2006/2008
STATUS OF AMBIENT SURFACE WATER QUALITY IN ARIZONA
Arizona's Integrated 305(b) Assessment and 303(d) Listing Report

November 2008

ADEQ
Arizona Department of Environmental Quality

Approved by:

Joan Card, Director, Water Quality Division

_____

Linda Taunt, Surface Water Section Manger (Acting)

_____

Jason Jones, Monitoring Unit Supervisor

_____

Jason Sutter, TMDL Unit Supervisor

_____

Steve Pawlowski, Standards and Assessment Unit Supervisor

_____

2006/2008 Status of Surface Water Quality in Arizona
Arizona's Integrated 305(b) Assessment and 303(d) Listing Report

Drafted by:

Anel Avila, 305(b) Water Quality Assessment Coordinator
Steve Pawlowski, Water Quality Standards & Assessment Unit
Diana Marsh, Watersheds and Assessment Program

Editing, Graphics, and Database Assistance:

Lisa Rowe, Jason Sutter, Linda Taunt,
Patti Tuve, Chris Varga, Yan Zhao, Nicholas Moore, and Peter Bierly

A special thanks to ADEQ's monitoring staff who traveled across the state collecting the data used in this report:

Amanda Fawley, Susan Fitch, Tim Franquist, Jennifer Hickman, Lee Johnson, Lin Lawson, Doug McCarty, Greg Olsen, Patsy Olsen, Kyle Palmer, Jamie Piver, Samuel Rector, Robert Scalamera, Patti Spindler, Jason Sutter, Doug Towne, and R. Scott Williams

Special Note:
ADEQ has combined the 2006 and 2008 305(b) assessment and 303 (d) listing report. No new data was evaluated for the 2008 integrated report. ADEQ anticipates a full update on Arizona waters in 2010.

CHAPTER I
INTRODUCTION AND PURPOSE

Every two years, the Arizona Department of Environmental Quality (ADEQ) is required by the federal Clean Water Act to conduct a comprehensive analysis of water quality data associated with Arizona's surface waters to determine whether state water quality standards are being met and designated uses are being supported. This integrated surface water assessment and impaired waters listing report (2006/2008 Assessment Report) serves three functions.

- Nationally, it fulfills a reporting requirement of the Clean Water Act, and is submitted to the Environmental Protection Agency (EPA), and used to report on national water quality issues and concerns.

- For ADEQ, it provides a mandate to compile environmental data and information from ADEQ's surface water quality protection programs, as well as from other agencies, organizations, and individuals. This comprehensive evaluation of quality of water in Arizona is used to set priorities, allocate resources, and make decisions about land use activities, discharges to the water, future monitoring, and program initiatives.

- For the public, it provides an opportunity to learn about and comment on the status of surface water quality in the state.

Surface Water Assessment Methods and Technical Support

ADEQ has created a separate assessment methods document. It is assumed that the reader will obtain and reference this technical support document (Appendix G) when using the information in this assessment.

The Assessment Methods and Technical Support document provides a description of the assessment process and specific assessment and impaired water listing criteria. It also provides information about the monitoring data and information used in this assessment and Arizona's credible data requirements. The three appendices provide: surface water quality standards used in the assessment, Arizona's TMDL statute, and the Impaired Water Identification Rule.

Report Overview

Chapter I – Introduction and Purpose
Chapter II – Assessments of individual surface waters, organized by watershed
Chapter III – Summary Information
Chapter IV – Action Plan
Annotated References
Appendix A – Look up table of surface waters, indicating the watershed
Appendix B – Assessment Category Lists
Appendix C – Impaired Water Schedule and Prioritization
Appendix D – Critical Conditions
Appendix E – Delisting Impairments
Appendix F – Water Quality Improvements
Appendix G – Surface Water Assessment Methods and Technical Support Document

Although an attempt was made to avoid technical jargon and unnecessary abbreviations, this is a technical report. Acronyms and terms used in the assessment report are defined in the Assessment Methods and Technical Support document (draft 2006/2008).

