

# Bill Williams Watershed Water Quality Assessments

## Watershed Description

The Santa Maria River and the Big Sandy River drainages merge at Alamo Lake to create the Bill Williams River, which connects to the Colorado River at Parker Dam. Land ownership is divided approximately as 45% federal, 28% state, and 27% private (no Tribal lands). With only 8,000 people (2000 census), this watershed does not have any large population centers. Open range grazing is the principal land use. A large mining complex is located in the Bagdad area, while historic mine sites are scattered throughout the watershed.

Elevations range from 8,417 feet (above sea level) at Hualupai Peak to 1,000 feet near the Colorado River. Most of the watershed is below 5,000 feet, with low desert fauna and flora (Sonoran Desert - Mohave Desert transition area) and warmwater aquatic communities where perennial waters exist.

## Water Resources

There is little precipitation, from 13 inches a year, with an additional inch of snowfall per year in higher elevations, so surface water resources are sparse. Perennial flow in this watershed is frequently interrupted (short segments), even on the larger main-stem rivers. The largest lake, Alamo Lake, covers 11,950 acres; however, only an estimated 1,415 acres are perennial.

An estimate of surface water resources in the Bill Williams Watershed is provided in the following table, based on USGS digitized hydrology at 1:100,000, rounded to the nearest 5 miles or 5 acres.

Estimated Surface Water Resources in the Bill Williams Watershed

	Perennial	Intermittent	Ephemeral
Stream miles	185	655	5035
Lake acres	1832	11,950	

Ambient monitoring focuses on perennial waters; however, special investigations may identify water quality problems on intermittent and even ephemeral waters.

## Assessments

The Bill Williams Watershed can be separated into the following drainage areas in Arizona:

15030201	Big Sandy River
15030202	Burro Creek
15030203	Santa Maria River
15030204	Bill Williams River

These drainage areas and the surface waters assessed as “attaining” or “impaired” are illustrated on the following watershed map. Methods used to complete these assessments are described in the “Surface Water Assessment Methods and Technical Support” document.

# A LAMO LAKE

15030204-0040A  
1415 Acres

Category 5  
Impaired

*Mercury in fish tissue (EPA 2002),  
Ammonia (2004) and high pH (1996)*

FC - Impaired • FBC - Impaired • AGL - Impaired  
AWW - Impaired

## Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Dissolved oxygen (top 1 m)	6.0 mg/L	12/13/2010	1.98 mg/L	AWW is attaining with 3 exceedances in 29-31 samples in all three regions (lower, mid and upper) of the lake (binomial). October and November exceedances are due to lake turnover.
		5/9/2011	4.61 mg/L	
		10/18/2011	0.23 mg/L	
		11/18/2011	0.9 mg/L	
		12/19/2011	3.99 mg/L	
		11/30/2012	4.23 mg/L	
pH	Max 9.0 SU Min 6.5 SU	3/8/2011	9.3 SU	AWW, AGL and FBC remain impaired with 8 exceedances in 33 samples.
		5/9/2011	6.08 SU	
		6/7/2011	9.2 SU	
		8/15/2011	9.2 SU	
		4/3/2013	9.7 SU	
		7/25/2013	9.3 SU	
		8/21/2013	9.4 SU	
		9/18/2013	9.5 SU	
Ammonia	0.634 mg/L chronic @ pH 8.52 & Temp 22 C	10/21/2012	1.1 mg/L	AWW chronic remains impaired with 1 exceedance.

# Monitoring Summary

Sampling period: 10/19/2010 - 9/18/2013

Bill Williams

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
AT DAM (Lower Lake)	BWALA-A	101350	ADEQ, COE	Clean Lakes Program, Data Sharing Partnership
MID LAKE (Upper Lake)	BWALA-B	101351	ADEQ, COE	Clean Lakes Program, Data Sharing Partnership
MID LAKE NORTH END (Mid Lake)	BWALA-C	102514	ADEQ, COE	Clean Lakes Program, Data Sharing Partnership

Metal Samples	Nutrients & Related Samples	Other Samples
(3-27) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(39-42) Ammonia, nitrite/nitrate, nitrogen, phosphate, phosphorus, total Kjeldahl nitrogen	(2-97) Dissolved oxygen, pH, SSC, total dissolved solids

## Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	<i>E. coli</i>
Missing Seasonal Distribution	Zinc (dissolved), cadmium (dissolved), copper (dissolved), <i>E. coli</i> , copper, lead
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
High	Collect more samples to support development of TMDLs for nutrients and mercury in fish tissue.

Impairment Discussion
Remains impaired for high pH (1996), ammonia (2004) and mercury in fish tissue (EPA, 2002).

