



**Summary of AMAFCA's MS4  
Public Education, Outreach, Involvement, and Participation Program  
FY 2022 (July 1, 2021 - June 30, 2022)**

NPDES Permit No. NMR04A000  
Part I.D.5.g - Public Education and Outreach on Stormwater Impacts and  
Part I.D.5.h - Public Involvement and Participation

# Outcome Report for Fiscal Year 2021–2022 (July 1, 2021 to June 30, 2022)



Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) • City of Albuquerque • Bernalillo County • Town of Bernalillo • Village of Corrales • Ciudad Soil and Water Conservation District • Eastern Sandoval County Arroyo Flood Control Authority (ESCAFCA) • Village of Los Ranchos de Albuquerque • Department of Transportation (NMDOT) • City of Rio Rancho • Sandoval County • Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA)

PRESENTED BY

# SUNNY505

# Introduction

The outcomes report is designed to illustrate the collective successes of the Middle Rio Grande Stormwater Quality team. In fiscal year 2022, the Storm Team reached over 100,000 individuals in the Albuquerque Metro area through special events, educational efforts, as well as digital promotions via various social media and the website.

The Storm Team is a collaborative organization made of of the following: The Albuquerque Metropolitan Arroyo Flood Control Authority, the City of Albuquerque, Bernalillo County, the City of Rio Rancho, Ciudad Soil and Water Conservation District, the New Mexico Department of Transportation, the Southern Sandoval County Arroyo Flood Control Authority, the Town of Bernalillo, the Village of Corrales and the Village of Los Ranchos.



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# Bernalillo County

## Public Outreach and Education Tracking

FY2022: July 1, 2021 – June 30, 2022

Date	Location	Event Topic	Description of Education/Outreach Event Program/Materials	Participants	Source for Participant Count
8/11/2021	Bosque	Illegal dumping cleanup	BernCo and Amazon Illegal Dumping Partnership Clean Up in the Bosque. Illegal Dumping Partnership 1,250 tons of junk and rubbish cleaned up on annual basis.	80	BernCo News Release
9/9/2021	505Outside monthly landscaping newsletter	Learn How to Harvest Rainwater in Your Yard article	Provided article promoting video training series on how to design, construct, and maintain residential rainwater harvesting features. See <a href="https://www.505outside.com/2021/09/01/learn-how-to-harvest-rainwater-in-your-yard/">https://www.505outside.com/2021/09/01/learn-how-to-harvest-rainwater-in-your-yard/</a>	1098 visits to article	cbustos@abcwua.org jillbrown@brown greenandmore.com
9/26/2021	Los Vecinos Community Center (478 NM-333, Tijeras, NM 87059)	East Mountain Celebration	Natural Resources Services table in Bernalillo County tent. Provided information to educate County residents on stormwater quality, water conservation methods and incentive programs, and groundwater monitoring program.  In addition, the County worked working in collaboration with Knowaste Services to provide a litter free event. East Mt. Celebration resulted in Compost 168.0 lbs., Recycle 29.0 lbs., Landfill 155.5 lbs., Cardboard 33.5 lb., Glass 4.5 lbs., Film 1.0 lbs., total weight managed 391.5 lbs., total weight diverted 236.0 lbs. with a diversion rate of 60.3%	2500	Bernco Office of Community Engagement and Outreach email - Cathy Lopez
9/27/2021 and 10/1/2021	Virtual and Gutierrez Hubbell House (6029 Isleta Blvd SW, Albuquerque, NM 87105)	Waterwise Landscaping training for ABC Tree Stewards Program	This workshop for the ABC Tree Stewards Program addressed principles of Waterwise Landscapes including native and arid-adapted plants, mulch, efficient irrigation, and rainwater harvesting. Day Two of the training was a tour of the Rainwater Harvesting Learning Landscape at the Gutierrez-Hubbell House.	11	2021 Tree Stewards cohort



2/11/2022	All Nations Wellness & Healing Center (6416 Zuni Rd SE, Albuquerque, NM 87108)	EJ in Action: Water-Wise Workshop	This class addressed waterwise landscaping principles including efficient irrigation, native and arid-adapted plants, and rainwater harvesting.	16	Head count at event
3/2/2022–3/4/2022	Virtual and in-person conference at Indian Pueblo Cultural Center (2401 12th St NW, Albuquerque, NM 87104)	New Mexico Land and Water Summit conference	Conference theme was “From Concept to Completion: Lessons Learned” and addressed GSI/LID projects through all stages of development including planning and design, implementation, public acceptance, and maintenance. Conference also included full-day tour of GSI/LID projects in Santa Fe. Attendees included engineers, architects, landscape architects, planners, and water resources professionals. Served on Planning Committee, provided \$5,000 sponsorship, and presented “Bernalillo County GSI/LID Standards”.	272	Land and Water Summit Whova virtual conference platform report
3/19/2022	Loma Linda Community Center (1700 Yale Ave SE, Albuquerque, NM 87106)	Work day at Loma Linda Community Center Community Garden	Provided demonstration on how to convert an IBC Tote to a rain barrel	22	Head count at event
4/7/2022	Our Land: New Mexico’s Environmental News/ NM In Focus	LIVE NOW: Plastic Bags & Stormwater Risks	Interview on how the repeal of Albuquerque’s plastic bag ban could affect water quality in Rio Grande. <a href="https://www.newmexicopbs.org/productions/newmexicoinfofocus/assessing-the-impact-of-tax-rebate-checks-recreational-cannabis-legalization-spring-runoff-forecast/">https://www.newmexicopbs.org/productions/newmexicoinfofocus/assessing-the-impact-of-tax-rebate-checks-recreational-cannabis-legalization-spring-runoff-forecast/</a>	65,000-70,000 viewers in Central & Northern NM	KNME Communications Director Michael Privet
4/19/2022	Gutierrez Hubbell House (6029 Isleta Blvd SW, Albuquerque, NM 87105)	Waterwise Landscaping training for ABC Tree Stewards Program	This workshop for the ABC Tree Stewards Program addressed principles of Waterwise Landscapes including native and arid-adapted plants, mulch, efficient irrigation, and rainwater harvesting, and included a tour of the Rainwater Harvesting Learning Landscape at the Gutierrez-Hubbell House.	18	2022 Tree Stewards cohort
4/24/2022	Westside Community Center (1250 Isleta Blvd SW, Albuquerque, NM 87105)	South Valley Pride Day	Natural Resources Services table in Bernalillo County tent. Provided information to educate County residents on stormwater quality, water conservation methods and incentive programs, and groundwater monitoring program.	4000	Bernco Office of Community Engagement and Outreach email - Cathy Lopez
4/29/2022	ABQ BioPark (2601 Central Ave NW, Albuquerque, NM 87104)	Maintenance of Green Stormwater Infrastructure features	This class provided an introduction to GSI, descriptions of GSI features (permeable pavement, stormwater harvesting basins, infiltration conveyances, plants, and mulch), and maintenance requirements for GSI features.	20	Registration list from ABCWUA Water Conservation Program
5/14/2022	Le Jardin Verde (540 Utah St NE, Albuquerque, NM, 87108)	Spanish Waterwise Workshop	This Spanish-language workshop addressed waterwise landscaping principles including native and arid-adapted plants and rainwater harvesting.	18	Head count at event
5/19–20 2022	Virtual Conference	Next Generation Water Summit	Conference theme was “Growth in a Time of Drought.” Attendees included the building and development community, water reuse professionals, water policymakers, and the general public. Provided sponsorship of \$1,500. Sponsorship included free registration for Bernalillo County staff and customers of the Bernalillo County Water Conservation Program (i.e. private well owners and customers of small water systems in Bernalillo County).	364	Next Generation Water Summit Planning Committee email (Doug Pushard at doug@kuelwater.org)

6/9/2022	Virtual workshop	Rainwater or Graywater: Which is Right for You? Workshop	This workshop provided an overview of residential rainwater harvesting and graywater systems that can supply water for use indoors and outdoors.	53	Bernco Cervis Event Registration System report
6/11/2022	Virtual workshop	Rainwater or Graywater: Which is Right for You? Workshop	This workshop provided an overview of residential rainwater harvesting and graywater systems that can supply water for use indoors and outdoors.	26	Bernco Cervis Event Registration System report
6/23/2022	Gutierrez Hubbell House (6029 Isleta Blvd SW, Albuquerque, NM 87105)	Residential Rainwater Harvesting: Q&A with Local Experts Workshop	In this workshop, local rainwater harvesting experts discussed passive water harvesting best practices and took questions from the audience.	73	Bernco Cervis Event Registration System report
6/25/2022	Gutierrez Hubbell House (6029 Isleta Blvd SW, Albuquerque, NM 87105)	Selecting Plants for Rainwater Harvesting Basins Workshop	This workshop addressed how to select plants for rainwater harvesting basins in the Middle Rio Grande.	22	Headcount at event. 35 registered per Bernco Cervis Event Registration System report.
8/24/21, 9/28/21, 3/16/22, 5/6/22	Water Conservation Program News Bulletin	Water Conservation Program News Bulletin	Water conservation articles, news, and events for Bernalillo County residents	1300	GovDelivery subscriptions
7/20/21, 10/26/21	Stormwater Quality and Watershed Protection News Bulletin	Stormwater Quality and Watershed Protection News Bulletin	Stormwater quality and watershed health-related articles, news, and events for Bernalillo County residents	800	GovDelivery subscriptions
9 events (7/10/21-6/25/22)	Multiple	HHW collection events	HHW weekend collection events	333	HHW Annual Report
FY2022	Homes and businesses in unincorporated Bernalillo County	Water efficiency consultations	Conducted water efficiency consultations at homes and businesses to educate Bernalillo County residents on water conservation best practices. Consultations address water-efficient plumbing fixtures and appliances, landscaping, irrigation systems and scheduling, rainwater harvesting, graywater, and leaks.	94	WaterWays database



FY2022	Homes and businesses in Bernalillo County	Rain barrels	Provided rain barrels to Bernalillo County residents encourage rainwater harvesting through Bernalillo County Rainwater Harvesting incentive program	147	WaterWays database
FY2022	BernCo Website	Website Views	Public interaction with the “How Can Public Works Help You?” Webpages	4656	BernCo analytics
FY2022	Multiple	BEMP	BEMP direct student interactions	8549	BEMP Education Report
FY2022	Multiple	BEMP	BEMP Social Media interactions	88973	BEMP Education Report
FY2022	Multiple		River Xchange	866	River Xchange mid year report
FY2022	Multiple	Trail restoration and planting/ invasive special removal	Youth Corps, including Talking Talons, Rocky Mountain, Ancestral Lands Conservation Corps, and Valle de Oro National Wildlife Refuge. 43 volunteers worked 3428 hours.	43	BernCo tracking Youth Corps Engagement
FY2022			WW Permits Processed	1183	
FY2022		Septic permitting and outreach	Bernalillo County contacted system owners through the “unpermitted and aging wastewater system campaigns” in FY 2022 and an estimated 293 properties were resolved.	293	
FY2022	BernCo Open Space		Master Naturalist – 750 hours	17	
FY2022		IDDE	Employee Training	21	Training spreadsheet
FY2022		Stormwater Quality	Employee Training	14	Training spreadsheet
FY2022		Illegal Dumping Awareness Campaign	Online resources, digital advertising and billboard public outreach for the illegal dumping awareness campaign. Number includes repeats.	6,239,578	



