Regional Scale Stormwater Treatment

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June 22, 2017

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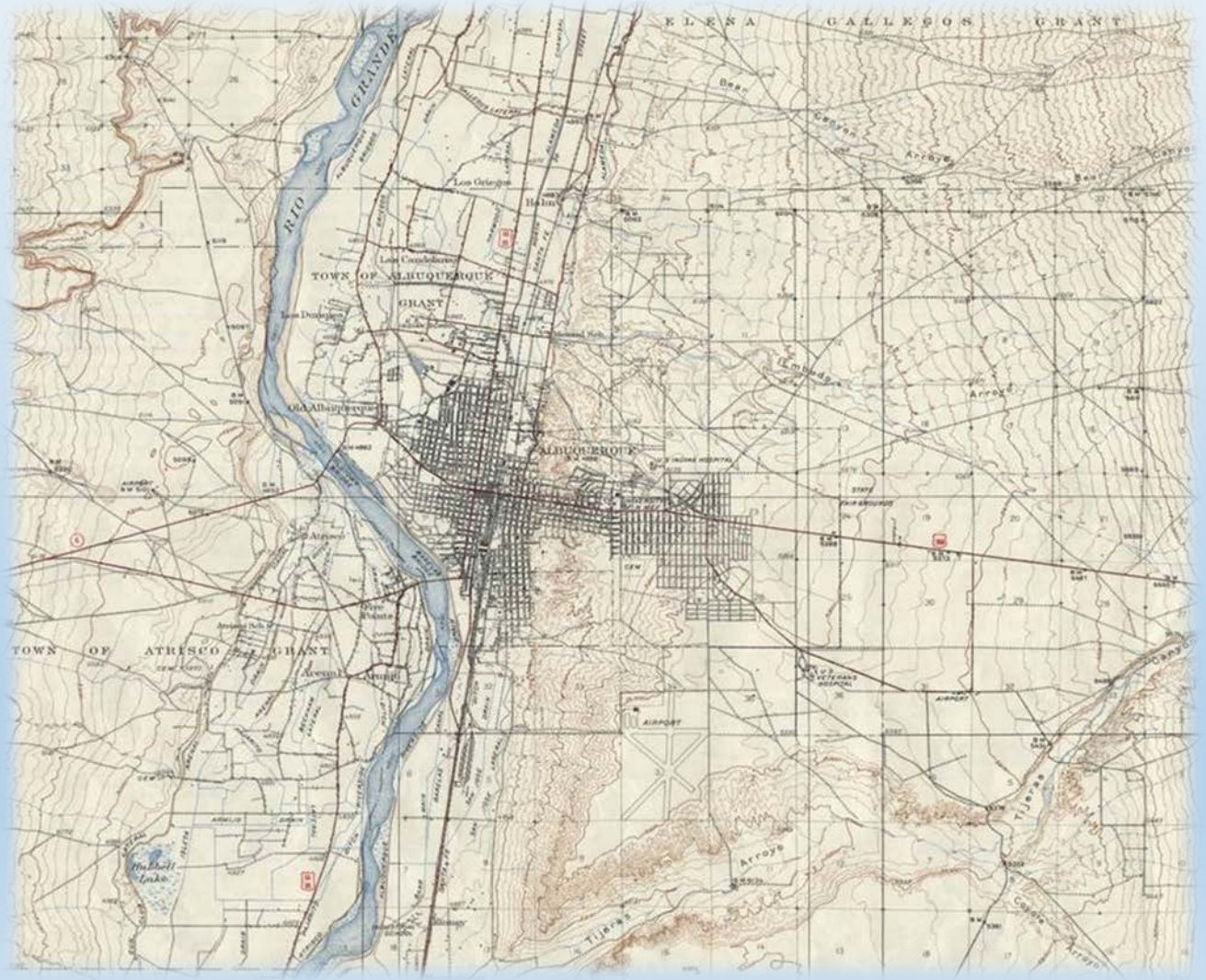
Presentation Overview

- What is AMAFCA?
- Watershed Based Permit Cooperation
- Examples of Regional Scale Stormwater Treatment

Map of Albuquerque in 1938



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Rio Grande Flooding in 1941

AMAFCA was created as a political subdivision of the State by the 1963 Legislature

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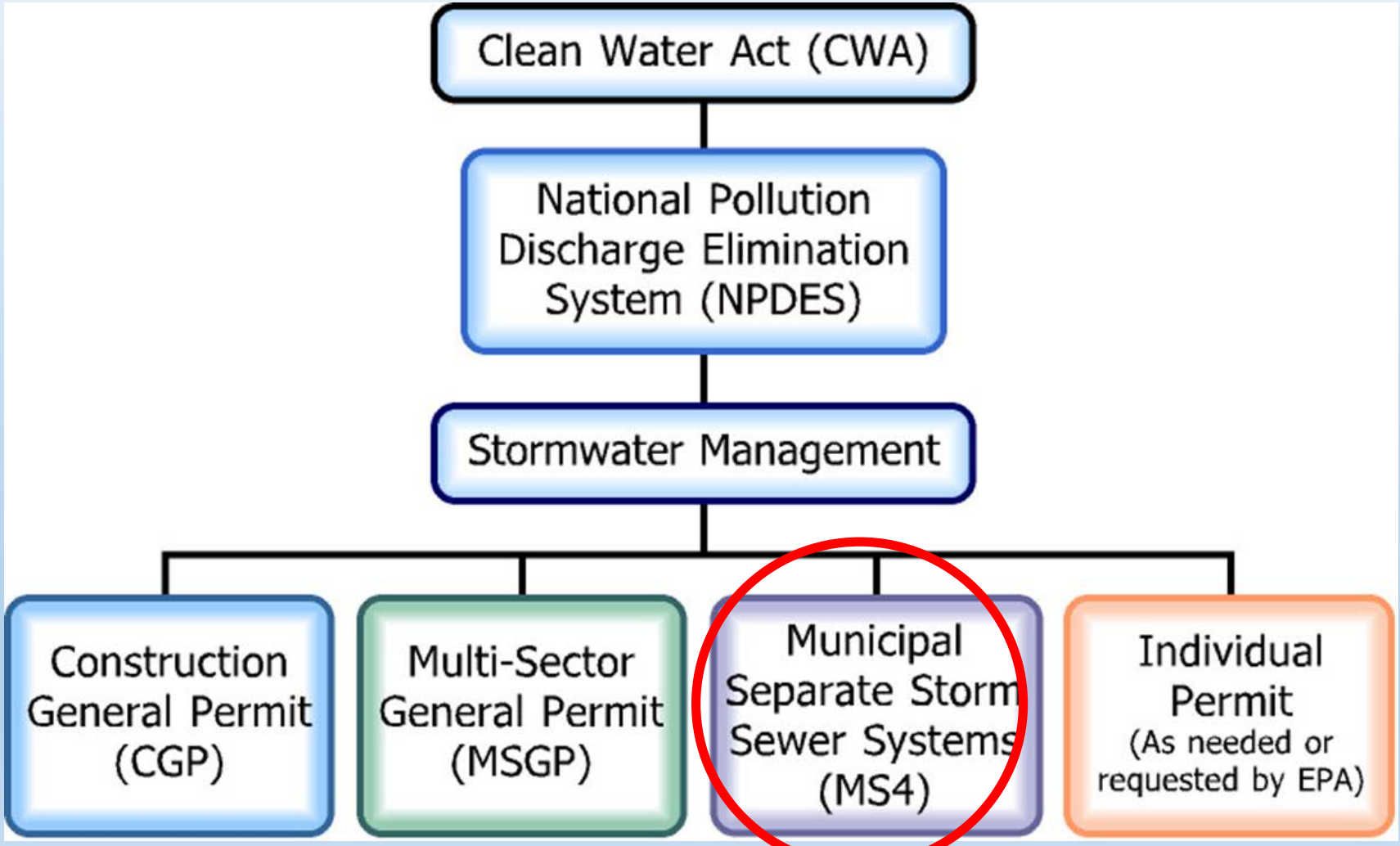
AMAFCA's Purpose

- ***To prevent injury or loss of life and to eliminate or minimize property damage due to flooding.***

Stormwater Quality Regulations - Quick Overview



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What is an MS4?

Municipal **S**eparate **S**torm **S**ewer **S**ystem

- Stormwater conveyance or

  system of conveyances
  - roads with drainage systems,
  - municipal streets,
  - curbs and gutters,
  - ditches,
  - manmade channels, or
  - storm drains
- Owned by a state, city, town, special district, tribe, or other public entity that discharges to waters of the U.S. and is:
  - designed or used for collecting or conveying stormwater
  - not a combined sewer
  - not part of a Publicly Owned Treatment Works (POTW)

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Watershed-based Permitting Pilot Projects

- In 2010, USEPA Headquarters designated:
  - Ramsey Washington Watershed District, Minnesota
    1 entity, established in 1975 under the Minnesota Watershed District Act
  - Milwaukee Metro Watershed, Wisconsin
    1 entity, created in 1982 by the Wisconsin legislature
  - Middle Rio Grande, New Mexico
    19 entities, no oversight governmental body

- Draft small system MS4 permit for New Mexico was published in 2015

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Middle Rio Grande Watershed-based MS4 Permit

- Class A Permittees – 4 total:
  - City of Albuquerque
  - Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA)
  - University of New Mexico (UNM)
  - New Mexico Department of Transportation (NMDOT), District 3

Middle Rio Grande Watershed-based MS4 Permit

- Class B Permittees – 10 total:
  - Bernalillo County
  - Sandoval County
  - Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA)
  - City of Rio Rancho
  - Village of Corrales
  - Los Ranchos de Albuquerque
  - Kirtland Air Force Base (KAFB)
  - Town of Bernalillo
  - State Fair Grounds/Expo NM
  - NMDOT District 3

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Middle Rio Grande Watershed-based MS4 Permit

- Class C Permittees – 2 total:
  - Eastern Sandoval County Arroyo Flood Control Authority
  - Sandia Labs and the Department of Energy (DOE)
- Class D Permittees – 3 total:
  - Pueblo of Sandia
  - Pueblo of Isleta
  - Pueblo of Santa Ana

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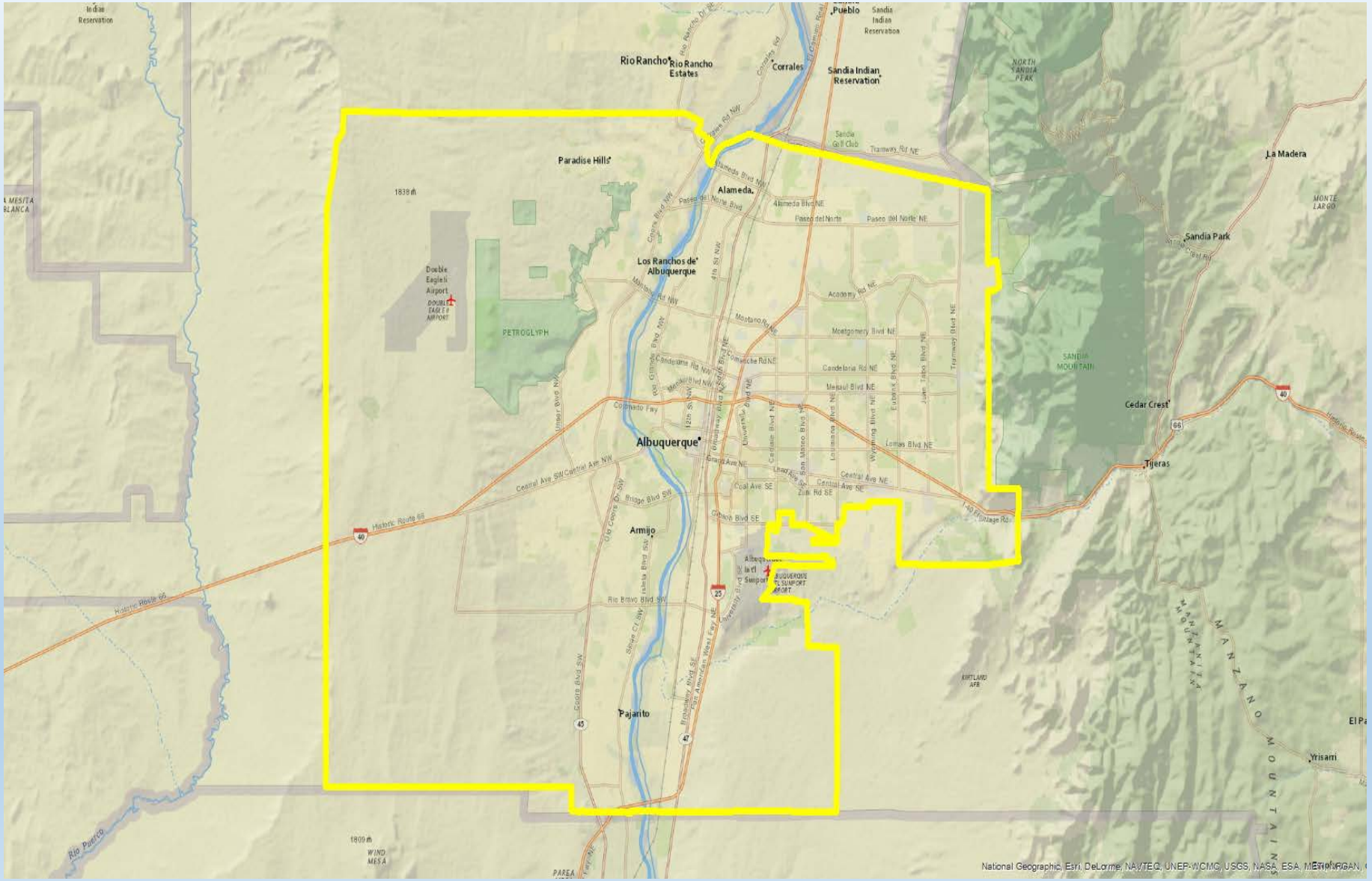
AMAFCA's Boundary



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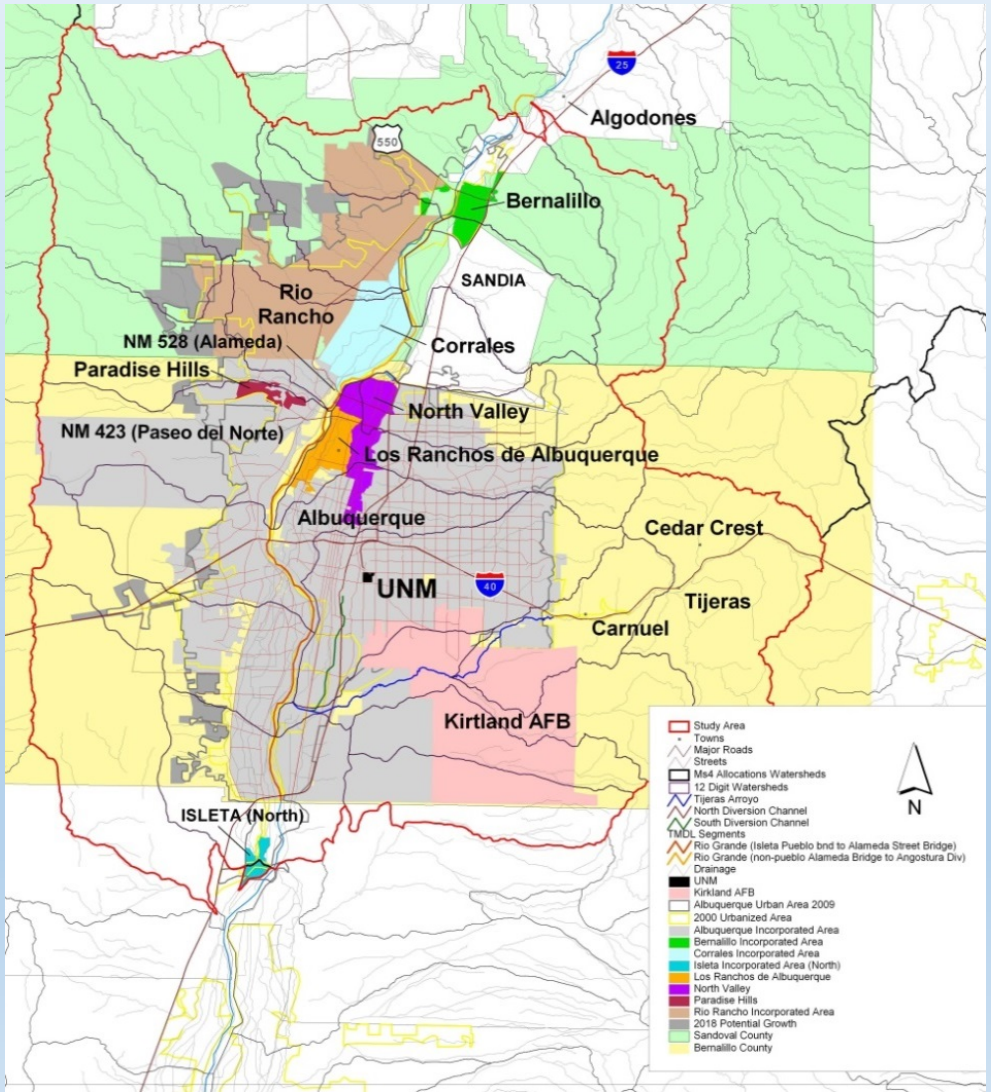
Middle Rio Grande Watershed – 19 MS4s



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Middle Rio Grande Watershed-based MS4 Permit

- General Permit Requirements:
  - Special Conditions
    - Compliance with water quality standards
    - Discharges to impaired waters with and without TMDLs
    - ESA requirements for addressing dissolved oxygen and sediment pollutant loads
  - Stormwater Management Program (SWMP)
    - Control Measures
  - Monitoring and Assessment

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Middle Rio Grande Watershed-based MS4 Permit

- SWMP Control Measures:
  - Construction site stormwater runoff control
  - Post-construction stormwater management in new development and redevelopment
  - Pollution prevention/good housekeeping
  - Industrial and high risk runoff (COA and AMAFCA only)
  - Illicit discharges and improper disposal
  - Control of floatables discharges
  - Public education and outreach
  - Public involvement and participation

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MRG WSB Permit Control Measures

- Construction Site Stormwater Runoff Control
  - The permittee must develop, revise, implement, and enforce a program to reduce pollutants in any stormwater runoff to the MS4 from construction activities that result from all construction activities with land disturbances equal to or greater than one acre, including sites which disturb less than one acre but are part of a larger common plan of development.
  - The permittee must develop an ordinance or other regulatory mechanism to require erosion and sediment controls, as wells as sanctions to ensure compliance, to the extent allowable under State, Tribal, or local law.
  - Evaluate site plans for construction projects for opportunities to incorporate GI/LID/ Sustainable practices and when the opportunity exists, encourage project proponents to incorporate such practices into the site design to mimic the pre-development hydrology of the previously undeveloped site.

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MRG WSB Permit Control Measures

- Post-Construction Stormwater Management in New Development and Redevelopment
    - The permittee must develop, revise, implement, and enforce a program to reduce pollutants in any stormwater runoff to the MS4 from new development and redevelopment projects with land disturbances equal to or greater than one acre, including sites which disturb less than one acre but are part of a larger common plan of development.
    - The permittee must implement and enforce an ordinance or other regulatory mechanism to address post-construction runoff from new and redevelopment projects to the extent allowable under State, Tribal, or local law. The ordinance or policy must incorporate a stormwater quality design standard that manages on-site the 90th percentile storm event discharge volume (0.65”) associated with new development sites and 80th percentile storm event discharge volume (0.48”) associated with redevelopment sites.

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MRG WSB Permit Control Measures

- Post-Construction Stormwater Management in New Development and Redevelopment , cont.
    - Ensure implementation of post-construction structural controls
    - Develop procedures for:
        - Education program for project developers
        - Site inspections and enforcement for O&M of BMPs
    - Assess all existing codes, ordinances, planning documents and other applicable regulations, for impediments to the use of GI/LID/ Sustainable practices.
    - Implement stormwater management practices that protect and enhance groundwater recharge as allowed under the applicable water rights laws.

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MRG WSB Permit Control Measures

- Illicit Discharges and Improper Disposal
  - The permittee must develop, revise, implement, and enforce a program to detect and eliminate illicit discharges entering the MS4.
  - The permittee must develop an ordinance or other regulatory mechanism to prohibit non-stormwater discharges into the MS4 and implement appropriate enforcement procedures and actions.
  - Develop and implement an Illicit Discharge Detection and Elimination (IDDE) plan.
  - Develop an education program to promote, publicize, and facilitate public reporting of illicit connections or discharges, distribution of outreach materials, and establish a hotline for reporting illicit discharges.
  - Investigate suspected significant/severe illicit discharges, review complaint records and develop a targeted source reduction program.
  - Screen the entire jurisdiction once every 5 years and high priority areas at least once per year.

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MRG WSB Permit Control Measures

- Control of Floatables Discharges
  - Develop, update, and implement a program to address and control floatables in discharges into the MS4.
  - Estimate annual volume of floatables and trash removed and characterize the floatable type.
- Public Education and Outreach
  - Develop, revise, implement, and maintain an education and outreach program.
- Public Involvement and Participation
  - Develop, implement, and maintain a public involvement and participation plan.

