REGIONAL WATER QUALITY NEWSLETTER

DATE: Report for August 2011

A Tempe, Glendale, Peoria, Chandler, CAP, SRP, Arizona American Water– ASU Regional Water Quality Partnership

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

Quick Update of Water Supplies for August 2011
(during day of sampling – August 2, 2011)

Source	Trend in supply	Discharge to water supply system	Flow into SRP Canal System	**MIB** * Concentration (ng/L)	Dissolved organic carbon Concentration (mg/L) **
Salt River	Reservoirs at 81% full	1417 cfs	857 cfs into **Arizona Canal**	**130 ng/l [11 ng/L]**	4.6 mg/L
Verde River	Reservoirs At 31% full	150 cfs	768 cfs into **South Canal (90% Salt River Water)**	**2 ng/L [11 ng/L]**	3.4 mg/L
Colorado River	Reservoirs at near historic lows (Lake Pleasant is 58% full)	3200 cfs from CAP (Lake Pleasant releasing water)	83 cfs of **CAP water** into Arizona Canal	**<2**	3.5 mg/L
Groundwater	Generally increasing due to recharge	120 cfs pumping by SRP	120 cfs **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

Data from the following websites:

- http://www.srpwater.com/dwr/
- http://www.cap-az.com/Operations/LakePleasantOps.aspx

SUMMARY: EVALUATION AND RECOMMENDATIONS

1. MIB plus geosmin levels above 10 ng/L in finished water lead to noticeable earthy-musty odors by customers. Currently MIB+geosmin levels are 10-15 ng/L in the SRP canals and lower in treated water. Concentrations are increasing in Saguaro Lake and over the next month will start to increase levels in the SRP Canals. Lake Pleasant levels are low and this should be ok as CAP tries to release water from Lake Pleasant later into September this year.
2. We show long term trends in DOC concentrations in the reservoir systems as some cities consider ordering more CAP water, with lower DOC, into the SRP canal system. WE WANT ANY DATA YOU MAY Have – see section below.
3. We are starting to monitor water quality in Roosevelt Lake to track impacts of the Wallow Fire in the upper parts of the SRP watershed on our water supply.
4. We show the short-term effect of monsoon rains on dissolved organic carbon in the SRP canal from a recent rain event.

Taste and Odor Data

MIB plus geosmin levels above 10 ng/L in finished water lead to noticeable earthy-musty odors by customers. Currently MIB+geosmin levels are above 10 ng/L in the canals.

Water Supply Sources

Reservoir Samples – August 2, 2011

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant (July11)	Eplimnion	<2.0	<2.0	2.6
Lake Pleasant (July11)	Hypolimnion	<2.0	<2.0	10.5
Verde River @ Beeline				
Bartlett Reservoir	Epilimnion	2.5	<2.0	<2.0
Bartlett Reservoir	Epi-near dock	11.2	<2.0	2.0
Bartlett Reservoir	Hypolimnion	<2.0	<2.0	<2.0
Salt River @ BluePt Bridge		5.8	2.8	5.6
Saguaro Lake	Epilimnion	121.5	2.7	2.6
Saguaro Lake	Epi - Duplicate	143.9	<2.0	2.3
Saguaro Lake	Epi-near dock	38.3	<2.0	<2.0
Saguaro Lake	Hypolimnion	11.3	<2.0	<2.0
Lake Havasu (July11)		<2.0	3.5	5.0
Verde River at Tangle Creek (June11)		7.7	4.5	7.2

Reservoir Samples – July 12, 2011

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)
Lake Pleasant (June11)	Eplimnion	<2.0	<2.0
Lake Pleasant (June11)	Hypolimnion	<2.0	<2.0
Verde River @ Beeline			
Bartlett Reservoir	Epilimnion	<2.0	2.2
Bartlett Reservoir	Epi-near dock	<2.0	<2.0
Bartlett Reservoir	Hypolimnion	<2.0	2.3
Salt River @ BluePt Bridge		2.2	<2.0
Saguaro Lake	Epilimnion	20.3	2.4
Saguaro Lake	Epi - Duplicate		
Saguaro Lake	Epi-near dock	11.3	2.1
Saguaro Lake	Hypolimnion	3.7	<2.0
Lake Havasu (June11)		<2.0	2.5
Verde River at Tangle Creek		<2.0	4.0

Around this time every year, Saguaro Lake has very high MIB levels. As the lake thermally destratifies (usually in September) this causes a 4 to 6 week PULSE of MIB into the SRP system. Fortunately, MIB also biodegrades in the reservoir at a rate of about 1 ng/L/day. Also, the epiliminion of warm water containing the MIB is only 10-15 m deep, so when it mixes with the other 30-40 m depth of water it is also diluted.