# ONE ALBUQUE RQUE

city of albuquerque



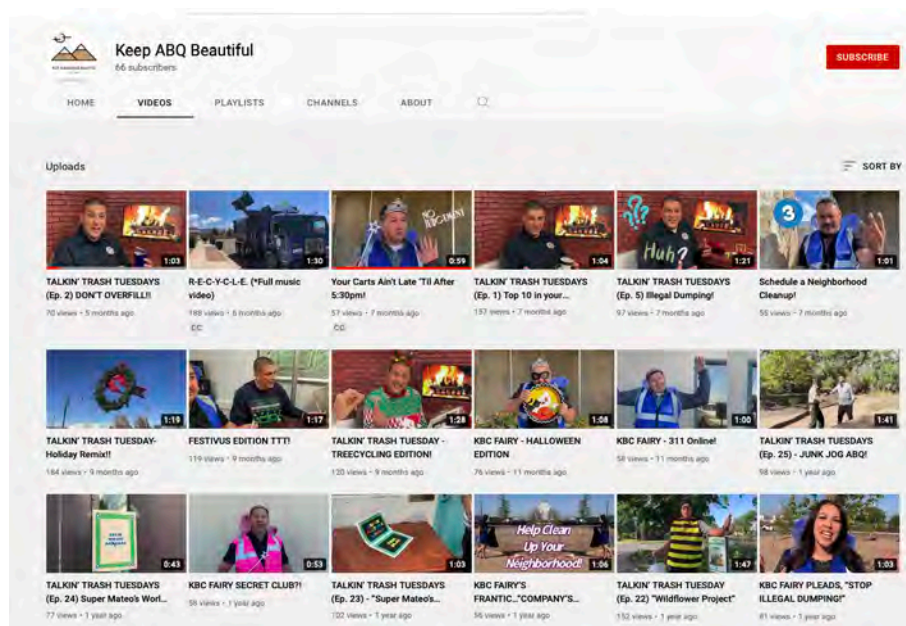
# City of Albuquerque

## Public Participation Numbers

In 2021 the City of Albuquerque's Solid Waste's Keep ABQ Beautiful Program garnered 867 views of their YouTube channel, encouraging the public to pick up and recycle trash.

<https://www.youtube.com/channel/UCEjJlI8yYk-IEv3Lpi6Bw3w/videos>

WATCH OUR YOUTUBE CHANNEL



Additionally, the City of Albuquerque hosted clean up events from July 1, 2021 through June 30, 2022, with the following successes:

### Company's Comin' Cleanup

- 9/25/21 – 9am to 12pm
- 699 Volunteers/Participants
- 3 hours
- 7.54 tons/15,080 lbs of trash collected

### Junk Jog on the Bosque – Plogging

- 10/23/21 – 9a to 12p
- 20 Volunteers
- 98 Participants
- 3 hours
- .97 tons/1,940 lbs of trash collected

### Household Hazardous Waste Collection Event

- 11/13/21 – 10am to 3pm
- 585 Participants
- 5 hours
- 24.19 tons/48,373 lbs of HHW collected

### One ABQ Cleanup Month

- 4/9/22, 4/16/22, 4/23/22 & 4/30/22 – 9am to 12pm
- 895 Volunteers/Participants
- 3 hours each day x 4
- 38.32 tons/76,640 lbs of trash collected






# Planting Numbers for 2021–2022

## River Exchange

## Other

Date	School	Adults	Kids	Cotton	Willows	Date	Group	Adults	Youth	Cotton	Willows
2.11.22	Valle Vista	4	34	27		2.10.22	Holy Ghost	2	27	50	
2.16.22	7 Bar	4	50	35		2.19.22	Peace Corps	31	11	65	25
2.17.22	7 Bar	3	22	37		2.23.22	Holy Ghost	2	36	53	
2.18.22	Manzano Mesa	2	40	27		2.26.22	Multi Agency Community Day	42	8	50	100
2.25.22	Manzano Mesa	2	18	18		3.4.22	Cottonwood Classical	4	15	48	
3.2.22	La Mesa	5	36	36		3.19.22	Peace Corps	39	7	75	25
3.9.22	La Mesa	5	46	40	10	<b>TOTALS</b>		<b>120</b>	<b>104</b>	<b>341</b>	<b>150</b>
3.10.22	Monte Vista	9	48	11	57						
3.11.22	John Baker	6	18	11	15						
3.16.22	John Baker	7	43	14	47						
3.30.22	Cochiti	6	27	20	40						
4.1.22	Valle Vista	3	35	21	29						
<b>TOTALS</b>		<b>56</b>	<b>417</b>	<b>297</b>	<b>198</b>						



# Total Waste Diverted

FY22 Total HHW (lbs) Diverted from Landfill

FY22 Total HHW (lbs) Diverted from Landfill																		
Calendar Year	Month	Recycled Waste																
		Reuse Center	RC0014 Waste Oil	RC5056 Motor Fluids	RC0016 Lead Acid Batteries	RC6006 Mercury	ACT15687 Household Paint, xylene, toluene etc	RC0011 Aerosols	RC7485 Alkaline Batteries	RC7486 Lithium Batteries	RC6254 NiCad Batteries	ACT46232 Compact Bulbs, CFL	ACT46233 HID Lamps	ACT46235 4 Foot Lamps	RC7658 8 Foot Lamps	ACT50491 Non PCB Ballast	ACT58121 Fire Extinguisher	ACT58246 Fertilizer
2021	Jul	1,902		28,874	1,034			3,265	1,382	371	603	385		87	34	347		
	Aug	1,806		19,817	133	5		2,930	956	84	256	310		88	81			
	Sep	2,334		22,986	1,145			921	796	190	227	317		18		137		
	Oct	2,730		13,854		766		6,418	883			114		40	32	300		
	Nov	2,850		22,039	1,241			1,319	444		1,576	222		62	51			
	Dec	3,066		12,811				1,000	479			378						
MID YEAR		14,688	0	120,381	3,553	771	0	15,853	4,940	645	2,662	1,726	0	295	198	784	0	0
2022	Jan	2,130		9,286				884	923			582		62	59			
	Feb	1,668		7,716										61	32		247	
	Mar	1,530		9,176				1,472	443			242		14				
	Apr	1,806		10,544	1,234			1,575	1,247			214		38	20			
	May	1,662		19,007				1,716	863			432		80	61			
	Jun	2,532		17,152	1,131			2,330	1,242	209		229		102	2,029			
TOTAL (lbs)		26,016	0	193,262	5,918	771	0	23,830	9,658	854	2,662	3,425	0	652	2,399	784	247	0

\* Misc = Compact Bulbs, 4 ft lamps, Ballast, PCB Capacitors, Carbides, Phosphides, Fertilizers, CO2 Cylinders, etc...

TOTAL	345,872
TOTAL Recycled Waste	225,967
% Recycled	65.3%

PO Amount:	\$1,000,500.00
Paid Amount:	\$954,466.81
Amount left on PO:	\$46,033.19

PO# DSW0016901  
PO# DSW0022306

\* Information on this report is gathered from the Reuse forms sent by mail from ACT and the breakdown of items processed list sent by email monthly by Nicole Gwash

Sent for Destruction								
RC0012 Acids	RC0013 Bases	RC0015 Flammables Incinerated	RC6002 Toxic-Solid (Poisons)	RC7129 Compressed Gas	RC7182 Oxidizers	ACT145226 Pesticides Liquid Toxic	Misc*	TOTAL
1,684	1,354	2,689	2,886	749	299			47,945
895	1,290	861	1,510	169			917	32,108
1,006	981		930	135	78		1,601	33,802
610	518			458			1,330	28,053
805	540	120	1,248			2,352		34,869
588	3,483		682			1,594		24,081
5,588	8,166	3,670	7,256		377		3,848	200,858
472	569		580	100	177	1,823		17,647
848	5,003		175			442		16,192
1,987	4,366		858		837	1,008		21,933
802	822		767			971		20,040
1,383	2,632		1,155			2,357		31,348
2,599	5,264		1,396			1,639		37,854
13,679	26,822	3,670	12,187		1,391		3,848	345,872

	Total Pounds Recycled	Tons Recycled	Total Destroyed	Amount Paid
July	38,284	19.14	4.83	\$105,924.00
August	26,466	13.23	2.82	\$91,903.31
September	29,071	14.54	2.37	\$86,831.00
October	25,137	12.57	1.46	\$85,161.75
November	29,804	14.90	2.53	\$72,841.00
December	17,734	8.87	3.17	\$59,653.00
January	13,926	6.96	1.86	\$66,513.25
February	9,724	4.86	3.23	\$47,311.00
March	12,877	6.44	4.53	\$64,536.25
April	16,678	8.34	1.68	\$83,559.75
May	23,821	11.91	3.76	\$86,074.75
June	26,956	13.48	5.45	\$104,157.75
	270,478	135.24	30.80	\$954,466.81

# City of Albuquerque and Bernalillo County: Public Participation Numbers

Household Hazardous Waste Collection Participation											
July 2019- June 2020											
Month	Participants w/Unknown Location or Not Enough Info to Geocode	Total	Orphaned waste at facility	City Participants (City + No Match or Not Enough Info)	County Participants	Out of County	Out of County Breakdown	County Percentage	Monthly Cost	Light Bulbs (included in monthly cost)	Total Cumulative Cost
Jul-19		1550		1329	206	15	Sandoval- 13, SF-1, Valencia-1	13.3%	\$102,037.50	\$1,287.50	\$102,037.50
Aug-19		1500		1273	216	11	Sandoval- 7, SF-2, Valencia-2	14.4%	\$97,977.00	\$477.00	\$97,977.00
Sep-19	44	1227		1042	175	10	Sandoval - 8, SF-1, Taos-1	14.3%	\$80,771.25	\$1,016.25	\$80,771.25
Oct-19	50	1190		962	222	6	Sandoval - 4, Valencia - 2	18.7%	\$78,985.00	\$1,635.00	\$78,985.00
Nov-19	44	939		758	168	13	Sandoval- 9, Socorro-1, Valencia-3	17.9%	\$62,614.25	\$1,579.25	\$62,614.25
Dec-19	32	715		602	110	3	Sandoval - 2, SF-1	15.4%	\$47,934.50	\$1,459.50	\$47,934.50
Jul-Dec 2019	170	7121	0	5,966	1,097	58		15.4%	\$ 470,319.50	\$7,454.50	\$470,319.50
Jan-20	53	990		831	154	5	Sandoval County-4, Valencia County-1	15.6%	\$66,612.00	\$2,262	\$66,612.00
Feb-20	65	834		713	111	10	Sandoval County-8, Valencia County-2	13.3%	\$56,121.00	\$1,911	\$56,121.00
Mar-20	51	928		754	165	9	Sandoval County-8, Torrance County-1	17.8%	\$61,742.75	\$1,423	\$61,742.75
Apr-20	67	1031		864	152	15	Sandoval County-10, SF-2, Valencia-3	14.7%	\$67,646.25	\$631	\$67,646.25
May-20	47	1535		1270	233	32	Udalla-1, Sandoval-24, Santa Fe-3, Torrance-1, Valencia-3	15.2%	\$101,687.75	\$1,913	\$101,687.75
Jun-20	113	1829		1,523	284	22	Sandoval -14, SF-6, Valencia-2	15.5%	\$120,614.00	\$685	\$120,614.00
Jan-Jun 2020	396	7,147	0	5,955	1,099	93		15.4%	\$474,423.75	\$8,825	\$474,423.75
FY20 Total	566	14,268	0	11,921	2,196	151		15.4%	\$944,743.25	\$16,279	\$944,743.25
Participant Total (other than orphaned)							14,268			\$16,279	

Monthly Average **1189**

Participant Fee \$ 65.00

FY20 Budget \$ 540,000.00  
Remaining Balance \$ (404,743.25)

	Participants	Percentage	Cost
BERNCO Participation to date	2,196	15.4%	\$142,740
Unknown or Not Enough Info to Geocode (costs absorbed by COA)	566	3.97%	\$36,790

Email Daniele Berardelli, Jake Daugherty, Debra Kelley and Steve Falk if we need to adjust POR amount before the end of the fiscal year.