Changes Affecting the Assessment Process

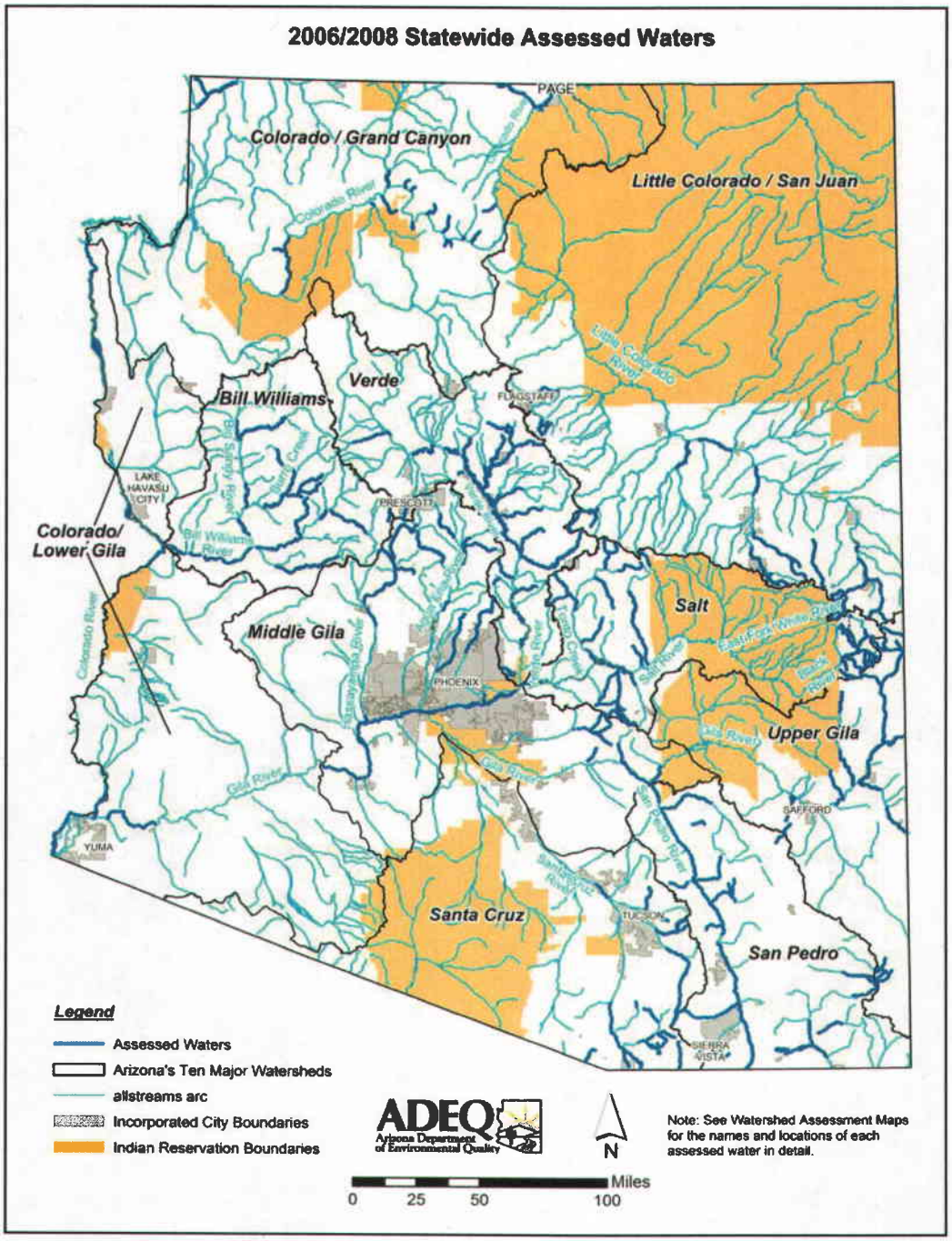
Although ADEQ has proposed revisions to surface water quality standards and the Impaired Water Identification Rule, this assessment does not reflect any changes in either of these rule packages. The assessment is using the same rules that were in effect for the 2004 assessment. However, the following changes and clarifications in federal guidance for completing assessments and listings were incorporated in this assessment:

- Evidence of whether a sample represents a 4-day period, such as hydrologic stability, should be evaluated where available, when using a grab sample to represent chronic aquatic and wildlife conditions.
- An assessment unit can be listed in multiple categories when a TMDL has been completed on some pollutants, but not all pollutants causing impairment.
- When listing an impaired assessment unit in Category 4B, based on alternative pollution control requirements, the state must provide substantial supporting evidence of a regulatory commitment to bringing the surface water into compliance with its standards.

The Surface Water Assessment Methods and Technical Support document describes how these changes were implemented in this assessment. Further revisions of the Impaired Water Identification Rule are required to establish any of these as listing or delisting requirements.

CHAPTER II
WATER QUALITY ASSESSMENTS BY WATERSHED

Assessments are reported alphabetically by individual assessment units in this chapter and grouped by the 10 watersheds, as illustrated on the following map: Bill Williams Watershed, Colorado – Grand Canyon Watershed, Colorado – Lower Gila Watershed, Little Colorado Watershed, Middle Gila Watershed, Salt Watershed, San Pedro Watershed, Santa Cruz Watershed, Upper Gila Watershed, and Verde Watershed.



If the reader is uncertain about which watershed to look in for assessment information, an alphabetical listing of surface waters assessed is provided in **Appendix A**.

Assessment Information

A summary page is provided for each assessment indicating:

- Designated use support and an overall assessment
- Impairment status and pollutant causing impairment (if applicable)
- Monitoring used in the assessment
- Exceedances
- Data gaps and monitoring priorities.

The data gaps and monitoring needs information provides the "Planning List" information used to prioritize future monitoring. Surface waters not assessed are also included in the general planning list, as the lack of data to support assessments is a reason to be placed on ADEQ's internal Planning List.

The reader should refer to the Surface water Assessment Methods and Technical Support document for information concerning the assessment process, determining exceedances, assessment criteria, assessment categories, and monitoring prioritization criteria.

