Regional Water Quality NEWSLETTER

DATE: Report for February 2014
A Tempe, Glendale, Peoria, Chandler, Phoenix, ADEQ, CAP, SRP, Epcor
NSF Central Arizona-Phoenix Long-Term Ecological Research
ASU Regional Water Quality Partnership

http://faculty.engineering.asu.edu/pwesterhoff/research/regional-water-quality-issues/

SUMMARY

1. In December and January T&O levels were elevated in some canals, and geosmin was being produced. In February – T&O levels are low again – below 5 ng/L and no geosmin production is observed.
2. This month was our quarterly sampling in the Salt River Reservoirs and dissolved organic carbon (DOC) levels are fairly uniform across the reservoirs and on the order of 3.5 to 4.0 mg/L.

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Havasu (Jan)		2.8	0.048	1.7	0.5
Lake Pleasant (Jan)	Epilimnion	3.0	0.046	1.5	0.4
	Hypolimnion	3.1	0.047	1.5	0.4
Bartlett Reservoir	Epilimnion	3.5	0.083	2.4	0.4
	Hypolimnion	3.4	0.083	2.4	0.4
Saguaro Lake	Epilimnion	4.5	0.070	1.5	0.5
	Epi - Duplicate	4.6	0.070	1.5	0.6
	Hypolimnion	6.1	0.070	1.2	0.5
Roosevelt					
Point 1	Epilimnion	3.8	0.070	1.8	0.35
	Hypolimnion	4.2	0.074	1.8	0.49
Point 2	Epilimnion	3.7	0.069	1.9	0.36
	Hypolimnion	3.6	0.069	1.9	0.40
Apache					
Point 1	Epilimnion	4.0	0.062	1.5	0.43
	Hypolimnion	3.7	0.060	1.6	0.40
Point 2	Epilimnion	3.7	0.055	1.5	0.43
	Hypolimnion	4.1	0.061	1.5	0.45
Canyon					
Point 1	Epilimnion	4.0	0.067	1.7	0.53
	Hypolimnion	4.5	0.068	1.5	0.54
Point 2	Epilimnion	4.1	0.068	1.7	0.52
	Hypolimnion	4.0	0.067	1.7	0.52

3. The Arizona snowpack is below normal through February 7, 2014 – and without additional snow, then runoff may be light this spring. Low runoff results not only in reduced availability of water in the reservoirs, but reduced runoff brings in less "organic matter" into the reservoirs.
4. On the ASU campus, we have observed copper in tap water of recently completed buildings (2-4 years old) and are seeking ideas for how to reducing this corrosion potential.

Blue-Water at ASU

ASU has many new buildings (lucky us), but we have discovered high levels of copper in the tap water of these new buildings. Our own research building had copper levels above 1.3 mg/L on a recent sampling. Many of the water fountains and fixtures have classical "blue" stains associated with copper.

The City of Tempe water outside the building contains < 0.1 mg/L and it is clear the copper is coming from corrosion of the pipes in building.

Industrious students have sampled other buildings on campus, and found a general relationship between the age of the building and copper levels – with buildings brough on-line within the last 2-4 years all having copper levels above 0.3 mg/L.

As copper pipes age, they build up impermeable scales on the inside of the pipes. Until these scales develop, lighter and fluffier scales of blue copper deposits such as malichite develop. When flushed by moving water, these fluffier scale slough off and come out the tap – giving blue water. Does anyone know how long it takes for new copper pipes to age, and develop scales that yield low copper levels?

ASU is looking into means to control copper corrosion in the buildings – ANY GOOD IDEAS?

SNOWPACK UPDATE

http://www.thorntonweather.com/snow-basins.php

United States Department of Agriculture | Natural Resources Conservation Service | Water and Climate Center Portland, Oregon