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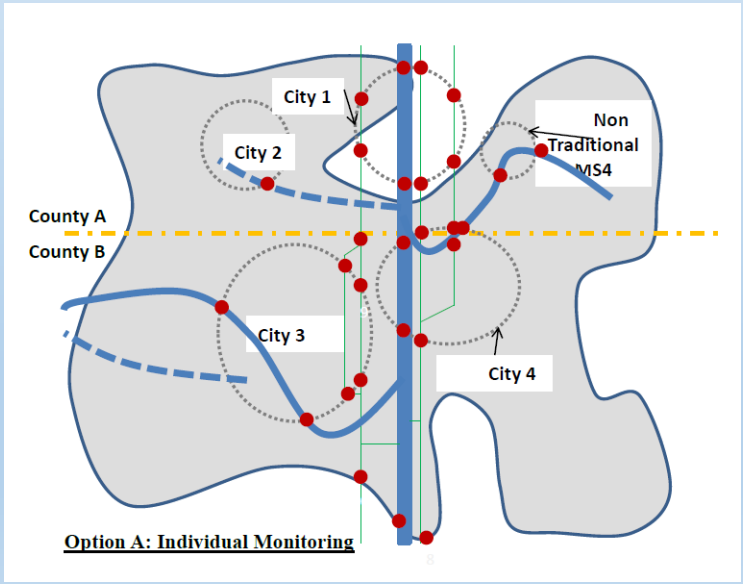
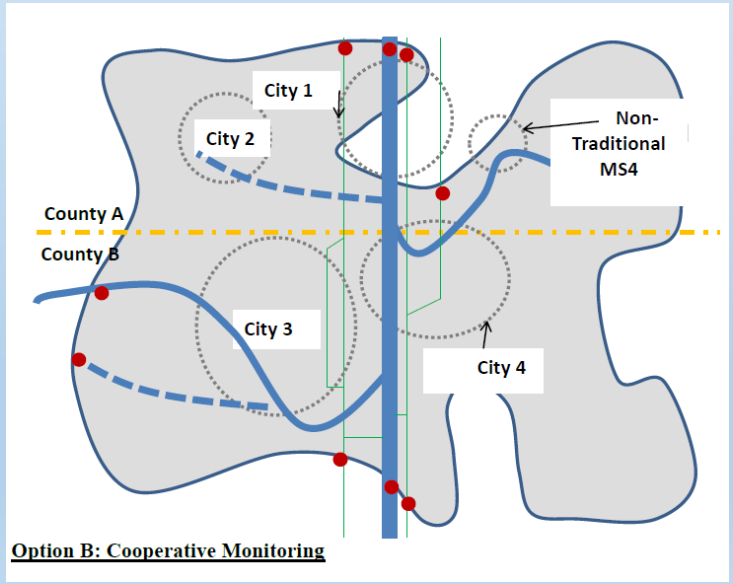
Middle Rio Grande WSB Permit

- Wet weather monitoring
  - Significant permit incentive for MS4s to cooperate on monitoring





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Middle Rio Grande Watershed-Based Permit

Cooperative Programs

- Natural collaborations
  - Cities/towns/villages, counties, and flood control authorities/NMDOT occupy same geographical area.
  - Pre-existing collaborative efforts from previous permits.
  - Extension of implementation deadlines with associated cooperative programs

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Middle Rio Grande Watershed-Based Permit

- Exchange of information between entities - the Technical Advisory Group (TAG)
  - An agreement where the participating entities cooperate and exchange information
  - Keep it Simple
    - No monetary contribution required
    - Needed to be a non-binding obligation
    - Allows entities to be part of the group and exchange information
  - Fourteen signatories to the TAG.
  - All levels of government represented (except Tribal).
  - TAG started meeting in early 2014 and monthly since the permit was issued.

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Middle Rio Grande Watershed-Based Permit

- Stormwater Quality Team (SWQT)
  - Prior to the Watershed Based (WSB) Permit, several of the MS4s formed a collaboration for outreach and education, the SWQT.
  - The SWQT continued to operate and opened up its membership to other MS4s covered in the WSB Permit.
  - Requires financial contribution for each member.
  - Provides education, outreach, involvement and participation on permit required topics.
  - Currently there are 9 members of the SWQT, membership is open.

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Middle Rio Grande Watershed-Based Permit

- The TAG formed a working group, the Compliance Monitoring Cooperative (CMC), to develop a monitoring plan.
  - 12 MS4s are currently cooperating on wet weather monitoring.
  - The TAG worked with NMED and EPA to develop the wet weather monitoring plan.

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How Trash Talks - Gross Pollutant Debris Study

- Combination of litter, organic debris and coarse sediments
- Litter is defined as manufactured items made from paper, plastic, cardboard, glass, metal, et cetera
- Vegetation debris including leaves, branches, seeds, twigs, grass clippings
- Sediments are soil, sand and minerals conveyed in or deposited from storm water runoff

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Gross Pollutants 101

- Storm drains and channels carry runoff to the Rio Grande
- Often untreated

Who Cares and Why?

- Previous study began in 2003 (RFP) and completed in 2005

- Language from draft MS4 Permit in 2003:

  "Develop a program to reduce the discharge of floatables and trash from the North Diversion Floodway Channel to the maximum extent practicable. Submit results of a study conducted to determine the most effective structural or treatment control BMPs to reduce the levels of floatables discharged through this storm water conveyance"

- Uniform standard for measuring and evaluating gross pollutants has not been established

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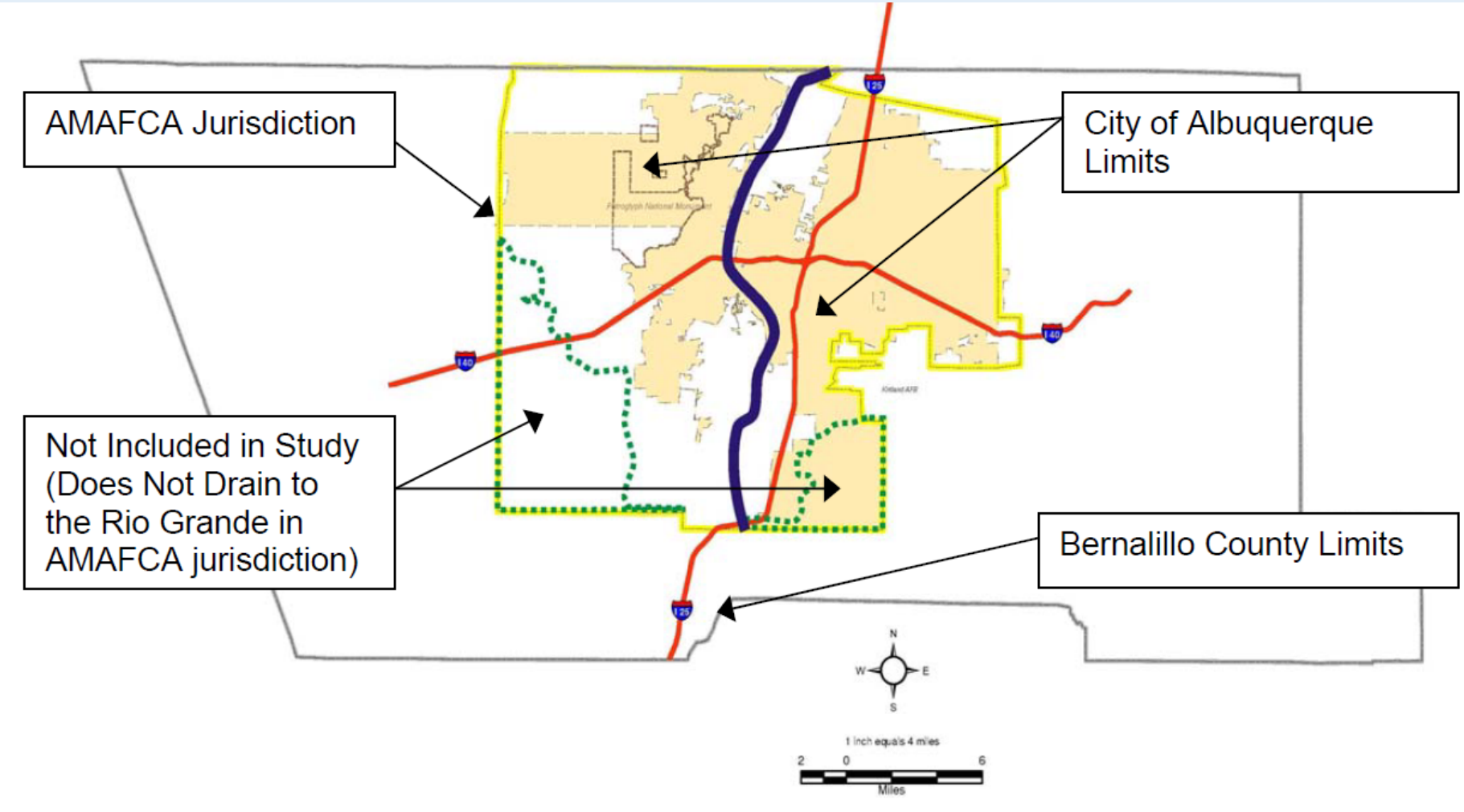
Albuquerque MS4 Watershed



Scope of Work – 2005 Gross Pollutant Study

- Review other agency programs
  - The State of Maryland, Department of Environmental Quality
  - The City of Los Angeles
  - The North-Central Texas Council of Governments
  - City of Tuscon
  - Pima County Flood Control Authority
  - Maricopa County Flood Control Authority

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Scope of Work - continued

- Review of existing facilities in Albuquerque develop a computer database of existing floatable removal facilities
  - Type of facility
  - Flow rate treated
  - 100 year system design flowrate
  - Document effectiveness in debris removal
  - Installation cost of facility
  - Frequency and type of maintenance required and estimated effectiveness of total debris removal
  - Facility effect on storm water flow

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Scope of Work - continued

- Discuss options for floatable control
- Trash and debris testing
- Trash and debris monitoring
  - Gross pollutants are the larger particles (defined as 1-3/4” or larger)
- Trash and debris public education and non-structural treatment

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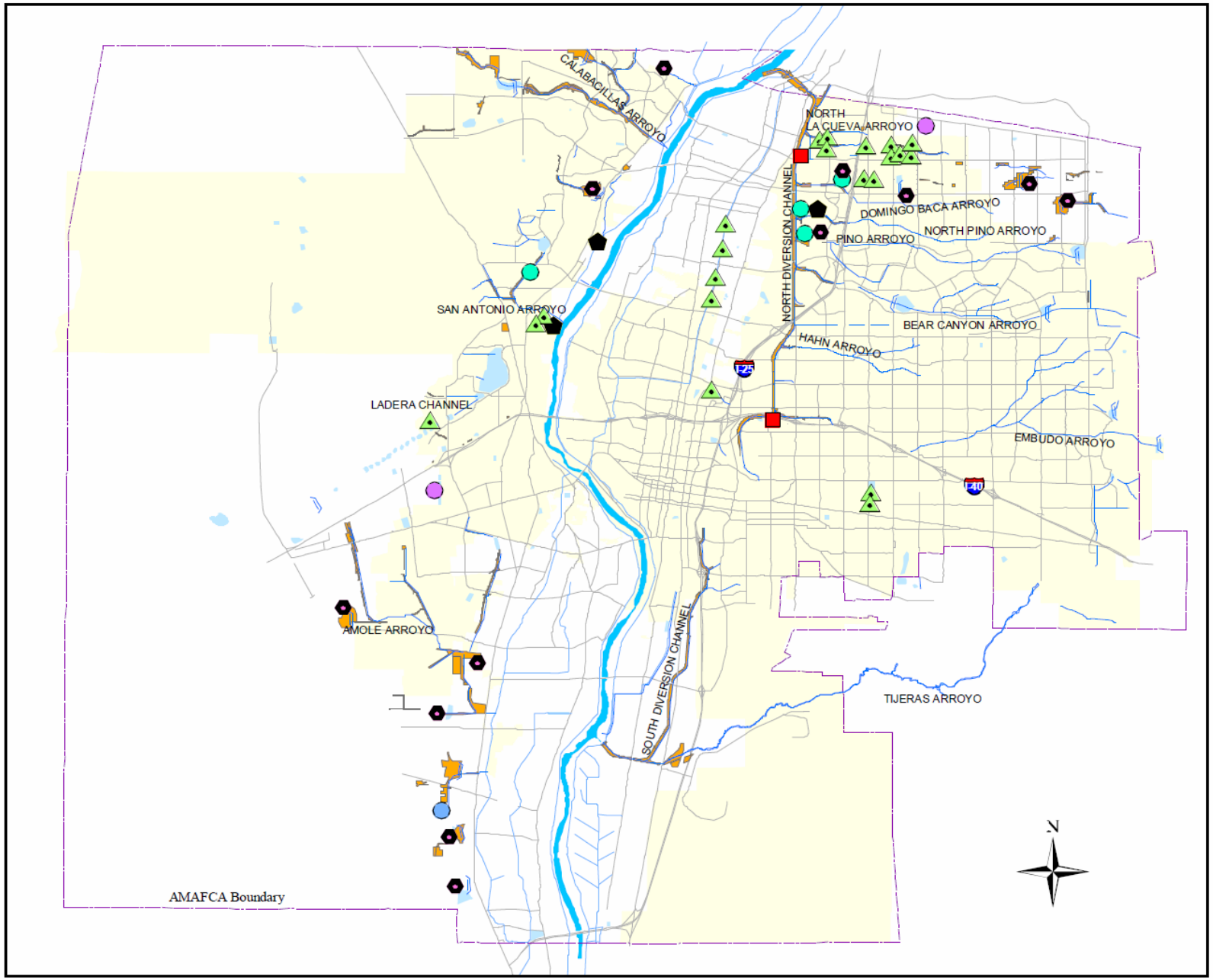
Water Quality Improvements Requiring Maintenance

March 2003

Legend

- Environmental Pond
- Sediment Pond
- Debris Screen Structure
- Dam Outlet Debris Tower
- Concrete Debris Baffle Structure
- Debris Manhole



Past Study Objectives

- Conduct a wet test on samples of trash obtained from the Albuquerque drainage system and perform chemical analysis on the leachate

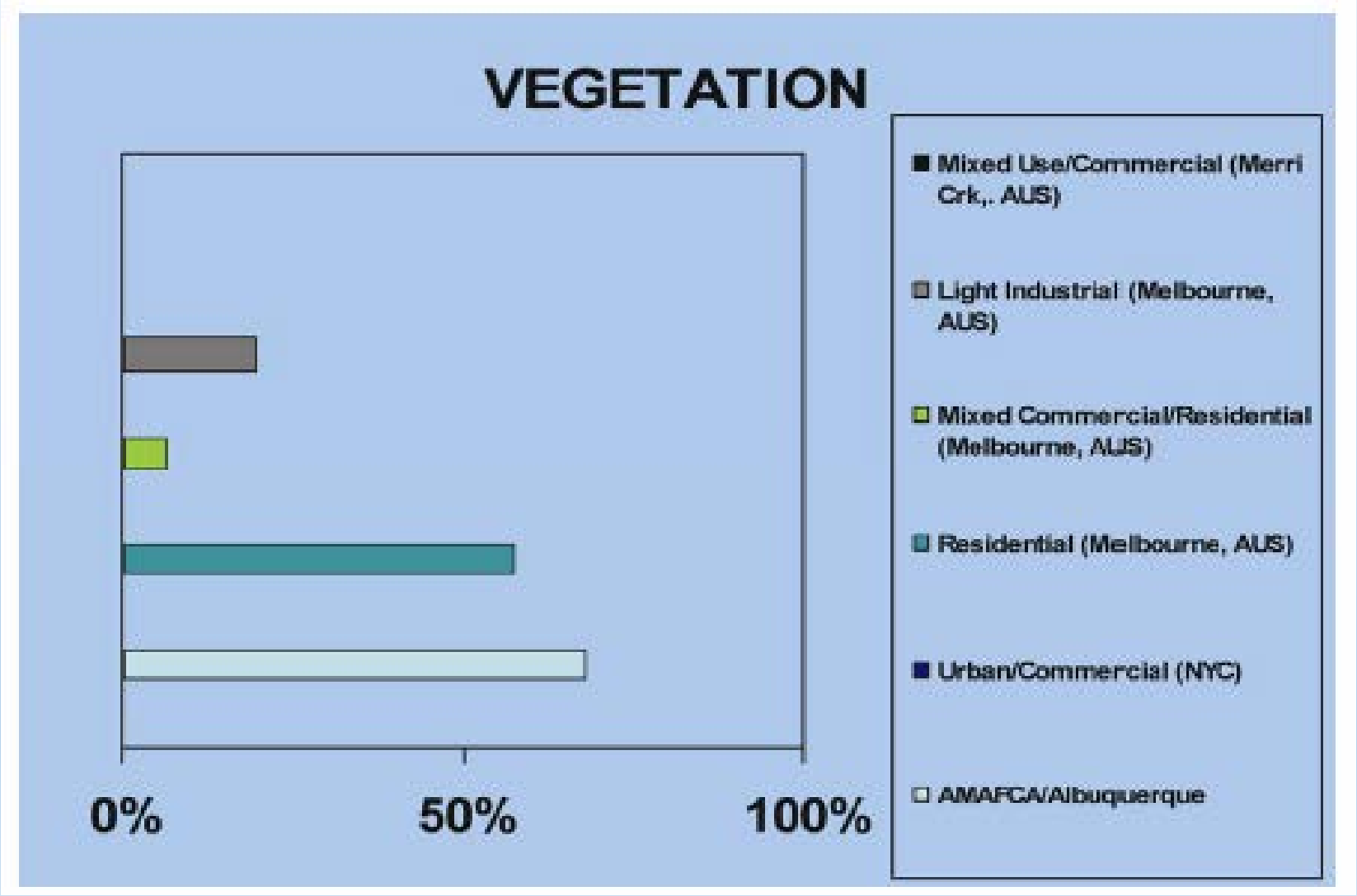
- Retrofits of floatable removal methods into the existing drainage system (water quality not mentioned in RFP)

2005 Study Methodology

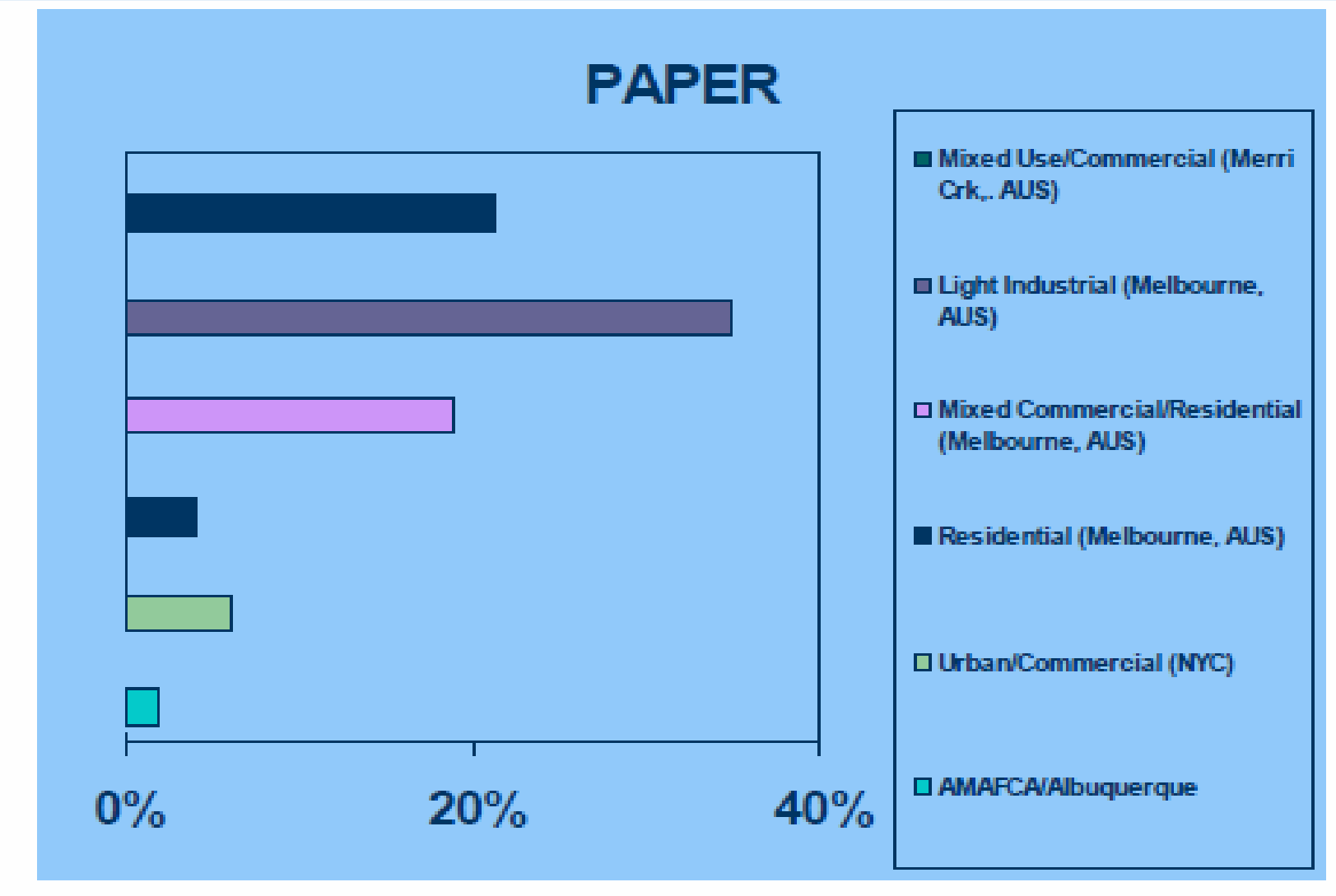
- Samples were collected from nine different sites, segregated into categories, weighed and the volume of each estimated

- Gross pollutant characterization was determined from the literature and from testing of local gross pollutants