\* All information in this report comes from ACT - Nichole Gwash (NGwash@ACTEnviro.com) by email. She will send an invoice, a list of residents (which must then be sent to Ben Sanborn for geocoding), a list of items processed, and any logs for drums and light bulbs & tubes.

Use the invoice from ACT emailed by Nicole Gwash to fill in the Monthly Costs and Light Bulbs section. Use the geocoded (by Ben Sanborn) resident list to fill in the participant information. Ben will add a sheet with totals, but go back and search for the "abandoned" items to add to the report. add the number of residents that did not have enough information to the COA total but also list them separate so we can track them.

All information in this report comes from ACT—Nichole Gwash (NGwash@ACTEnviro.com) by email. She will send an invoice, a list of residents (which must then be sent to Ben Sanborn for geocoding), a list of items processed, and any logs for drums and light bulbs & tubes.



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Jul-20	78	1624		1329	280	15	Sandoval-10, SF-5	17.2%	\$106,809.00	\$490.00	\$106,809.00
Aug-20	142	1799		1526	246	27	Sandoval-18, SF-8, Valencia-1	13.7%	\$119,039.25	\$789.00	\$119,039.25
Sep-20	119	1419		1190	224	5	Sandoval-5	15.8%	\$94,591.00	\$931.00	\$94,591.00
Oct-20	78	1374		1162	202	10	Sandoval-5, SF-4, Valencia-1	14.7%	\$90,951.25	\$622.00	\$90,951.25
Nov-20	39	892		755	133	4	Sandoval-1, SF-3	14.9%	\$59,205.00	\$463.00	\$59,205.00
Dec-20	42	830		716	113	1	Sandoval-1	13.6%	\$55,716.00	\$665.00	\$55,716.00
Jul-Dec 2020	498	7938	0	6,678	1,198	62		15.1%	\$ 526,311.50	\$3,960.00	\$526,311.50
Jan-21	44	992		842	150	0	0	15.1%	\$66,322.75	\$715	\$66,322.75
Feb-21	60	885		745	140	0	0	15.8%	\$59,791.25	\$859	\$59,791.25
Mar-21	41	1248		1078	169	1	Valencia-1	13.5%	\$83,046.50	\$758	\$83,046.50
Apr-21	60	1396		1187	209	0	0	15.0%	\$91,927.25	\$529	\$91,927.25
May-21	70	1426		1237	188	1	Sandoval-1	13.2%	\$95,211.75	\$998	\$95,211.75
Jun-21	59	1636		1,399	237	0	0	14.5%	\$108,494.75	\$874	\$108,494.75
Jan-Jun 2021	334	7,583	0	6,488	1,093	2		14.4%	\$504,794.25	\$4,733	\$504,794.25
<b>FY20 Total</b>	<b>832</b>	<b>15,521</b>	<b>0</b>	<b>13,166</b>	<b>2,291</b>	<b>64</b>		<b>14.8%</b>	<b>\$1,031,105.75</b>	<b>\$8,693</b>	<b>\$1,031,105.75</b>
Participant Total (other than orphaned)						15,521				\$8,693	

Monthly Average 1293.416667

Participant Fee \$ 65.00

FY21 Budget \$ 540,000.00  
Remaining Balance \$ (491,105.75)

BERNCO Participation to date			
Participants	2,291	Percentage	14.8%
Cost			\$148,915
Unknown or Not Enough Info to Geocode 832 5.36% \$54,080 (costs absorbed by COA)			

Email Daniele Berardelli, Jake Daugherty, Debra Kelley and Steve Falk if we need to adjust POR amount before the end of the fiscal year.

\* All information in this report comes from ACT - Nichole Gwash (NGwash@ACTenviro.com) by email. She will send an invoice, a list of residents (which must then be sent to Ben Sanborn for geocoding), a list of items processed, and any logs for drums and light bulbs & tubes.

Use the invoice from ACT emailed by Nicole Gwash to fill in the Monthly Costs and Light Bulbs section. Use the geocoded (by Ben Sanborn) resident list to fill in the participant information. Ben will add a sheet with totals, but go back and search for the "abandoned" items to add to the report. add the number of residents that did not have enough information to the COA total but also list them separate so we can track them.







ACT Environmental Services  
208 Murray Road SE  
Albuquerque, NM 87105  
(505) 445-9400 ext. 410 Office  
E-mail: [mthornton@ACTEnviro.com](mailto:mthornton@ACTEnviro.com)

### HHW Chemical Waste Inventory:

---

Project Name: Albuquerque/Bernalillo County Household Hazardous Waste Collection Event  
5000 Balloon Fiesta Parkway  
Albuquerque, NM 87113  
Job Date: November 13, 2021  
Client: City of Albuquerque/Bernalillo County  
Report Date: January 25, 2022  
Author: Melanie Thornton / Martin Aranda  
Site Contact(s): Jake Daugherty

---

On November 13, 2021, ACT Environmental Services, and the City of Albuquerque/Bernalillo County, in a joint effort collected, segregated, packaged, labeled, transported, and disposed of 48,373 pounds of Household Hazardous Waste, and 10,380 pounds of Non-Regulated Solid Waste from 585 residents from residents within the Albuquerque/Bernalillo County at an average of 100.43 pounds of waste per customer.

This work was performed per the Scope of Work given to ACT by the City of Albuquerque/Bernalillo County. A copy of each HHW Chemical Waste Manifest/Bill of Ladings was provided to the City Representative at the time of collection.

DOT Hazard Class	Subsidiary Risk	Types of Chemicals	Total Gross Weight	Number of Drums X Size of Drums	Treatment Technology
Non-Haz		Used motor oil & Antifreeze	8,262 lbs.	4 X 275 Portable Totes	Recycle
Non-RCRA/Non-DOT Regulated Material Solid		Solid waste, empty containers, trash	10,380 lbs.	4 X 40 Yard Bins	Landfill
Non-RCRA/Non-DOT Regulated Material Liquid		Latex Paint	27,280 lbs.	1 X 20 Yard Bin 1 x 30 Yard Bin	Landfill
2.1 – Flammable Gas		Aerosol Spray Cans	1,686 lbs.	3 X 275 Cubic Yard Box	Energy Recovery / Fuel Blending
3 – Flammable Liquid		Paint Related Material	3,511 lbs.	10 X 55 Gallon Metal Drum	Energy Recovery / Fuel Blending
3 – Flammable/Toxic Liquid	6.1 - Toxic	Captan, Diazinon	2,887 lbs.	16 X 55 Gallon Poly Drum	Energy Recovery / Fuel Blending
5.1 – Oxidizing Solids		Potassium Nitrate/Sodium Hypochlorite	12 lbs.	1 X 05 Gallon Poly Drum	Incineration
6.1 – Toxic Solid		Captan, Diazinon	944 lbs.	6 X 55 Gallon Poly Drum	Energy Recovery/Fuel Blending
8 – Corrosive (Acids)		Hydrochloric Acid, Sulfuric Acid	342 lbs.	2 X 55 Gallon Poly Drum	Stabilization / Landfill
8 – Corrosive (Basic)		Sodium Hydroxide, Potassium Hydroxide	1,491 lbs.	8 X 55 Gallon Poly Drum	Stabilization / Landfill
8 – Corrosive (Batteries)		Automotive Lead Batteries, NiCad, Lithium Ion, Alkaline	1,340 lbs.	1 x Wooden Pallet, 2 x 30 Gallon Poly Drum, 5 x 5 Gallon Poly Drums	Recycle
8 – Mercury		Mercury	5 lbs.	1 X 5 Gallon Poly Drum	Recycle
9 – Environmentally Hazardous		Fluorescent Light Bulbs	613 lbs.	9 x Cylinder Box & 1 x 55 Gallon Poly Drum	Recycle



# Albuquerque/Bernalillo County Household Hazardous Waste Collection Event at Balloon Fiesta Park

Treatment Technology	Weight
Recycle	10,220 lbs.
Energy Recovery / Fuel Blending	9,028 lbs.
Incineration	12 lbs.
Landfill	39,493 lbs.

Waste Total	Cost	Cost/lbs.
58,753 lbs.	\$40,663.75	\$1.44/lbs.

585 – Albuquerque/Bernalillo County Participants

We are committed to working with you in fulfilling the environmental needs of our communities.

Melanie Thornton  
ACTEnviro Office Manager - ABQ





## 2022 Foothills Spring Cleanup Results (1 of 2)

2022 Foothills Spring Cleanup Results										
Location	Volunteers	Dog Poop (in Lbs.)	Trash (bags)	Trash * (cubic yards)	Mixed Recycling (bags)	Glass (5 gal buckets)	Aluminum (bags)	New Trail Built (miles)	Trail maintained (miles)	Notes:
Rt 66	29			14.5	6	4	2	0.1		Large items included numerous tires and a mattress, 2 trail crews completed the a reroute
Copper	51	40	5	0.9	1	1	0.33		0.5	4 trail crews did maintenance on .5 miles of trail. One cactus crew closed off several social trails
Indian School	43	25	1	0.2	1	0.5	0		0.45	4 trail crews did maintenance on about .45 miles of trail. Two cactus crews planted hundreds of cactus cuttings to block social trails.
Menaul	55	35	3	0.5	1	2.5	1		0.4	four trail crews did maintenance on about .4 miles of trail. Three cactus planting crews planted hundreds of cuttings to block off social trails
Piedra Lisa	39	25	0.5	0.1	0.5	2	0.5		0.25	1 trail crew built 27 drain dips on .25 miles of trail. 2 rock crews built steps on the Canyon Trail, 1 cactus planting crew planted hundreds of cactus cuttings on a variety of short cuts, and 1 graffiti crew scrubbed graffiti off a rock outcrop.
Embudo	31	20	1	0.2	1	0.33	0.25		0.2	1 trail crew built 20 drain dips and did general maintenance on .2 miles of trail, 1 rock crew reinforced several rock ramps on Trail 365, and 2 Cactus planting crews planted hundreds of cactus cuttings on several social trails adding up to .15 miles of trail closure.
*trash bags converted to cubic yards and added to cubic yard total										
2022 River Cleanup										
	102			15	10	6	2			Filled a dump trailer, plus 4 pickup trucks. Large items: 12 tires, 5 shopping carts, and a vinyl kiddie pool
2022 National Trails Day										
	100							0.04	1.4	4 crews planted cactus on short cuts and social trails 6 crews did maintenance on approximately 1.4 miles of trail 2 crews built rock retaining walls 1 crew built a trail reroute (about 190 feet) to replace several social trails several volunteers cleaning up dog poop and trash

## 2022 Foothills Spring Cleanup Results (2 of 2)

		Volunteers	Dog Poop ( in Lbs.)	Trash (bags)	Trash (cubic yards)	Mixed Recycling (bags)	Glass (5 gal buckets)	Aluminum (bags)	New Trail Built (miles)	Trail maintained (miles)
Totals		450	145	10.5	31.4	20.5	16.33	6.08	0.14	3.2
Dia del Rio										
Make a Diff Day										
Grand Total		652	145	10.5		30.5	22.33	8.08		





