Colorado – Grand Canyon Watershed

Watershed Description

This watershed is defined by the Colorado River drainage area, beginning in Arizona at Lake Powell, through the Grand Canyon National Park, to Hoover Dam at Lake Mead. It does not include the Little Colorado River drainage. The watershed contains spectacular incised canyons formed by erosion of sandstone formations, as well as volcanically formed mountains and high plateaus.

Land ownership is divided approximately as: 45% federal, 25% tribal, 15% private, and 5% state. Most of the 16,437 square miles in this watershed are sparsely populated, with an approximate population of 67,500 people (2000 census). The largest communities are Kingman and Williams. Land use is primarily open grazing, recreation, and silviculture (forestry), with scattered mining districts. The Grand Canyon National Park, Kaibab National Forest, Lake Mead National Recreation Area, and Glen Canyon National Recreation Area are all located within this watershed and all have restricted land uses to protect natural resources. These federal lands also draw a large number of tourists and recreationists.

Elevations range from 1,000 feet (above sea level) along the Colorado River to 10,400 feet near Flagstaff. The majority of the watershed is between 5,000-7,000 feet elevation, with high desert fauna and flora, including coldwater aquatic communities where perennial waters exist.

Water Resources

Precipitation varies from 10-15 inches a year, including about 1 inch of snowfall per year in higher elevations. Excluding the Colorado River and its reservoirs (Lake Powell and Lake Mead), surface water is sparse.

An estimate of surface water resources in the Colorado – Grand Canyon Watershed is provided in the following table. Waters on Tribal lands are not assessed by ADEQ; therefore, those statistics are shown separately.

Estimated Surface Water Resources in the Colorado – Grand Canyon Watershed

	Perennial	Intermittent	Ephemeral
Stream miles	480	260	14,870
	Perennial	Non-perennial	
Lake acres	68,400	13,415	

Additional Estimated Water Resources on Tribal Lands – Not Assessed

	Perennial	Intermittent	Ephemeral
Stream miles	125	5	3,740
	Perennial	Non-perennial	
Lake acres	390	0	

Ambient monitoring focuses on perennial waters; however, special investigations may identify water quality problems on intermittent and even ephemeral waters. Estimated miles and acres are based on USGS digitized hydrology at 1:100,000 and have been rounded to the nearest 5 miles or 5 acres.