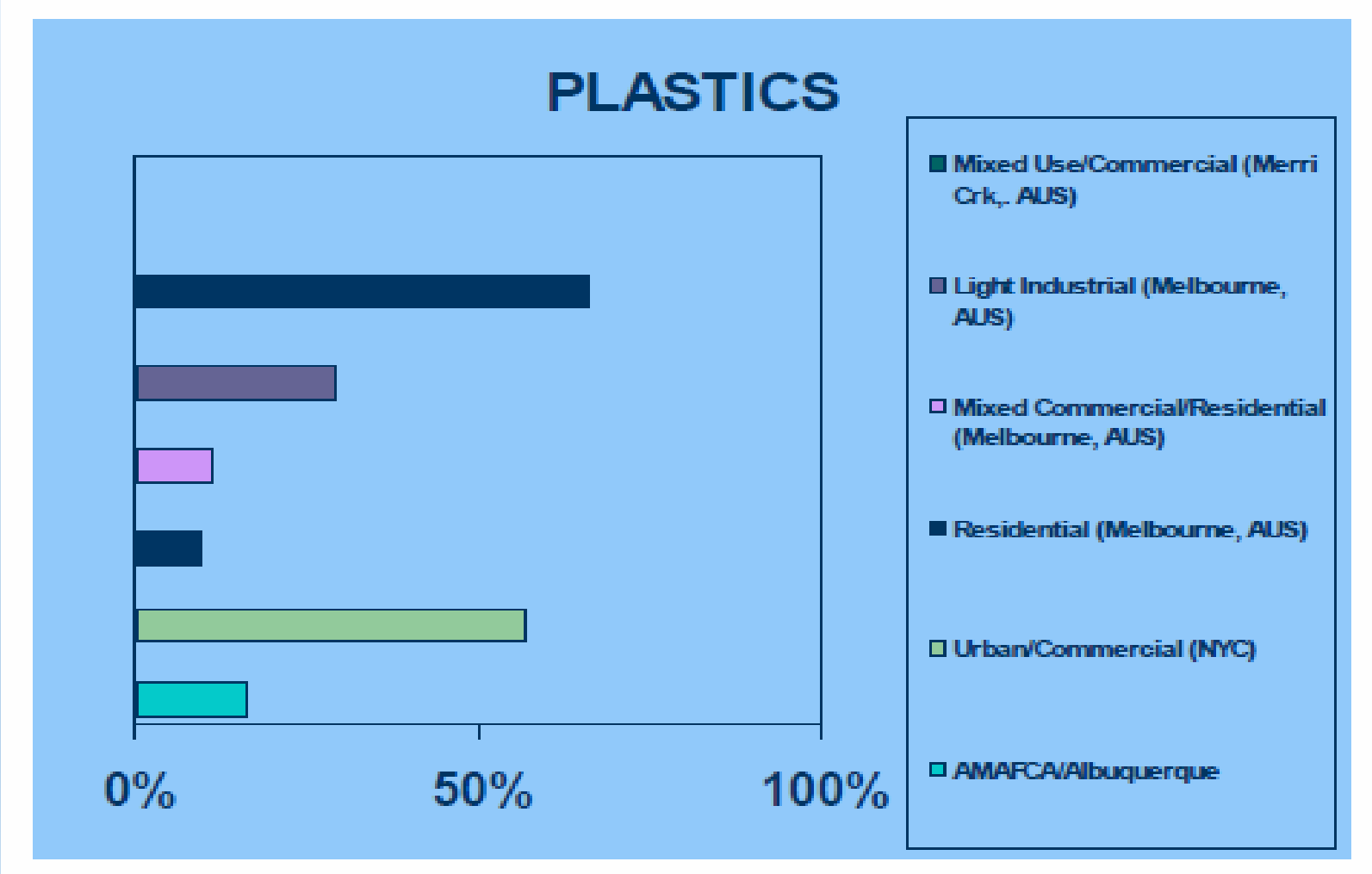
2005 Study Results



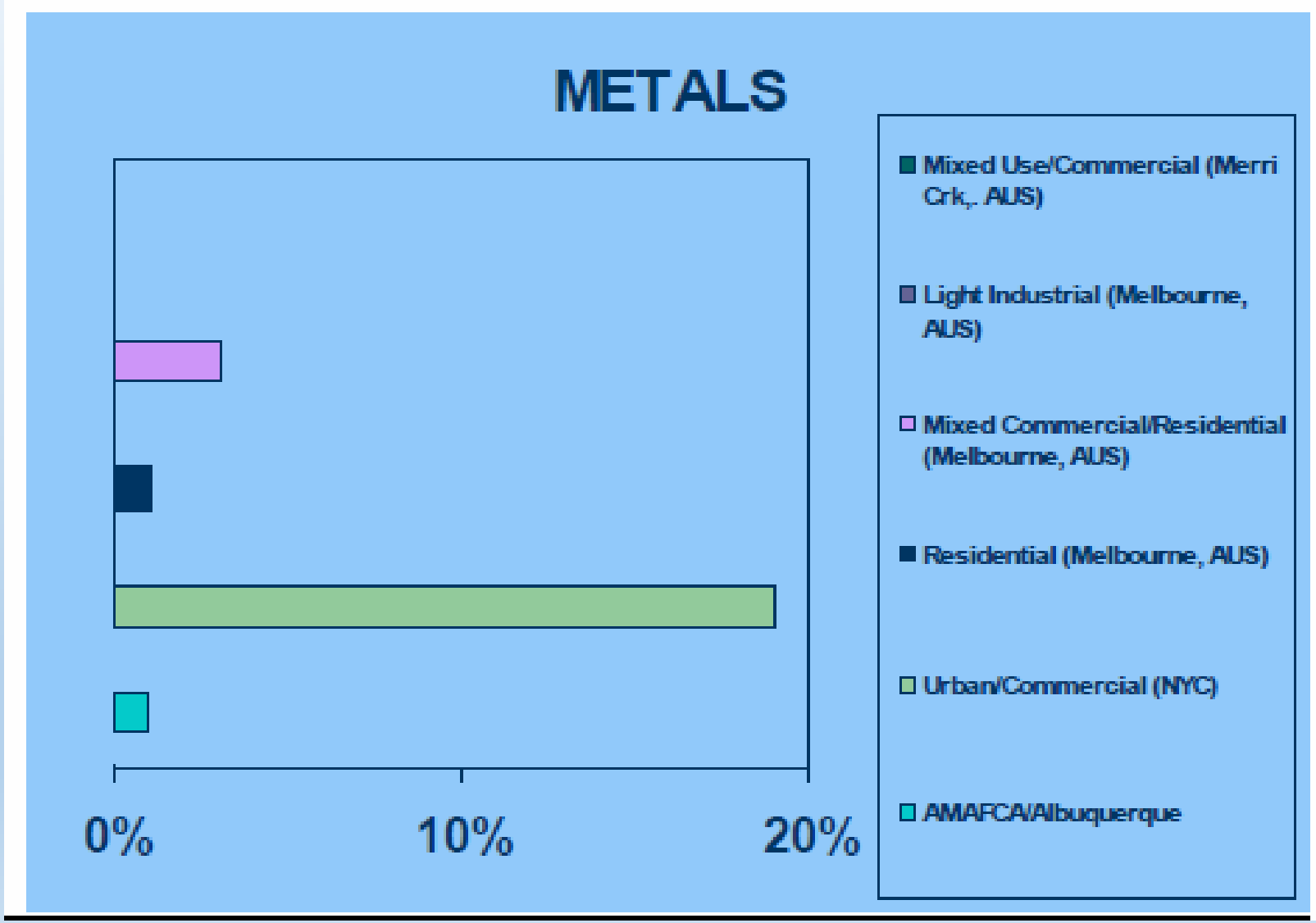
2005 Study Results - continued



2005 Study Results - continued

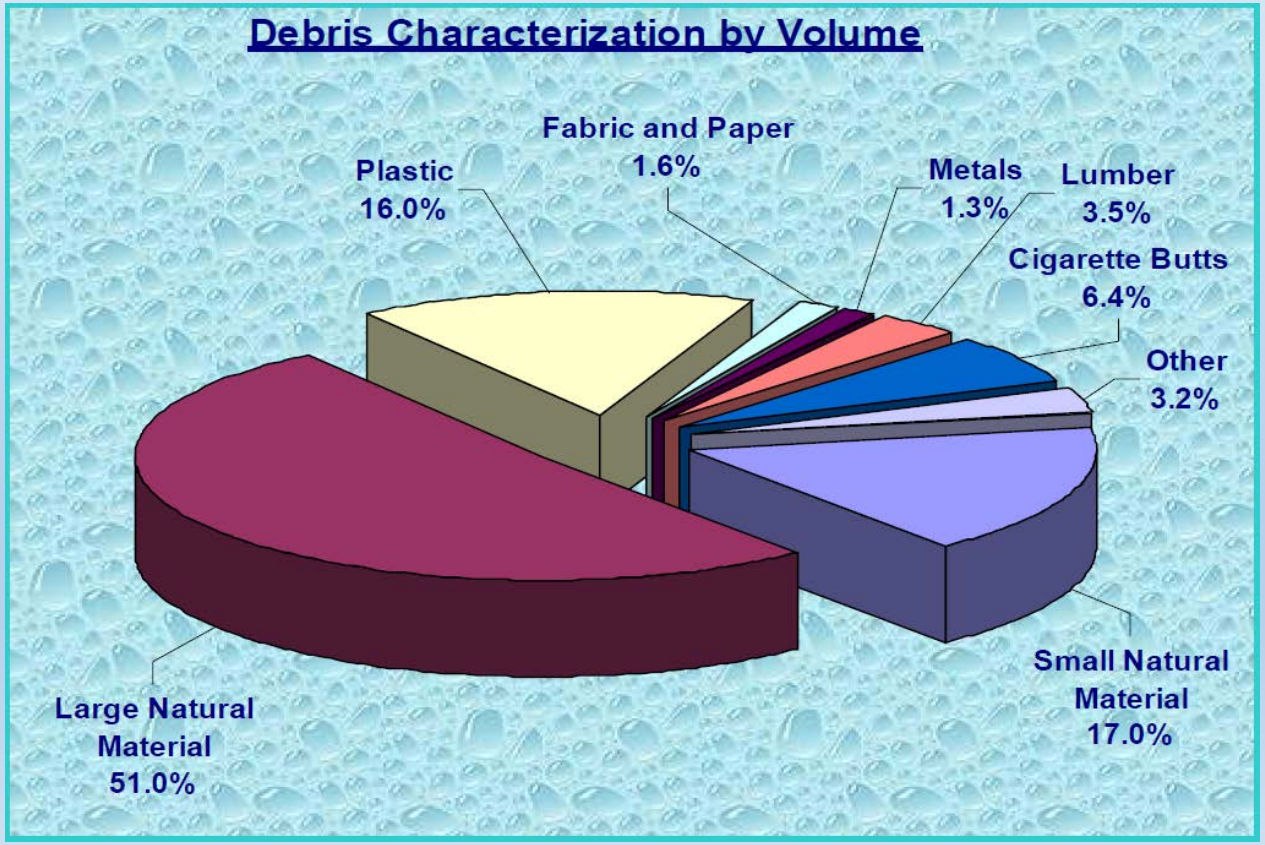


2005 Study Results - continued



2005 Study Recommendations and Conclusions

- Results
  - LITRNO (Litter In The River –No) Plan
  - Significant maintenance required
- What is Stormwater Quality?



Stormwater Quality Constituents

- Suspended and dissolved pollutants (non-gross pollutants) such as metals, nutrients, minerals, microbiological, volatile organic compounds, pesticides, PCBs, hydrocarbons, BOD, COD, TSS, et cetera

- Samples indicate that suspended and dissolved stormwater quality constituents are attached to the gross and non-gross pollutants

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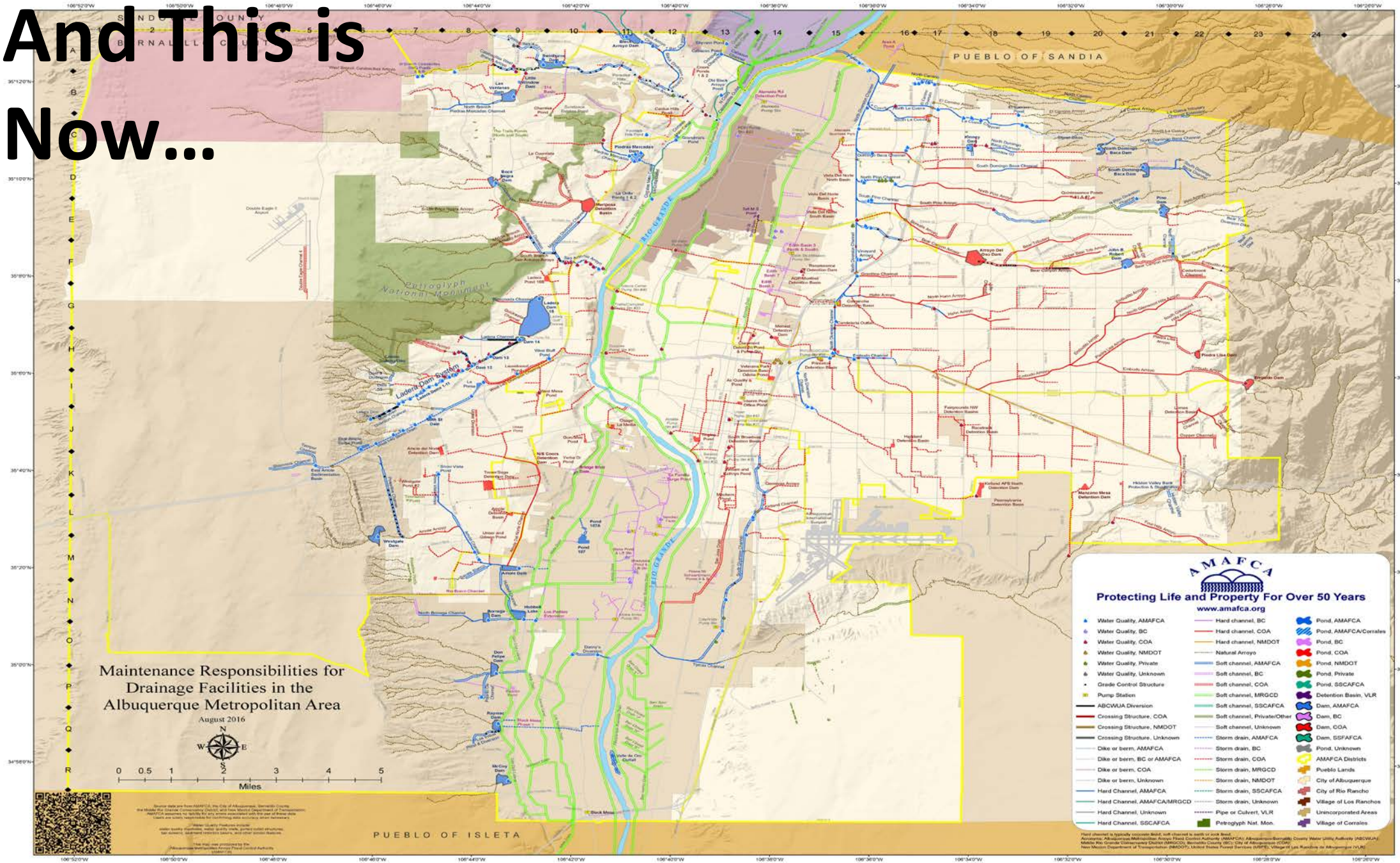
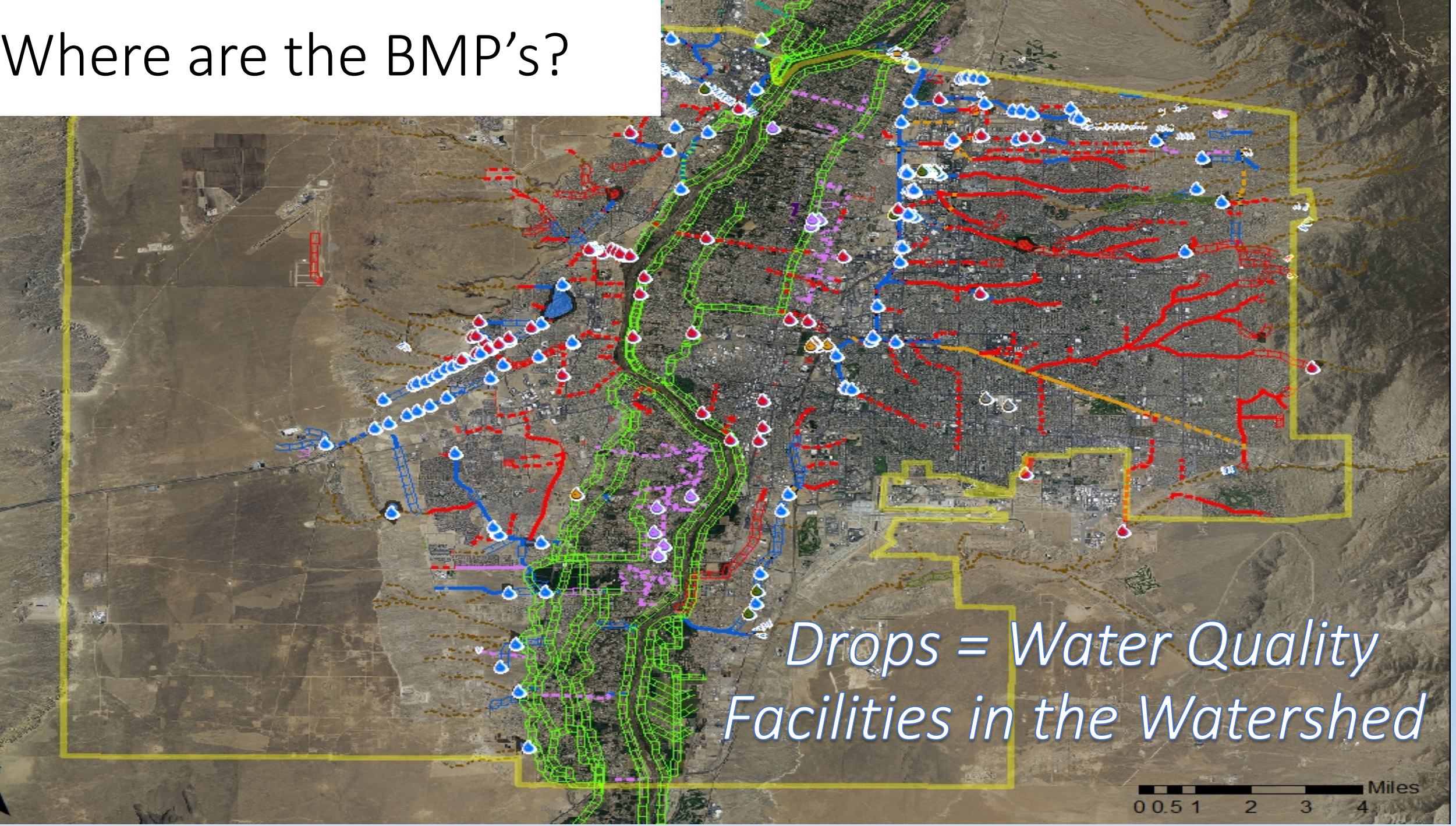
So…that was then…

And This is Now…



Where are the BMP's?



What do AMAFCA BMPs look like and do?

How to Assess performance?