Watershed Information

General background information and a few maps are provided for each watershed to provide some context for the assessments. One map (or a series of maps) shows the assessed surface waters and the monitoring sites used in this assessment. The watershed reports also provide descriptions of TMDLs, water quality improvement projects, and other studies that have been initiated or completed since 2000.

Little Colorado River Watershed

Watershed Description

This watershed is defined by the Little Colorado River, from its headwaters to the Colorado River, and tributaries to the San Juan River which flow into north and east into New Mexico and Utah. This area contains horizontally stratified sandstone and limestone which have eroded to form canyon and plateaus. In a few areas, igneous rocks have deposited on sedimentary formations due to volcanic activity. Natural erosion can be easily increased by human activities in such locations.

Land ownership is divided approximately as: 60% tribal, 12% federal, 12% private, 6% state. This 26,794 square mile watershed is sparsely populated outside of Flagstaff, with 236,500 people (including Flagstaff) (2000 census). Land use is primarily open grazing, forestry, recreation, and mining. The area contains four national monuments, four wilderness areas, and two national forests with varying levels of use restrictions.

Elevations range from 12,600 feet (above sea level) at Humphrey's Peak near Flagstaff to 2,700 feet near the Colorado River. However, most of the watershed is above 5000 feet elevation, with desert highlands flora and fauna, and coldwater aquatic communities where perennial waters exist.

Water Resources

The climate provides approximately 10 inches of rain and 15 to 20 inches of snow yearly. Snow melt has been a primary source of water for this region. The flow on the Little Colorado River is "interrupted" (stretches of perennial, intermittent, and ephemeral flow). Perennial flow is generally limited to headwaters streams.

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

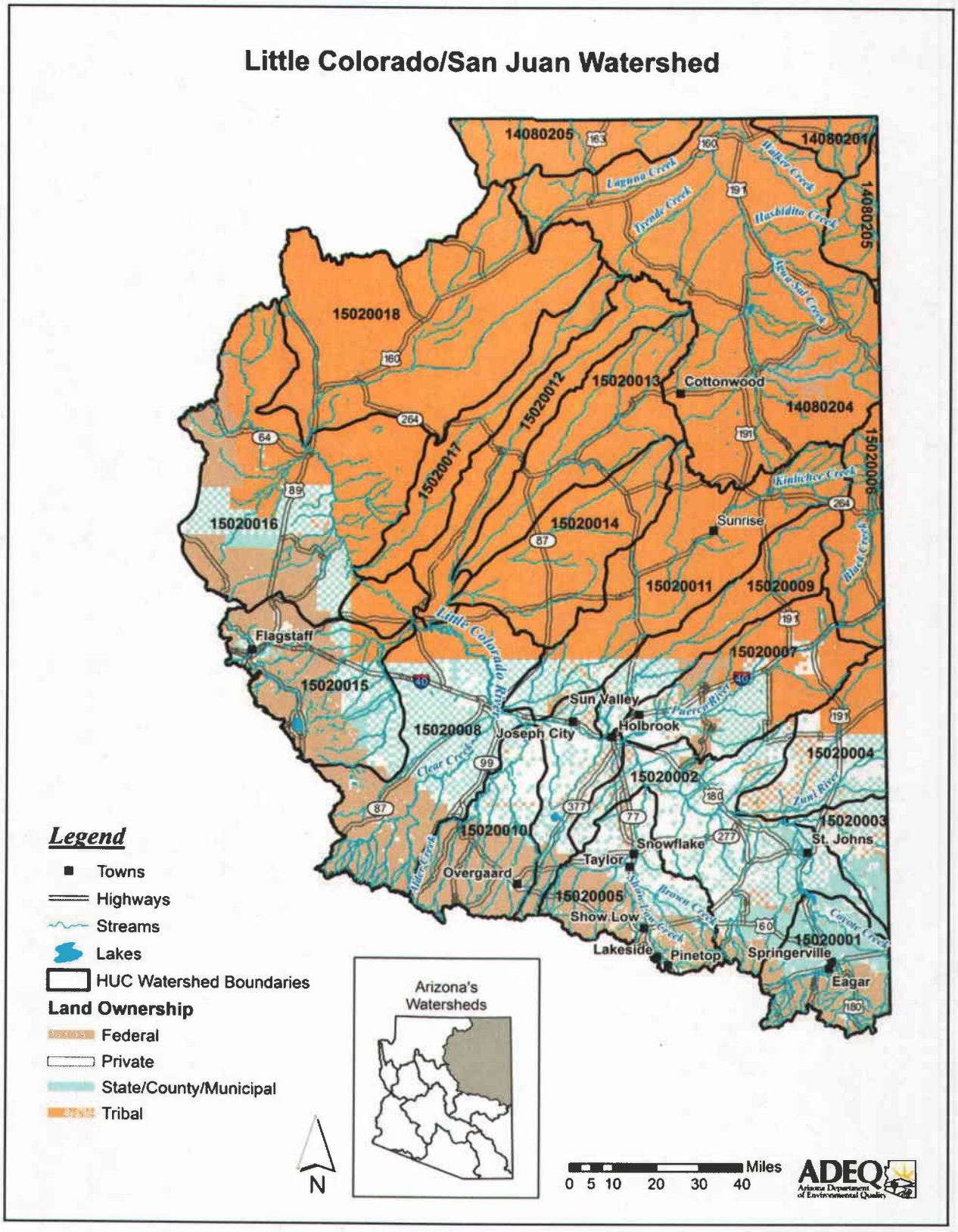
Estimated Surface Water Resources in the Little Colorado Watershed