Over the next few weeks we can expect MIB concentration in SRP water to gradually increase.

Canal Sampling –August 1, 2011

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	<2.0	<2.0	<2.0
	Salt River @ Blue Pt Bridge	5.8	2.8	5.6
	Verde River @ Beeline			
AZ	AZ Canal above CAP Cross-connect	8.2	4.5	3.0
Canal	AZ Canal below CAP Cross-connect	6.4	3.7	<2.0
	AZ Canal at Highway 87	9.0	3.7	8.3
	AZ Canal at Pima Rd.	5.4	4.6	5.3
	AZ Canal at 56th St.	4.5	5.5	3.4
	AZ Canal - Central Avenue	7.9	8.9	7.5
	AZ Canal - Inlet to Glendale WTP	5.4	7.1	<2.0
	Head of the Consolidated Canal	5.3	<2.0	2.0
	Middle of the Consolidated Canal	3.7	4.0	<2.0
South	South Canal below CAP Cross-connect	7.1	4.2	7.4
Tempe	Head of the Tempe Canal	4.8	3.6	5.0
Canals	Tempe Canal - Inlet to Tempe's South Plant	<2.0	<2.0	<2.0

Table 3 - Canal Sampling – July 11, 2011

System	Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
CAP	Waddell Canal	<2.0	<2.0	<2.0
	Union Hills Inlet			
	CAP Canal at Cross-connect			
	Salt River @ Blue Pt Bridge	2.2	<2.0	2.5
	Verde River @ Beeline			
AZ	AZ Canal above CAP Cross-connect	3.4	2.4	2.6
Canal	AZ Canal below CAP Cross-connect	3.8	2.3	2.9
	AZ Canal at Highway 87	3.1	2.6	2.7
	AZ Canal at Pima Rd.	2.4	2.4	<2.0
	AZ Canal at 56th St.	2.6	3.3	<2.0
	AZ Canal - Central Avenue	3.3	4.5	2.5
	AZ Canal - Inlet to Glendale WTP	3.7	3.2	<2.0
	Head of the Consolidated Canal	3.0	2.2	2.3
	Middle of the Consolidated Canal	2.3	2.4	<2.0
South	South Canal below CAP Cross-connect	2.0	2.4	4.1
Tempe	Head of the Tempe Canal	4.4	2.3	6.3
Canals	Tempe Canal - Inlet to Tempe's South Plant	<2.0	<2.0	<2.0

The SRP canals contain 90% Salt River and 10% Verde River water at the head of the AZ and South Canals (roughly). Therefore, the MIB levels are dominated by release of water from the Salt River system. The MIB levels are about double now in August compared to July. **Addition of PAC or other MIB control measures within your plants are now needed, as customers can sensor the earthy-musty-moldy odor when MIB+geosmin exceeds around 15 ng/L combined.** There is no unusual production of T&O compounds in the Canal system

Water Treatment Plants – August 1, 2011

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Union Hills Inlet	<2.0	<2.0	<2.0
Union Hills Treated	<2.0	<2.0	<2.0
Tempe North Inlet	6.5	5.6	3.5
Tempe North Plant Treated	3.2	<2.0	<2.0
Tempe South WTP	<2.0	3.0	<2.0
Tempe South Plant Treated	<2.0	<2.0	<2.0
Anthem Inlet	<2.0	<2.0	<2.0
Anthem Treated	<2.0	<2.0	<2.0
Chandler Inlet	4.4	<2.0	<2.0
Chandler Treated	3.0	3.7	<2.0
Greenway WTP Inlet	<2.0	3.6	<2.0
Greenway WTP Treated	<2.0	2.8	<2.0
Glendale WTP Inlet	5.4	7.1	<2.0
Glendale WTP Treated	<2.0	<2.0	<2.0