- Determine amount of trash caught by BMP's and corresponding runoff, contributing area
- Highlight watersheds with high pollutant/debris loadings
- Highlight opportunities for better maintenance
- Highlight opportunities for new BMP construction

2016 Study

- More material
- Mechanical Sieve

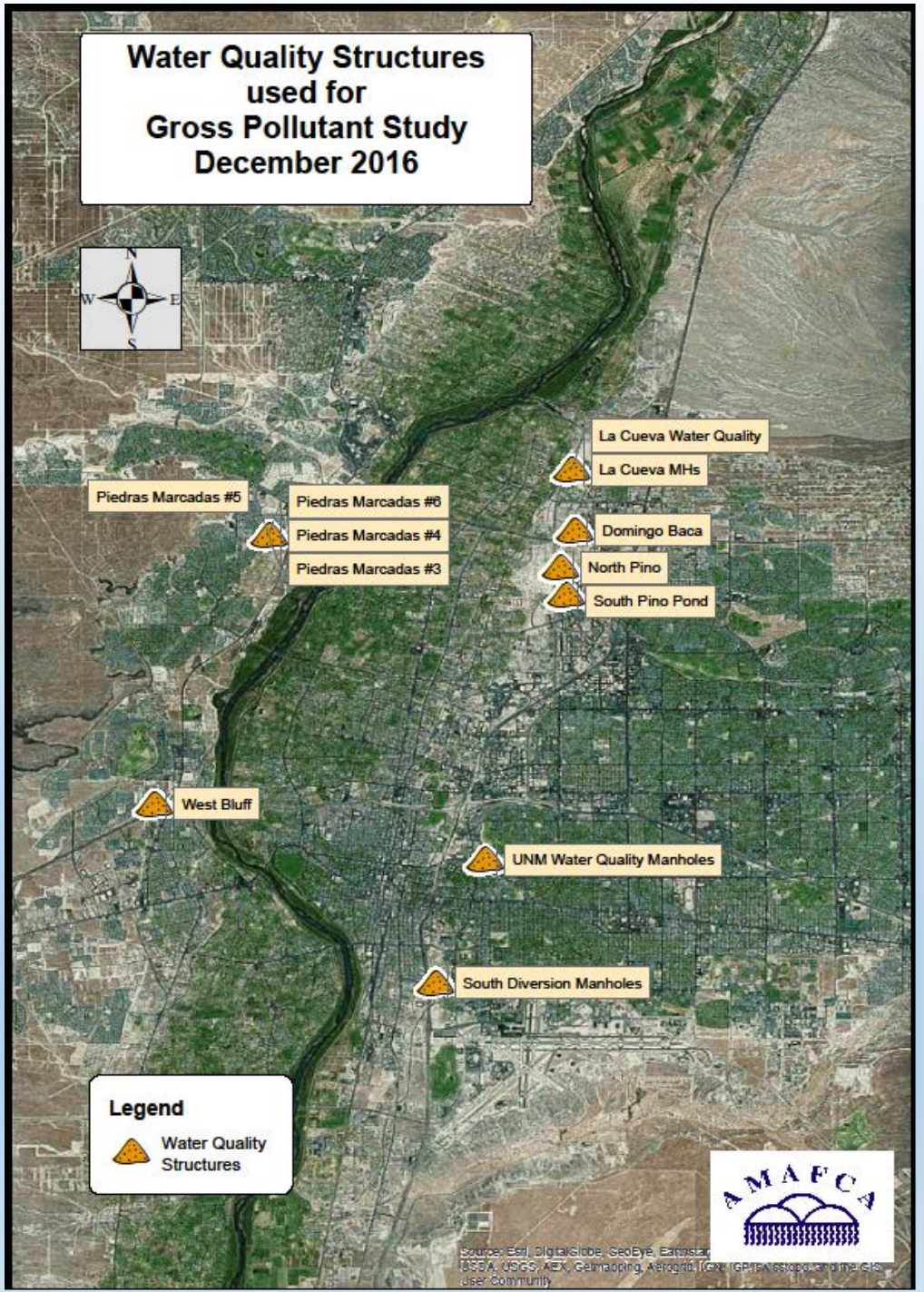
Debris Sieve (October 2016)

Collected Debris (October 2016)

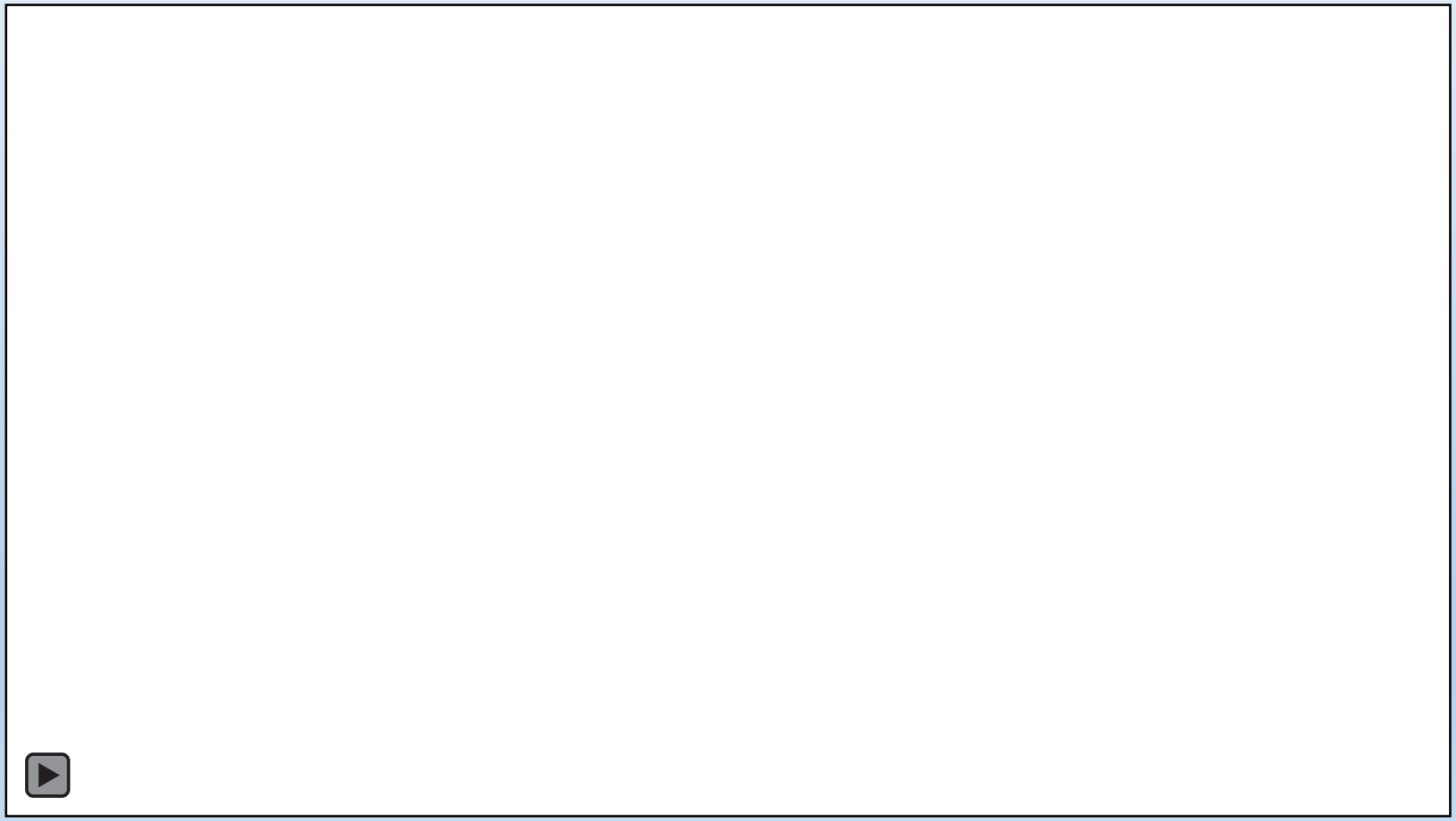
Sorted debris for characterization (6/30/04)

Trash Rack – South Broadway Pond (4/23/04)

Where are the BMP's for this study?

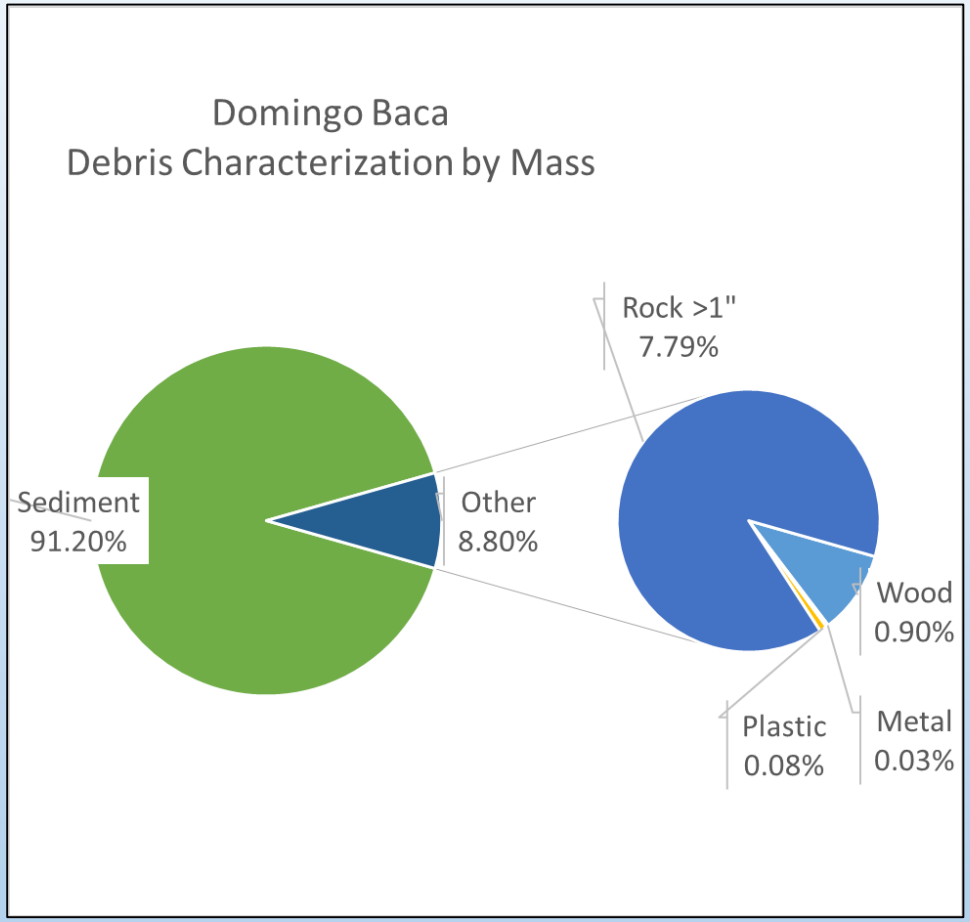


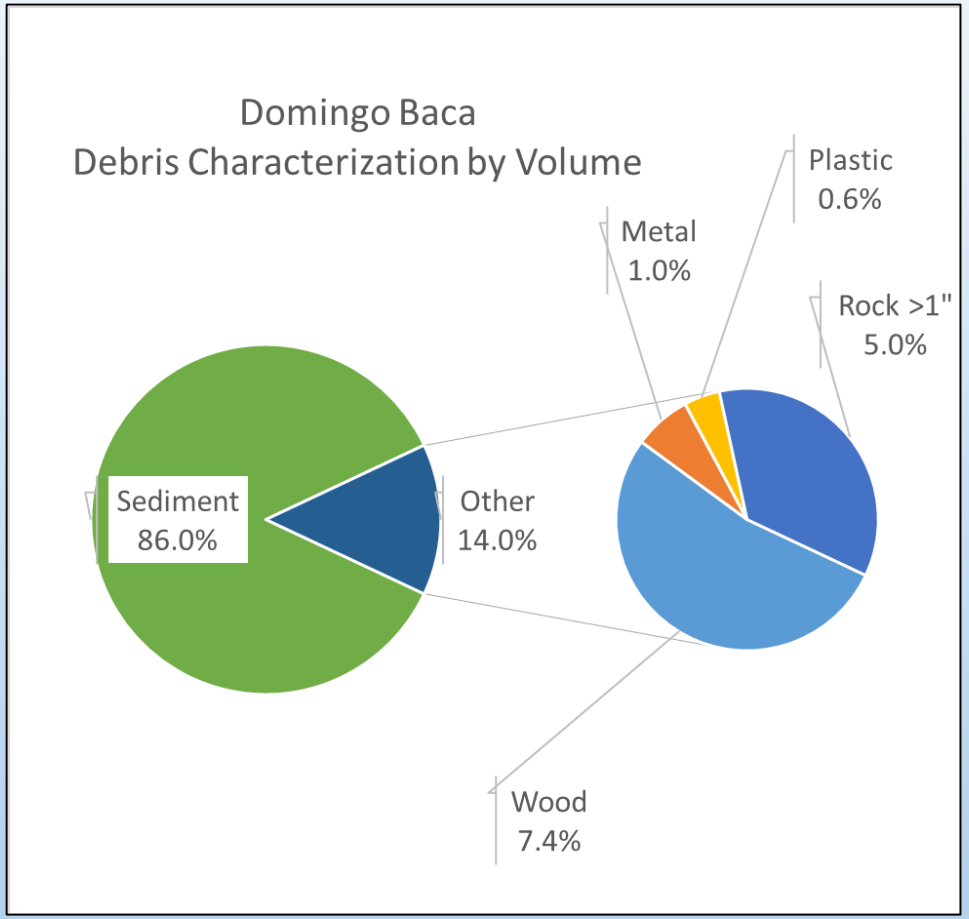
2016 Gross Pollutant Study




Temporary Berm
Staging Area (less than an acre)
Washington St NE
Ellison St NE
Villa Corrales NE
N Channel Trail
Academy Pkwy N NE
Academy Pkwy E NE
© 2016 Google
Google earth
1991
35°09'35.56" N 106°36'04.57" W elev 5126 ft eye alt 7609 ft

