vegas Boat Harbor at the southern end of the lake by an alert marina employee who was repairing a breakwater.

Wen Baldwin, president of the Lake Mead Boat Owner's Association, confirmed the sighting and alerted authorities on Monday, Jan. 8. Subsequent examinations at Las Vegas Boat Harbor and at Lake Mead Marina further up lake revealed additional live mussels.

"Zebra mussels are a serious threat to water delivery, recreation, and fish and wildlife resources," says Larry Riley, chief of fisheries for the Arizona Game and Fish Department. "This report is credible and is being thoroughly investigated. The department is working with other state and federal agencies, particularly the National Park Service, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, and Nevada Department of Wildlife, as well as private partners to develop a rapid response strategy."

Lake Mead is approximately 1,000 miles west of any established population of zebra mussels.

Additional details will be posted on this Web site

as they develop.

For information about zebra mussels, other aquatic invasive species, and actions you can take to stop the spread of all aquatic hitchhikers, visit Protect Your Waters.

Additional information can also be found at The 100th Meridian Initiative.

## Frequently Asked Questions



## What are zebra mussels?

Zebra mussels (*Dreissena polymorpha*) are small, freshwater bi-valve mollusks (relatives to clams and oysters) that are triangular in shape with an obvious ridge between the side and bottom. The zebra mussel gets its name from the black (or dark brown) and white striped markings that appear on its shell.

## Where did zebra mussels come from?

Zebra mussels are native to the Caspian, Black and Azov seas of Eastern Europe. This exotic species was first discovered in the U.S. in Lake Saint Clair, Michigan in 1988 and is believed to have been introduced in 1986 through ballast

water discharge from ocean-going ships. Since their initial discovery, zebra mussels have spread rapidly throughout the Great Lakes and Mississippi River Basin states and other watersheds throughout the eastern and central U.S.

**How did zebra mussels get to Lake Mead?**

The zebra mussels in Lake Mead are 1,000 miles farther west than any other known colony of zebra mussels. The primary method of overland dispersal by zebra mussels is through human-related activities. Given their ability to attach to hard surfaces and survive out of water, many infestations have occurred by adults hitching rides on watercraft. The microscopic larvae also can be transported in bilges, ballast water, live wells, or any other equipment that holds water.

**What do they eat?**

They are primarily algae feeders. They feed by filtering up to a liter of water per day through a siphon.

**Why should we be concerned about Zebra Mussels?**

Zebra mussels are filter feeders that consume large portions of the microscopic plants and animals that form the base of the food web. The removal of significant amounts of phytoplankton from the water can cause a shift in native species and a disruption of the ecological balance of the lake.

Zebra mussels often settle in massive colonies that can block water intake and effect municipal water supply and agricultural irrigation and power plant operation. In the U.S., Congressional researchers estimated that zebra mussels cost the power industry $3.1 billion in the 1993-1999 period, with their impact on industries, businesses, and communities over $5 billion.

**Only a few zebra mussels were found in Lake Mead, how can that become a problem?**

Zebra mussels can live for three to five years and can release thirty to forty thousand fertilized eggs in a breeding cycle and one million fertilized eggs in a year.

**Do zebra mussels have any predators?**
Zebra mussels do not have many natural predators in North America. But, it has been documented that several species of fish and diving ducks have been known to eat them.

**What can I do to help?**
It is up to each of us to take extra precautions to stop the spread of zebra mussels or any other invasive species. The following actions should be taken with any equipment used in potentially infested waters:

- All equipment (e.g., dive gear, boats, trailers, motors, etc.) should be visually and tactically (by feel) inspected for the presence of zebra mussels prior to and after use in any water body. Additionally, any vegetation attached to this equipment must be removed and left at the site of origin.
- Remove all sediment and gritty organic materials; these could actually be zebra mussel veligers (juveniles).
- Clean and scrub boat hulls, motors, anchors and trailers, then hose equipment with hot (140° F) and/or high-pressure water. Bilges, live wells, and any other compartments that could hold water should be drained at the site of origin, and, if possible, flushed with disinfectant or hot water. All boat equipment should be allowed to remain completely dry for at least 24 hours before being used again.
- Thoroughly clean all equipment in a saltwater bath (1/2 cup per gallon) or with warm tap water (104 degrees Fahrenheit). Ensure that all equipment remains completely dry for at least 24 hours before being used again. Pay special attention to those areas and equipment that can hold water.
- Take similar precautions with waders, bait buckets, and other equipment that can hold water or comes into contact with water.