Water Treatment Plants – July 11, 2011

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Union Hills Inlet			
Union Hills Treated	<2.0	<2.0	<2.0
Tempe North Inlet	2.8	2.9	<2.0
Tempe North Plant Treated	2.5	<2.0	4.8
Tempe South WTP	<2.0	<2.0	<2.0
Tempe South Plant Treated	<2.0	<2.0	<2.0
Anthem Inlet	<2.0	<2.0	<2.0
Anthem Treated	<2.0	<2.0	<2.0
Chandler Inlet	2.0	2.1	<2.0
Chandler Treated	<2.0	3.7	<2.0
Greenway WTP Inlet	4.8	3.5	<2.0
Greenway WTP Treated	<2.0	<2.0	<2.0
Glendale WTP Inlet	3.7	3.2	<2.0
Glendale WTP Treated	<2.0	<2.0	<2.0

Organic Matter in Water Treatment Plants

Water Treatment Plants –August 01, 2011

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN	DOC removal (%)
Union Hills Inlet	3.21	0.05	1.54	0.52	
Union Hills Treated	2.62	0.03	1.10	0.46	18
Tempe North Inlet	3.90	0.08	2.01	0.37	
Tempe North Plant Treated	2.67	0.04	1.49	0.32	32
Tempe South WTP	3.77	0.08	2.01	0.39	
Tempe South Plant Treated	2.59	0.04	1.56	0.28	31
Greenway WTP Inlet	3.62	0.08	2.09	0.79	
Greenway WTP Treated	2.76	0.03	1.03	1.76	24
Glendale WTP Inlet	3.91	0.08	1.95	0.41	
Glendale WTP Treated	2.51	0.03	1.14	0.48	36
Anthem WTP Inlet	3.09	0.05	1.57	0.53	
Anthem WTP Treated	2.94	0.05	1.61	0.53	5
Chandler WTP Inlet	3.72	0.08	2.08	0.68	
Chandler WTP Treated	3.07	0.05	1.60	0.57	17

Water Treatment Plants –July 11, 2011

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN	DOC removal (%)
Union Hills Inlet	3.36	0.05	1.48	0.47	
Union Hills Treated	2.78	0.03	0.95	0.36	17
Tempe North Inlet	5.01	0.13	2.57	0.64	
Tempe North Plant Treated	3.03	0.04	1.30	0.29	39
Tempe South WTP	4.02	0.08	1.87	0.33	
Tempe South Plant Treated	2.92	0.04	1.42	0.27	28
Greenway WTP Inlet	3.76	0.07	1.84	1.36	
Greenway WTP Treated	2.98	0.03	0.88	1.47	21
Glendale WTP Inlet	4.10	0.08	1.90	0.68	
Glendale WTP Treated	2.77	0.03	1.16	0.35	32
Anthem WTP Inlet	3.19	0.05	1.48	0.50	
Anthem WTP Treated	3.10	0.05	1.45	0.46	3
Chandler WTP Inlet	4.04	0.08	1.91	0.35	
Chandler WTP Treated	3.05	0.05	1.54	0.34	24

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)