S N O W - P R E C I P I T A T I O N U P D A T E

Based on Mountain Data from NRCS SNOTEL Sites
As of FRIDAY: FEBRUARY 7 , 2014

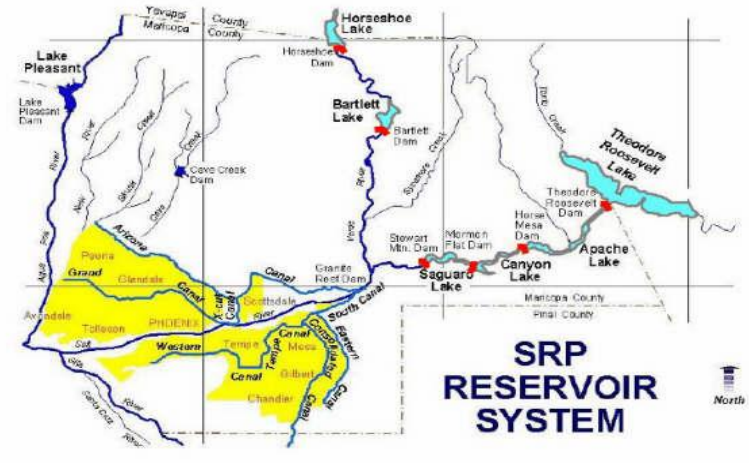
STATE RIVER BASIN	Number of Sites	PERCENT OF Snow Water Equivalent	Normal Accum Precip
ARIZONA			
VERDE RIVER BASIN	5 of 10	43	55
SAN FRANCISCO PEAKS	1 of 1	93	66
CENTRAL MOGOLLON RIM	3 of 4	15	57
LITTLE COLORADO - SOUTHERN HEADWATERS	5 of 6	27	58
UPPER SALT RIVER BASIN / WHITE MOUNTAINS	7 of 8	39	57
SAN FRANCISCO / UPPER GILA RIVER BASIN	7 of 8	36	47

Quick Update of Water Supplies for February 2014
(during day of sampling – February 4, 2014)

Source	Trend in supply	Discharge to water supply system	Flow into SRP Canal System	Dissolved organic carbon Concentration (mg/L) **
Salt River	Reservoirs at 56% full	8 cfs	53 cfs into **Arizona Canal**	4.5 mg/L
Verde River	Reservoirs At 50% full	322 cfs	350 cfs into **South Canal** **(97% Verde River Water)**	3.5 mg/L
Colorado River	Lake Pleasant is 73% full (Lake Powell is 40% full)	Lake Pleasant is being filled from the CAP canal	27 cfs of **CAP water** into Arizona Canal	3.0 mg/L
Groundwater	Generally increasing due to recharge	113 cfs pumping by SRP	113cfs **Groundwater Pumping** into SRP Canals	0.5 to 1 mg/L

*Concentration of these taste and odor compounds in the upper [lower] levels of the terminal reservoir (Saguaro Lake on the Salt River; Bartlett Lake on the Verde River; Lake Pleasant on the CAP system
**Concentration of DOC in the terminal reservoir
*** On paper cities are receiving CAP water in the SRP canals, but as a method of "paying back" from the last drought for excess CAP deliveries – SRP is delivering wet water only from the Salt and Verde Rivers
Data from the following websites:

- http://www.srpwater.com/dwr/
- http://www.cap-az.com/index.php/departments/water-operations/lake-pleasant
- http://lakepowell.water-data.com/



Dissolved Organic Carbon In Reservoirs and Treatment Plants

DOC = Dissolved organic carbon
UV254 = ultraviolet absorbance at 254 nm (an indicator of aromatic carbon content)
SUVA = UV254/DOC
TDN = Total dissolved nitrogen (mgN/L)

Reservoir Samples

Table 4 - Reservoir Samples – February 5-6, 2014

Reservoir sampling conducted monthly. CAP is sampling Lake Pleasant and Havasu, and USGS is sampling Verde River at Tangle and Salt River above Roosevelt on slightly different days than the other reservoirs.

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Havasu (Jan)		2.8	0.048	1.7	0.5
Lake Pleasant (Jan)	Epilimnion	3.0	0.046	1.5	0.4
	Hypolimnion	3.1	0.047	1.5	0.4
Verde River (Jan)	@ Tangle	not collected due to government shutdown			
Verde River	@ Beeline Hwy	3.4	0.079	2.3	0.5
Bartlett Reservoir	Epilimnion	3.5	0.083	2.4	0.4
	Hypolimnion	3.4	0.083	2.4	0.4
Saguaro Lake	Epilimnion	4.5	0.070	1.5	0.5
	Epi - Duplicate	4.6	0.070	1.5	0.6
	Hypolimnion	6.1	0.070	1.2	0.5
Salt River	@ Blue Point Bridge	dry river bed			