# BIG SANDY RIVER

Stove Spring - Sycamore  
15030201-006  
2.83 Miles

**Category 2**  
Attaining some uses

FC - Attaining • FBC - Inconclusive • AGL - Attaining  
AWW - Inconclusive

## Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
<i>E. coli</i>	235 cfu/100 ml	8/14/2012	3629.4 cfu/100 mL	FBC is inconclusive with 1 exceedance in 4 samples.
SSC	80 mg/L	8/14/2012	360 mg/L	AWW is attaining with no median exceedances.
		11/28/2012	100 mg/L	
Bottom deposits	< 50% fines	5/16/2013	64%	AWW is inconclusive.

## Monitoring Summary

Sampling period: 8/14/2012 - 5/16/2013

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
EAST OF WIKIEUP	BWBSR037.79	107384	ADEQ	Ambient Monitoring

Metal Samples	Nutrients & Related Samples	Other Samples
(4) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(4) Ammonia, nitrite/nitrate, nitrogen, phosphorus, total Kjeldahl nitrogen	(1-4) Dissolved oxygen, <i>E. coli</i> , pH, SSC, total dissolved solids, bottom deposits, biocriteria

## Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	Bottom deposits, <i>E. coli</i>
Missing Core Parameters	None
Missing Seasonal Distribution	None
Lab Detection Limits Not Low Enough	Selenium, mercury (dissolved)

Priority	Monitoring Recommendations
Medium	Collect bottom deposits and <i>E. coli</i> samples due to exceedances. Use lower detection limits for selenium and dissolved mercury.

# BILL WILLIAMS RIVER

Alamo Lake - Castaneda Wash  
15030204-003  
35.9 Miles

**Category 5**  
Impaired

Bill Williams

## IMPAIRMENT

**Ammonia (2006)**

FC - Attaining • FBC - Attaining • AGL - Attaining  
AWW - Impaired

## STATUS

### Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Ammonia	0.344 mg/L chronic @ pH 9.2 & 15.5 C	10/21/2012	0.79 mg/L	AWW remains impaired with 1 chronic exceedance.
Dissolved oxygen	6.0 mg/L	12/13/2010	4.26 mg/L	AWW is inconclusive with 5 exceedances in 31 sample (binomial).
		11/18/2011	5.16 mg/L	
		11/30/2012	5.78 mg/L	
		3/20/2013	5.62 mg/L	
		5/15/2013	5.7 mg/L	
pH	9.0 SU	10/21/2012	9.2 SU	AGL and FBC are attaining with 2 exceedances in 34 samples (binomial).
		4/3/2013	9.3 SU	

## Monitoring Summary

Sampling period: 10/19/2010 - 9/17/2013

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
BELOW ALAMO DAM AT USGS GAGE	BWBWR038.52	102316	USFWS	Data Sharing Partnership
AT ABOVE GROUND PIPELINE	BWBWR025.86	107385	ADEQ	Ambient Monitoring

Metal Samples	Nutrients & Related Samples	Other Samples
(4-8) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(13-17) Ammonia, nitrite/nitrate, nitrogen, phosphate, phosphorus, total Kjeldahl nitrogen	(4-34) Dissolved oxygen, <i>E. coli</i> , pH, SSC, total dissolved solids

# Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	Dissolved oxygen, ammonia
Missing Core Parameters	None
Missing Seasonal Distribution	None
Lab Detection Limits Not Low Enough	Chromium, selenium, mercury (dissolved)

Priority	Monitoring Recommendations
High	Collect more pH, ammonia and dissolved oxygen samples due to exceedances.

Impairment Discussion
Reach remains impaired for ammonia (2006) due to the chronic exceedance. AGL and FBC are no longer impaired for pH with 2 exceedances in 34 samples (binomial). Remove pH (2006) from the 303(d) list.

# BILL WILLIAMS RIVER

Mohave Wash - Colorado River  
15030204-001  
17.5 Miles

## Category 2

Attaining some uses

FC - Inconclusive • FBC - Attaining • AGL - Inconclusive  
AWW - Inconclusive

### Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Dissolved oxygen	6.0 mg/L	5/19/2014	5.2 mg/L	AWW is attaining. Low dissolved oxygen is likely due to low flow and groundwater upwelling.