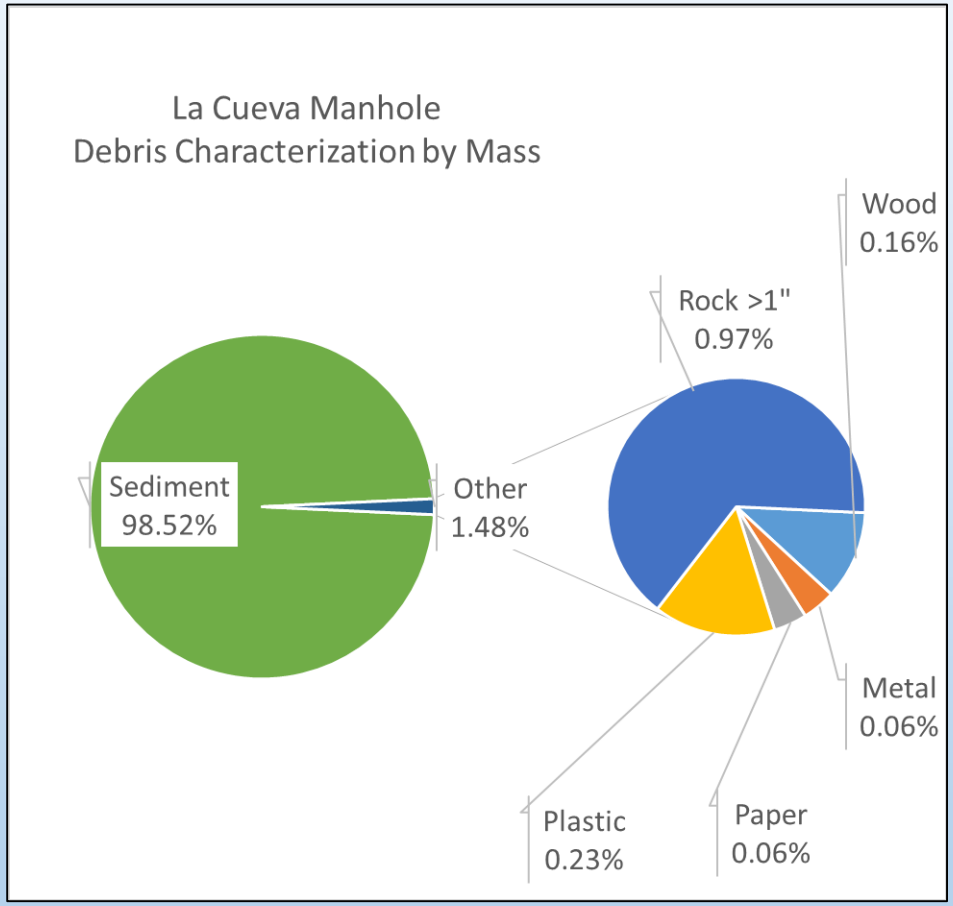
Domingo Baca Quality Facility

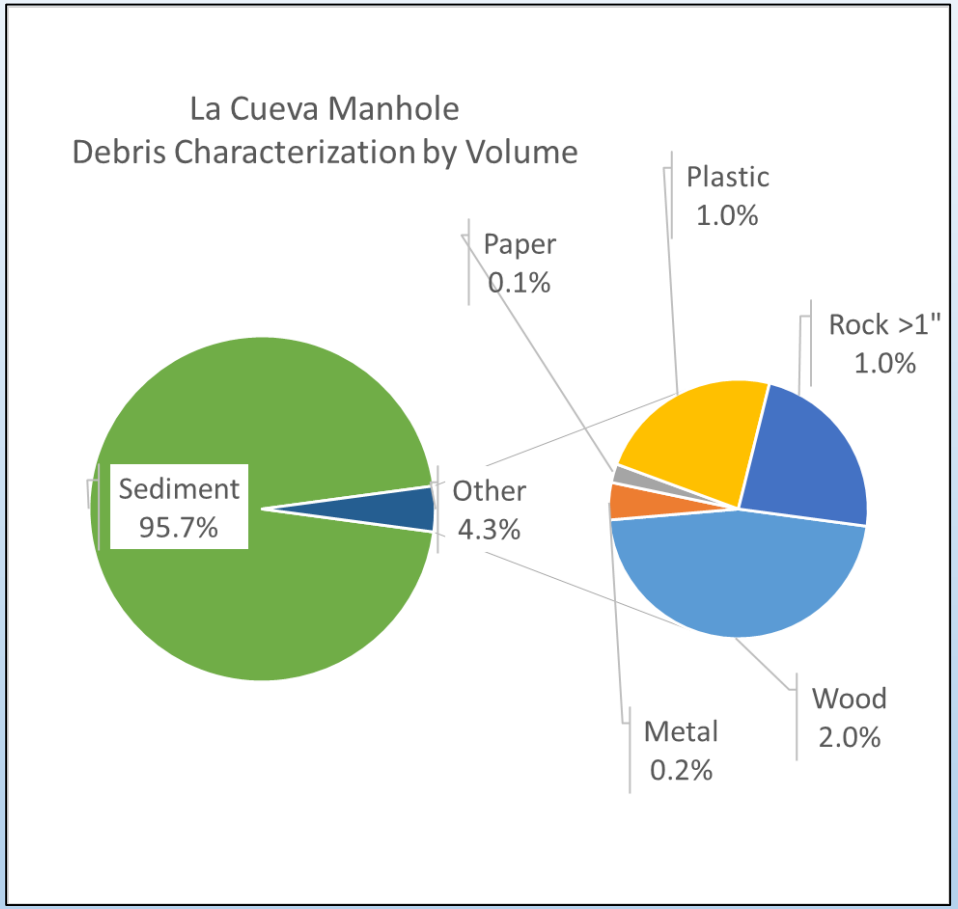




Days in Period: 46
Watershed Area: 12.34 sq. km
BMP's upstream: 13

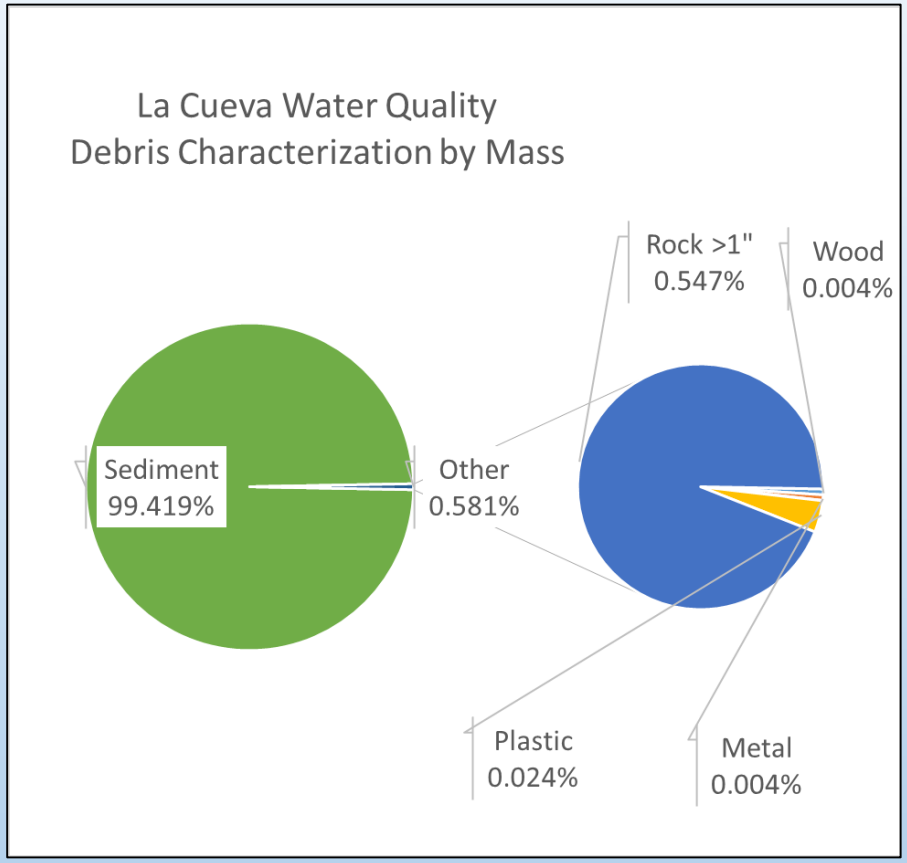
La Cueva Manhole

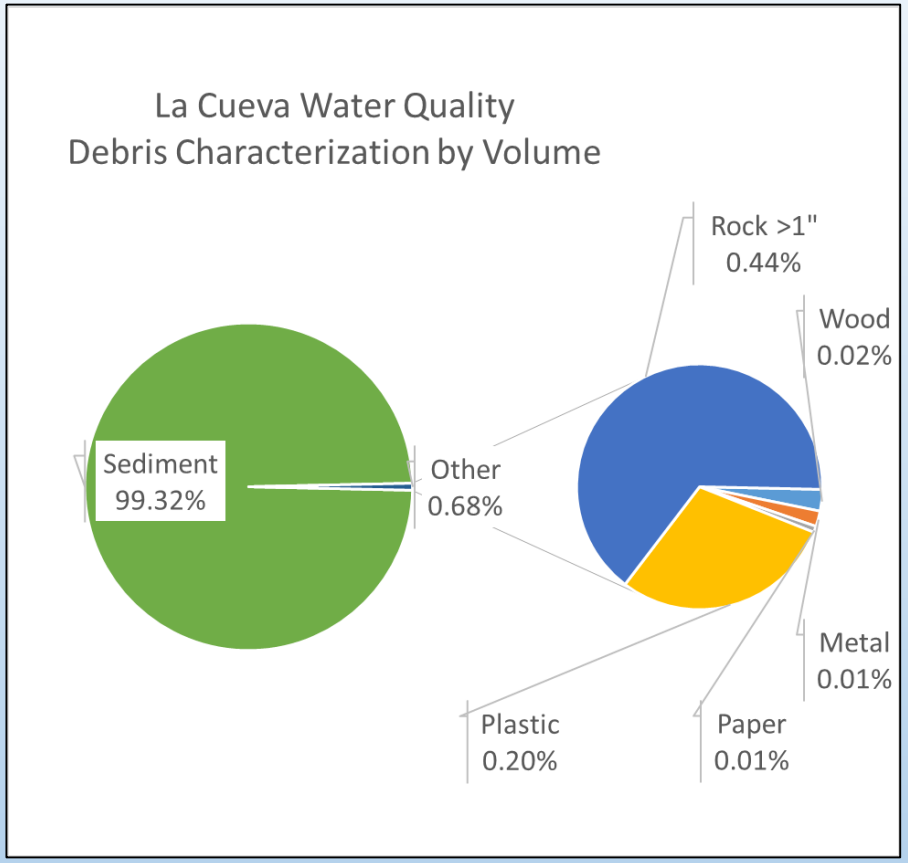




Days in Period: 279
Watershed Area: 6.74 sq. km
BMP's upstream: 14

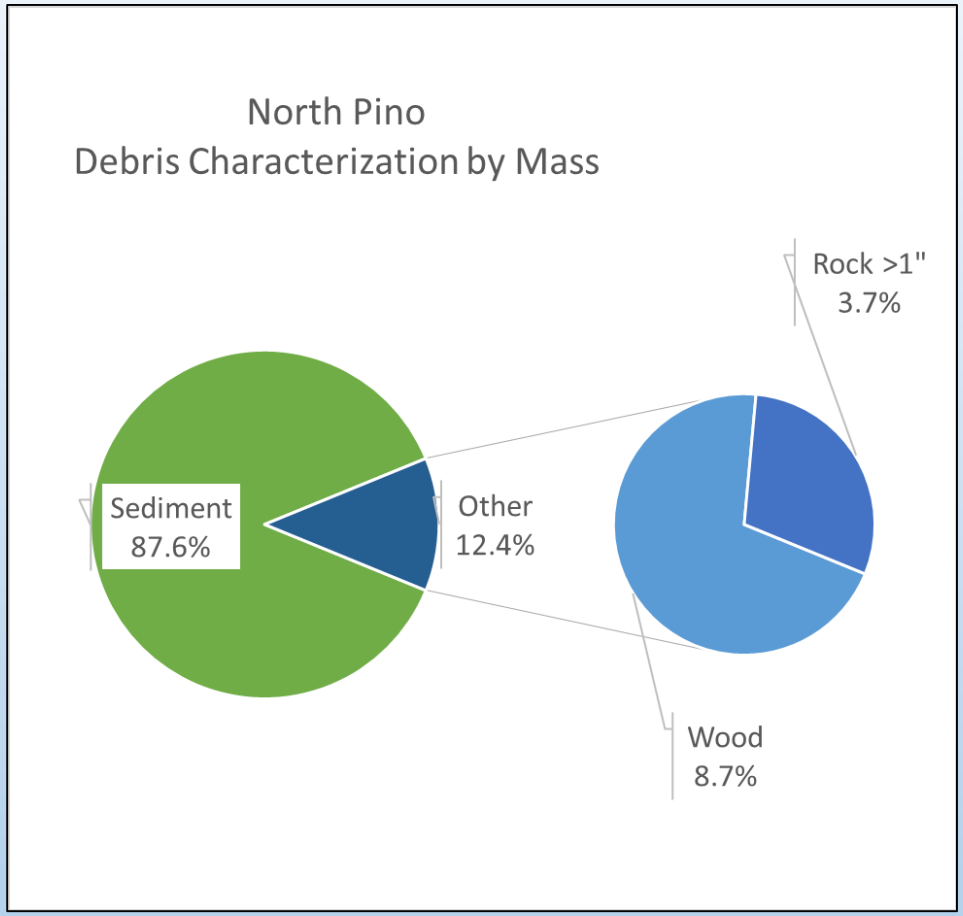
La Cueva Water Quality

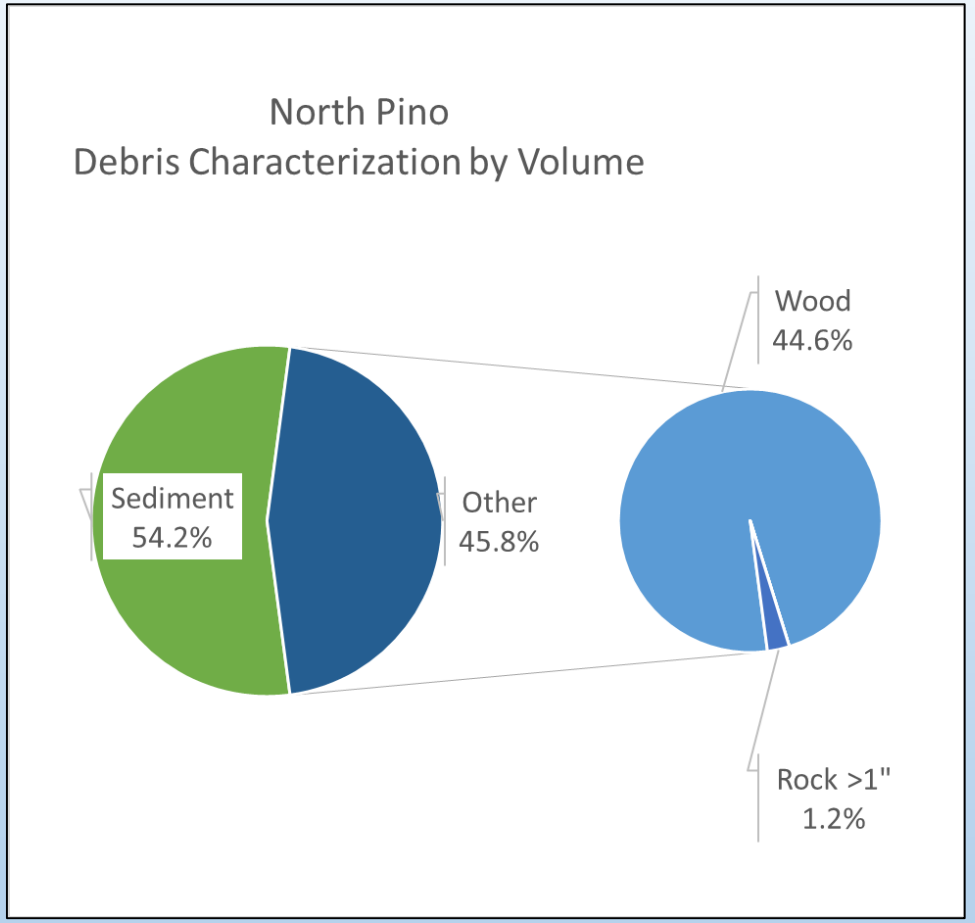




Days in Period: 287
Watershed Area: 6.74 sq. km
BMP's upstream: 14

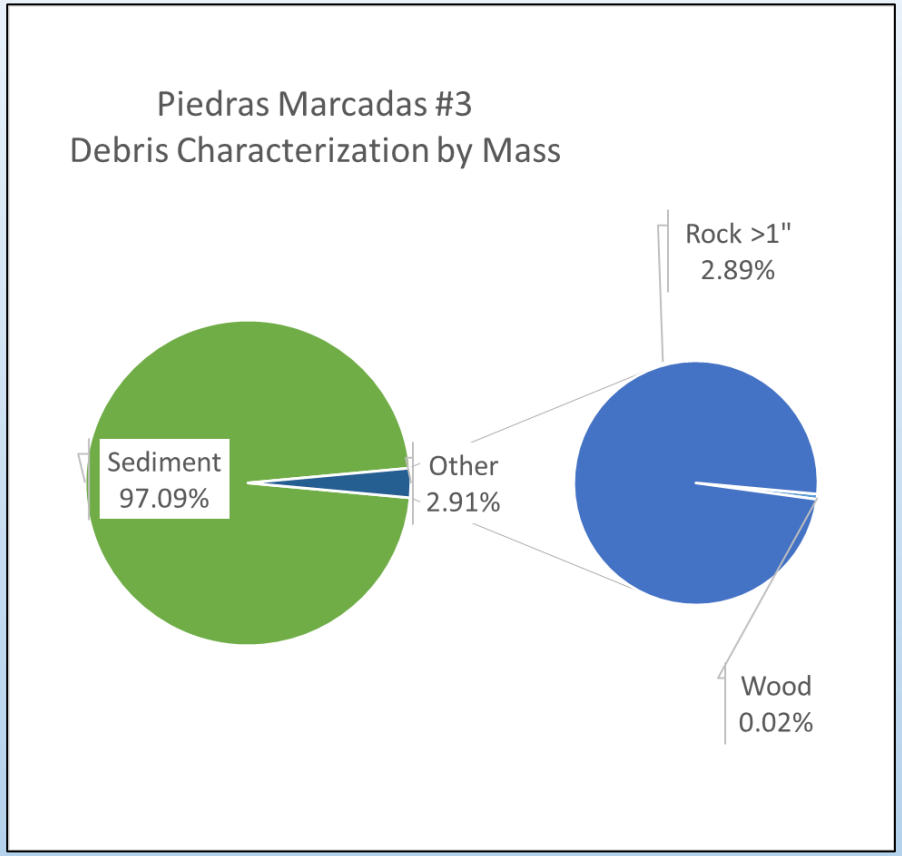
North Pino Pond

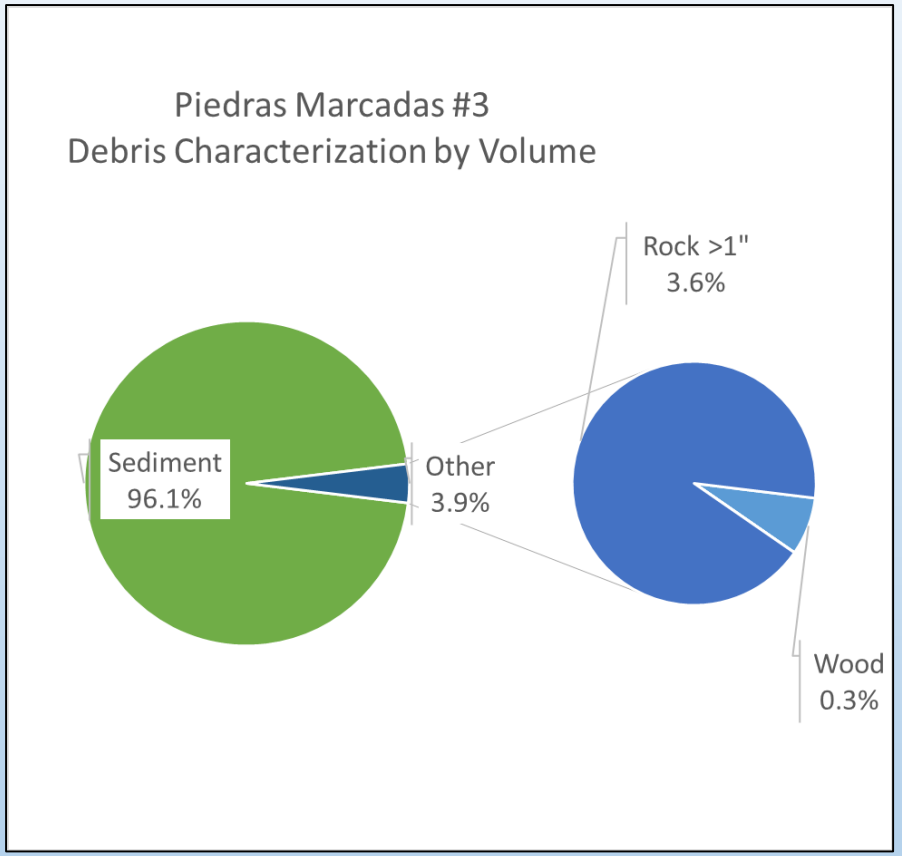




Days in Period: over 1 year
Watershed Area: 2.86 sq. km
BMP's upstream: 10

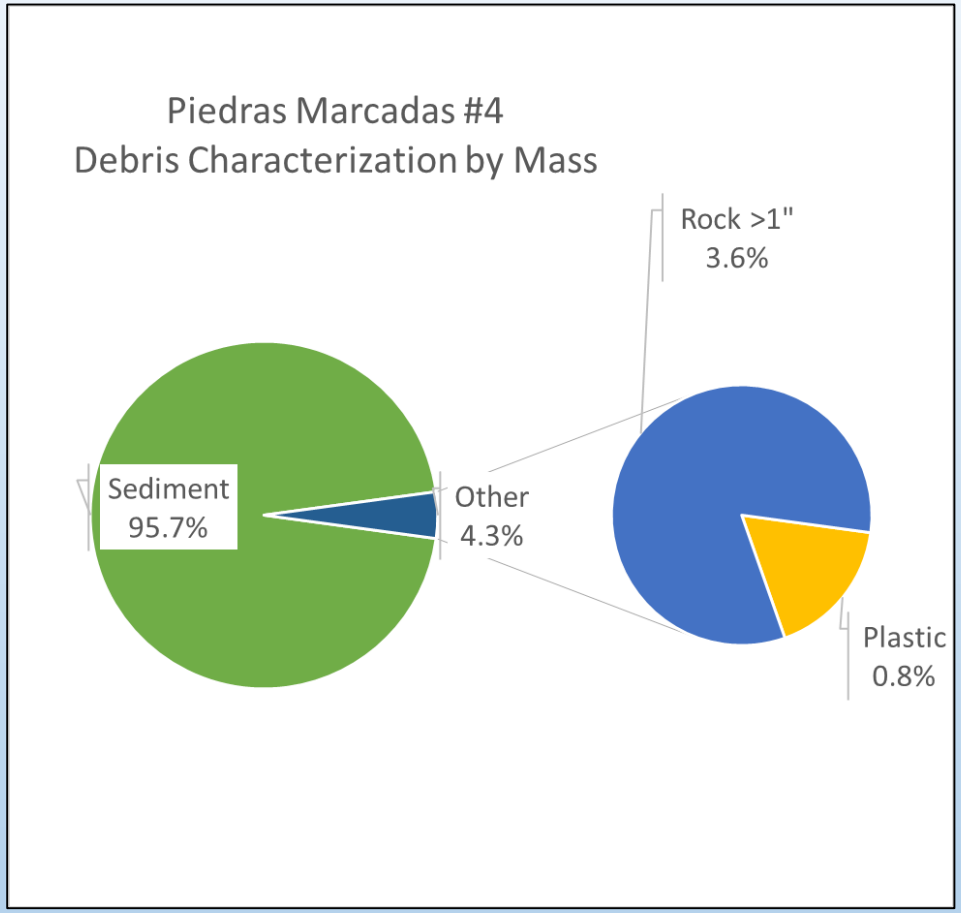
Piedras Marcadas #3

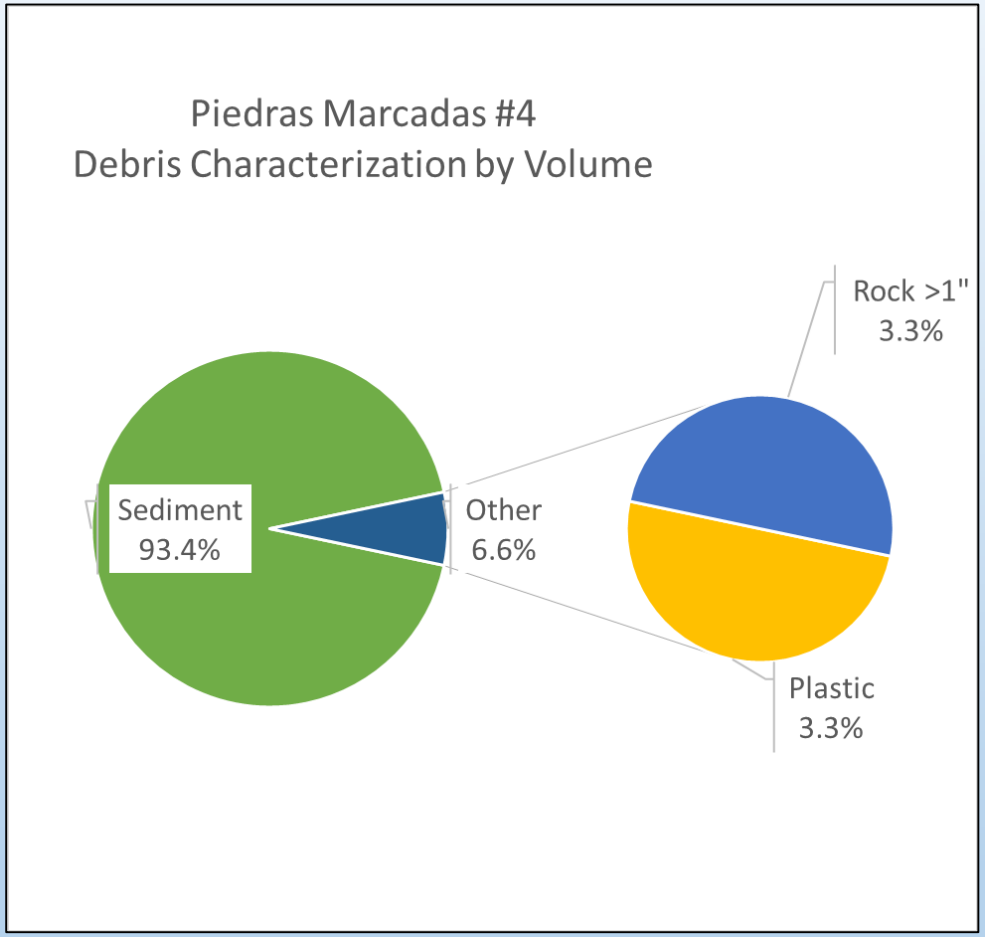




Days in Period: 122
Watershed Area: 12.34 sq. km
BMP's upstream: 1

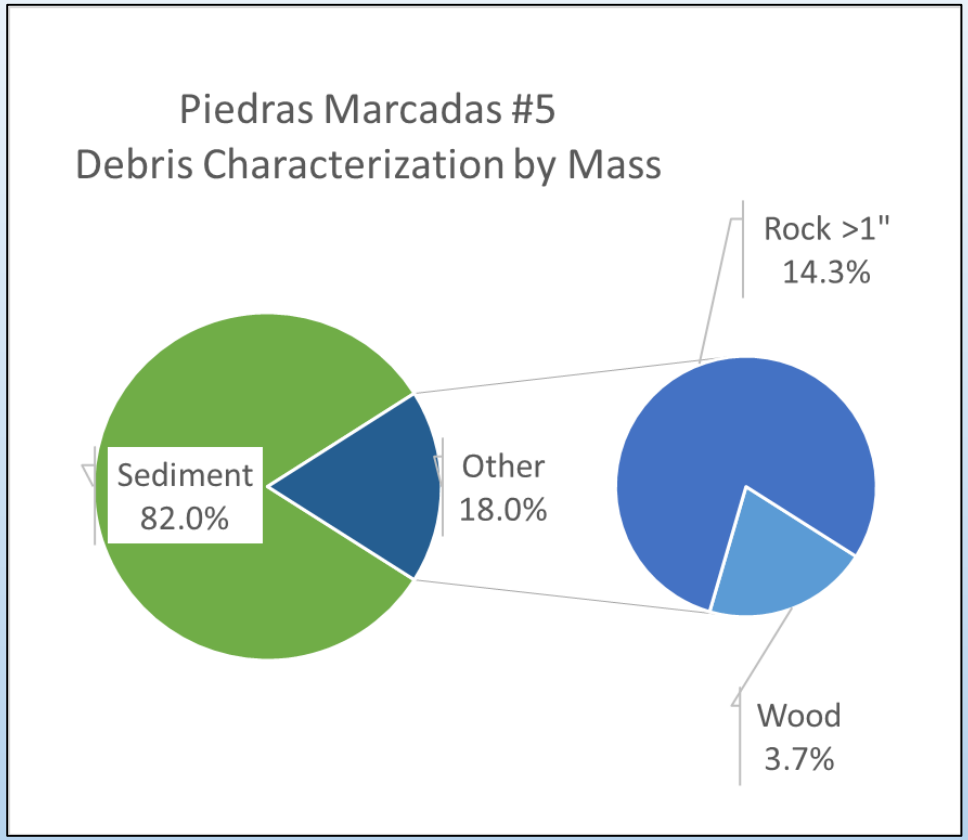
Piedras Marcadas #4

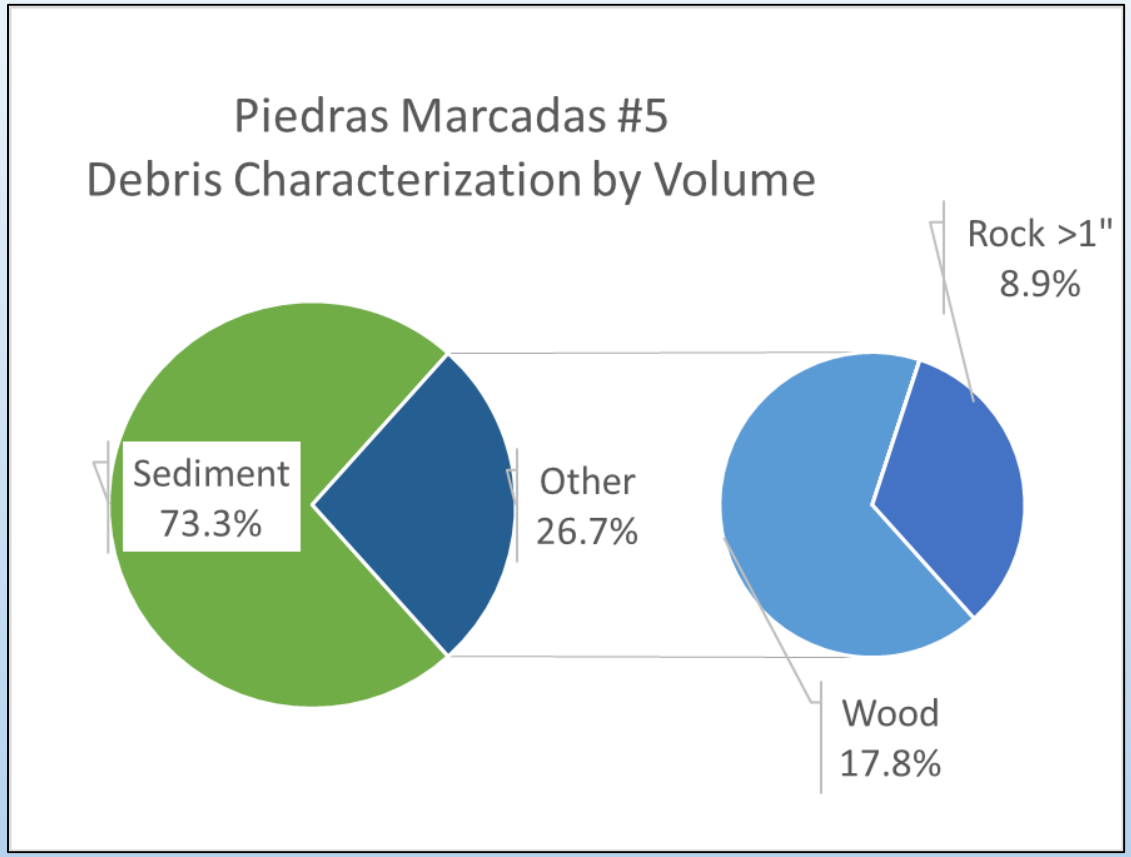




Days in Period: 122
Watershed Area: 12.34 sq. km
BMP's upstream: 1

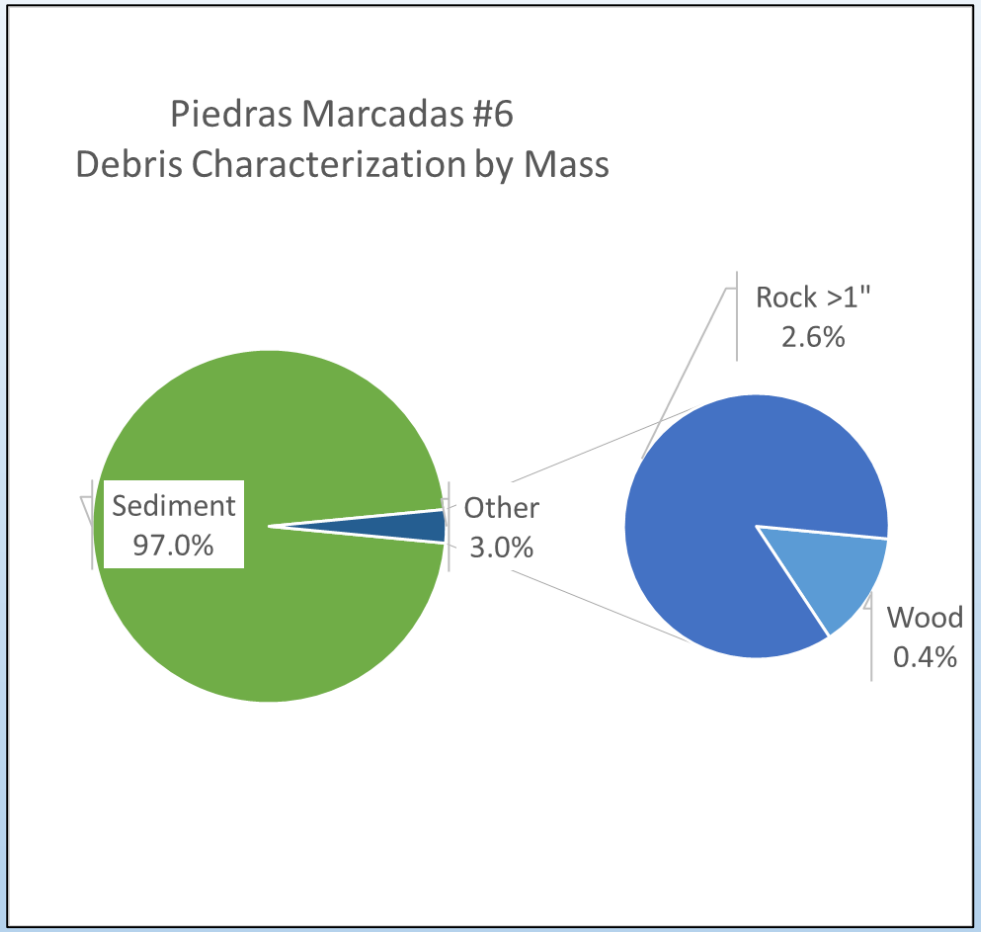
Piedras Marcadas #5

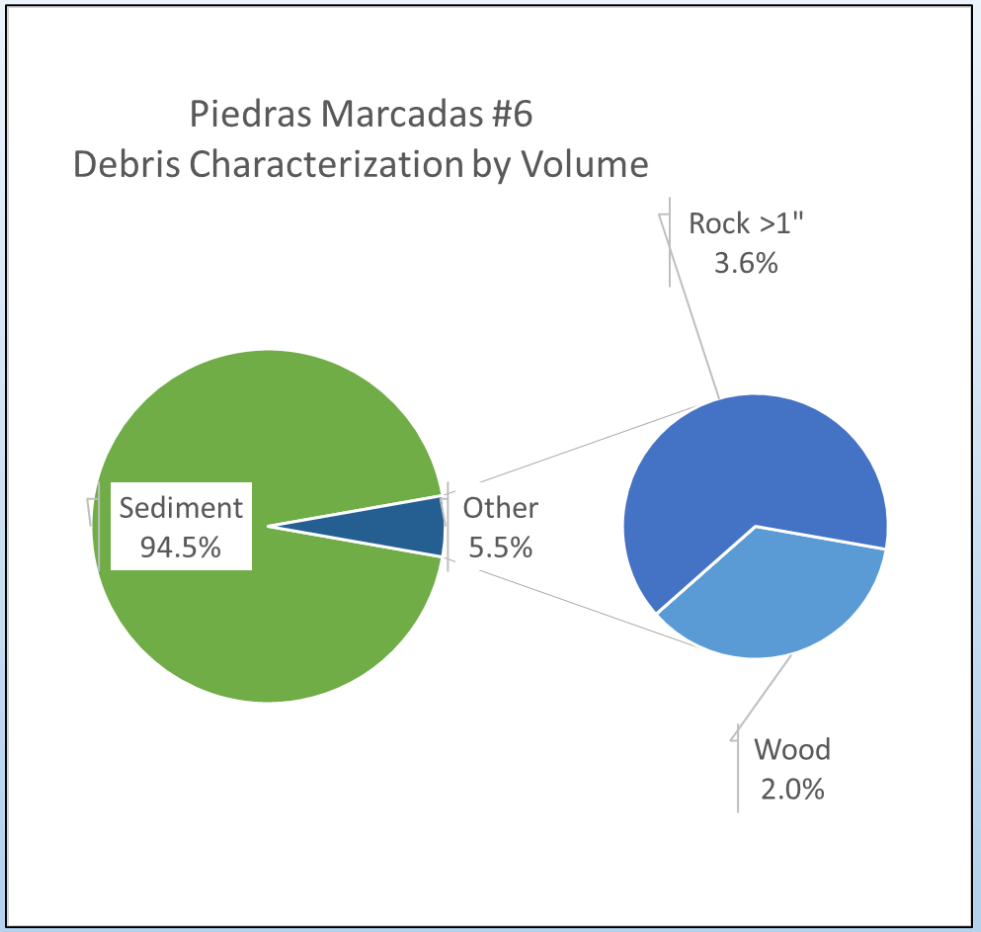




Days in Period: 122
Watershed Area: 12.34 sq. km
BMP's upstream: 1

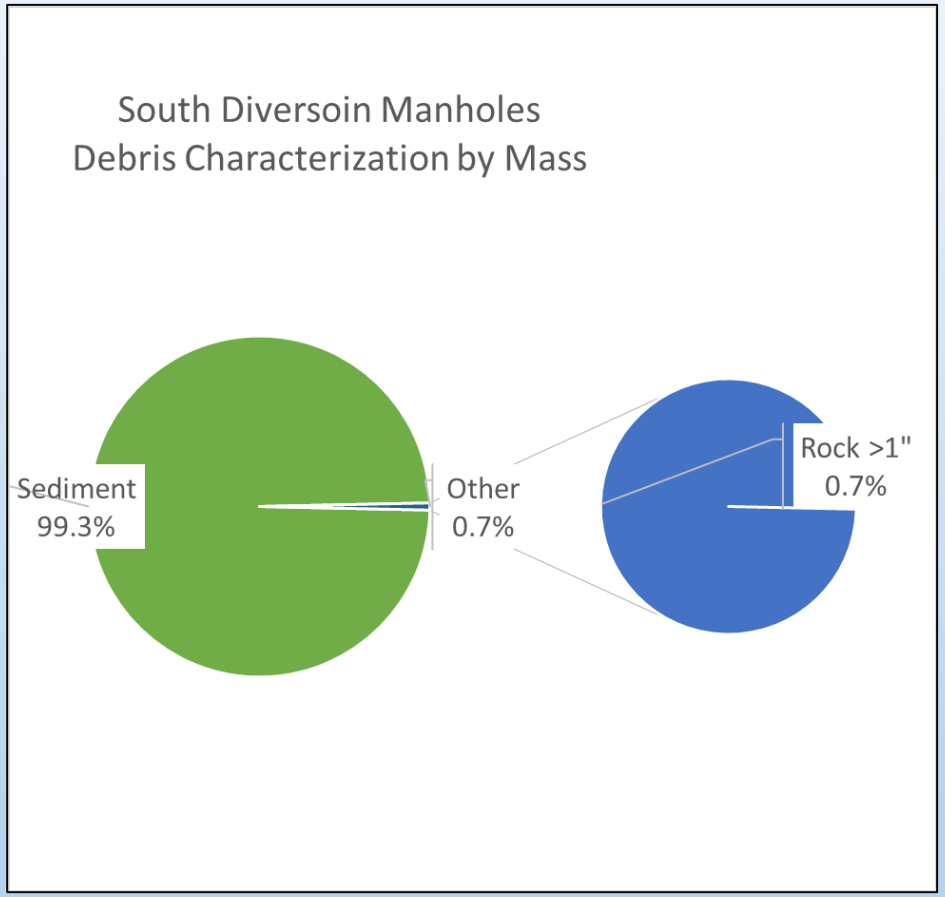
Piedras Marcadas #6

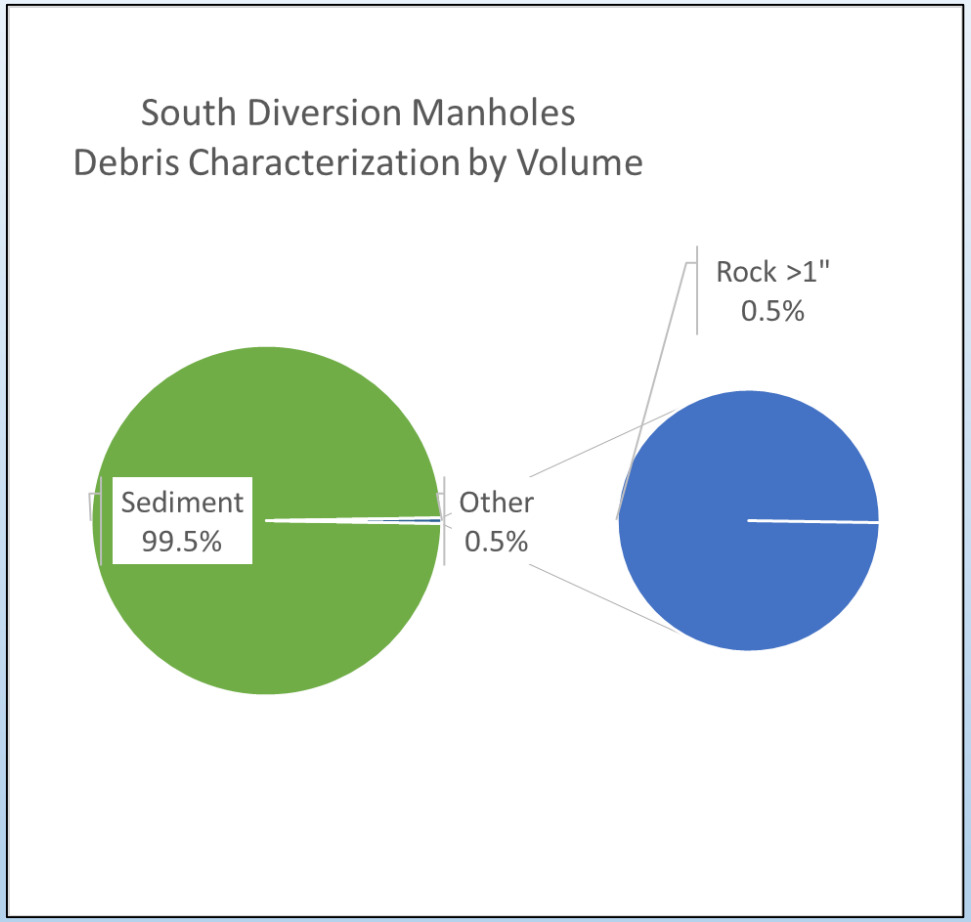




Days in Period: 122
Watershed Area: 12.34 sq. km
BMP's upstream: 1

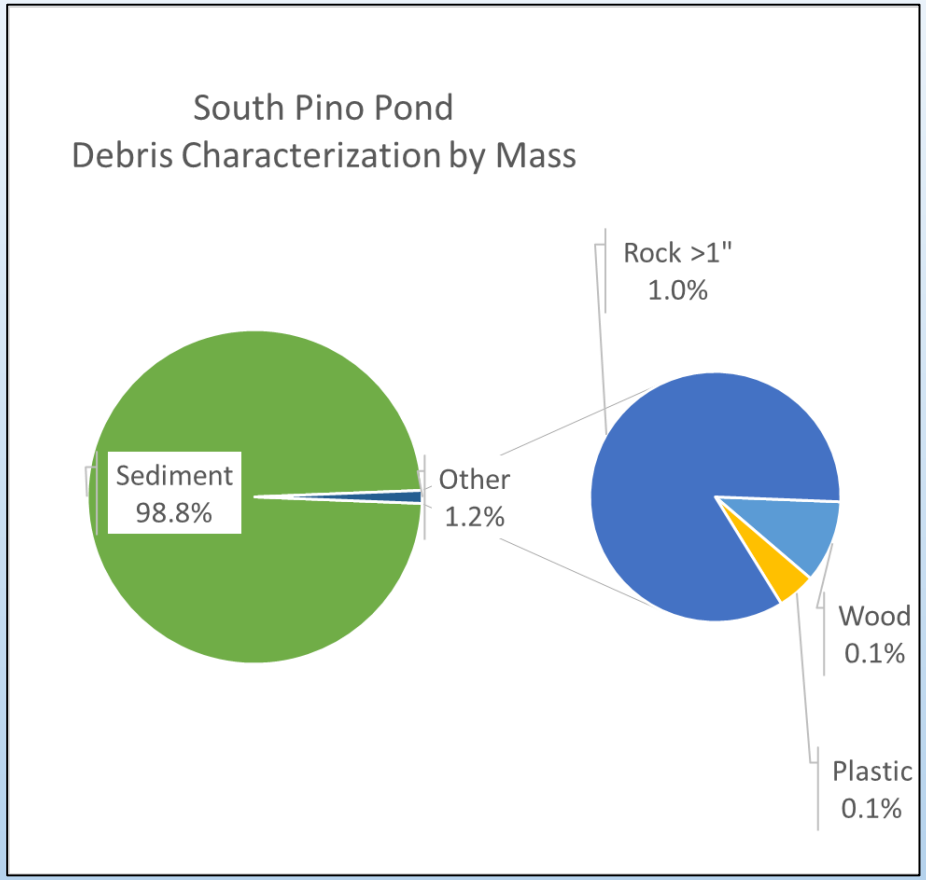
South Diversion Manholes

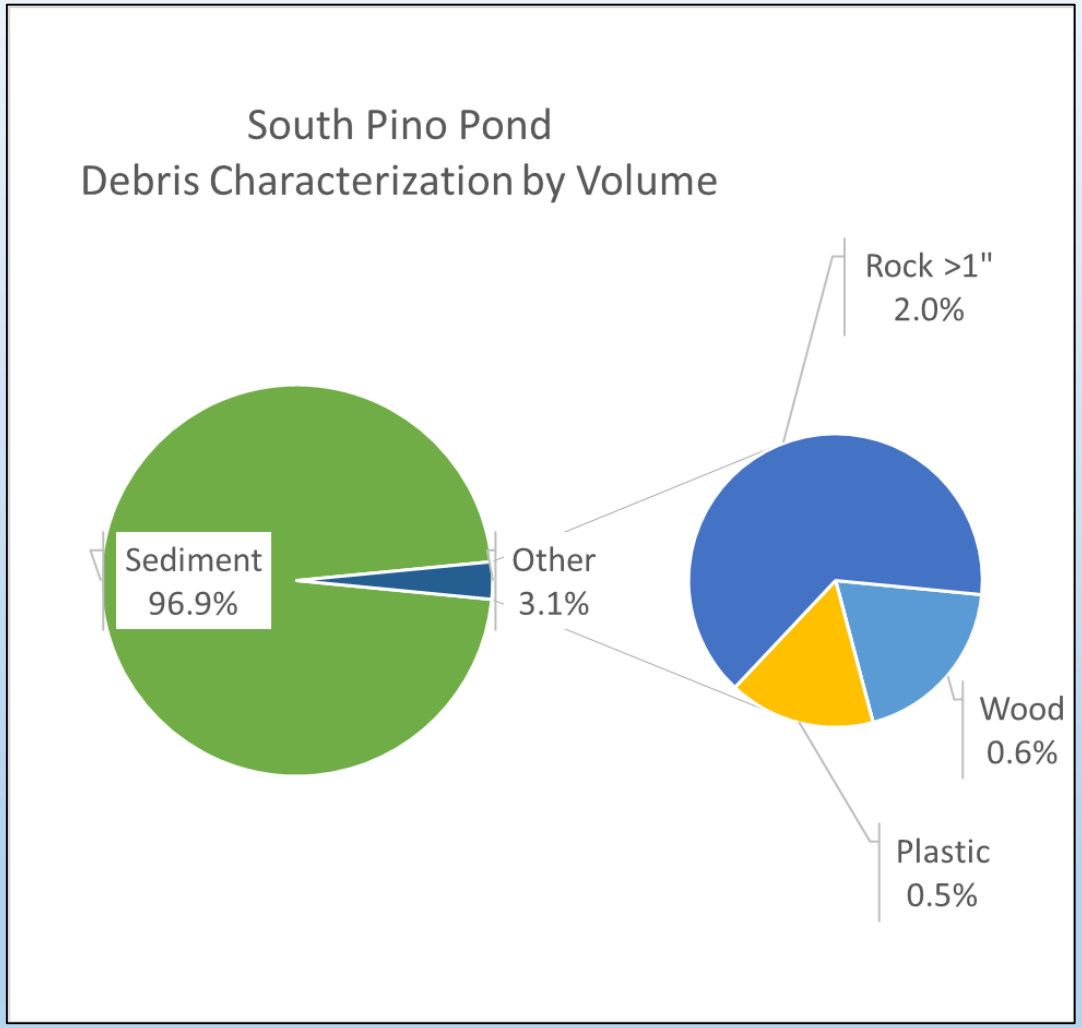




Days in Period: 270