Table 5 - Upper Reservoir Samples – February 5-6, 2014

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Roosevelt					
Point 1	Epilimnion	3.8	0.070	1.8	0.35
	Hypolimnion	4.2	0.074	1.8	0.49
Point 2	Epilimnion	3.7	0.069	1.9	0.36
	Hypolimnion	3.6	0.069	1.9	0.40
Apache					
Point 1	Epilimnion	4.0	0.062	1.5	0.43
	Hypolimnion	3.7	0.060	1.6	0.40
Point 2	Epilimnion	3.7	0.055	1.5	0.43
	Hypolimnion	4.1	0.061	1.5	0.45
Canyon					
Point 1	Epilimnion	4.0	0.067	1.7	0.53
	Hypolimnion	4.5	0.068	1.5	0.54
Point 2	Epilimnion	4.1	0.068	1.7	0.52
	Hypolimnion	4.0	0.067	1.7	0.52

Table 3 - Rivers and Canals – February 4, 2014

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Waddell Canal	4.4	0.048	1.1	0.6
Anthem WTP Inlet	Not Accessible			
Union Hills Inlet	2.8	0.047	1.7	0.5
CAP Salt-Gila Pump Station (Jan)	3.0	0.047	1.6	0.4
CAP Mesa Turnout (Jan)	3.3	0.047	1.4	0.4
CAP Canal at Cross-connect	2.9	0.047	1.6	0.5
Salt River @ Blue Pt Bridge	dry river bed			
Verde River @ Beeline	3.4	0.079	2.3	0.5
AZ Canal above CAP Cross-connect	3.4	0.073	2.2	0.5
AZ Canal below CAP Cross-connect	3.4	0.073	2.2	0.5
AZ Canal at Highway 87	3.5	0.077	2.2	0.4
AZ Canal at Pima Rd.	3.5	0.084	2.4	2.2
AZ Canal at 56th St.	no flow			
AZ Canal - Central Avenue	3.8	0.089	2.3	0.5
AZ Canal - Inlet to Glendale WTP AZ Canal - Inlet to GreenwayWTP	Offline			
South Canal below CAP Cross-connect	3.0	0.072	2.4	0.4
Head of the Tempe Canal	3.0	0.070	2.4	0.5
Tempe Canal - Inlet to Tempe's South Plant	2.9	0.069	2.4	2.4
Head of the Consolidated Canal	3.8	0.072	1.9	0.5
Middle of the Consolidated Canal	2.9	0.060	2.1	0.8
Chandler WTP – Inlet	2.3	0.055	2.3	1.3

Table 2 - Water Treatment Plants – February 4, 2014

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN	DOC removal (%)
Union Hills Inlet	2.8	0.047	1.7	0.5	
Union Hills Treated	2.5	0.028	1.1	0.5	13
Tempe North Inlet Tempe North Plant Treated	Offline				
Tempe South Inlet	2.9	0.069	2.4	0.4	
Tempe South Plant Treated	2.5	0.038	1.5	0.5	14
Greenway WTP Inlet Greenway WTP Treated	Offline				
Glendale WTP Inlet Glendale WTP Treated	Offline				
Anthem WTP Inlet Anthem WTP Treated	Not Accessible				
Chandler WTP Inlet	2.3	0.055	2.3	1.3	
Chandler WTP Treated	2.0	0.038	1.9	1.9	16

Taste and Odor

MIB, Geosmin and Cyclocitral are compounds naturally produced by algae in our reservoirs and canals, usually when the water is warmer and algae are growing/decaying more rapidly. They are non toxic, but detectable to consumers of water because of their earthy-musty-moldy odor. The human nose can detect these in drinking water because the compounds are semi-volatile. Since compounds are more volatile from warmer water, these tend to be more noticable in the summer and fall. The human nose can detect roughly 10 ng/L of these compounds. Our team collects samples from the water sources and raw/treated WTP samples.