Organic Matter In Reservoirs

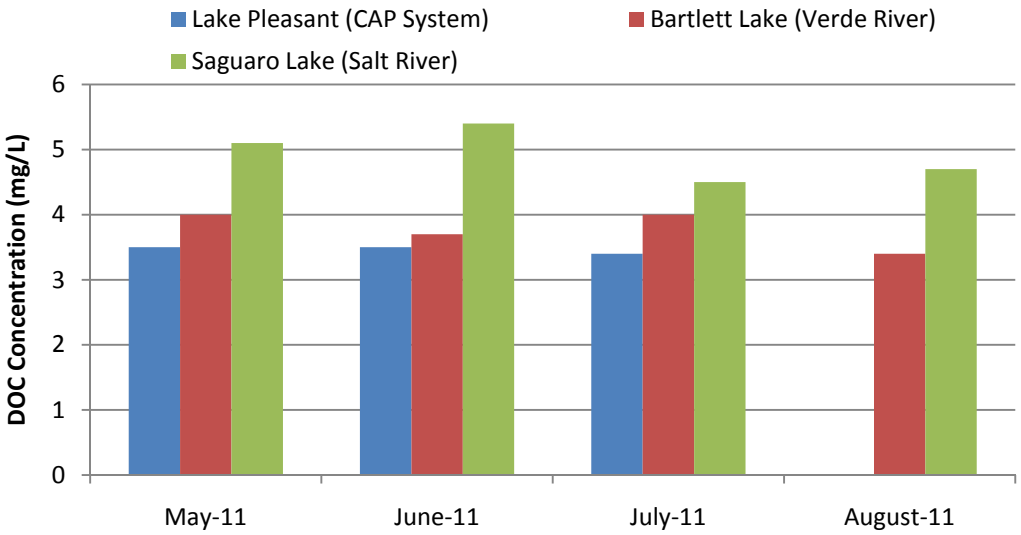
Reservoir Samples – August 01, 2011

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant - July 2011	Eplimnion	3.20	0.05	1.63	0.88
Lake Pleasant - July 2011	Hypolimnion	3.62	0.05	1.31	0.41
Verde River @ Beeline					
Bartlett Reservoir	Epilimnion	3.37	0.06	1.67	0.35
Bartlett Reservoir	Epi-near dock				
Bartlett Reservoir	Hypolimnion	3.39	0.08	2.35	0.35
Salt River @ BluePt Bridge		4.07	0.08	2.00	0.34
Saguaro Lake	Epilimnion	4.60	0.09	1.91	0.37
Saguaro Lake	Epi - Duplicate	4.72	0.09	1.85	0.37
Saguaro Lake	Epi-near doc				
Saguaro Lake	Hypolimnion	4.48	0.09	1.90	0.42
Verde River at Tangle	Jun-11	0.96	0.03	3.32	0.23
Havasu	Jul-11	2.74	0.05	1.73	0.58

Reservoir Samples – July 11, 2011

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant	Eplimnion	3.20	0.05	1.63	0.88
Lake Pleasant	Hypolimnion	3.62	0.05	1.31	0.41
Verde River @ Beeline					
Bartlett Reservoir	Epilimnion	3.78	0.06	1.48	0.37
Bartlett Reservoir	Epi-near dock				
Bartlett Reservoir	Hypolimnion	4.20	0.08	2.00	0.40
Salt River @ BluePt Bridge		4.37	0.08	1.88	0.28
Saguaro Lake	Epilimnion	4.30	0.09	2.00	0.50
Saguaro Lake	Epi - Duplicate				
Saguaro Lake	Epi-near doc				
Saguaro Lake	Hypolimnion	4.66	0.10	2.10	0.59
Verde River at Tangle					
Havasu		2.74	0.05	1.73	0.58

Four month Trend in DOC levels in the Reservoirs



Data from Canals

There is no unusual sources or production of DOC in the canal system

	August 2011 Data					July 2011 Data			
Sample Description	**DOC (mg/L)**	**UV254 (1/cm)**	**SUVA (L/mg-m)**	**TDN**		**DOC (mg/L)**	**UV254 (1/cm)**	**SUVA (L/mg-m)**	**TDN**
Waddell Canal	**3.10**	**0.05**	**1.62**	**0.52**		**3.36**	**0.05**	**1.48**	**0.47**
Anthem WTP Inlet	**3.09**	**0.05**	**1.57**	**0.53**		**3.19**	**0.05**	**1.48**	**0.50**
Union Hills Inlet	**3.21**	**0.05**	**1.54**	**0.52**					
CAP Canal at Cross-connect	**3.27**	**0.05**	**1.64**	**0.55**					
Salt River @ Blue Pt Bridge	**4.07**	**0.08**	**2.00**	**0.34**		**4.37**	**0.08**	**1.88**	**0.28**
Verde River @ Beeline									
AZ Canal above CAP Cross-connect	**4.07**	**0.08**	**2.00**	**0.38**		**4.27**	**0.08**	**1.88**	**0.36**
AZ Canal below CAP Cross-connect	**3.78**	**0.08**	**2.00**	**0.38**		**4.21**	**0.08**	**1.91**	**0.30**
AZ Canal at Highway 87	**3.97**	**0.08**	**1.91**	**0.37**		**4.24**	**0.08**	**1.90**	**0.30**
AZ Canal at Pima Rd.	**3.90**	**0.08**	**1.97**	**0.35**		**4.29**	**0.08**	**1.92**	**0.40**
AZ Canal at 56th St.	**3.87**	**0.08**	**1.98**	**0.42**		**5.02**	**0.12**	**2.38**	**0.66**
AZ Canal - Inlet to 24th Street WTP									
AZ Canal - Central Avenue	**3.94**	**0.08**	**1.98**	**0.39**		**5.06**	**0.11**	**2.19**	**0.49**
AZ Canal - Inlet to Deer Valley WTP									
AZ Canal - Inlet to Glendale WTP	**3.91**	**0.08**	**1.95**	**0.41**		**4.10**	**0.08**	**1.90**	**0.68**
AZ Canal - Inlet to GreenwayWTP	**3.62**	**0.08**	**2.09**	**0.79**		**3.76**	**0.07**	**1.84**	**1.36**
South Canal below CAP Cross-connect	**3.92**	**0.08**	**2.04**	**0.36**		**4.28**	**0.08**	**1.86**	**0.30**
South Canal at Val Vista WTP									
Head of the Tempe Canal	**3.96**	**0.08**	**2.05**	**0.35**		**4.21**	**0.08**	**1.91**	**0.28**
Tempe Canal - Inlet to Tempe's South Plant	**3.77**	**0.08**	**2.01**	**0.39**		**4.02**	**0.08**	**1.87**	**0.33**
Head of the Consolidated Canal	**3.92**	**0.08**	**2.03**	**0.36**		**4.15**	**0.08**	**1.95**	**0.31**
Middle of the Consolidated Canal	**3.85**	**0.08**	**1.99**	**0.67**		**4.29**	**0.09**	**2.01**	**0.36**
Chandler WTP – Inlet	**3.72**	**0.08**	**2.08**	**0.68**		**4.04**	**0.08**	**1.91**	**0.35**