Watershed Area: 5.21 sq. km
BMP's upstream: 0

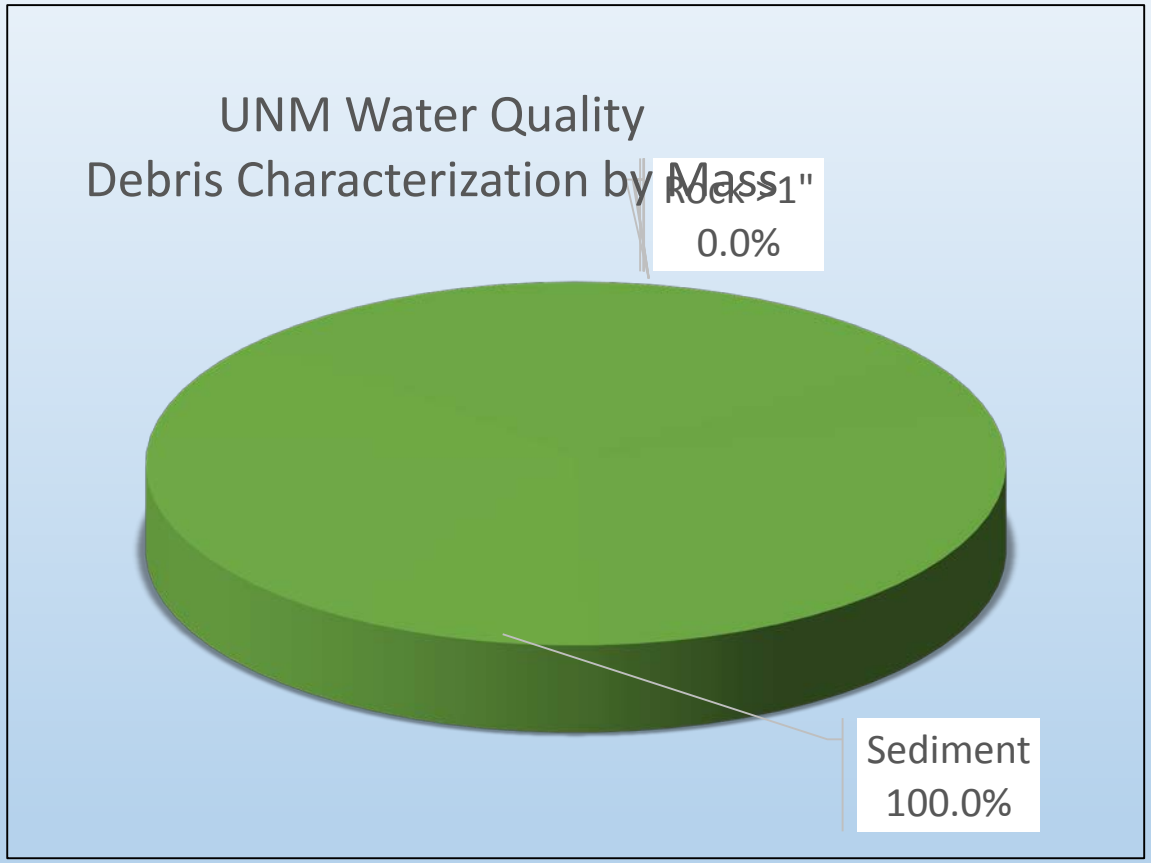
South Pino Pond

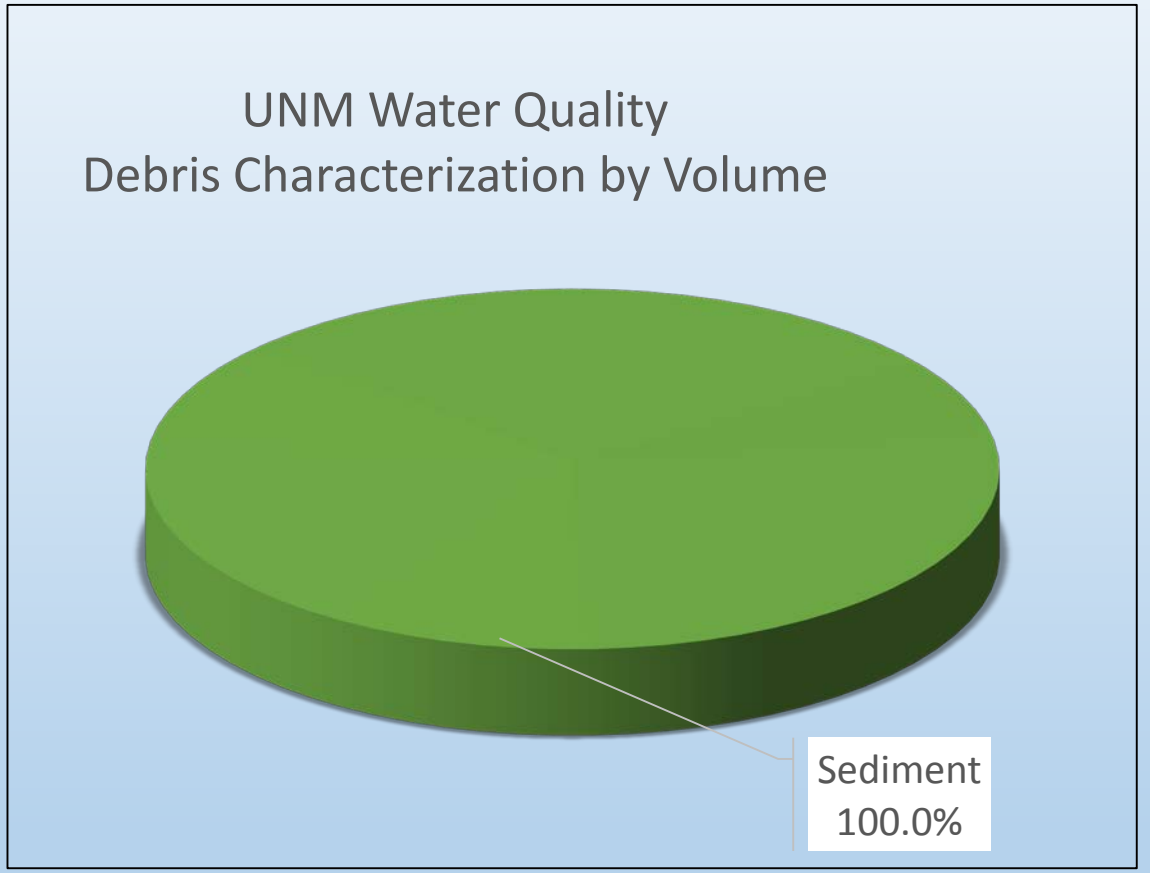




Days in Period: over 1 year
Watershed Area: 10.34 sq. km
BMP's upstream: 7

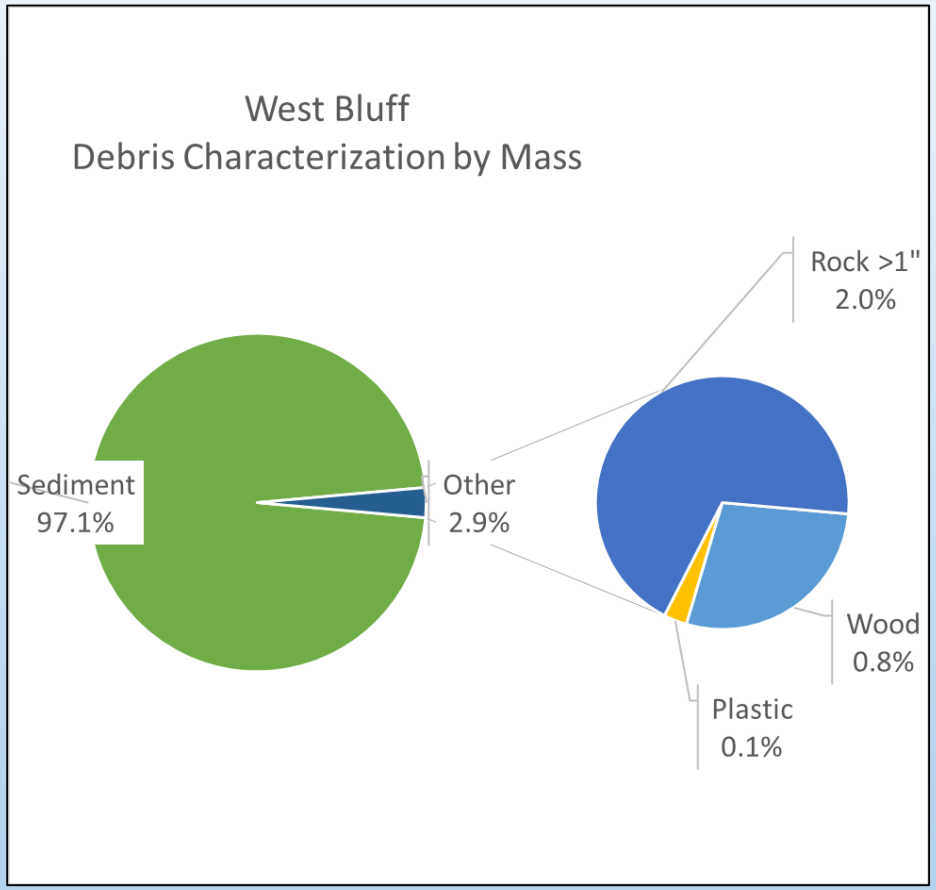
UNM Water Quality Facility

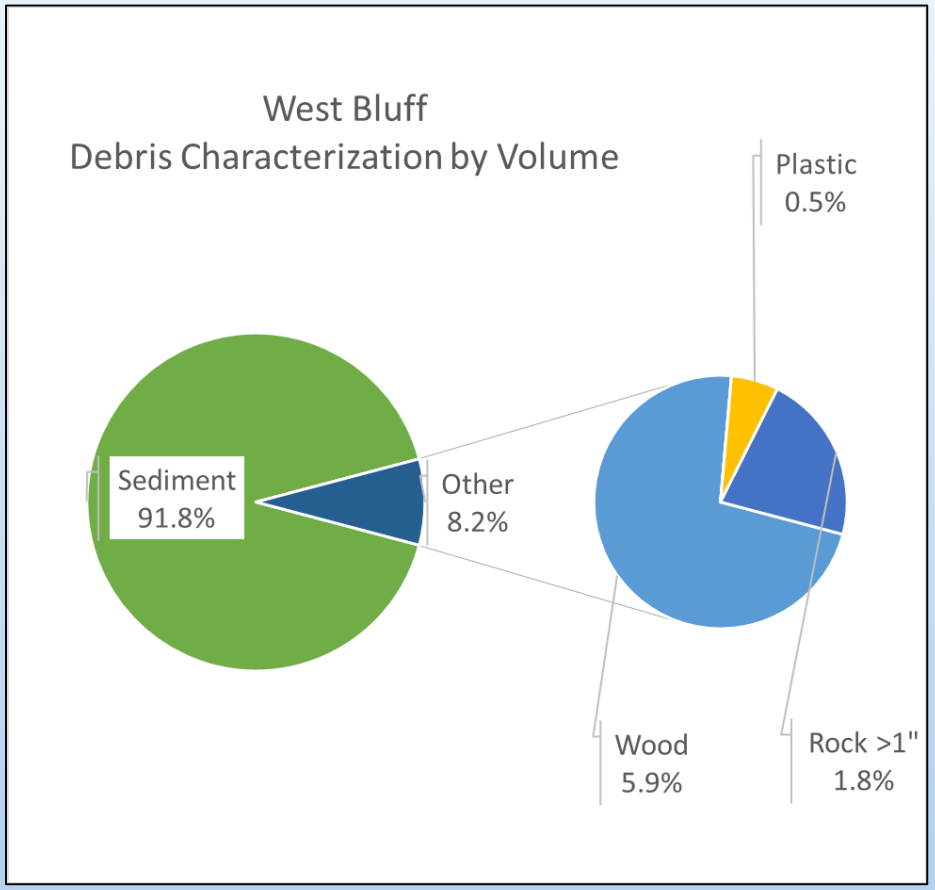




Days in Period: 282
Watershed Area: 2.64 sq. km
BMP's upstream: 0

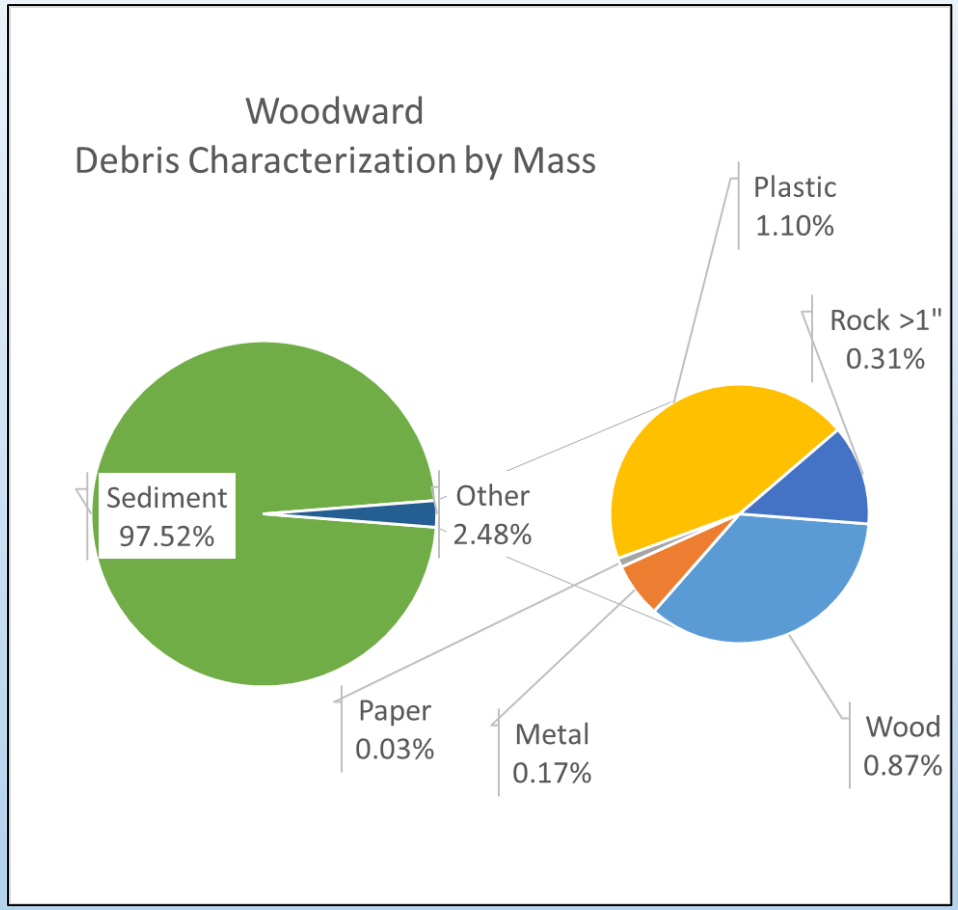
West Bluff Pond

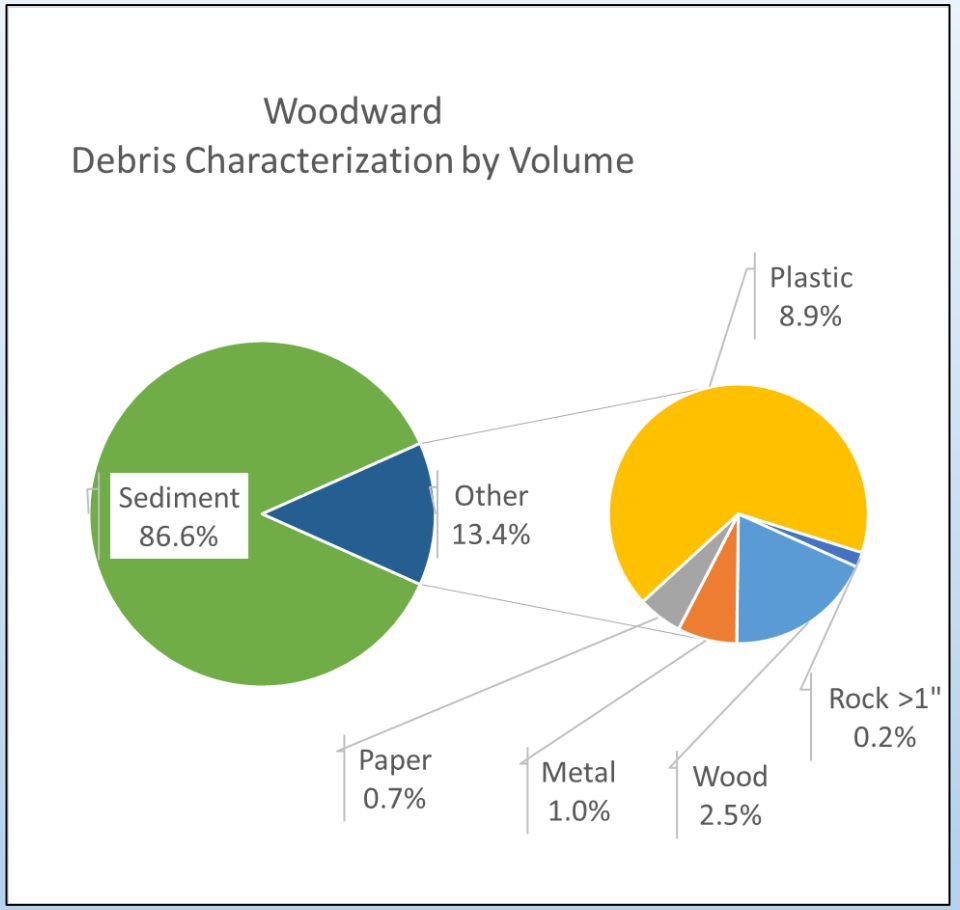




Days in Period: 364
Watershed Area: 7.93 sq. km
BMP's upstream: 13

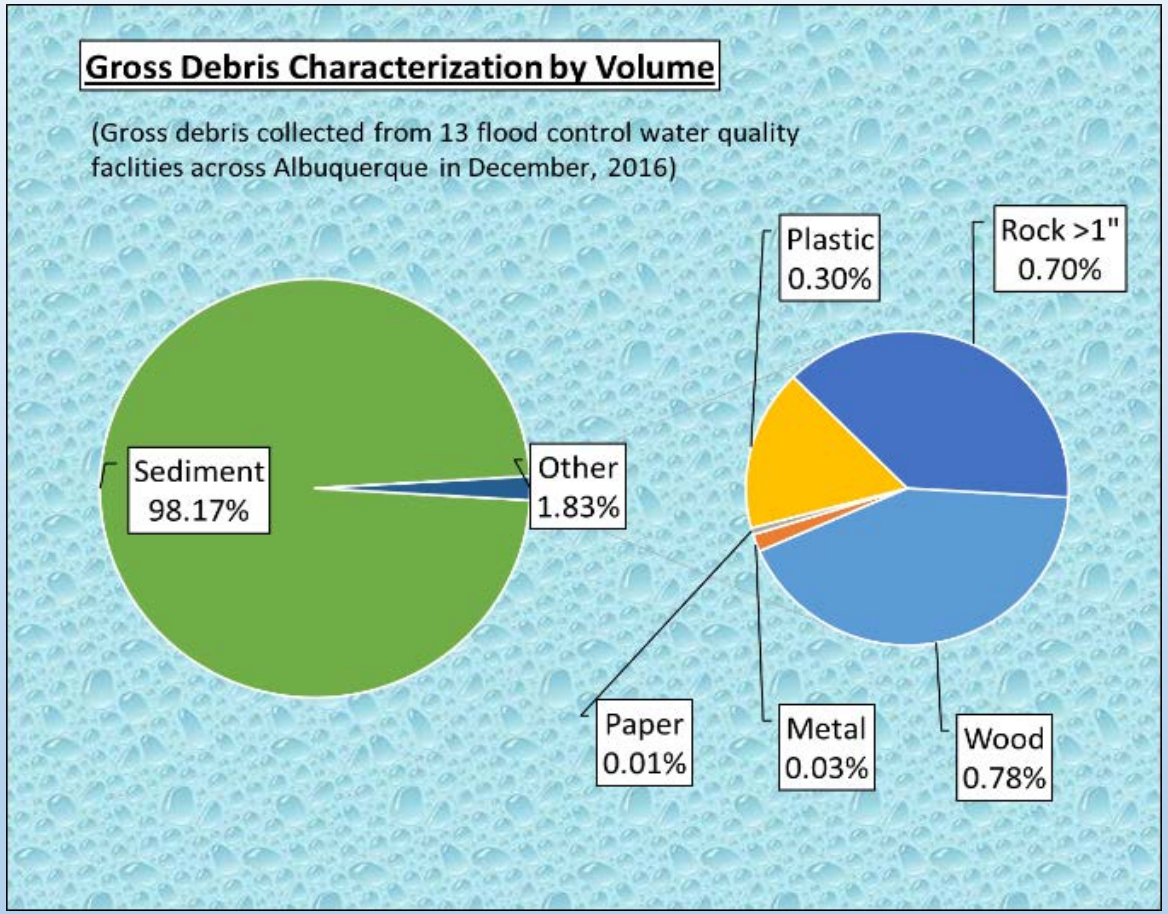
Woodward Pond and Baffle Structure

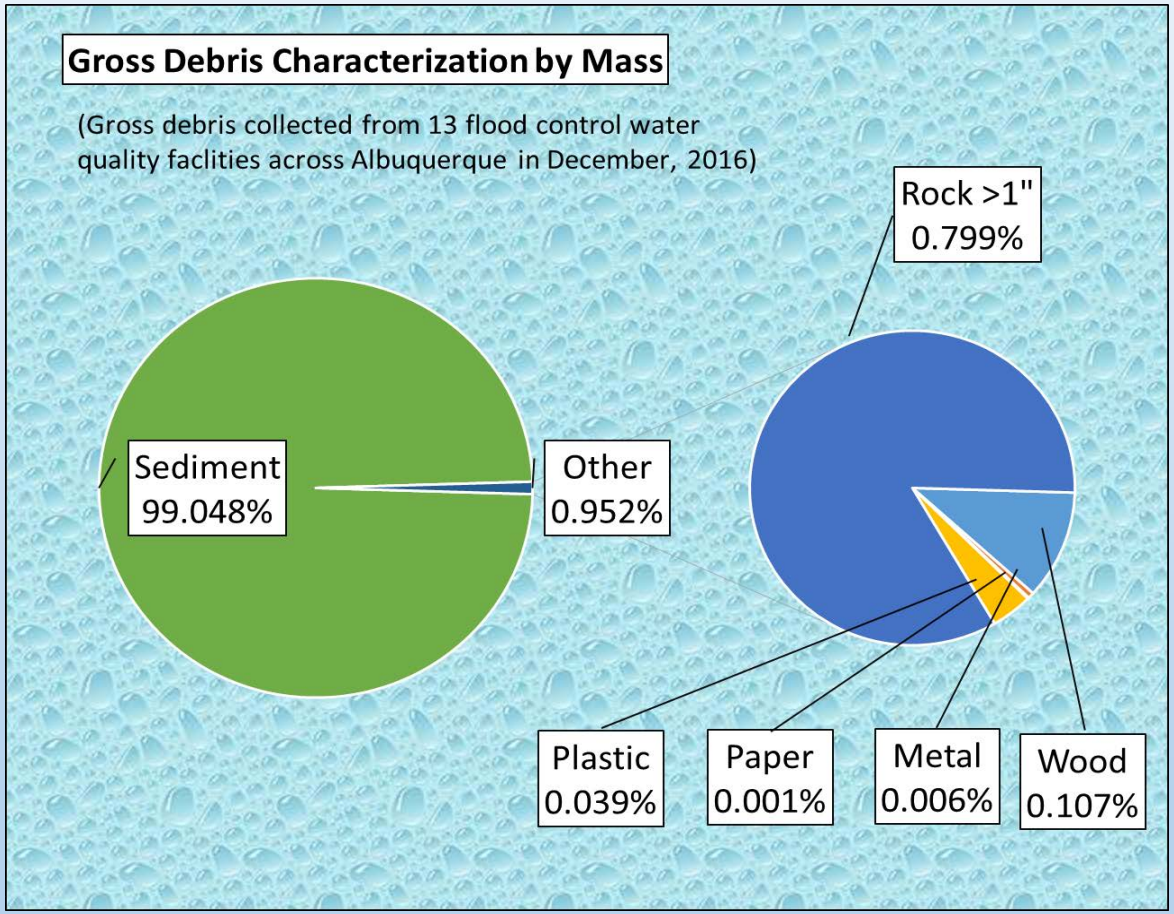




Days in Period: 135
Watershed Area: 1.57 sq. km
BMP's upstream: 0

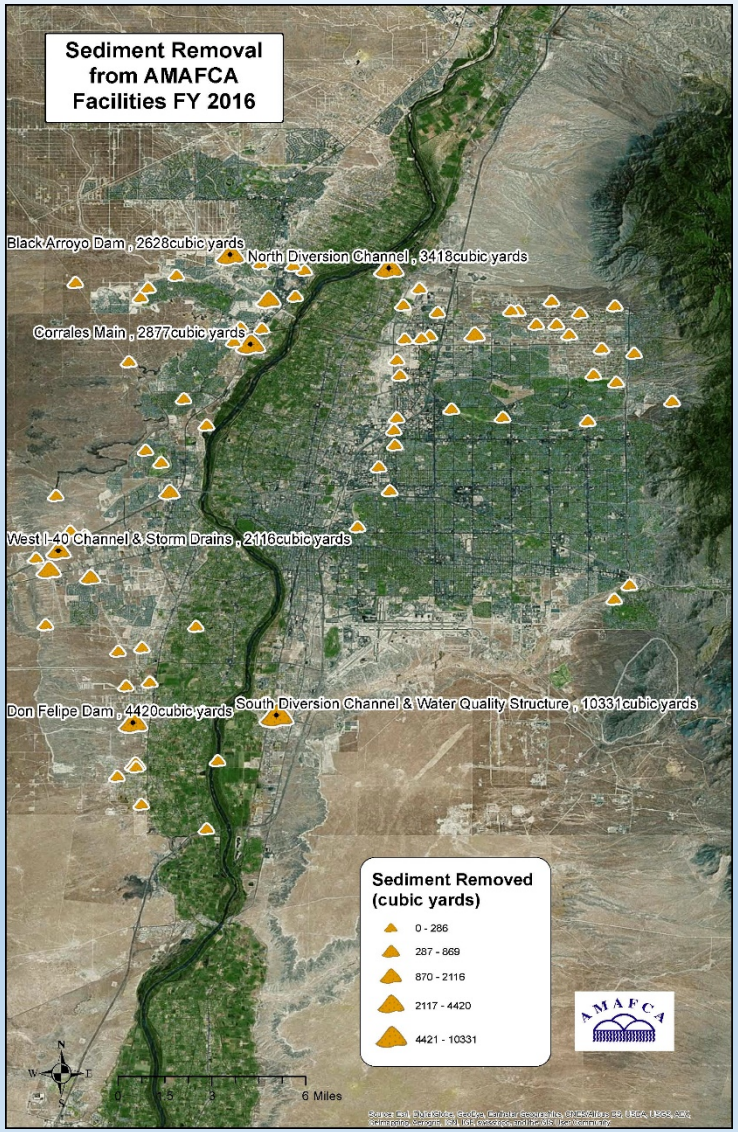
Combined Results

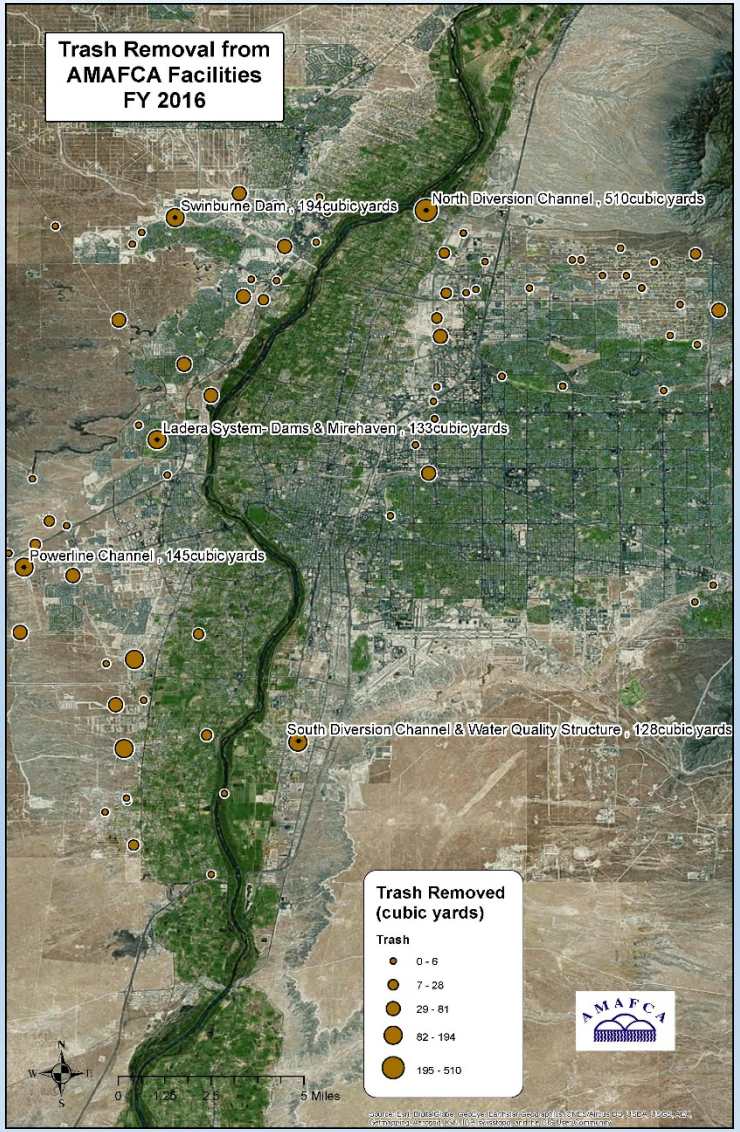


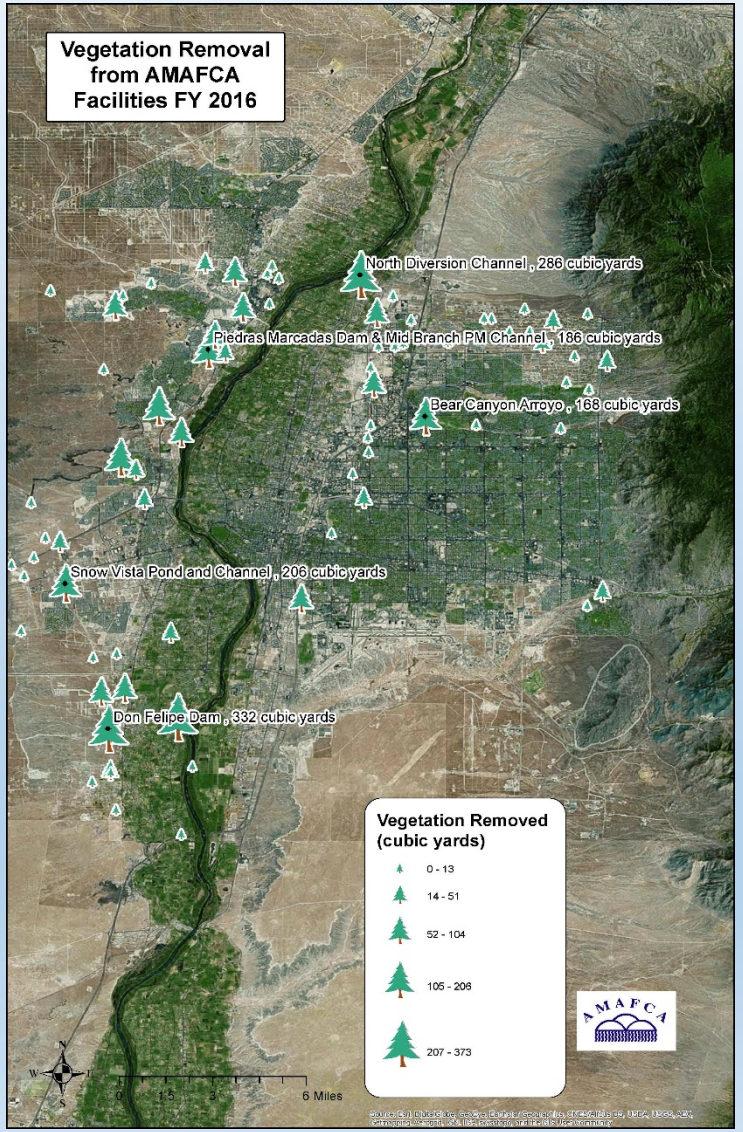


What Gets Removed and Where?

- Sediment, Vegetation, and Trash removed and tracked monthly







Monthly Comparison of Peak Flow Amounts

Average of 45% Reduced

Date: 2015	NDC at Alameda Gage Monthly Summation of Peak Flows (cfs)	Discharge to Rio Grande Monthly Summation of Peak Flows (cfs)	Percent Reduction (%)
June	3,560	2,121	40%
July	8,428	3,737	56%
September	4,000	3,046	24%
October	2,510	1,095	56%
November	953	605	37%
December	540	351	35%
Totals	19,991	10,955	45%

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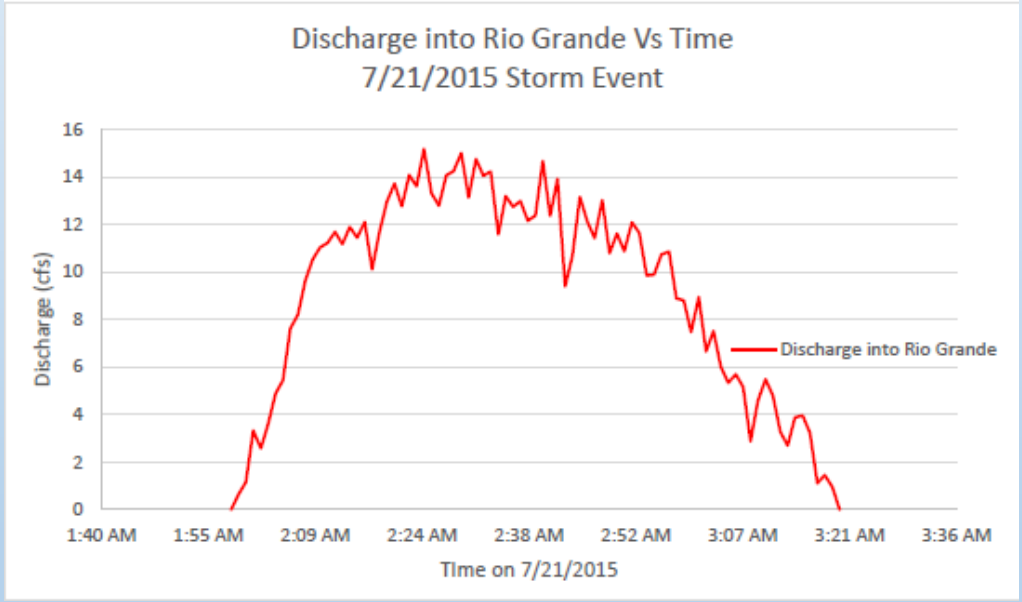
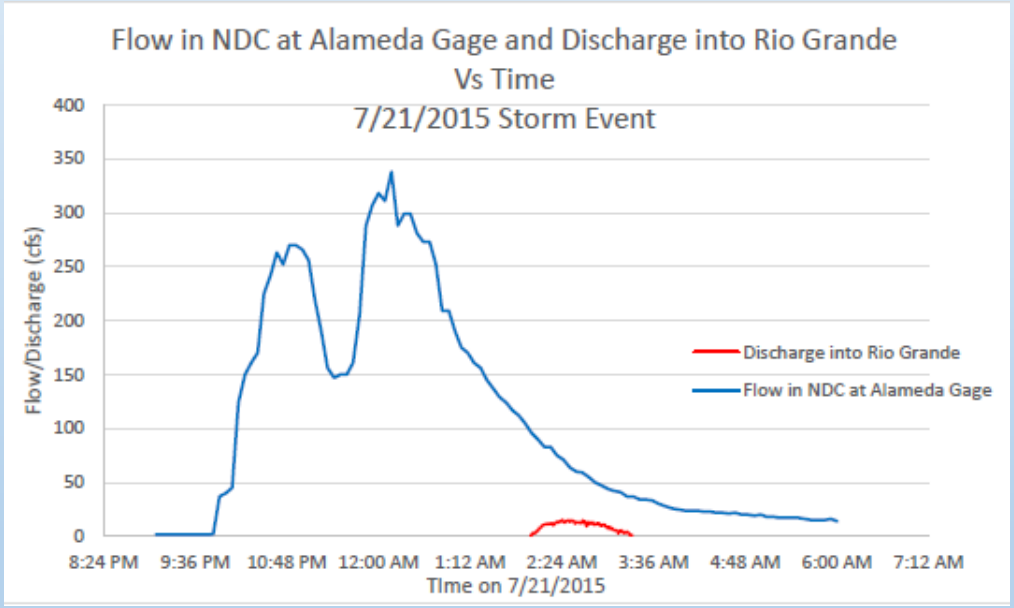