Table 4 - Reservoir Samples – February 5, 2014

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant (Jan)	Eplimnion	**4.2**	**<2.0**	**<2.0**
Lake Pleasant (Jan)	Hypolimnion	**4.8**	**<2.0**	**<2.0**
Verde River @ Beeline		**2.4**	**3.6**	**<2.0**
Bartlett Reservoir	Epilimnion	**<2.0**	**<2.0**	**<2.0**
Bartlett Reservoir	Epi-near dock	**<2.0**	**<2.0**	**<2.0**
Bartlett Reservoir	Hypolimnion	**<2.0**	**<2.0**	**<2.0**
Salt River @ BluePt Bridge				
Saguaro Lake	Epilimnion	**<2.0**	**<2.0**	**<2.0**
Saguaro Lake	Epi - Duplicate	**<2.0**	**<2.0**	**<2.0**
Saguaro Lake	Epi-near dock	**<2.0**	**<2.0**	**<2.0**
Saguaro Lake	Hypolimnion	**<2.0**	**<2.0**	**<2.0**
Lake Havasu (Jan)		**<2.0**	**4.2**	**<2.0**
Verde River at Tangle Creek		**<2.0**	**<2.0**	**<2.0**
Roosevelt at Salt River Inlet		**<2.0**	**<2.0**	**<2.0**

Quarterly Lake Sampling - February 5-6, 2013

Sample Description	Site	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Roosevelt Lake	Site 1A	Eplimnion	2.6	<2.0	<2.0
Roosevelt Lake	Site 1B	Hypolimnion	2.7	<2.0	<2.0
Roosevelt Lake	Site 2A	Eplimnion	2.2	<2.0	<2.0
Roosevelt Lake	Site 2B	Hypolimnion	2.1	<2.0	<2.0
Apache Lake	Site 1A	Eplimnion	<2.0	<2.0	<2.0
Apache Lake	Site 1B	Hypolimnion	<2.0	<2.0	<2.0
Apache Lake	Site 2A	Eplimnion	<2.0	<2.0	<2.0
Apache Lake	Site 2B	Hypolimnion	<2.0	<2.0	<2.0
Canyon Lake	Site 1A	Eplimnion	<2.0	<2.0	<2.0
Canyon Lake	Site 1B	Hypolimnion	<2.0	<2.0	<2.0
Canyon Lake	Site 2A	Eplimnion	<2.0	<2.0	<2.0
Canyon Lake	Site 2B	Hypolimnion	<2.0	<2.0	<2.0

Table 2 - Water Treatment Plants – February 4, 2014

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Union Hills Inlet	<2.0	2.6	<2.0
Union Hills Treated	<2.0	2.7	<2.0
Tempe North Inlet			
Tempe North Plant			
Tempe South WTP	2.4	3.2	<2.0
Tempe South Plant	2.4	4.6	<2.0
Anthem Inlet			
Anthem Treated			
Chandler Inlet	<2.0	2.2	<2.0
Chandler Treated	<2.0	2.8	<2.0
Greenway WTP Inlet			
Greenway WTP Treated			
Glendale WTP Inlet			
Glendale WTP Treated			
24th St. WTP Inlet			
24th St. WTP Outlet			

Table 3 - Canal Sampling – February 4, 2014

System	Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
CAP	Waddell Canal	2.2	3.1	<2.0
	Union Hills Inlet	<2.0	2.6	<2.0
	CAP Canal at Cross-connect	<2.0	2.7	<2.0
	Salt River @ Blue Pt Bridge			
	Verde River @ Beeline	2.4	3.6	<2.0
AZ	AZ Canal above CAP Cross-connect	<2.0	4.2	<2.0
Canal	AZ Canal below CAP Cross-connect	<2.0	4.4	<2.0
	AZ Canal at Highway 87	2.4	4.4	<2.0
	AZ Canal at Pima Rd.	2.7	5.1	<2.0
	AZ Canal at 56th St.			
	AZ Canal - Central Avenue	<2.0	2.7	<2.0
	AZ Canal - Inlet to Glendale WTP			
	Head of the Consolidated Canal	2.5	4.8	<2.0
	Middle of the Consolidated Canal	2.4	3.8	<2.0
	Tempe Canal - Inlet to Tempe's South Plant	2.4	3.2	<2.0
	Mesa Turnout (Jan)	4.0	<2.0	<2.0
	Salt-Gila Pump (Jan)	3.7	<2.0	<2.0
	ISTB4	<2.0	2.7	<2.0