	Perennial	Intermittent	Ephemeral
Stream miles	640	1,655	9,635
	Perennial	Non-perennial	
Lake acres	16,050	6,830	

On Tribal Lands – Not assessed

	Perennial	Intermittent	Ephemeral
Stream miles	305	170	15,310
	Perennial	Non-perennial	
Lake acres	5,295	118	

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.


Little Colorado/San Juan Watershed
14080205
14080201
14080204
15020018
15020017
15020012
15020013
15020016
15020014
15020011
15020009
15020007
15020015
15020008
15020004
15020002
15020003
15020010
15020005
15020001
Cottonwood
Sunrise
Flagstaff
Sun Valley
Holbrook
Joseph City
Snowflake
St. Johns
Taylor
Overgaard
Show Low
Lakeside
Pinetop
Springerville
Eagar
Legend
Towns
Highways
Streams
Lakes
HUC Watershed Boundaries
Land Ownership
Federal
Private
State/County/Municipal
Tribal
Arizona's Watersheds
N
0 5 10 20 30 40
Miles
ADEQ
Arizona Department of Environmental Quality

Watershed Partnerships

- **Little Colorado River Watershed Coordinating Council**
  This council looks at water quality and quantity issues across an immense watershed coving nearly 27,000 square miles that includes parts of New Mexico. They coordinate and encourage efforts by the smaller subwatershed listed below. The council meets in Holbrook or Winslow for quarterly meetings. For information contact: Ronald Smith, Project Director, at (928) 367-335 or rsmith@whitemtns.com; Jim Boles, Chair, 928-298-2422; or Larry Winn, Vice Chair, 505-879-3060.

  The following subwatersheds groups are also meeting and working on projects:
  - Show Low Creek Group – Tom Thomas at (928) 368-8885, tthomas@ci.pinetop-lakeside.az.us;
  - Silver Creek Advisory Commission – Ron Solomon, (928) 536-7366, ron@tayloraz.org; or Kerry Ballard, (928) 536-2539;
  - Upper Little Colorado River Partnership (above Lyman Lake) – Bill Greenwood, (928) 333-4128 x226, bgreenwood@eagar.com.

Special Studies and Water Quality Improvement Projects

Total Maximum Daily Load Analyses – The following TMDL analyses are scheduled to be completed in this watershed. Further information about the status of these investigations or a copy of the TMDL if completed can be obtained at ADEQ's website: www.azdeq.gov

- Nutrioso Creek is impaired by suspended sediment (turbidity).
  A TMDL was completed in 2000. Field investigations found that historic grazing and some forestry practices had contributed to a loss of riparian vegetation and stream entrenchment. Healthy riparian areas are needed to stabilized stream banks and dissipate stream energy during high flow events. Stream entrenchment causes a loss of flood plain, which leads to further increased stream velocity and related shear stress during higher flows. The silty-organic clay soils in this area are highly susceptible to water transport. The TMDL identified a variety of management practices to improve cattle grazing and forestry practices. Several of these have been implemented and effectiveness monitoring is ongoing.

- Rainbow Lake is impaired by nutrient loadings, high pH, and low dissolved oxygen.
  Excess nutrients can lead to high pH and low dissolved oxygen, algal blooms and even fish kills. A nutrient TMDL was approved in 2000. Nutrient load reductions were assigned to several sources to achieve water quality standards:
  - Septic systems – 75% reduction in nitrogen loading,
  - Runoff (residential, commercial, agricultural, and forests) – 50% reductions in nitrogen and phosphorus loadings
  - Macrophyte (aquatic plant) decomposition – 50% reductions in nitrogen and phosphorus loadings

  ADEQ is working with landowners and other interested stakeholders to implement strategies identified in the TMDL to achieve water quality standards. Further monitoring is scheduled to determine whether these strategies have been successful.

- The Little Colorado River near Springerville is impaired by suspended sediment (turbidity).
  Suspended sediment which causes high turbidity readings represents a risk to aquatic life. A turbidity/suspended sediment TMDL was completed in 2002. The investigation indicated that sediment loadings actually start upstream of these segments. The main cause of the suspended sediments is loss of vegetative cover due to historic grazing practices. Loss of vegetation, especially in the riparian area, allows increased runoff, soil erosion, and bank destabilization. Effective management strategies include increasing riparian vegetation, stream bank stabilization, maintenance of flood plains, and minimization of the impact of cattle in the general area. ADEQ has been working with landowners and other interested stakeholders to implement strategies to reduce sediment transport in the Little Colorado River. Further monitoring to determine the effectiveness of implemented strategies is ongoing.