Water Quality After a Monsoon Rain Event

Data below shows a "pulse" of high DOC water in the AZ Canal after a monsoon event. The highest concentration of DOC was associated with the most turbid water (reaced around 56th Street). The pulse of turbidity represented a few hours of travel time (not apparent at Pima Road – end of pulse; slightly turbid at Central Ave – start of pulse). This has impact on DBP formation for very short periods. Even though THM and HAA regulations are based upon quarterly running averages at specific distribution system locations, these pulses of DOC associated with runoff from the lower Verde River region (Sycamore Creek/Fountain Hills area) – we should be aware that pulse of higher DOC and higher DBP water are moving through the distribution system after treatment. A potential upside is that the runoff DOC has a slightly higher SUVA value than usual water coming from the reservoirs, which would make the DOC a little easier to treat/remove.

Sampling site	Arizona Canal @ Glendale WTP Inlet	Arizona Canal @ Central Ave	Arizona Canal @ 56th Street	Arizona Canal @ JGM WTP Inlet	Arizona Canal @ Pima Road	Arizona Canal @ Highway 87	Arizona Canal below CAP cross-connect	Arizona Canal above CAP cross-connect
Sample Pictures								
Sampling time	11:30 an	10:50 am	10:30 am	2:00 pm	10:00 am	4:30 pm	4:10 pm	4:00 pm
DOC (mg/L)	4.1	5.1	5.0	5.0	4.3	4.2	4.2	4.3
UV254 (1/cm)	0.0780	0.1108	0.1192	0.1288	0.0825	0.0805	0.0802	0.0802
SUVA (L/mg-m)	1.9	2.2	2.4	2.6	1.9	1.9	1.9	1.9
TDN (mg/L)	0.7	0.5	0.7	0.6	0.4	0.3	0.3	0.4