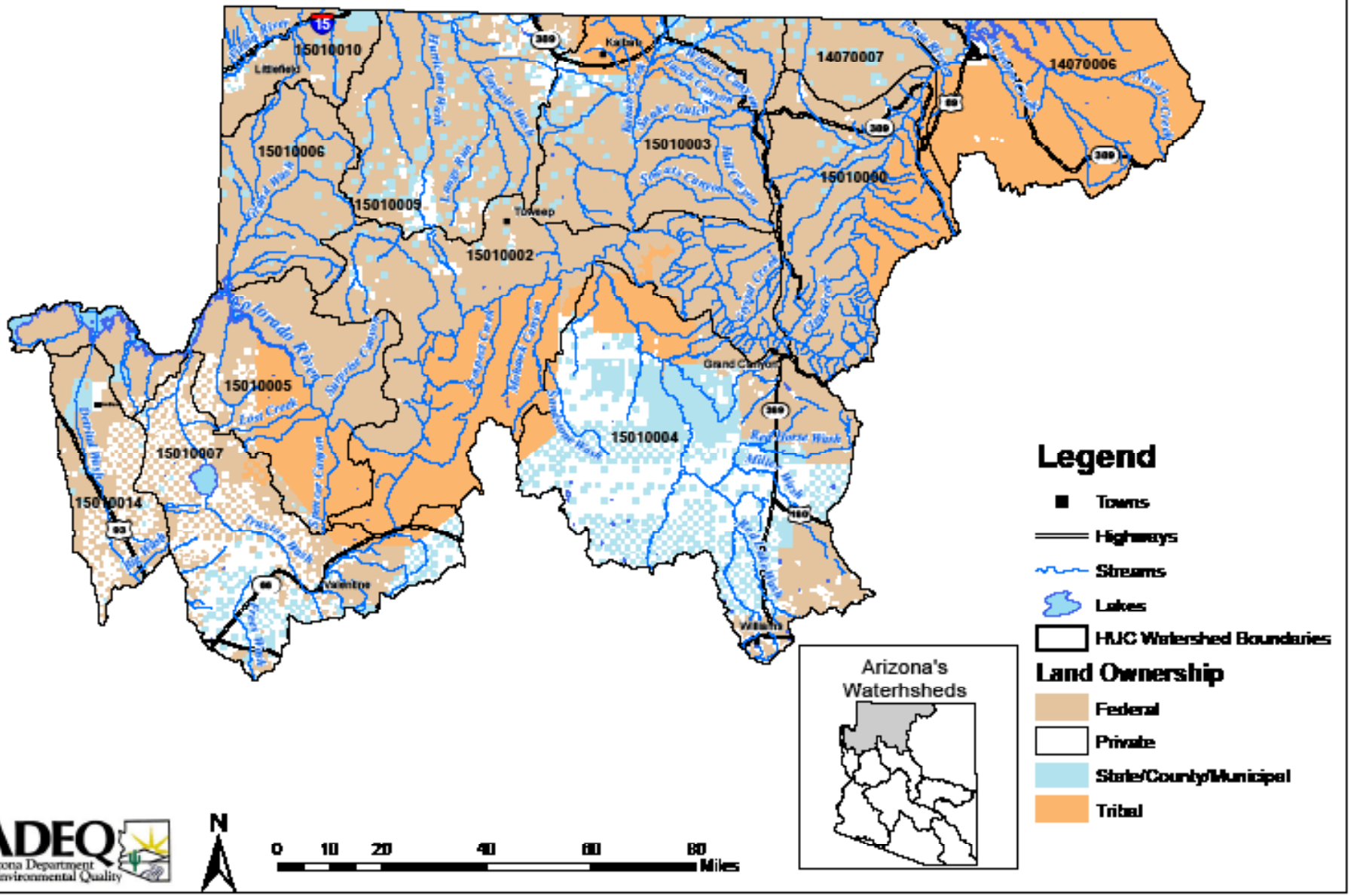
Assessments

The Colorado – Grand Canyon Watershed can be separated into the following drainage areas in Arizona:

14070006	Lake Powell
14070007	Paria River
15010001	Marble Canyon
15010002	Grand Canyon
15010003	Kanab Creek
15010004	Havasu Creek
15010005	Lake Mead
15010006	Grand Wash
15010007	Red Lake
15010009	Fort Pearce Wash
15010010	Virgin River
15010014	Detrital Wash