- The Little Colorado River near Joseph City is impaired due to copper, silver, and suspended sediment concentration (SSC). These pollutants pose a risk to aquatic life and wildlife. Further monitoring is needed to identify sources in this drainage area. TMDLs will be initiated in 2007.

- The Little Colorado River near Woodruff is impaired due to *E. coli* bacteria and suspended sediment. *Escherichia coli* contamination presents a significant public health concern if people are swimming or even wading in the water. A bacteria TMDL will be initiated in 2007. Monitoring for the sediment TMDL will occur in conjunction with monitoring for the other TMDLs on the Little Colorado River.

- Lakes in the Lake Mary region near Flagstaff are impaired by mercury: Upper Lake Mary, Lower Lake Mary, Lower Long Lake, Soldiers Lake, and Soldiers Annex Lake.
  Fish consumption advisories have been issued at each of these lakes because consumption of mercury poses risks to humans who eat the fish. Mercury also poses risks to other animals that prey on the fish.

  A draft model development report for the Lake Mary region (Malcolm Pirnie, 2006) indicates that mercury is from indirect sources such as: air deposition to the lake and to the watershed (transported to the lakes via runoff), ground water, and natural background. Several remediation scenarios were evaluated using the model: lake aeration, sediment dredging, watershed load reduction, lake level management, and fisheries management. This analysis indicated that reduction of water column concentrations would require reductions in atmospheric loads directly and by reducing soil erosion in the watershed. A draft TMDL should be completed in 2006.

- Lyman Lake (near Springerville) is also impaired by mercury.
  A fish consumption advisory has been issued at this lake because consumption of mercury poses risks to humans who eat the fish. Mercury also poses risks to other animals that prey on the fish.

- Bear Canyon Lake is impaired by low pH (alkaline conditions)
  Low pH conditions can negatively impact most designated uses (swimming, aquatic life, agriculture). A TMDL is scheduled and will investigate whether sources of this water quality problem.

Water Quality Improvement Grant Projects – ADEQ awarded the following Water Quality Improvement Grants (319 Grants) in this watershed. More information concerning these grants or projects can be obtained at: http://www.azdeq.gov/environ/water/watershed/fin.html.

- **EC Bar Ranch Turbidity Reduction Projects**
  EC Bar Ranch (2000, 2001, 2002, 2003, 2004, and 2005)
  Restore riparian conditions by exclude cattle from riparian areas and provide alternative water sources for cattle. This should result in stream bank stabilization and reductions in sediment loading to Nutrioso Creek.

- **Rogers Ranch Turbidity Reduction Project**
  Rogers Ranch (2000)
  Restore riparian vegetation and stream bank stability by excluding cattle from riparian areas and providing alternative water sources along Nutrioso Creek.

- **Big Ditch Water Quality Improvement Project**
  The Town of Eager (2000)
  Line "Big Ditch", an irrigation canal, to reduce leakage and improve riparian growth.

- **Murray Basin – Saffel Canyon Phase II Project**
  The Apache Sitgreaves National Forest (2001)
  Restore stream channels to their natural form and function on two severely degraded tributaries to Nutrioso Creek. Project includes realigning and regrading roads, obliterated some roads, and revegetated some disturbed sites in the Apache Sitgreaves National Forest.

- **Overgaard Townsite Water Protection Project**

The Overgaard Domestic Wastewater Improvement District (2001, 2004)
Connect 20 homes to a 10,000 gallon septic tank and leach field to protect public health and underlying aquifers and nearby streams.

- **Greenwood Sediment Reduction Project**
  The Apache Sitgreaves National Forest (2001)
  Reconstruct and realign forest roads to reduce sediment contributions to Nutrioso Creek. Erosion stabilization techniques were applied to control active head-cutting and bank erosion caused by roads.

- **Best Management Practices for Wastewater Treatment at Tolani Lake Project**
  The Navajo Nation (2001)
  Develop a modern wastewater lagoon system and constructed wetland at Tolani Lake. The project was used to teach and promote best management practices associated with the operation and maintenance of wastewater systems, including effluent reuse.

- **Juan Curley Project**
  The Navajo Nation (2004)
  Develop and implement a grazing management plan for a 270 acre Navajo allotment. The plan is to identify strategies to reduce stream bank and gully erosion.

- **Hell's Hole Spring Development Project**
  Apache-Sitgreaves National Forest (2003)
  Improve water quality, wetland function, and water capacity at the following springs: Yellow Bull, Upper Linden, Coyote, and Miner.

Water Protection Fund Projects – The following Water Protection Fund Projects have been awarded by the Arizona Department of Water Resources. Information about these funds or projects can be obtained from ADWR at: http://www.azwater.gov.

- **Murray Basin – Saffel Canyon Phase II Project**
  The Apache-Sitgreaves National Forest (2000)
  Restore stream channels to their natural form and function on two severely degraded tributaries to Nutrioso Creek. The Forest Service also realigned and regraded roads, obliterated some roads, and revegetated some disturbed sites.