Long – Term Datasets Being Used For Valley GAC Study

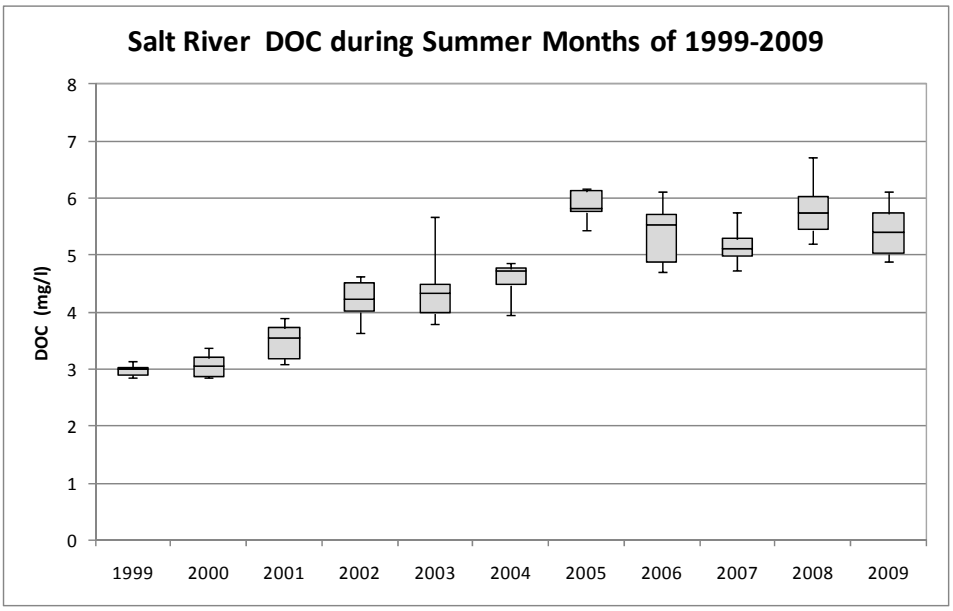
We would like your help. We want to gather as much data together into a central database for the following parameters:

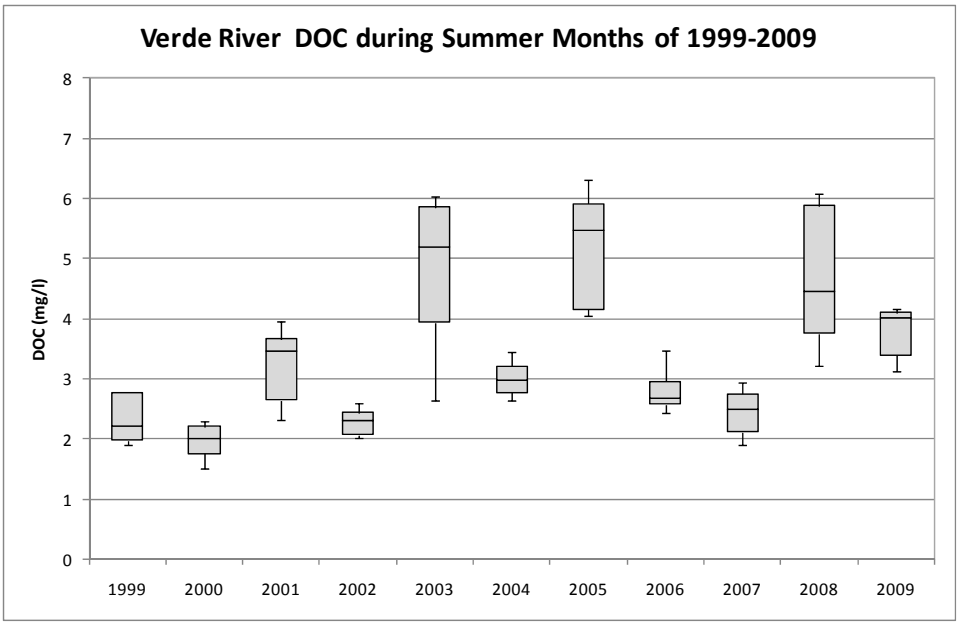
1. TOC
2. UVA 254
3. Color
4. Turbidity

If you have data you would like to contribute, that would be great. We can accept daily or monthly averaged data, or even grab data. We will then include the data in a statistical analysis of climate variability we plan to undertake over the next 6 months. The data may be for your specific plant or the watershed.

Please email me if you have reports or other historic data:
p.westerhoff@asu.edu

We would like to extend this type of data further back in time.





Wallow Fire Sampling

ASU has started sampling water quality related to the 2011 Wallow Fire on the Salt River Watershed. We are coordinating with the USGS and collecting our own samples. Our samples will focus on water quality within Roosevelt Lake. Below is data for July 2011 which should serve as a baseline, before any real runoff from the Salt River watershed. The DOC at the surface was measured and is consistent throughout the lake.

	DOC (mg/L)	TDN (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)
Roosevelt #1	3.7	0.25	0.0637	1.71
Roosevelt #1-Dup	3.7	0.23	0.0632	1.73
Roosevelt #2	3.7	0.22	0.0633	1.71
Roosevelt #2-Dup	3.6	0.23	0.0635	1.74
Roosevelt #3	3.7	0.24	0.0633	1.70
Roosevelt #4	3.7	0.24	0.0634	1.70