**Map of Lake Mead**

Zebra mussel were found at Las Vegas Boat Harbor and Lake Mead Marina on 1/8/07. See Anchor icons above.

**Zebra Mussel Resources:**

**AWWARF**

821 Controlling Zebra Mussels at Water Treatment Plant Intakes II
Investigates operational aspects likely to be affected by zebra mussel infestation. Studies distribution of pipe infestation, pipe interior roughness changes and hydraulic impacts, and waste material handling. Also evaluates sodium hypochlorite, potassium permanganate, chlorine dioxide, and chloramine for preventing mussel settlement. Research partner: USEPA. Ended in 1998. *A report of partial findings is available only to AwwaRF subscribers.* 1992 821 733 Biology and Potential Impacts of Zebra Mussels in Large Rivers
Evaluates the survival, growth, and reproduction of the zebra mussel, *Dreissena polymorpha*, and the quagga mussel, *D. bugensis*, in riverine mesocosms using untreated, flowing river water. Also examines the seasonal effects of elevated temperatures and the influence of current velocity. Helps predict the ecological success of *Dreissena polymorpha* in large river ecosystems, and thus their potential impact on water utilities. Also monitors the population dynamics of zebra mussels within the Ohio River. Published in 1997. ***(Still available to AwwaRF subscribers as Order 90724.)*** 1991 90724 614 Controlling Zebra Mussels at Water Treatment Plant Intakes
Evaluates the effectiveness and costs of chemical treatments on zebra mussel veliger inactivation and veliger mortality. Reports on studies of sodium hypochlorite, iron plus hydrogen peroxide,

potassium permanganate, chlorine dioxide, chloramine, and ammonium at two Lake Erie sites. Published in 1997. ***(Still available to AwwaRF subscribers as Order 90612.)*** 1990 90612

**USGS**
**http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/**

**Welcome to the Zebra Mussel Page** 

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 **Zebra and Quagga Mussel Information**

- Zebra mussel fact sheet
- Quagga mussel fact sheet
- FAQ (frequently asked questions about the zebra mussel)
- Zebra mussel vs. Quagga mussel FAQ

 Zebra Mussel - U.S. Distribution Information

- U. S. Distribution Maps: 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, **2004**, **2005**, Downloadable 2005 map - 1 MB
- Zebra Mussel Time Series Map
- Zebra Mussel Distribution in U. S. Lakes Map (mouse over states for more information)
- Zebra Mussel Query By State

 Zebra Mussel News

- Zebra Mussel Distribution Update (August 1993)
- Zebra Mussel Distribution Update (July 1994)
- Zebra Mussel Distribution Update (July 1995)
- Zebra Mussel Distribution Update (July 1996)
- Zebra Mussel Distribution Update (July 1997)
- Zebra Mussel Found in the Missouri River (1999)

--Significant Reports--

- **Zebra Mussels Found in Virginia Waters for the First Time.** (9/9/2002) They were discovered August 3, 2002 by a recreational diver in Millbrook Quarry adjacent to the Broad Run near Haymarket, Virginia. The diver, who recognized them immediately, then very alertly contacted the

Virginia Department of Game and Inland Fisheries. Shortly afterwards, the mussels were positively identified as zebra mussels. It appears that they are established as there may be several year classes present.

- **Zebra Mussels Found for the First Time in Kansas in El Dorado Lake in Southeastern Kansas** (8/25/2003)

- **Zebra Mussel Veligers Were Identified from the Middle Missouri River in Northeast Nebraska** (2/12/2004)Water samples were collected last summer and recently identified to have zebra mussel veligers (larvae) at two places in the river. No adult population has been found to date near the veliger sites.
(2005 U.S. Distribution Map)


Photo Gallery

- Zebra Mussel (*Dreissena polymorpha*)
- Quagga Mussel (*Dreissena bugensis*)


Journals with zebra mussel information

Journals