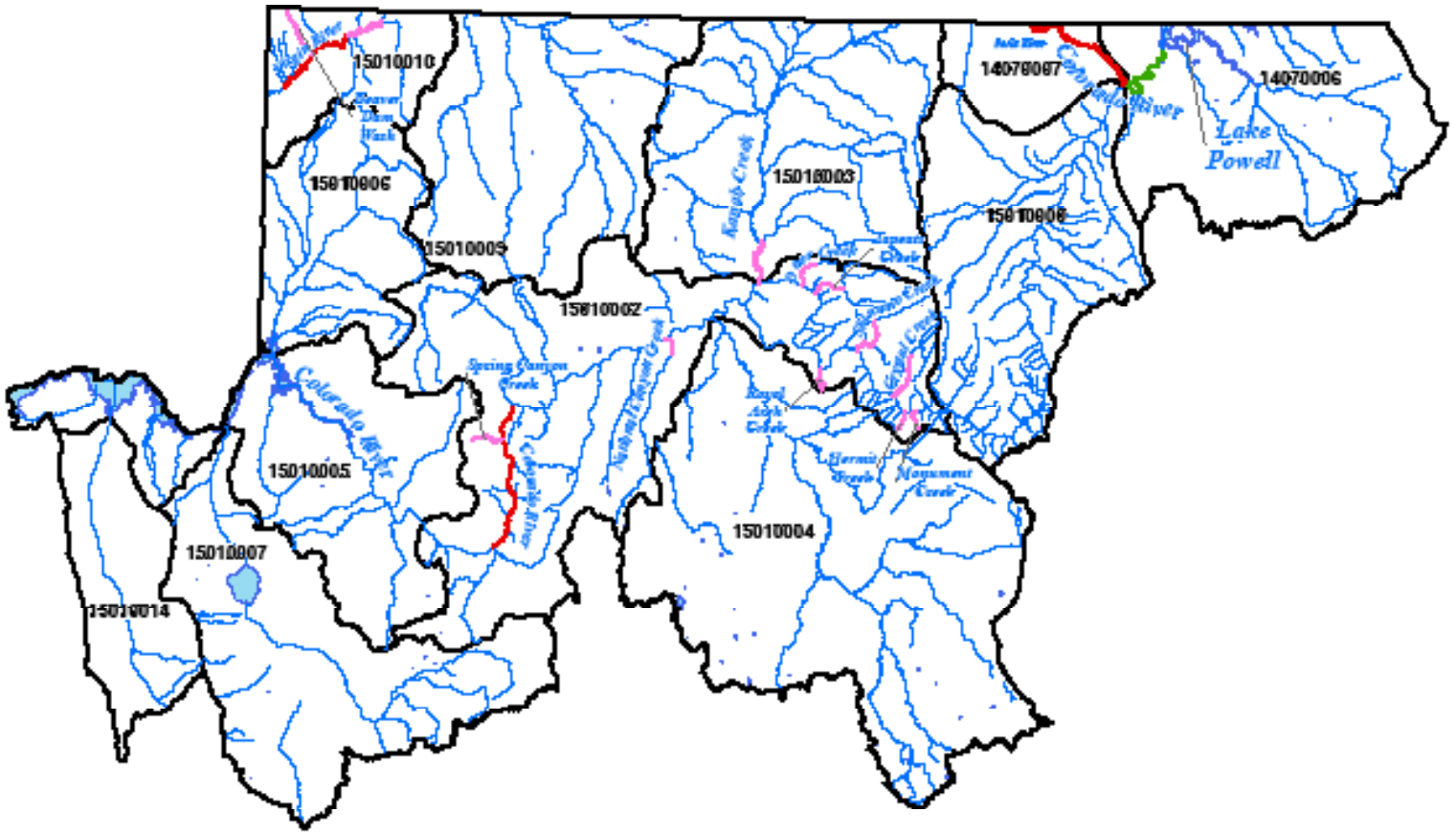
These drainage areas and the surface waters assessed as “attaining” or “impaired” are illustrated on the following watershed map. Methods used to complete these assessments are described in the “Surface Water Assessment Methods and Technical Support” document.

Colorado-Grand Canyon Watershed



Colorado - Grand Canyon

Colorado / Grand Canyon Watershed
2012/2014 Assessment for Streams and Lakes

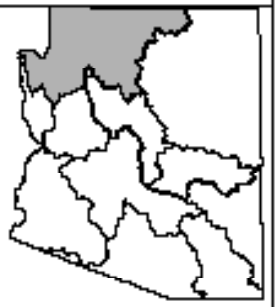


0 40 Miles

Legend

Assessed Lakes - 2012
ADEQ and EPA Listings
- Attaining
- Inconclusive
- Not Attaining
- EPA Impaired
- Impaired
- HUC Watershed Boundaries

Assessed Streams - 2012
ADEQ and EPA Listings
- Attaining
- Inconclusive
- Not Attaining
- EPA Impaired
- Impaired
- Lakes
- Streams



See Individual HUC Printouts for Waters not Labeled

N

ADEQ
Arizona Department of Environmental Quality

BEAVER DAM WASH

Utah border - Virgin River
15010010-009
9.6 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • AGL - Inconclusive
A&Ww - Inconclusive

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
E. coli	235 cfu/100 mL, SSM	3/9/2010	2000 cfu/100 mL	FBC is inconclusive with 1 exceedance. Note: This exceedance occurred during a storm event.
Lead	15 ug/L	3/9/2010	37 ug/L	FBC is inconclusive with 1 exceedance in 1 sample (binomial).
SSC	80 mg/L	3/9/2010	2600 mg/L	A&Ww is attaining. This exceedance occurred during a local storm event.

Monitoring Summary

Sampling period: 11/10/2009 - 4/27/2010

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
BELOW HIGHWAY 91 BRIDGE IN LITTLEFIELD	CGBDW000.99	100449	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	*E. coli*, lead
Missing Core Parameters	Dissolved oxygen
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*, copper, lead
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Low	Need seasonal coverage on all core parameters. Collect more *E. coli* and lead samples to determine FBC attainment.