- **Pueblo Colorado Wash Project**
  Hubbell Trading Post Natural Site (2000)
  Continue the riparian area restoration of Pueblo Colorado Wash. This project was first funded in 1997 and has been successful in reestablishing the natural sinuosity of the channel, function of the riparian area, and natural vegetative communities in the area.

- **Hubbell Trading Post Riparian Restoration using Treated Effluent Project**
  Hubbell Trading Post Natural Site (2000)
  In conjunction with the project above, develop a distributions system to use secondary treated effluent to irrigate four acres of flood plain while reestablishing native vegetation in this riparian area.

- **Lake Mary Watershed Streams Restoration Project**
  Northern Arizona University (2000)
  Reduce sedimentation in tributaries to both Upper and Lower Lake Mary. The project will modify stream channels, revegetate riparian areas, and where possible, relocate roads further from the tributaries.

- **Upper Fairchild Draw Riparian Restoration Project**
  Apache Sitgreaves National Forest (2000)

Build an 8-foot high fence to enclose grazing wildlife from a 14 acre wet meadow and plant willows within the enclosure. This work is to reduce detrimental grazing, improve riparian conditions in this headwater to Willow Creek, and therefore, reduce sediment loadings.

- **Round Valley Water Users Project**
  Town of Eagar and Round Valley Water Users Association Project (2000)
  Study water losses due to current irrigation delivery system and feasibility of a more efficient system. Reductions in water losses are expected to encourage riparian area growth and therefore water quality in the Little Colorado River.

- **Polacca Wash Grazing Management Project**
  The Hope Tribe (2000)
  Exclude livestock from riparian areas and revegetate using native plants along portions of Polacca Wash.

- **Wet Meadows – A Riparian Restoration Project**
  The National Wild Turkey Federation (2003)
  Fence off wildlife from five wet meadows in the Apache Sitgreaves National Forest.

- **Wilkins' Little Colorado River Riparian Enhancement Project**
  Ranchers (2003)
  In collaboration with Arizona Game and Fish Department, revegetate using native plants, stabilize ¾ mile of stream banks, and create better wildlife habitat along the Little Colorado River near Springerville.

- **Diamond X Ranch Riparian Enhancement Project**
  Diamond X Ranch (2004)
  Revegetate and improve riparian conditions along the Little Colorado River to reduce sediment loading.

- **EC Bar Ranch Well and Drinker Project**
  EC Bar Ranch (2004)
  Develop alternative water sources to minimize livestock and wildlife use of a fragile riparian area along Nutrioso Creek.

Other Water Quality Studies

- ***Bathymetric Study of Northern Arizona Lakes – Draft Final Report***
  Paul Gremillion and Cristina Piastrini, Northern Arizona University (2005)
  Bathymetric maps of the following lakes were created to support the development of Total maximum Daily Loads for mercury and other water quality studies: Ashurst Lake, Kinnikinick Lake, Long Lake, Lower Lake Mary, Upper Lake Mary, Soldier Lake, and Soldier Annex Lake. Along with the maps, tables of surface area and volume versus storage were developed for these seven lakes.

- ***Upper Little Colorado River Concept Plan – A Road Map and Resource Guide to Riparian Enhancement for Private Landowners***
  Tom Moody, Ruth Valencia, Kelly Wirtanen, and Mark Wirtanen, Northern Arizona University, College of Engineering and Technology, Dept of Civil and Environmental Engineering (2001)
  This report provides information to the riverside landowner for the management of their private lands. It describes fundamental characteristics of a stream and its riparian community and recommends specific practices to reduce bank erosion and channel incision, and improve riparian condition, fishery habitat, livestock watering, and water diversions. The plan also provides information about regulatory permits necessary to conduct projects in and along the riparian corridor and a set of potential funding sources for stream enhancement projects.

- ***Generalized Hydrogeology and Ground Water Budget for the C Aquifer, Little Colorado River Basin and Parts of the Verde and Salt River Basins, Arizona and New Mexico***
  Robert J. Hart, John J. Ward, Donald J. Bills, and Marilyn E. Flynn – U.S.G.S.(2002)

This report discusses the hydrogeology, structural controls, aquifers, ground water movement and development, interaction of ground water and surface water, and ground water budget components for the C aquifer. The C aquifer covers more than 27,000 square miles and is the most productive aquifer in the Little Colorado River Watershed. It has a direct hydraulic connection to the Little Colorado River in some places, especially at spring discharges in the lower 13 miles (just above the Colorado River confluence). Ground water pumpage from the C aquifer during 1995 was about 140,000 acre-feet. Discharge from the C aquifer is estimated to be 319,000 acre-feet/year, with downward leakage to limestones accounting for most of the total discharge.