### Poop Fairy Signs

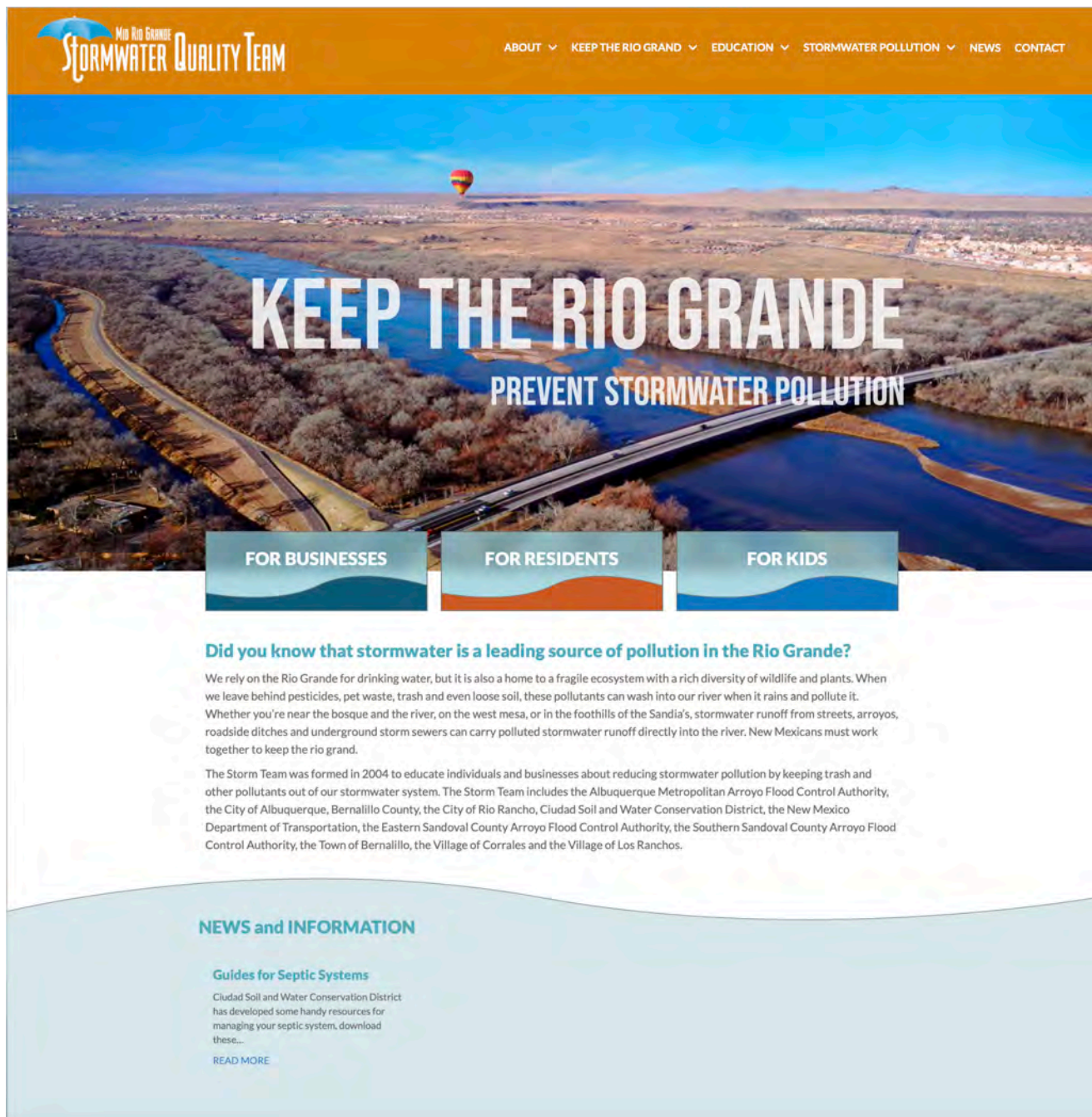
During FY22 we distributed 276 Poop Fairy signs to local residents. We also gave 250 to Parks and Open Space for posting.



# Mid Rio Grande Stormwater Quality Team

In FY2022 the MRGSQT developed a brand new website.

<https://keeptheriogrand.org>





# FACEBOOK

The MRGSQT Facebook page garnered 1,322 page reach, and an overall 73.1% increase in new page likes.



## What can you do to protect the Rio Grande?

Individuals and businesses need to know the steps they can take to reduce stormwater pollution. Here are a few things to consider:

- Properly dispose of pet waste
- Properly dispose of automotive fluids
- Keep fats, oils and grease out of storm drains
- Use commercial car washes when possible
- Keep fertilizers, pesticides and weed killers off the streets
- Properly dispose of hazardous materials on worksites

Together we can help protect the Rio Grande by keeping trash and other pollution out of our stormwater system.

Visit [keeptheriogrand.org](http://keeptheriogrand.org) for more information

1234 Address Address  
Albuquerque, NM 88888

Keep the Rio Grand!

**Prevent Stormwater Pollution**

Additionally, the MRGSQT team developed a new survey card that is now in the rotation for distribution.

Outcomes Report Fiscal Year July 1, 2021 to June 30, 2022 • Presented by SUNNY505

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# Village of Corrales

The Village of Corrales does not have a municipal storm sewer system. To handle stormwater flows from development, engineered grading and drainage (G & D) plans are required of all new residential construction (anything roofed or paved areas on sloped areas) that disturb more than 1,000 square feet. Engineers may use retention ponding, berms and other aspects that

keep the impervious surface stormwater flows on the subject property and not running into streets or adjacent properties. In the Commercial zone, retention areas must be built into Site Development Plans.

During the past year, 18 residential G&D's were processed through the Planning and Zoning Department.

# Village of Los Ranchos

Similar to the Village of Corrales, Los Ranchos does not have a municipal storm sewer system. Grading and drainage plans are required for most residential and commercial construction within the Village, and Site Development Plans are additionally required for major subdivisions and new commercial construction. Permeable pavement elements have been incorporated throughout the Fourth Street redevelopment area in Los Ranchos (as shown on page 13), which provide multiple benefits such as reducing flooding and erosion and

enhancing groundwater recharge. The next phase of the Fourth Street Project, from Pueblo Solano Rd NW to Ortega Rd NW, will include elements that address stormwater and drainage concerns within that phase. This year, staff participated in educational outreach activities as part of the Stormwater Quality Team, including distributing materials at the Los Ranchos Farmer's Market and posting and distributing poop fairy signs throughout the irrigation system in Los Ranchos.



## Ciudad Soil & Water Conservation District



# Ciudad Soil & Water Conservation District

## Stormwater Presentations 2022

Date	Times	RR or ES	Event	Presenter(s)	Visitors
4.23.2022	9:00am–12:00pm	RR	RiverXchange Community Day	Erin, Steve, Salema	10
6.4.2022	9:00am–12:00pm	RR	BernCo Master Naturalist Presentation	Steve, Erin	25
6.11.2022	9:00am–12:00pm	RR	GHH	BernCo OSD	12
6.13.2022	9:00am–12:00pm	RR	Shady Lakes	Erin, Steve, Jaren (Nature Ninos)	45
6.18.2022	9:00am–12:00pm	RR	Phil Chacon Park	COA OSD – Nature in Your Neighborhood	did not attend
6.13.2022	10:00am–1:00pm	RR	Shady Lakes: Nature Ninos Summer Camp	Steve, Jaren, Saleema (Nature Ninos)	40
6.23&25.2022	6:00–7:30pm 9:00–11:00am		Residential Rainwater Harvesting 2.0 (Online & In-person at GHH)	Erin, Judith, Hunter, Tess, Jim	45
6.30.2022	10:00am–1:00pm	RR	Shady Lakes: Nature Ninos Summer Camp	Steve, Jaren, Saleema	75

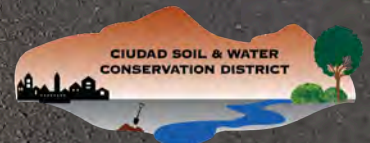






# MIDDLE RIO GRANDE Green Stormwater Infrastructure **MAINTENANCE MANUAL**

Prepared by Arid Low Impact Development Coalition  
June 2022







# The Arid Low Impact Development (LID) Coalition

is a multi-disciplinary group representing an array of perspectives, skills, and organizations who share a common vision to foster public awareness of stormwater as an asset instead of a liability and to increase literacy around effective, arid-adapted **green stormwater infrastructure (GSI) and low impact development (LID)** strategies. The many benefits of these strategies include improving water quality, watershed stewardship, and well-being for all inhabitants in the Rio Grande Watershed.

The Coalition works to provide technical resources and education needed to design GSI and LID interventions in our high desert environment, facilitate communication and collaboration, and support high-quality demonstration and research projects. For more information please visit [www.aridlidcoalition.org](http://www.aridlidcoalition.org).

This document was developed by the Arid LID Coalition in conjunction with partners Ciudad Soil and Water Conservation District, The Nature Conservancy, Bernalillo County, Sites Southwest, New Mexico Department of Transportation, MRWM Landscape Architects, Water Authority, and the Urban Waters Federal Partnership.



Special thanks to Sunny 505 and MRWM for providing graphics.

# Document Overview

This manual provides an introduction to GSI (Module 1), followed by descriptions of GSI techniques (permeable pavement, stormwater harvesting basins, infiltration conveyances, plants, and mulch) and maintenance requirements for these GSI features (Modules 2 through 6).





**MODULE 1** Green Stormwater Infrastructure: Introduction **p.1**

**MODULE 2** Permeable Pavement **p.9**

**MODULE 3** Stormwater Harvesting Basins **p.17**

**MODULE 4** Infiltration Conveyance **p.26**

**MODULE 5** Plant Identification and Maintenance **p.34**

**MODULE 6** Mulch Maintenance **p.41**

Click on the green box  
to go to the page.