BRIGHT ANGEL CREEK

Phantom Creek - Colorado River
15010001-019
1.9 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Ww - Inconclusive

No Exceedances

Monitoring Summary

Sampling period: 10/16/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE PHANTOM RANCH	CGBRA001.36	100423	ADEQ	Ambient
BELOW PHANTOM RANCH	CGBRA000.44	100422	ADEQ	Ambient

Metal Samples	Nutrients & Related Samples	Other Samples
(2) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(2) Ammonia, nitrite/nitrate, nitrogen, phosphorus, total Kjeldahl nitrogen	(1-2) Dissolved oxygen, *E. coli*, pH, SSC, total dissolved solids

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Low	Need seasonal coverage on all core parameters.

COLORADO RIVER

Lake Powell - Paria River
14070006-001
16.3 Miles

Category 2
Attaining some uses

DWS - Inconclusive • FC - Attaining • FBC - Attaining
AGI - Attaining • AGL - Attaining • A&Wc - Inconclusive

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Dissolved oxygen	7 mg/L	12/4/2007	6.5 mg/L	A&Wc is inconclusive. Low dissolved oxygen in 2 of 9 samples (binomial).
		8/19/2008	6.3 mg/L	
Mercury[d]	0.01 ug/L	3/6/2007	0.012 ug/L	A&Wc chronic is inconclusive. The exceedance on 6/5/2007 is unreliable - the dissolved fraction greater than the total value (0.008 ug/L). Only 1 valid exceedance during the assessment period.
		6/5/2007	0.011 ug/L	

Monitoring Summary

Sampling period: 8/8/2006 - 12/1/2008

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
AT LEES FERRY, AZ USGS 09380000	CGCLR698.93	100743	USGS	Ambient

Metal Samples	Nutrients & Related Samples	Other Samples
(10) Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(10) Nitrite/nitrate, nitrogen, phosphorus, total Kjeldahl nitrogen	(9-10) Dissolved oxygen, *E. coli*, pH, SSC, total dissolved solids, fluoride

Data Gaps and Monitoring Needs

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

Priority	Monitoring Recommendations
Medium	Collect additional dissolved oxygen and dissolved mercury samples due to exceedances. Reach was originally listed for selenium in 2006, but new data (20 samples collected between 2006 and 2011) indicate no evidence of continuing selenium problems. Since there have been no exceedance measured in the last 6 years and data were collected from the same site and under similar flow conditions as the previous exceedances this reach has been delisted.

COLORADO RIVER

Parashant Canyon - Diamond Creek
15010002-003
27.6 Miles

Category 5
Impaired

IMPAIRMENT

SSC and selenium (2004)

STATUS

DWS - Inconclusive • FC - Inconclusive • FBC - Inconclusive
AGI - Inconclusive • AGL - Inconclusive • A&Wc - Impaired

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
SSC	25 mg/L	7/13/2006	933 mg/L	A&Wc remains impaired. All 9 single samples exceeded the standard and no exclusions for storm events.
		8/31/2006	3310 mg/L	
		11/7/2006	172 mg/L	
		2/1/2007	264 mg/L	
		3/15/2007	78 mg/L	
		4/26/2007	65 mg/L	
		6/6/2007	905 mg/L	
		7/18/2007	419 mg/L	
		8/15/2007	2190 mg/L	
Selenium[d]	2 ug/L	4/26/2007	2.2 ug/L	A&Wc chronic remains impaired with 2 exceedances. Note: These exceedances are based on dissolved selenium results.
		8/15/2007	2.1 ug/L	

Monitoring Summary

Sampling period: 7/13/2006 - 8/15/2007

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE DIAMOND CREEK USGS 09404200	CGCLR473.00	101483	USGS	Ambient

Metal Samples	Nutrients & Related Samples	Other Samples
(9 dissolved) Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, silver, zinc	(6-9) Nitrate, nitrite, nitrite/nitrate, nitrogen, phosphate, phosphorus, total Kjeldahl nitrogen	(9) Dissolved oxygen, pH, SSC, total dissolved solids

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	*E. coli*, nitrite/nitrate, fluoride, arsenic, chromium, lead, boron, manganese, copper, lead
Missing Seasonal Distribution	*E. coli*, nitrite/nitrate, fluoride, arsenic, chromium, lead, boron, manganese, copper, lead
Lab Detection Limits Not Low Enough	None

Priority	Monitoring Recommendations
High	Collect samples to support development of suspended sediment and selenium TMDLs. Most core parameters in need of sample number and seasonal coverage.