- ***Ground Water, Surface Water, and Water Chemistry Data, Black Mesa Area, Northeastern Arizona 2000-2001, and Performance and Sensitivity of the 1988 USGS Numerical Model of the N Aquifer***
  Blakemore E. Thomas – U.S. Geological Survey, in cooperation with the Arizona Dept of Water Resources and Bureau of Indian Affairs (2002)
  The N aquifer is the major source of water in the 5,400 square mile Black Mesa area in northeastern Arizona. Since 1971, monitoring has been designed to determine the long term effects of ground water withdrawals from the N aquifer for industrial and municipal uses. During the past 10 years, total withdrawals increased at an average rate of about 3% per year. Water levels in 33 wells dropped an average of 17 feet during the past 35 years (ranging 169-foot drop to 10-foot increase). Long-term effects of pumping on surface waters could not be measured. No significant trend in the annual average discharges for Moenkopi Wash and Laguna Creek, while median winter flows for Dinnebito Wash and Polacca Wash have decreased during the last 6 years.

- ***Ground Water, Surface Water, and Water Chemistry Data, Black Mesa Area, Northeastern Arizona 2001-2002***
  Blakemore E. Thomas – U.S. Geological Survey, in cooperation with the Arizona Dept of Water Resources and Bureau of Indian Affairs (2002)
  This is a continuation of study above.

- ***Ground Water, Surface Water, and Water Chemistry Data, Black Mesa Area, Northeastern Arizona 2001-2002***
  Blakemore E. Thomas – U.S. Geological Survey, in cooperation with the Arizona Dept of Water Resources and Bureau of Indian Affairs (2003)
  This is a continuation of study above.

- ***Ground Water, Surface Water, and Water Chemistry Data, Black Mesa Area, Northeastern Arizona 2002-2003***
  Blakemore E. Thomas – U.S. Geological Survey, in cooperation with the Arizona Dept of Water Resources and Bureau of Indian Affairs (2004)
  This is a continuation of study above.

- ***Ground Water, Surface Water, and Water Chemistry Data, Black Mesa Area, Northeastern Arizona 2003-2004***
  Blakemore E. Thomas – U.S. Geological Survey, in cooperation with the Arizona Dept of Water Resources and Bureau of Indian Affairs (2005)
  This is a continuation of study above.

- ***Hydrology of the D Aquifer and Movement and Ages of Ground Water Determined from Geochemical and Isotopic Analyses, Black Mesa Area, Northeastern Arizona.***
  Margot Truini and Steve A. Longsworth, U.S. Geological Survey, in cooperation with the Bureau of Indian Affairs (2003)
  Water samples from the D aquifer contain higher concentrations of dissolved solids than samples from the N aquifer; therefore, the Navajo Nation and the Hopi Tribe in Black Mesa are concerned about leakage from the overlying D aquifer into the N aquifer which is their primary source of potable water. The study found that leakage is most likely to occur in the southern part of Black Mesa.

- ***Water Quality Data form Navajo National Monument, Northeastern Arizona 2001-2002***
  Blakemore E. Thomas – U.S.G.S., in cooperation with the National Park Service (2003)
  Water samples were collected from two springs and one well near Betatakin ruin, one spring near Keet Seel Ruin, and one spring and one stream near Inscription House Ruin in 2001 and 2002. Water from all sites is from the N aquifer.

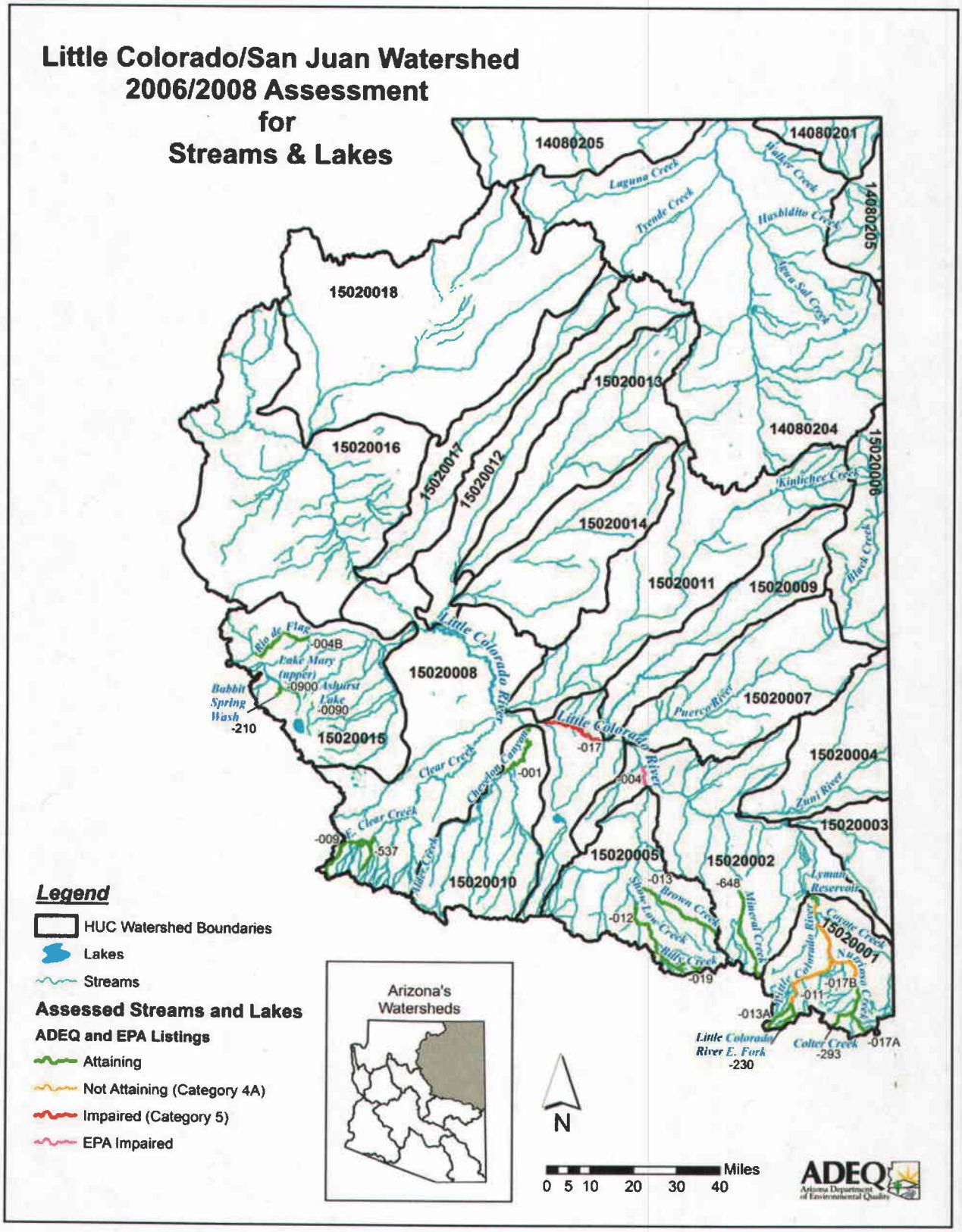
- ***Water Quality Data for Walnut Canyon and Wupatki National Monuments, Arizona 2001-02***
  Blakemore E. Thomas, U.S. Geological Survey in cooperation with the National Park Service (2003)
  Water quality data were collected from Cherry Canyon seep in Walnut Canyon, the Walnut Canyon headquarters well, Heiser Spring in Wupatki, and from the Little Colorado River at the edge of Wupatki to provide baseline water quality information.