## Monitoring Summary

Sampling period: 2/22/2011 - 5/19/2014

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
AT MINERAL WASH, NEAR PLANETUSGS 09426600	BWBWR009.92	100924	ADEQ	Ambient Monitoring

Metal Samples	Nutrients & Related Samples	Other Samples
(1) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(1-9) Ammonia, nitrate, nitrite, nitrite/nitrate, nitrite/nitrate, nitrogen, phosphate, phosphorus, total Kjeldahl nitrogen	(3-9) Dissolved oxygen, <i>E. coli</i> , pH, SSC, total dissolved solids

## Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), copper, lead, mercury (or mercury in fish tissue)
Missing Seasonal Distribution	Zinc (dissolved), copper, lead, mercury
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Low	Collect core parameters to represent at least 3 seasons during an assessment period.

# Boulder Creek

Wilder Creek - Butte Creek  
15030202-005A  
1.4 Miles

**Category 4A**  
Not attaining

*Arsenic, copper, and zinc (1998)  
Beryllium, manganese, and low pH (2006/2008)*

FC - Not Attaining • FBC - Not Attaining • AGI - Not Attaining  
AGL - Not Attaining • AWW - Not Attaining

## Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Arsenic	2000 ug/L (AGI) 200 ug/L (AGL) 80 ug/L (FC) 30 ug/L (FBC)	5/21/2013	2400 ug/L	AGI, AGL, FC and FBC remain not-attaining with 2 exceedances in 2 samples (binomial).
		5/28/2015	4280 ug/L	
Arsenic (dissolved)	340 ug/L acute 150 ug/L chronic	5/21/2013	2300 ug/L	AWW remains not-attaining with 2 exceedances in 2 samples.
		5/28/2015	2780 ug/L	
Dissolved oxygen	6.0 mg/L	5/28/2015	0.69 mg/L	AWW is attaining. Low dissolved oxygen due to groundwater upwelling.
Zinc (dissolved)	379.298 ug/L acute & chronic @ 400 mg/L hardness	5/21/2013	1100 ug/L	AWW remains not-attaining with 2 exceedances in 2 samples.
		5/28/2015	1290 ug/L	

## Monitoring Summary

Sampling period: 5/21/2013 - 5/28/2015

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
SITE G- BELOW HILL-SIDE MINE LOWER TAILINGS PIL	BWBOU007.13	101010	ADEQ	TMDL Monitoring
SITE H - BETWEEN MIDDLE AND LOWER TAILINGS PILE	BWBOU007.76	101011	ADEQ	TMDL Monitoring
AT HILLSIDE MINE ADIT	BWBOU007.83	102024	ADEQ	TMDL Monitoring
SITE JJ - UPSTREAM OF TAILINGS PILES	BWBOU008.28	101439	ADEQ	TMDL Monitoring
ABOVE HILLSIDE MINE	BWBOU008.42	102023	ADEQ	TMDL Monitoring



Metal Samples	Nutrients & Related Samples	Other Samples
(6) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(0) None	(5-6) Dissolved oxygen, pH, total dissolved solids

## Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	Dissolved oxygen
Missing Core Parameters	<i>E. coli</i>
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), <i>E. coli</i> , boron, manganese, copper, lead, mercury
Lab Detection Limits Not Low Enough	Antimony (dissolved), selenium, mercury (dissolved)

Priority	Monitoring Recommendations
Medium	Collect arsenic, copper, zinc, beryllium, manganese and pH samples during critical conditions. Collect core parameters to represent at least 3 seasons during an assessment period.

Impairment Discussion
Reach remains not-attaining for arsenic, copper, and zinc (1998) and beryllium, manganese, and low pH (2006/2008). TMDL for arsenic, copper, and zinc completed in 2004.

# Boulder Creek

Butte Creek - Copper Creek  
15030202-005B  
1.8 Miles

**Category 4A**  
Not attaining

## IMPACT

### Arsenic (1998)

## STATUS

FC - Inconclusive • FBC - Not Attaining • AGI - Inconclusive  
AGL - Inconclusive • AWW - Inconclusive

**No Exceedances**

## Monitoring Summary

Sampling period: No samples

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
N/A				

Metal Samples	Nutrients & Related Samples	Other Samples
(0) None	(0) None	(0) None

## Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	All core parameters
Missing Seasonal Distribution	All core parameters
Lab Detection Limits Not Low Enough	N/A

Priority	Monitoring Recommendations
Medium	Collect arsenic samples during critical conditions and in critical locations. Collect core parameters to represent at least 3 seasons during an assessment period.

Impairment Discussion
Reach remains impaired for arsenic (1998). TMDL for arsenic completed in 2004. The Hillside mine, located upstream of this reach, continues to degrade water quality. Additional sampling under critical conditions is needed to determine attainment of water quality standards.