Impairment Discussion
The reach remains impaired for selenium and SSC. ADEQ will coordinate development of selenium TMDLs along the Colorado River.

CRYSTAL CREEK

Tributary at 361342 / 1121148 - Colorado River
15010002-018B
9.1 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Ww - Inconclusive

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Arsenic	30 ug/L	10/18/2009	42 ug/L	FBC is inconclusive with 1 exceedance in 1 sample (binomial).

Monitoring Summary

Sampling period: 10/18/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE COLORADO RIVER	CGCRY000.05	100525	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	Arsenic
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Medium	Collect more arsenic samples to determine FBC attainment. All core parameters need sample number and seasonal coverage.

DEER CREEK

Tributary at 362616 / 1122816 - Colorado River
15010002-019B
4.9 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Ww - Inconclusive

No Exceedances

Monitoring Summary

Sampling period: 10/20/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE COLORADO RIVER	CGDEE000.07	100532	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Low	No exceedances but too little information to assess. All core parameters need coverage.

HAVASU CREEK

Havasupi Reservation - Colorodo River
15010004-001
3.3 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Ww - Inconclusive

No Exceedances

Monitoring Summary

Sampling period: 10/21/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE COLORADO RIVER USGS 09404115	CGHAV000.36	100568	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Low	No exceedances but too little information to assess. All core parameters need coverage.

HERMIT CREEK

Hermit Pack Trail crossing - Colorado River
15010002-020B
3.5 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Ww - Inconclusive

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Selenium	2 ug/L	10/17/2009	2.2 ug/L	A&Ww chronic is attaining. Elevated selenium concentration is considered entirely due to natural sources as there are no anthropogenic activities that can lead to selenium contamination in this small remote watershed.

Monitoring Summary

Sampling period: 10/17/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE COLORADO RIVER	CGHRM000.08	100570	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Low	All core parameters need sample number and seasonal coverage.

KANAB CREEK

Jump - up Canyon - Colorado River
15010003-001
12.8 Miles

Category 3
Inconclusive

DWS - Inconclusive • FC - Inconclusive • FBC - Inconclusive
AGL - Inconclusive • A&Ww - Inconclusive

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Selenium	2 ug/L	10/20/2009	3.8 ug/L	A&Ww chronic is inconclusive. Only 1 sample in the assessment period.

Monitoring Summary

Sampling period: 10/20/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE COLORADO RIVER	CGKAN000.26	100577	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	Selenium
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), copper, *E. coli*, nitrite/nitrate, fluoride, arsenic, chromium, lead
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), copper, *E. coli*, nitrite/nitrate, fluoride, arsenic, chromium, lead
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Medium	Collect additional selenium samples due to the exceedance. All core parameters need number of sample and seasonal coverage.

LAKE POWELL

14070006-1130
9770 Acres (in Arizona)

Category 5
Impaired

Impairment

EPA mercury in fish tissue (2010)

DWS - Inconclusive • FC - Inconclusive • FBC - Inconclusive
AGI - Inconclusive • AGL - Inconclusive
A&Wc - Inconclusive

Status

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
E. coli	235 cfu/100 mL, SSM	7/11/2006	727 cfu/100 mL	FBC is attaining. 1 single sample exceedance outside the analysis window (7/2008 - 6/2011).

Monitoring Summary

Sampling period: 7/10/2006 - 9/7/2006

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
AT ANTELOPE MARINA	CGPOW-ANTEL	102956	NPS/USGS	Special study
AT BEACH EAST OF NPS#2	CGPOW-BEACH	103938	USGS	Special study
ABOVE ANTELOPE CREEK	CGPOW-BYANT	105116	NPS	Special study
RANDOM SITES NEAR WAHWEAP	CGPOW-RAND	105121	NPS	Special study
AT WAHWEEP MARINA	CGPOW-WWMAR	102972	NPS	Special study

Metal Samples	Nutrients & Related Samples	Other Samples
(0) None	(0) None	(14-16) *E. coli*, petroleum products, chlorinated hydrocarbons, and other VOCs

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), copper, nitrite/nitrate, fluoride, arsenic, chromium, lead, manganese, boron
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*, copper, nitrite/nitrate, fluoride, arsenic, chromium, lead, manganese, boron
Lab Detection Limits Not Low Enough	None

Priority	Monitoring Recommendations
Low	Collect additional *E. coli* samples due to the exceedance. Collect core parameters to represent at least 3 seasons during an assessment period. *E. coli* problem is studied and monitored by the National Park Service.