Assessments

The Little Colorado River Watershed can be separated into the following drainage areas (subwatersheds):

14080105	La Plata River Drainage Area (Tribal Land – Not assessed)
14080106	Charco River Drainage Area (Tribal Land – Not assessed)
14080201	Cottonwood Creek Drainage Area (Tribal Land – Not assessed)
14080204	Chinle Wash Drainage Area (Tribal Land – Not assessed)
14080205	Oljeto Wash Drainage Area (Tribal Land – Not assessed)
15020001	Little Colorado River Headwaters Drainage Area
15020002	Upper Little Colorado River Drainage Area
15020003	Carrizo Wash Drainage Area
15020004	Zuni River Drainage Area
15020005	Silver Creek Drainage Area
15020006	Upper Puerco River Drainage Area (Tribal Land – Not assessed)
15020007	Lower Puerco River Drainage Area
15020008	Middle Little Colorado River Drainage Area
15020009	Wide Ruin Wash Drainage Area
15020010	Chevelon Canyon Drainage Area
15020011	Puerco Colorado Wash Drainage Area
15020012	Oraibi Wash Drainage Area (Tribal Land – Not assessed)
15020013	Polacca Wash Drainage Area (Tribal Land – Not assessed)
15020014	Jadito Wash Drainage Area (Tribal Land – Not assessed)
15020015	Canyon Diablo Drainage Area
15020016	Lower Little Colorado River Drainage Area
15020017	Dinnebito Wash Drainage Area (Tribal Land – Not assessed)
15020018	Moenkopi Wash Drainage Area (Tribal Land – Not assessed)

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 (2006).


Little Colorado/San Juan Watershed
2006/2008 Assessment
for
Streams & Lakes
14080205
14080201
Laguna Creek
Walker Creek
Trende Creek
Hashbidito Creek
Nava Sud Creek
15020018
15020013
14080204
15020016
15020017
15020012
Kinlichee Creek
15020014
15020011
15020009
Black Creek
Little Colorado River
Rio de Flag
-004B
Lake Mary (upper)
-0900
Ashurst Lake
-0090
Babbit Spring Wash
-210
15020008
Puerco River
15020007
-017
Little Colorado River
15020004
-001
-004
Clear Creek
Cherry Canyon
Zuni River
15020003
E. Clear Creek
-009
-537
15020005
15020002
Lyman Reservoir
Silver Lake
-013
-012
Brown Creek
Billys Creek
-019
-648
Mineral Creek
Coyote Creek
15020001
Nutrioso Creek
-017B
-011
-013A
Little Colorado River E. Fork
-230
Colter Creek
-293
-017A
15020010
Legend
HUC Watershed Boundaries
Lakes
Streams
Assessed Streams and Lakes
ADEQ and EPA Listings
Attaining
Not Attaining (Category 4A)
Impaired (Category 5)
EPA Impaired
Arizona's Watersheds
N
Miles
0 5 10 20 30 40
ADEQ
Arizona Department of Environmental Quality