# Boulder Creek

Tributary at 344114 / 1130334 - Wilder Creek  
15030202-006B  
14.4 Miles

Category 5  
Impaired

Bill Williams

## IMPAIRMENT STATUS

*Beryllium (2010)*

FC - Inconclusive • FBC - Inconclusive • AGI - Inconclusive  
AGL - Inconclusive • AWW - Impaired

**No Exceedances**

## Monitoring Summary

Sampling period: No samples

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
N/A				

Metal Samples	Nutrients & Related Samples	Other Samples
(0) None	(0) None	(0) None

## Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	All core parameters
Missing Seasonal Distribution	All core parameters
Lab Detection Limits Not Low Enough	N/A

Priority	Monitoring Recommendations
High	Collect dissolved beryllium samples in support of TMDL development. Collect core parameters to represent at least 3 seasons during an assessment period.

Impairment Discussion
Remains impaired for beryllium (2010).

**BURRO CREEK**  
Francis Creek - Boulder Creek  
15030202-008  
13.811 Miles

**Category 1**  
Attaining all uses

FC - Attaining • FBC - Attaining • AGL - Attaining  
AWW - Attaining

## No Exceedances

## Monitoring Summary

Sampling period: 9/20/2012 - 4/29/2013

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE BOULDER CREEK	BWBRO029.91	100404	ADEQ	Ambient Monitoring

Metal Samples	Nutrients & Related Samples	Other Samples
(4) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(4) Ammonia, nitrite/nitrate, nitrogen, phosphorus, total Kjeldahl nitrogen	(1-4) Dissolved oxygen, <i>E. coli</i> , pH, SSC, total dissolved solids, bottom deposits, biocriteria

## Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	None
Missing Seasonal Distribution	None
Lab Detection Limits Not Low Enough	Selenium, mercury (dissolved)

Priority	Monitoring Recommendations
Low	Good core parameter coverage. Use lower lab reporting limits for selenium and dissolved mercury.

**Mercury in fish tissue (EPA 2004)**

FC - Impaired • FBC - Inconclusive • AWW - Inconclusive

**Monitoring Summary**  
Sampling period: No current data

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
N/A				

Metal Samples	Nutrients & Related Samples	Other Samples
None	None	None

**Data Gaps and Monitoring Needs**

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	All designated uses
Missing Seasonal Distribution	All designated uses
Lab Detection Limits Not Low Enough	None

Priority	Monitoring Recommendations
High	Collect fish tissue mercury samples to support TMDL development. Collect core parameters to represent at least 3 seasons during an assessment period.

Impairment Discussion
EPA listing is due to a fish consumption advisory issued in 2004.

# PEOPLES CANYON CREEK

Headwaters - Santa Maria River  
15030203-524  
8.222 Miles

**Category 1**  
Attaining all uses

FC - Attaining • FBC - Attaining • AGL - Attaining  
AWW - Attaining

## No Exceedances

## Monitoring Summary

Sampling period: 10/23/2012 - 4/2/2013

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
AT SPRING	BWP003.51	100407	ADEQ	Ambient Monitoring

Metal Samples	Nutrients & Related Samples	Other Samples
(4) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(4) Ammonia, nitrite/nitrate, nitrogen, phosphorus, total Kjeldahl nitrogen	(1-4) Dissolved oxygen, <i>E. coli</i> , pH, SSC, total dissolved solids, bottom deposits, biocriteria

## Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	None
Missing Seasonal Distribution	None
Lab Detection Limits Not Low Enough	Selenium, mercury (dissolved)

Priority	Monitoring Recommendations
Low	Good core parameter coverage. Use lower lab reporting limits for selenium and dissolved mercury.

FC - Attaining • FBC - Attaining • AGL - Attaining  
AWW - Inconclusive

## Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Dissolved oxygen	6.0 mg/L	8/14/2012	5.57 mg/L	AWW is inconclusive with 1 exceedance in 4 samples.

## Monitoring Summary

Sampling period: 8/14/2012 - 5/16/2013

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
NEAR WIKIEUP	BWTRT002.43	100397	ADEQ	Ambient Monitoring

Metal Samples	Nutrients & Related Samples	Other Samples
(4) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(4) Ammonia, nitrite/nitrate, nitrogen, phosphorus, total Kjeldahl nitrogen	(1-4) Dissolved oxygen, <i>E. coli</i> , pH, SSC, total dissolved solids, bottom deposits, biocriteria

## Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	Dissolved oxygen
Missing Core Parameters	None
Missing Seasonal Distribution	None
Lab Detection Limits Not Low Enough	Selenium, mercury (dissolved)

Priority	Monitoring Recommendations
Low	Collect additional dissolved oxygen samples due to the exceedance.