Impairment Discussion
EPA overfile for mercury in fish tissue

MONUMENT CREEK

Headwaters - Colorado River
15010002-845
3.5 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Ww - Inconclusive

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Dissolved oxygen	6.0 mg/L	10/17/2009	4.73 mg/L	A&Ww is attaining. Low dissolved oxygen due to low flow.
Selenium	2 ug/L	10/17/2009	6.5 ug/L	A&Ww chronic is attaining. Elevated selenium concentration is considered entirely due to natural sources as there are no anthropogenic activities that can lead to selenium contamination in this small remote watershed.

Monitoring Summary

Sampling period: 10/17/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE COLORADO RIVER	CGMON000.19	101434	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Low	All core parameters need sample number and seasonal coverage. Use a lower detection limit for dissolved mercury (one A&W chronic exceedance in 2005).

NATIONAL CANYON CREEK

Headwaters - Colorado River
15010002-016
3.2 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Ww - Inconclusive

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Selenium	2 ug/L	10/22/2009	4.6 ug/L	A&Ww chronic is attaining. Elevated selenium concentration is considered entirely due to natural sources as there are no anthropogenic activities that can lead to selenium contamination in this small remote watershed.

Monitoring Summary

Sampling period: 10/22/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE COLORADO RIVER	CGNAT000.48	100602	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), pH, *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), pH, *E. coli*
Lab Detection Limits Not Low Enough	None

Priority	Monitoring Recommendations
Low	Collect core parameter samples over three season period.

PARIA RIVER

Utah border - Colorado River
14070007-123
29.4 Miles

Category 5
Impaired

IMPAIRMENT STATUS

E. coli (2006/8) and SSC (2004)

FC - Attaining • FBC - Impaired • A&Ww - Impaired

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Arsenic	30 ug/L	3/30/2010	34 ug/L	FBC is inconclusive. 1 exceedance in 3 samples (binomial).
Chromium	100 ug/L	2/9/2010	160 ug/L	FBC is inconclusive. 1 exceedance in 3 samples (binomial).
Lead	15 ug/L	2/9/2010	170 ug/L	FBC is inconclusive. 2 exceedances in 3 samples (binomial).
		3/30/2010	140 ug/L	
SSC	80 mg/L	2/9/2010	27500 mg/L	A&Ww remains impaired (2004). Both exceedances occurred during local storm events and were excluded from the median value determination. Insufficient number of samples left to assess.
		3/30/2010	7600 mg/L	
Biocriteria	IBI ≥ 50 attaining IBI 40-49 inconclusive IBI ≤ 39 violating	6/8/2010	IBI 40	A&Ww is inconclusive.

Monitoring Summary

Sampling period: 2/9/2010 - 6/8/2010

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
AT LEES FERRY, AZ	CGPAR000.49	101073	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	Arsenic, chromium, lead, biocriteria
Missing Core Parameters	*E. coli*
Missing Seasonal Distribution	*E. coli*
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
High	Collect additional *E. coli* and suspended sediment samples to support TMDL development. Collect arsenic, chromium, and lead samples due to exceedances. Collect an additional macroinvertebrate sample to verify the bioassessment result.

Impairment Discussion
Reach remains impaired for *E. coli* (2006) and Suspended Sediment (2004). TMDLs for these parameters will be initiated in 2014.

ROYAL ARCH CREEK

Headwaters - Colorado River
15010002-871
5.1 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Ww - Inconclusive

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Selenium	2 ug/L	10/19/2009	8.2 ug/L	A&Ww chronic is attaining. Elevated selenium concentration is considered entirely due to natural sources as there are no anthropogenic activities that can lead to selenium contamination in this small remote watershed.