# MODULE 1

## Introduction to Green Stormwater Infrastructure & Maintenance





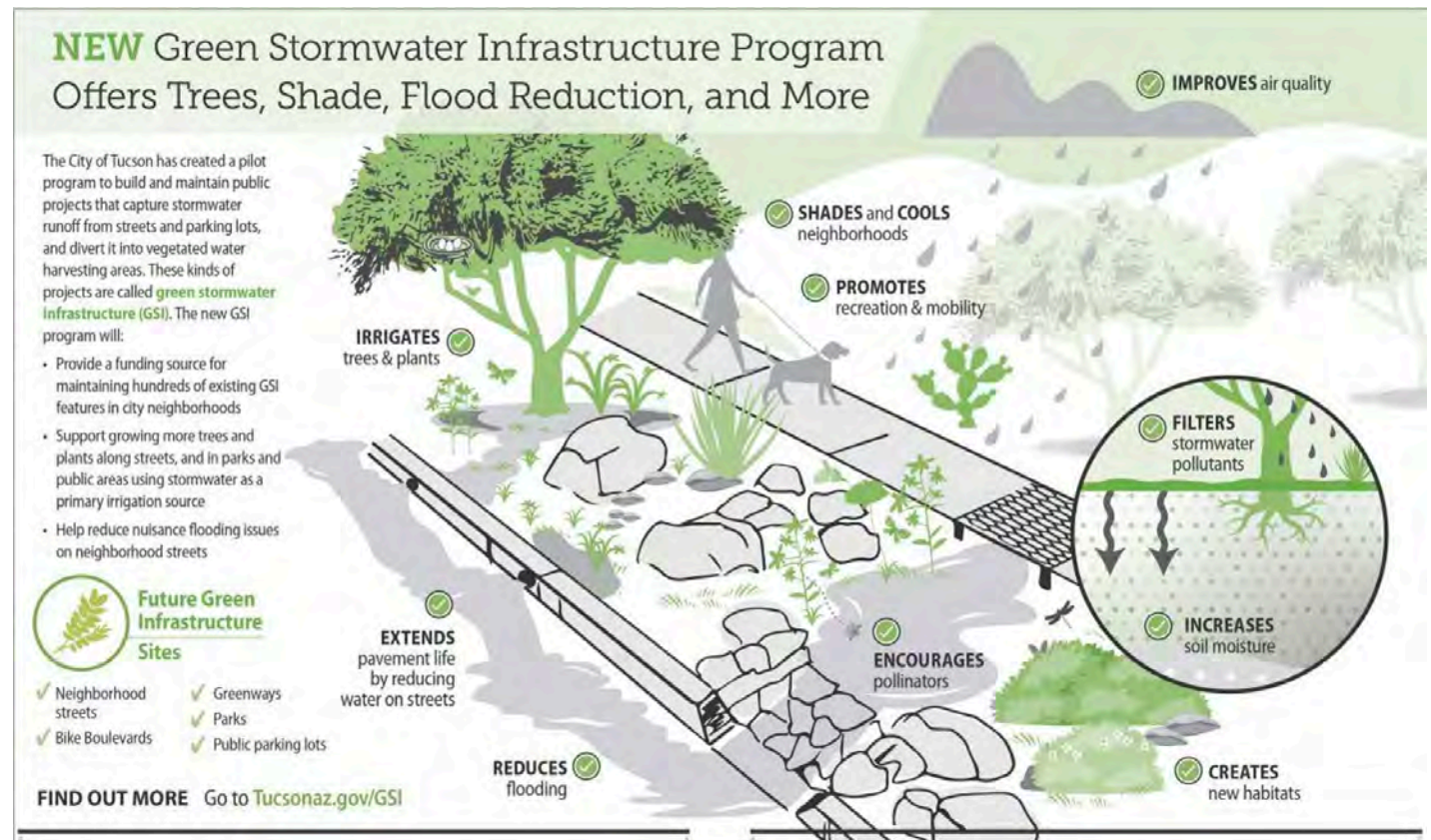
# Green Stormwater Infrastructure & Maintenance

When rain falls in natural, undeveloped areas, the water soaks into the ground and is filtered by soil and plants. But in an urban environment, when rain falls on impervious surfaces (roofs, streets, and parking lots), the water can no longer soak into the ground. Stormwater that runs off these impervious surfaces in urban areas results in higher flows in drains, gutters, storm sewers, and other gray stormwater

systems, eventually discharging into arroyos, streams, and rivers. Stormwater runoff carries trash, bacteria, heavy metals, and other pollutants that pose a threat to human health and the environment. Higher flows resulting from heavy rains also can cause flooding and property damage as well as erosion and flooding in streams, damaging habitat, property, and infrastructure.

Green stormwater infrastructure (GSI) is an approach to stormwater management that mimics natural processes to provide nature's benefits, such as:

- ☂ Reducing flooding
- ☂ Conserving water
- ☂ Improving water quality
- ☂ Improving air quality
- ☂ Carbon sequestration (capturing and storing carbon dioxide)
- ☂ Reducing heat island effects
- ☂ Providing shade
- ☂ Creating wildlife habitat
- ☂ Calming traffic
- ☂ Improving livability
- ☂ Promoting walkability in neighborhoods



From: [Tucsonaz.gov/gsi](http://Tucsonaz.gov/gsi)

# Why GSI?

Traditional gray stormwater infrastructure includes gutters, pipes, culverts, and detention ponds and is designed to move stormwater runoff from the built environment to water bodies like streams and rivers as quickly as possible.

GSI helps keep rainwater where it falls, provides natural benefits, is less expensive to build than traditional gray infrastructure, requires less maintenance over time, and is less resource intensive.

## What is GSI?

GSI includes a variety of measures—stormwater harvesting basins, infiltration conveyances like swales and trenches, permeable pavement—to store, treat, infiltrate, evaporate, or transpire (water use in plants) stormwater and reduce flows to stormwater sewer systems and surface waters. GSI is intended to be used alongside gray infrastructure, not replace it, and in some cases actually reduces the need for costly expansions of gray infrastructure improvements as networks of pipes are undersized in many cities with increased development or density of buildings.

## Gray Stormwater Infrastructure

Concrete, metal, pipes and drains



Storm Drain Inlet, Albuquerque, NM (photo by Tess Houle)



Culvert under Interstate 25, Albuquerque, NM (photo by Tess Houle)



North Diversion Channel, Albuquerque, NM (photo by Tess Houle)



# What GSI is NOT

GSI is not “zero-scaping”—it does not mean rockscapes with little or no plants. It is not a dirt hole in the ground that solely captures water without treatment or other benefits. GSI installations should include native and arid-adapted plants in order to function properly.

TOP: GSI with limited function: This stormwater harvesting basin does not support vegetation or properly treat pollutants; it instead uses heat-trapping rock mulch and cobble, and does not take advantage of the stormwater to irrigate the plants in this landscape.



BOTTOM: GSI with stacked functions: This stormwater harvesting basin captures street runoff that supports native trail-side shrubs and grasses; treats pollutants; balances organic and inorganic mulches; and overflows into subsequent basins further downstream to reduce in-street flooding during heavy storm events.

(Location: Alameda Drain Trial)

GSI is not meant to solve major flooding issues, but it does reduce localized flooding. Also, like any landscape feature, GSI does not take care of itself—it requires regular inspection, care and maintenance!



Photos by: Mario Nuño-Whelan



# Benefits of GSI

Implementing GSI practices in the middle Rio Grande region has many benefits for our watershed. The fundamental goal is to reduce the amount of stormwater runoff and pollution reaching surface waters and adversely impacting our watershed. Benefits of GSI include:

- ☂ Reducing air and water pollution by including trees and vegetation, which act as a natural filter.
- ☂ Providing traffic-calming benefits with trees and plants adjacent to roadways.
- ☂ Reducing heat-related impacts to people and natural landscapes.
- ☂ Replicating native environments and providing wildlife habitat in the urban environment.
- ☂ Providing opportunities for physical activity for residents, while also improving mental health outcomes by reducing stress and promoting cognition.
- ☂ Addressing social equity and environmental justice when used in communities that don't have access to quality outdoor spaces. Environmental justice means all people, regardless of race, color, national origin, or income, are entitled to equal protection from environmental risks.



# Maintenance

For green stormwater infrastructure to function properly and allow water to soak into the ground over time, maintenance is needed. Healthy plant root systems help water soak in, and removing sediment and debris prevents clogging and overflowing of the systems.

Modules 2 through 6 in this GSI Maintenance Manual will cover maintenance needs for the most common types of GSI features, including permeable pavement, stormwater harvesting basins, and infiltration conveyances, as well as routine and seasonal plant maintenance and mulch maintenance. Some routine maintenance tasks that generally apply to most GSI installations include:

- ☂ Visiting stormwater infrastructure during rainstorms to see stormwater flows in action. Green stormwater systems are designed to harvest rainwater and stormwater, so managing water flow is essential.
- ☂ Inspecting and maintaining irrigation systems.
- ☂ Managing vegetation that supports natural filtering, but doesn't block the flow of water.
- ☂ Removing sediment and trash and clearing inlets and outlets of debris and vegetation.
- ☂ Maintaining and refreshing mulch.
- ☂ Repairing erosion and human-caused damage.
- ☂ Adjusting schedules over time as issues arise and landscapes mature.. Frequencies of inspection and maintenance depend on drainage area, land use, activities in the watershed, and rainfall magnitude and intensity.

Some common problems to look for when doing maintenance inspections are:

- ☂ Is water backing up or not making it to the basins and tanks? Look for leaking gutters, clogged curb cuts, or clogged pipes.
- ☂ Has the capacity been reduced due to sediment and debris build-up?
- ☂ Is there enough capacity to capture sufficient rain?
- ☂ Are overflows and outlets working like they should? Look for water overflowing away from outlet or signs of erosion like rivers of dirt on sidewalks.
- ☂ Is there standing water for more than a few hours after a storm? If standing water is still present 24 hours after the storm, maintenance is likely needed.

## Tools and Specialized Equipment

Routine maintenance and best management practices on vegetated green infrastructure are similar to general landscape maintenance: removing trash and debris; keeping plants healthy; and cleaning out accumulated sediment and pollutants. These tasks can be completed using the following tools:

- ☂ Trash, debris, and sediment can be removed with rakes, shovels, and trash grabbers. Leaf and plant trimmings can be added to the basin bottoms to replenish mulch and provide a nutrient source for plants and healthy soils except for noxious and invasive weeds. They should be bagged and removed from site.
- ☂ Flat-blade shovels are especially useful for scraping accumulated sediment from inlets and along curbs and gutters or upstream of inlets.
- ☂ Vegetation can be pruned for safety, visibility, and plant health using pruning shears and weed pullers. Power shearing equipment should be used sparingly or not at all.
- ☂ Properly clean shears before and after use to eliminate the spread of diseases.
- ☂ Watering during the plant establishment period and in extended droughts can be done with a hose, bucket or irrigation system.
- ☂ Permeable pavement is best maintained using a vacuum-powered street sweeper, and replacement pavers are sometimes needed for repairs (See Module 2).
- ☂ Heavy equipment, such as backhoes and front-end loaders, may be needed infrequently if the facilities need to be replaced or if large amounts of sediment have accumulated. If using heavy equipment, care should be taken to avoid compacting soil at the bottom of GSI installations.



# Equipment Needed



**Site map/site plan/as-built**

**Trash grabbers**

**Trash bags**

**Gloves**

**Bucket/other sediment/  
trash removal container**

**Broom and dust pan**

**Tarps (for stockpiling  
plant materials removed)**

**Wheelbarrow**



**Push broom**

**Digging shovel**

**Square-nosed (or flat-bladed) shovel**

**Spade/trowel**

**Rake—leaf, shrub, row, and/or hand**

**Wire or stiff plastic brush**

**Pruning shears/clippers**





# Maintenance Objectives:

## Health and Safety

Health and safety plans and precautions should be provided by employer/site owner; below are a few considerations for health and safety during maintenance of GSI facilities:

- ☛ Appropriate Level D personal protective equipment (PPE), including a minimum of a safety vest, steel-toed boots, and safety glasses, should be worn during maintenance activities; hard hats and hearing protection should be used around heavy equipment.
- ☛ Equipment operations and procedures must meet Occupational Safety and Health Administration (OSHA) guidelines and standards.
- ☛ To protect the health, safety and welfare of the community, put into practice integrated pest management strategies that provide the least toxic methods to control pests, including noxious and invasive weeds.
- ☛ Cones, barricades, and/or other protective and warning devices for vehicles and pedestrians to ensure safety of workers and pedestrians.
- ☛ Sun protection including clothing, hats and minimum SPF30 sunscreen.
- ☛ Stay cool.
- ☛ Know the signs of heat stress and heat stroke and proper actions to take.
- ☛ Have a first aid kit and ensure that it is well stocked.
- ☛ Know where the nearest emergency room and/or urgent care facility is located.