Discharge into Rio Grande and Upstream Flow in North Diversion Channel





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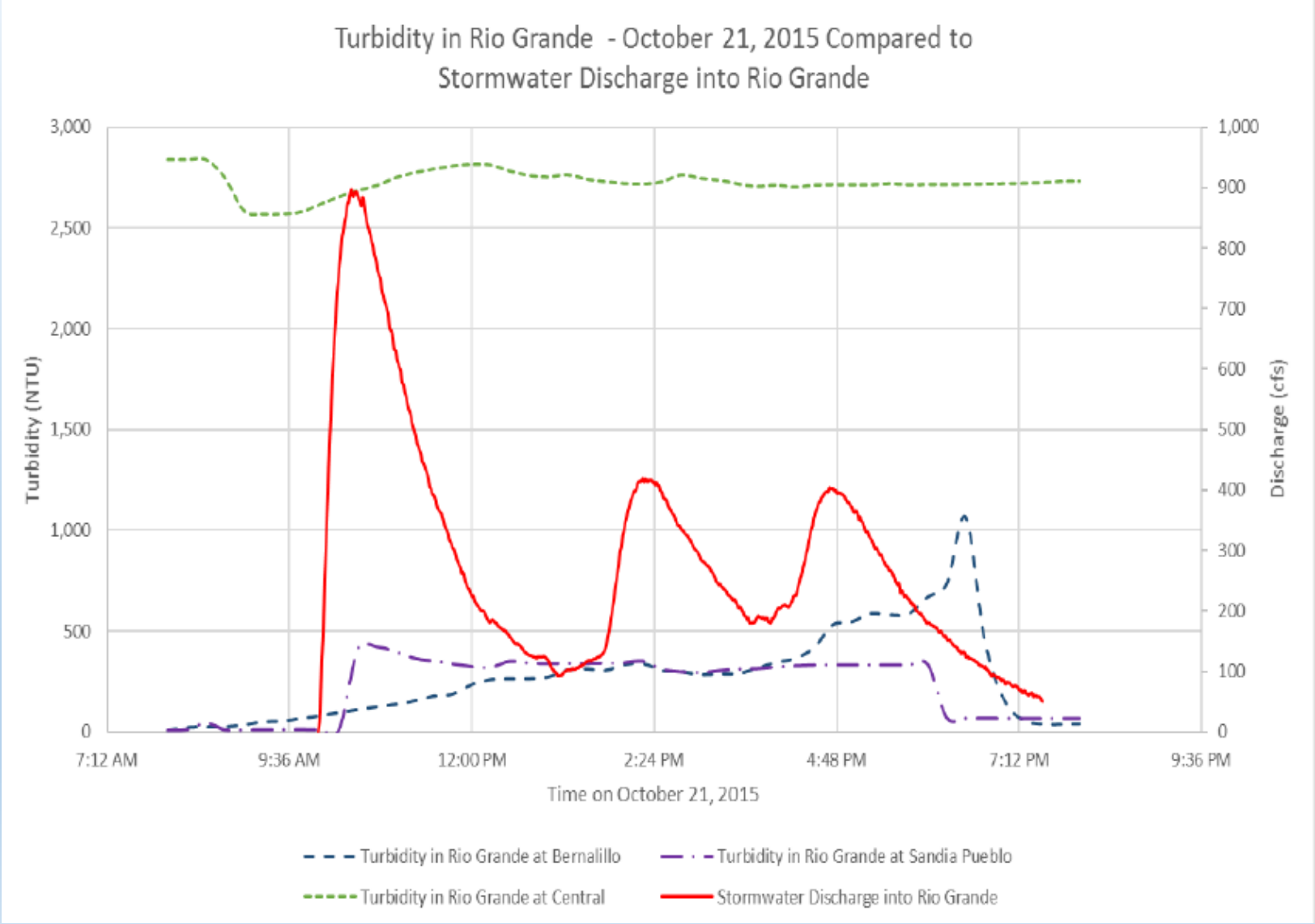
Does Discharge Affect Turbidity in Rio Grande?



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What Sort of Additional Info Is There?

- Rainfall data websites
- Water quality monitoring devices deployed in watershed
- Improved focus on tracking of operation and maintenance

What Does This Info Give us?

- Amount of rainfall in a particular sub-basin within the watershed over a period of time
- Volume of runoff in a given month at a given location
- Improved reporting of water quality expenditures relative to water quantity

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Next Steps for Analysis

Debris Removed From WQ Structures During Bracket Period

WQ Location	Bracket Period	Days in Period	Debris Volume for study (cy)	Debris Removed on Date Previously Cleaned (cy)	Debris Volume Removed from Upstream Facilities (cy) during bracket period
Domingo Baca	6/16/2016 - 8/1/2016	99	2 (39 cy total removed)	72	
La Cueva MHs	3/10/2016 - 12/14/2016	279	2.5	Volume not Listed	0 Logged
La Cueva Water Quality	3/1/2016 - 12/13/2016	287	180	26	0 Logged
North Pino	Unknown - 9/28/2016	Unknown (use 365 for analysis)	2 (3 loads removed)	No Data	17 Trash, 12 Vegetation
Piedras Marcadas #3			5		
Piedras Marcadas #4			0.75		
Piedras Marcadas #5			0.5		
Piedras Marcadas #6	8/18/2016 - 12/8/2016	122	2.5	Volume not Listed	No Data