Monitoring Summary

Sampling period: 10/19/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE COLORADO RIVER	CGRYA000.05	100632	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Low	All core parameters need sample number and seasonal coverage.

SHINUMO CREEK

Tributary at 361821 / 1121803 - Colorado River
15010002-029B
8.8 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Ww - Inconclusive

No Exceedances

Monitoring Summary

Sampling period: 10/18/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE COLORADO RIVER	CGSHI000.05	101436	ADEQ	Ambient

Metal Samples	Nutrients & Related Samples	Other Samples
(1) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(1) Ammonia, nitrogen, phosphorus, total Kjeldahl nitrogen	(1) Dissolved oxygen, *E. coli*, pH, SSC, total dissolved solids

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Low	No exceedances but too little information to assess. All core parameters need coverage.

SPRING CANYON CREEK

Headwaters - Colorado River
15010002-318
6.0 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Ww - Inconclusive

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Selenium	2 ug/L	10/25/2009	2.1 ug/L	A&Ww chronic is attaining. Elevated selenium concentration is considered entirely due to natural sources as there are no anthropogenic activities that can lead to selenium contamination in this small remote watershed.

Monitoring Summary

Sampling period: 10/25/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
ABOVE COLORADO RIVER	CGSPG000.17	100648	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Low	All core parameters need sample number and seasonal coverage.

TAPEATS CREEK

Headwaters - Colorado River
15010002-696
12.8 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • A&Wc - Inconclusive

No Exceedances

Monitoring Summary

Sampling period: 10/20/2009

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
AT COLORADO RIVER	CGTAP000.08	100662	ADEQ	Ambient

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

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	None
Missing Core Parameters	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, pH, cadmium (dissolved), copper (dissolved), *E. coli*
Lab Detection Limits Not Low Enough	Cadmium (dissolved), mercury (dissolved)

Priority	Monitoring Recommendations
Low	No exceedances but too little information to assess. All core parameters need coverage.

VIRGIN RIVER

Black Rock Gulch - Sullivans Canyon
15010010-006
10.3 Miles

Category 3
Inconclusive

FC - Inconclusive • FBC - Inconclusive • AGI - Inconclusive
AGL - Inconclusive • A&Ww - Inconclusive

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
E. coli	235 cfu/100 mL, SSM	3/9/2010	460 cfu/100 mL	FBC is inconclusive. Only 1 single sample exceedance in the last 3 years of monitoring. Note: This exceedance occurred during a storm event.
Selenium	2 ug/L	11/9/2009	2.1 ug/L	A&Ww is inconclusive with only one event at one site on one day.
SSC	80 mg/L	3/9/2010	911 mg/L	A&Ww is attaining. Both exceedances occurred during local storm events.
		4/27/2010	1100 mg/L	
Bottom deposits	50%	6/15/2010	89%	A&Ww is inconclusive with only one exceedance during the assessment period.

Monitoring Summary

Sampling period: 11/9/2009 - 6/15/2010

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
AT I-15 REST STOP	CGVGR052.23	100679	ADEQ	Ambient

Metal Samples	Nutrients & Related Samples	Other Samples
(3) Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, selenium, zinc	(3) Ammonia, nitrite/nitrate, nitrogen, phosphorus, total Kjeldahl nitrogen	(1-4) Dissolved oxygen, *E. coli*, pH, SSC, total dissolved solids, bottom deposits

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	Selenium, bottom deposits, *E. coli*
Missing Core Parameters	Dissolved oxygen
Missing Seasonal Distribution	Zinc (dissolved), dissolved oxygen, cadmium (dissolved), copper (dissolved), *E. coli*, boron, manganese, copper, lead
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
Medium	Collect more *E. coli*, selenium, and bottom deposits samples due to exceedances. Need seasonal coverage on most core parameters.

VIRGIN RIVER

Sullivans Canyon - Beaver Dam Wash
15010010-004
9.7 Miles

Category 5
Impaired

IMPAIRMENT

Add selenium to the 303(d) list.