# MODULE 2

## Permeable Pavement





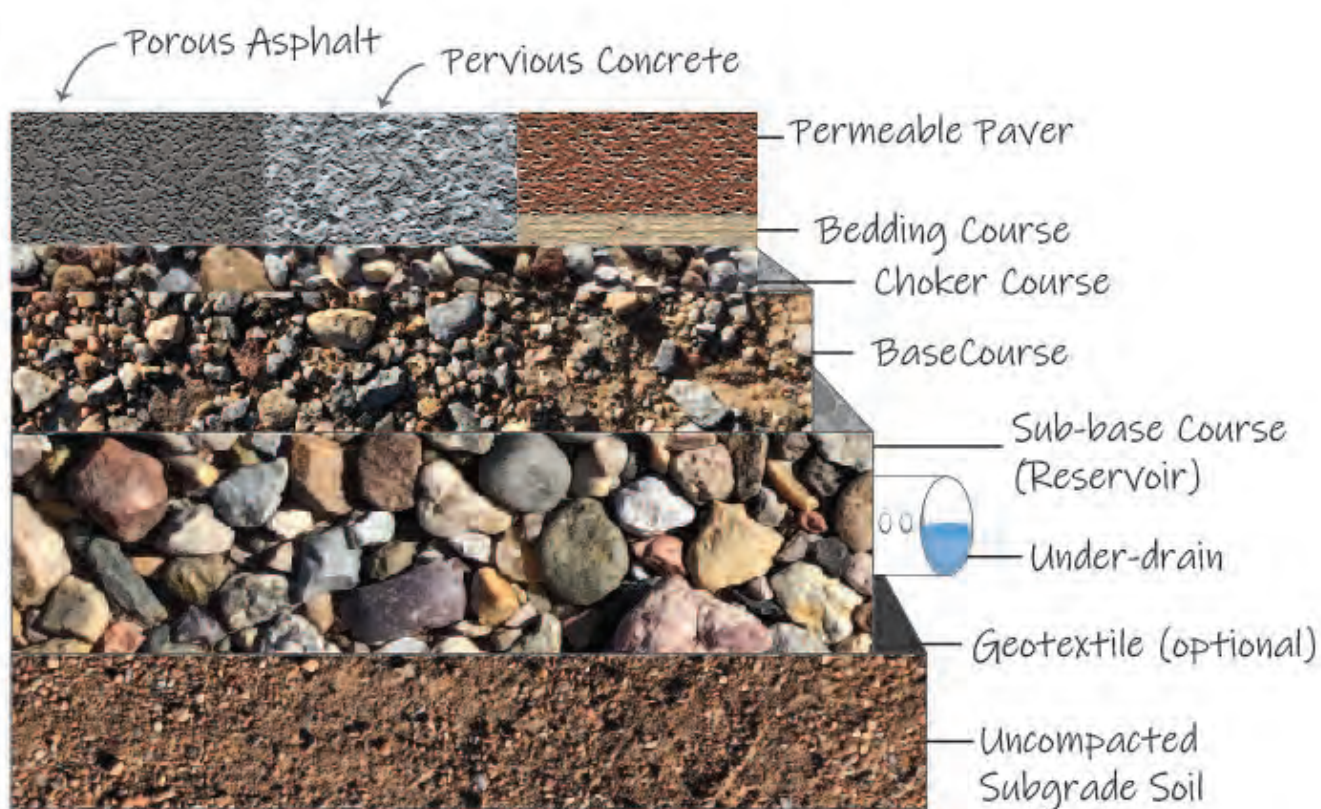
# Permeable Pavement

Permeable pavement is a constructed system that allows water to pass through the pavement to the underlying native soil or a constructed infiltration bed below the pavement. Permeable pavement systems can vary, but are generally made up of five layers:

- ☛ **Pavement:** A surface pavement layer that is permeable (for example: pervious asphalt, pervious concrete, permeable interlocking pavers).
- ☛ **Bedding course:** A thin bedding layer, approximately 2 inches thick, made of 3/8-inch to 1/2-inch diameter stone to stabilize the pavement.
- ☛ **Choker course:** An underlying crushed stone reservoir layer, a minimum of 6 inches thick, made of 1-inch- to 2.5-inch diameter stone.
- ☛ **Base course or subbase layer:** A combined layer of aggregate stones, ranging in size from 2 to 3 inches, for storing water and distributing the pavement load. A geotextile filter fabric is sometimes added below the subbase level.
- ☛ **Under-drain:** An under-drain is sometimes used to move water to additional storage capacity to prevent prolonged saturation.
- ☛ **Uncompacted soil subgrade:** (i.e., local soils).

Regular maintenance of permeable pavements ensures they remain functional, allowing water to soak into the ground quickly, reducing flooding during storm events and allowing water stored underground to be used by nearby trees and plants.

Types of permeable pavement may include porous concrete, pervious asphalt, or various types of interlocking pavers. In addition, plastic grid systems (also called reinforced turf pavement) can be used in areas with limited vehicular traffic (such as infrequent parking areas or emergency vehicle or fire access lanes). Permeable pavements can also be paired with other engineered structures like silva cells that create a supported, but suspended surface. This allows for uncompacted soils underneath that make space for tree and plant roots or additional stormwater storage.



# Benefits of Permeable Pavement

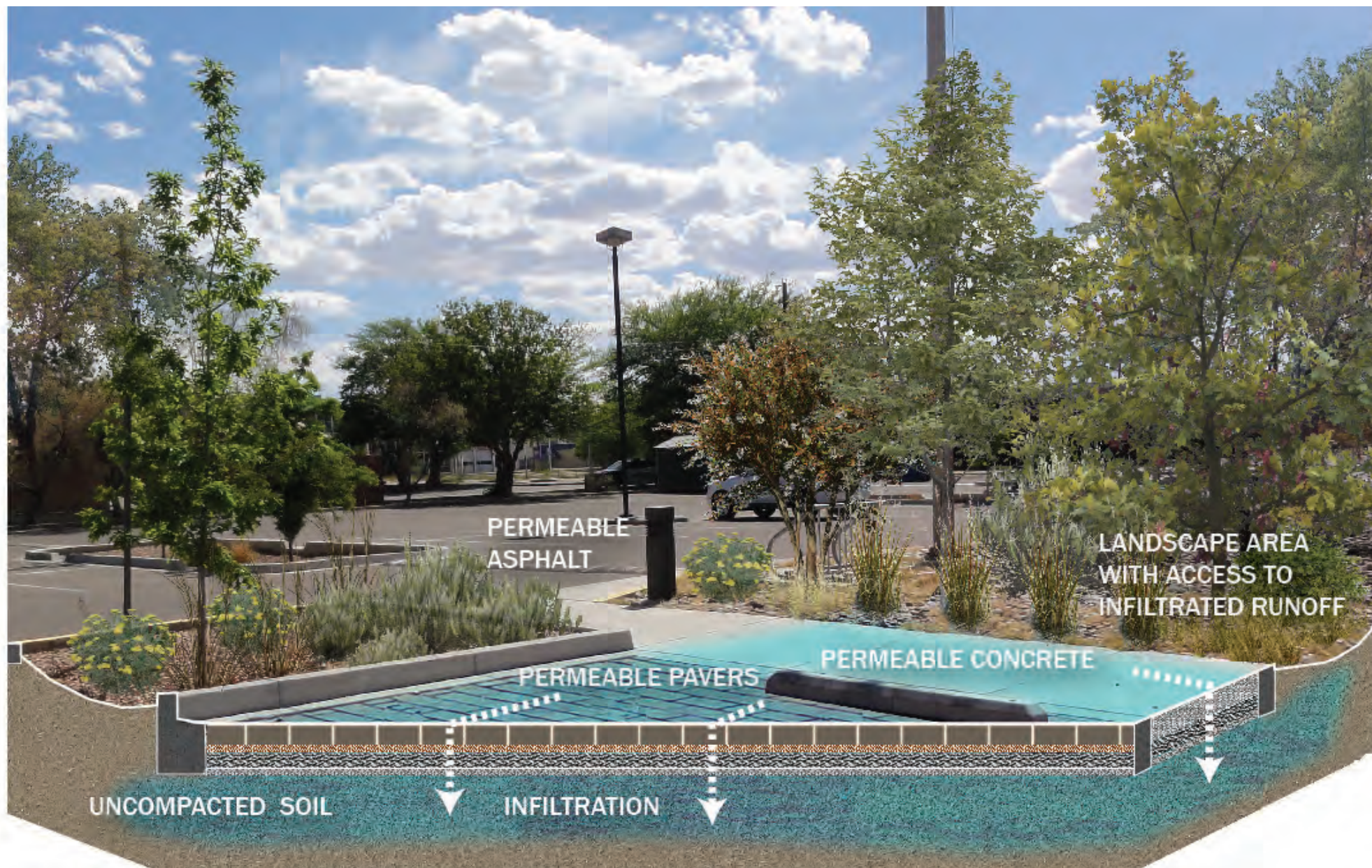
- ☔ Permeable pavement reduces flooding, prevents erosion and property damage, reduces pollutants carried into streams and rivers, and can enhance groundwater recharge by allowing stormwater to soak into the ground quickly instead of being carried away in roadways, sidewalks, or gutters.
- ☔ Permeable pavement can melt snow and ice faster during winter storms, dries faster than traditional impervious pavement, minimizing slips and falls, and reduces the need for deicing chemicals and costly snow removal services.
- ☔ Permeable pavement allows tree roots to access air and water easily, unlike traditional concrete. Trees along streets have been shown to substantially reduce nitrogen and other pollution loads in stormwater by acting as a natural filter and provide traffic-calming benefits.



Wheelchair accessible permeable pavement

Regular inspection of permeable pavers is needed to make sure they remain level with a smooth, ensuring compliance with the Americans with Disabilities Act (ADA) specifications.





System with multiple permeable pavement types



# Maintenance

Key maintenance issues for permeable pavement include:

- ☔ **Clogging.** To work effectively, permeable pavement needs to drain without clogging. Permeable pavement should NOT be located adjacent to areas with exposed soil that can clog these features.
- ☔ **Exposed soils.** Any nearby exposed soil should be separated from permeable pavement by barriers such as vegetated areas, and those barriers should be maintained to capture sediment before runoff reaches the permeable pavement.
- ☔ **Organic debris.** Organic debris, such as leaf litter and grass clippings, should NOT be deposited on or allowed to sit on permeable pavement, as debris can cause clogging and lifting. Leaves and plant material should be regularly collected from permeable pavements for composting.
- ☔ **Maintenance.** Ask landscape maintenance personnel to help maintain permeability by not dumping materials or sediment onto permeable pavement.
- ☔ **Drainage.** The permeable pavement system must be allowed to dry (de-water) between rainfall events. Too much water retention in the base course layers can prevent the absorption of additional rainfall and result in runoff. There should be an observation well that allows inspectors to determine if excessive water is being held within the system.
- ☔ **Site maps.** Show areas of permeable pavement and inspection wells on maintenance site maps.



4th Street permeable pavers curb detail, Photo by Sites SW



4th Street permeable pavers, Photo by Sites SW





4th Street Permeable Pavers, Photo by Sites SW



# Maintenance Tasks and Schedules

**NOTE:** Areas with a lot of vehicle traffic may require maintenance more frequently than those with less traffic or only pedestrian traffic.