South Diversion Manholes (Baffle Chute)	3/14/2016 - 12/9/2016	270	5	Volume not Listed (Vactor)	No Data
South Pino Pond	Unknown - 11/15/2016	Unknown (use 365 for analysis)	5	No Data	49 Vegetation, 24 Trash
UNM Water Quality	3/2/2016 - 12/9/2016	282	0.0625	Volume not Listed (Vactor)	No Data
West Bluff	11/11/2015 - 11/9/2016	364	5 (23 loads removed)	84	948 Sediment, 13 Trash, 13 Vegetation
Woodward	8/1/2016 - 12/14/2016	135	2 (4 loads removed)	No Data	0 Logged

Rainfall and Runoff Estimation

WQ Location	Upstream Area (sq. mi)	# Upstream BMP's	Total Rainfall during bracket period in Watershed (CoCoRaHS) (in.)	Total Volume of Rainfall in Upstream Area during bracket period (ac-ft)	Total Volume into NDC over bracket period (ac-ft)
Domingo Baca	12.34	13	1.27	835.92	No Data
La Cueva MHs	6.00	0	6.28	2009.86	No Data
La Cueva Water Quality	6.74	14	6.28	2256.96	96.6 *
North Pino	2.86	10	8.30	1267.49	9.5 *
Piedras Marcadas #3					
Piedras Marcadas #4					
Piedras Marcadas #5					
Piedras Marcadas #6	12.34	1	2.33	835.92	No Data
South Diversion Manholes (Baffle Chute)	5.21	0	7.25	2014.60	298.0
South Pino Pond	10.34	7	9.15	5046.93	76.6 *
UNM Water Quality	2.64	0	6.77	954.04	11.1 *
West Bluff	7.93	13	8.14	3444.03	No Data
Woodward	1.57	0	4.69	393.75	No Data

What is in the future?

- Improvement of debris collection and sediment removal – without decreasing flood control capacity
- Understanding of watershed response to rainfall events that generate runoff
- Improved Regional Stormwater Quality!

Questions?

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