STATUS

FC - Attaining • FBC - Inconclusive • AGI - Attaining
AGL - Attaining • A&Ww - Impaired

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
E. coli	235 cfu/100 mL, SSM	3/9/2010	346 cfu/100 mL	FBC is inconclusive. Only 1 single sample exceedance in the last 3 years of monitoring. Note: This exceedance occurred during a storm flow.
Selenium	2 ug/L	11/10/2009	2.4 ug/L	A&Ww is impaired with two exceedances out of four samples, average 1.3 times standard, over 6-7 month period (see discussion).
		6/16/2010	2.9 ug/L	
SSC	80 mg/L	3/9/2010	825 mg/L	A&Ww is attaining. Both exceedances occurred during local storm events.
		4/27/2010	982 mg/L	

Monitoring Summary

Sampling period: 11/10/2009 - 6/16/2010

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
AT LITTLEFIELD, AZ	CGVGR039.41	100680	ADEQ	Ambient
AT MOUTH OF NARROWS	CGVGR044.58	101835	ADEQ	Ambient

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	(3-5) Dissolved oxygen, *E. coli*, pH, SSC, total dissolved solids

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	*E. coli*
Missing Core Parameters	None
Missing Seasonal Distribution	Dissolved oxygen
Lab Detection Limits Not Low Enough	Mercury (dissolved)

Priority	Monitoring Recommendations
High	Good core parameter coverage with small number of samples. Collect more *E. coli* to determine FBC status and selenium to support development of TMDL.

Impairment Discussion
Impaired for selenium but not much data to assess overall situation. Only 6 total and 17 dissolved selenium values 1977-2005 with switch from dissolved to total after 1977. Large time gaps between samples (1977-1994-2005) and no seasonal distribution. Last three total Se rather high (two shown plus 7.2 in 2004).

VIRGIN RIVER

Beaver Dam Wash - Big Bend Wash
15010010-003
10.1 Miles

Category 5
Impaired

IMPAIRMENT STATUS

SSC and selenium (2004) and E. coli (2010)

FC - Inconclusive • FBC - Impaired • AGI - Inconclusive
AGL - Inconclusive • A&Ww - Impaired

Exceedances

Parameter	Applicable Standard	Date	Result	Designated use support comments
Boron[d]	1000 ug/L	6/17/2008	1010 ug/L	AGI is inconclusive (binomial).
E. coli	235 cfu/100 mL, SSM	8/24/2006	1500 cfu/100 mL	FBC remains impaired. No new data since last assessment.
		9/29/2006	13000 cfu/100 mL	
		3/9/2007	280 cfu/100 mL	
		12/17/2008	1400 cfu/100 mL	
Selenium[d]	2 ug/L	6/17/2008	2.1 ug/L	A&Ww remains impaired with 2 exceedances.
		12/17/2008	2.1 ug/L	
SSC	80 mg/L	12/20/2007	746 mg/L	A&Ww remains impaired. Exceedances on 6/17/08, 8/21/08, and 12/17/08 occurred during storm events. No new data since last assessment.
		3/10/2008	457 mg/L	
		6/17/2008	92 mg/L	
		8/21/2008	136 mg/L	
		12/17/2008	601 mg/L	

Monitoring Summary

Sampling period: 8/24/2006 - 12/17/2008

Site Name(s)	Site ID #	DEQ #	Sampling Agency	Purpose
AT LITTLEFIELD, AZ USGS 09415000	CGVGR038.80	101836	USGS	Ambient

Metal Samples	Nutrients & Related Samples	Other Samples
(6 dissolved) Arsenic, boron, iron, selenium	(6) Ammonia, nitrite/nitrate, nitrogen, phosphorus, total Kjeldahl nitrogen	(1-7) Dissolved oxygen, *E. coli*, pH, SSC, total dissolved solids, fluoride

Data Gaps and Monitoring Needs

Exceedances Needing More Samples to Assess	Boron
Missing Core Parameters	Zinc (dissolved), cadmium (dissolved), copper (dissolved), boron, manganese, copper, lead
Missing Seasonal Distribution	Zinc (dissolved), cadmium (dissolved), copper (dissolved), boron, manganese, copper, lead
Lab Detection Limits Not Low Enough	N/A

Priority	Monitoring Recommendations
High	Collect samples to support development of selenium, suspended sediment, and *E. coli* TMDLs. Collect additional boron samples due to the exceedance. Collect core parameters to represent at least 3 seasons during the assessment period.

Impairment Discussion
Reach remains impaired for SSC and selenium (2004) and *E. coli* (2010). No new data since last assessment.