- ☛ Keep sediment or areas with bare soil from draining onto permeable pavement and maintain vegetated areas that provide a buffer between pavement and bare soil.
- ☛ Inspect at least twice a year (at the end of winter and in the fall, when leaves drop) and remove any clogging material from permeable pavements to prevent safety issues (separation and lifting).
- ☛ Inspect after rain events of 0.25-inches or greater and remove any material that may clog permeable pavers/pavement.
- ☛ Vacuum porous asphalt or permeable concrete at least twice a year with standard street-cleaning equipment with a vacuum device. After vacuuming permeable pavers, stone between pavers may need to be replaced. Some types of permeable pavers do not require vacuuming (The third picture on the right is one example.).
- ☛ Inspect bricks for shifting, cracking, lifting, and/or clogging after freeze thaw cycles and after major storm events. Adjust bricks to maintain a smooth and level surface. This is important for trip hazards as well as ADA compliance.
- ☛ Observe performance during rainstorms. When water begins to pond during typical rainfall events, you may need to vacuum the pavement.
- ☛ DO NOT apply sand and/or fine aggregate to enhance snowmelt or winter condition

traction, as these materials will quickly clog permeable pavement causing water to pool on the surface instead of draining quickly.

- ☛ Sweep and remove any snowmelt products like salt as soon as it is no longer needed. Salts will effect water quality and plant health.
- ☛ DO NOT resurface or seal the permeable pavement, as you normally would with a traditional pavement. This will block the permeability of the pavement.
- ☛ Clean areas that are stained by grease or oils with a biodegradable grease and oil cleaner such as liquid dish soap or OxiClean.
- ☛ Repair or clean all damaged areas or areas that are not draining as soon as the issue is observed to prevent further damage.

## Tools and Specialized Equipment

See general tool list in Module 1.

Specialized equipment includes: street sweeper with vacuum attachment, brooms, trash-grabbers



Photos by: Mario Nuno-Whelan

# MAINTENANCE INSPECTION CHECKLIST & SCHEDULE

## Permeable Pavement

Location:

Weather: Rainfall over last 2–3 days?

Inspector:

Site conditions:

Pavement Type: ☐ asphalt ☐ concrete ☐ interlocking pavers ☐ grid pavers

Date:

Time:

MAINTENANCE NEEDED	ACTION	COMMENTS
<b>Pavement Surface</b>	<i>Frequency—Monthly</i>	
1. Are there signs of clogging? <input type="checkbox"/> YES <input type="checkbox"/> NO 2. Is there build-up of debris (sediment, trash)? <input type="checkbox"/> YES <input type="checkbox"/> NO 3. Is there standing water on the permeable pavement? <input type="checkbox"/> YES <input type="checkbox"/> NO	1. Schedule cleaning with street sweeper/vacuum. 2. Remove debris from surface of pavement. 3. Check inspection wells (if present) to see if there is water that has not infiltrated. If not, schedule a cleaning with street sweeper/vacuum.	
<b>Adjacent Areas</b>	<i>Frequency: Biannually or 2x per year</i>	
1. Is there erosion from or around underdrain, if present? <input type="checkbox"/> YES <input type="checkbox"/> NO 2. Are areas where soil is exposed discharging soil/sediment onto the permeable pavement? <input type="checkbox"/> YES <input type="checkbox"/> NO 3. Is the permeable pavement negatively impacted by an adjacent site feature? <input type="checkbox"/> YES <input type="checkbox"/> NO	1. Determine cause of erosion and mitigate by adjusting flow, using rip-rap, or other appropriate method. 2. Install a barrier, such as vegetation, rip-rap, curb, wall or fence with windscreen to stop the bare soil area from discharging sediment onto the permeable pavement. 3. Look for a way to reduce the impact. Discuss impacts and options with supervisor.	
<b>Outlets and Overflow</b>	<i>Frequency: Annually, after major storms (storms with 0.25" of rain or more)</i>	
1. If there is an outlet or overflow to a storm sewer system, is it free from debris and functioning? <input type="checkbox"/> YES <input type="checkbox"/> NO	1. If there is blockage, remove debris/sediment/trash.	
<b>Other</b>	<i>Frequency: Annually</i>	
1. Have there been complaints from residents? <input type="checkbox"/> YES <input type="checkbox"/> NO 2. Do you notice any hazards to the public? <input type="checkbox"/> YES <input type="checkbox"/> NO 3. Are there any other issue or problems? <input type="checkbox"/> YES <input type="checkbox"/> NO	1. Address complaints and/or discuss with supervisor. 2. If a hazard is observed, look for a way to fix the issue and discuss with supervisor. 3. If yes, describe in comments and discuss with supervisor.	

Inspector's signature: \_\_\_\_\_



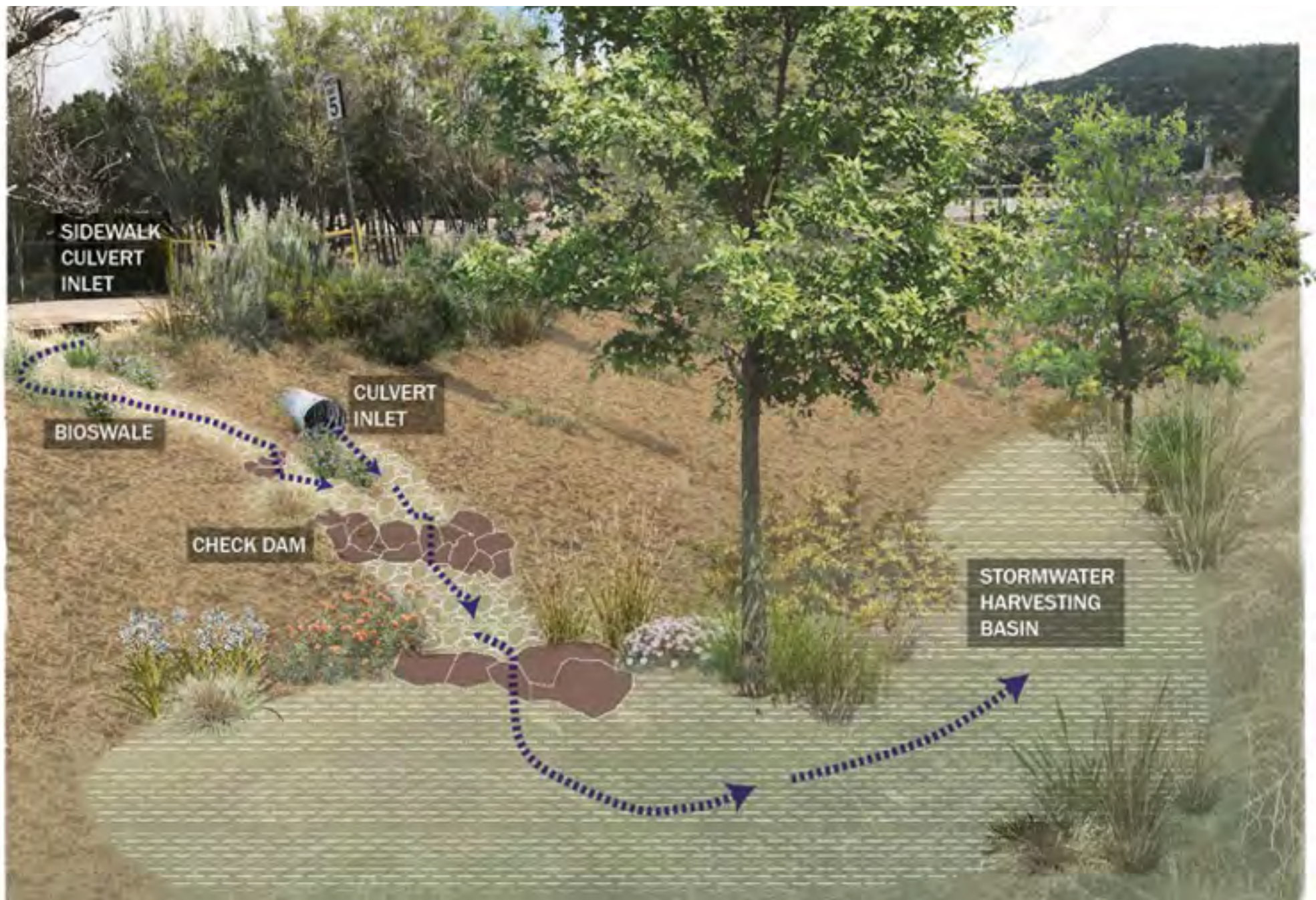


# MODULE 3

## Stormwater Harvesting Basins







Stormwater harvesting basin components



# Maintenance for Stormwater Harvesting Basins

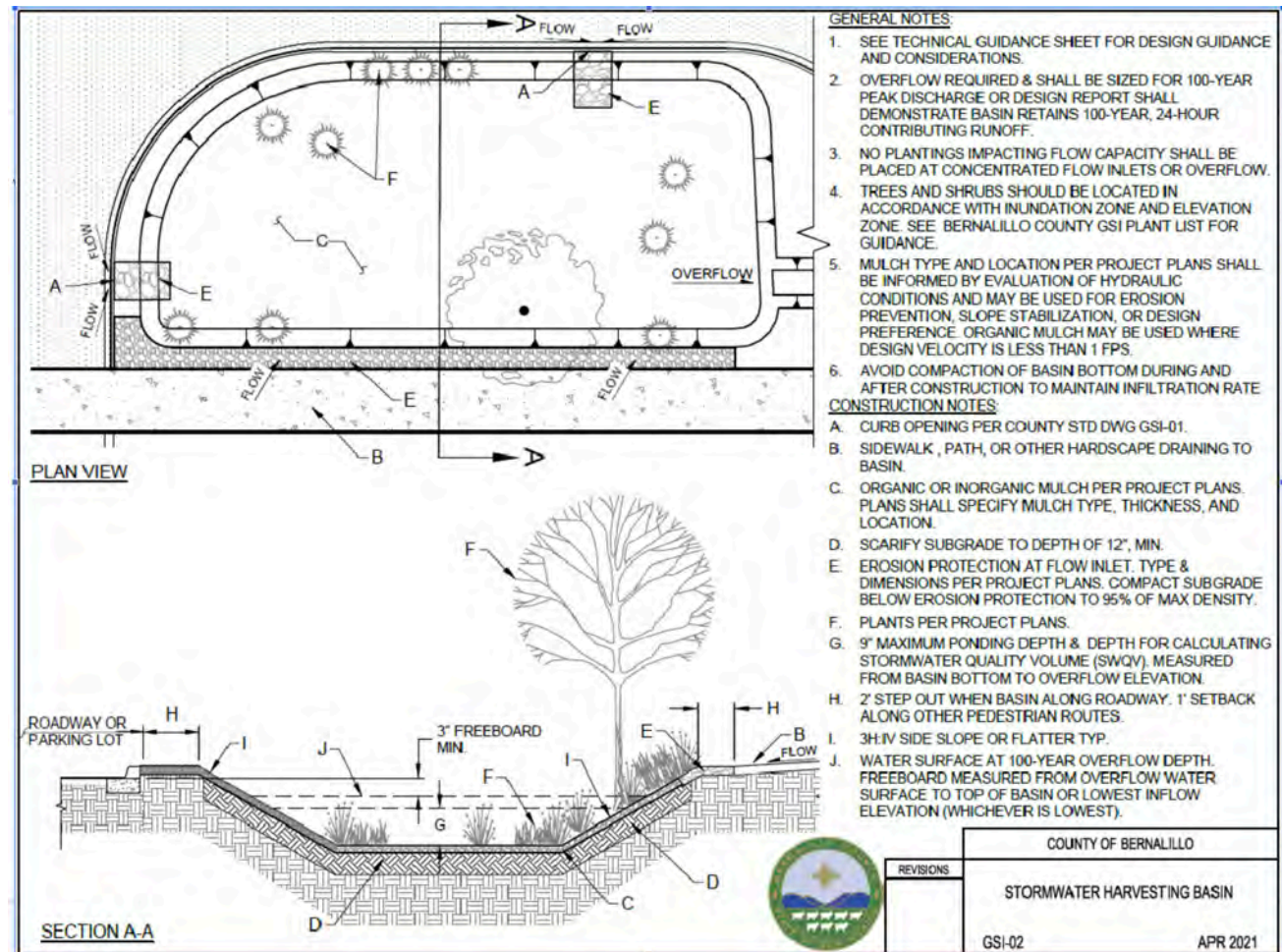
Stormwater harvesting basins are purposely vegetated depressions in the ground that collect stormwater runoff and allow that runoff to infiltrate the soil. The bottom of the basin should not be compacted because it will slow or even stop infiltration.

Stormwater harvesting basins help to control flooding and prevent pollutants from entering arroyos and rivers. The collected water supports trees and other vegetation, cooling our city and making it more livable.

Components of stormwater harvesting basins that need inspection and maintenance include:

- ☔ Inflow and outflow structures
- ☔ Sediment traps
- ☔ Infiltration rates (the rate water soaks into the ground)
- ☔ Erosion control/repair
- ☔ Plants/weeds management or removal
- ☔ Inundation zones within the basin (areas soaked with water after a storm)
- ☔ Irrigation system (if present)
- ☔ Mulch
- ☔ Access ramps/features

Careful maintenance is important to (1) ensure that stormwater harvesting basins capture runoff and allow it to infiltrate into the ground below and (2) prevent pollutants from running into surface waterways like arroyos, streams, and rivers. This protects our drinking water supply and makes our rivers swimmable and fishable.

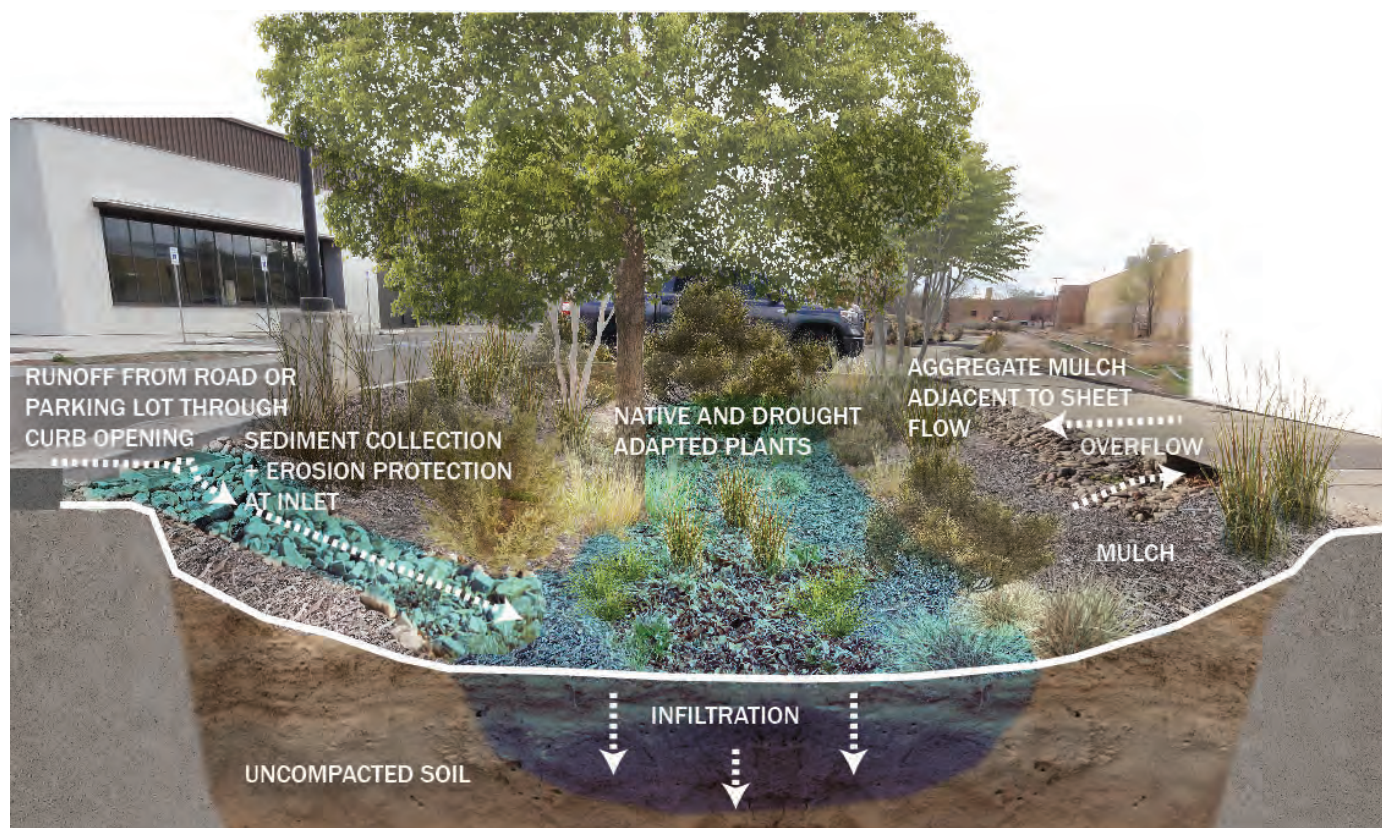


Bernalillo County standard design for a stormwater harvesting basin

# Maintenance for Infiltration

To control flooding and pollutants, stormwater harvesting basins must allow water to infiltrate into the soil. If water is standing in the basin for more than 24 hours you may need to drain small to medium sized basins using a pump in to prevent mosquitoes or make repairs. The following maintenance tasks are needed to improve infiltration:

- ☔ Remove built-up sediment within the basin by scraping/shoveling to prevent clogging from fine particles.
- ☔ Look for any movement of mulch to find pooling zones (areas where water collects). If stormwater runoff isn't spreading throughout the basin evenly, re-grade to direct runoff to the entire basin.
- ☔ Make sure you have at least 3 inches of organic mulch in basins. See Module 6, Mulch, for more information on mulch maintenance.
- ☔ The roots of grasses and shrubs that can survive in areas inundated with water will improve the soil and help infiltrate water. See Module 5 Plant Maintenance for more information.
- ☔ Install soil sponges (mulched vertical infiltration drains) to move water more quickly down into the soil. (See diagram on page 22)
- ☔ If there is caliche (a hard clay layer common in the desert) or other confining layer (a layer of soil that allows little if any infiltration) in or under the basin, you may need to use a digging bar or pick to punch through the confining layer in some areas. This is also a good application for a soil sponge or french drain.
- ☔ Make the basin wider if there is space available. Spreading the water over a larger area will help it soak in.



Stormwater harvesting basin schematic



# Maintenance for Erosion

It is important to check for and repair erosion (washed out or displaced soil or rock mulch) because it can impact the function of the basin by causing clogging from increased sediment. When inspecting a basin, look for places where water is flowing around the inlet/outlet feature and causing erosion. Additional modifications to inlet height may be needed to redirect flow to inlet.

- ☔ Fill eroded areas with soil material similar to the existing material in place.
- ☔ Grade filled material with a rake, hoe, or other hand tool so that it matches the grade of the surfaces around it.
- ☔ If planting seeds, use an appropriate native seed mix.
- ☔ If erosion is happening due to a lot of water entering the basin too fast, consider installing a check dam, Zuni bowl, erosion blanket, or rip/rap. This will help slow the water down and minimize the amount of sediment washed into the bottom of the basin, which can cause clogging and additional maintenance.



Signs of soil erosion



Left: Stormwater harvesting basin at CNM

Zuni Bowl

A Zuni bowl is an erosion control feature. It generally consists of rock-lined steps and basins used to prevent headcuts or rills from forming. They work by slowing down and removing energy from the flowing water.

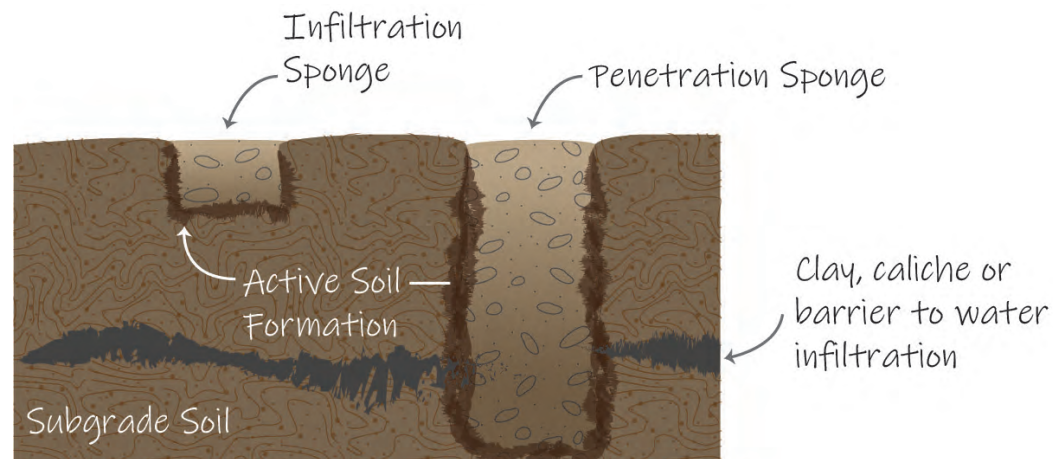
## Maintenance to Prevent Clogging:

Use hand tools, such as shovels, rakes and push brooms, to remove sediment, trash, and plant material from:

- ☔ Sidewalk/paved areas adjacent to curb cuts/grates
- ☔ In and around inlets and outlets
- ☔ Sediment traps (plant material can be left in the bottom of basins)
- ☔ Basin
- ☔ Structure grates
- ☔ Pipe/structure openings
- ☔ Screens

## Maintenance for Plants, Inundation Zones, and Mulch:

- ☔ Regular maintenance of plants is needed to keep stormwater harvesting basins functional. Please see the Plants Maintenance Guidelines in Module 5 for more detail.
- ☔ Mulch maintenance is also needed to keep stormwater harvesting basins functional. Please see the Mulch Maintenance Guidelines in Module 6 for more detail.



## Maintenance for Access Ramps/Features:

- ☔ Inspect the hard infrastructure (storm drain inlets, curb inlets, etc.) to ensure that they are not damaged or cracked and are not being undermined by higher-velocity water flows.
- ☔ Keep access ramps open and free of vegetation to allow access for maintenance activities.



# Tools and Specialized Equipment

Removal of sediment/organic debris/trash by mechanized equipment may be necessary. However, use of heavy equipment may seriously damage the basin. To reduce impacts during maintenance activities:

- ☔ Include a provision in maintenance contract to quickly replace vegetation that is damaged or removed.
- ☔ Do not stage or drive heavy/mechanized equipment on or across infiltration areas to avoid compaction of soil/media.
- ☔ For soil sponge installation, an auger or post-hole digger will be needed.

See also the general tool list in Module 1.



Runoff captured in stormwater harvesting basin at CNM

# MAINTENANCE INSPECTION CHECKLIST & SCHEDULE

## Stormwater Harvesting Basins and and Bioswales (Conveyence)

Location:

Weather: Rainfall over last 2–3 days?

Inspector:

Precipitation amount:

Date:

Time:

MAINTENANCE NEEDED	ACTION	COMMENTS
<b>Frequency—Monthly</b>		
1. Are there plants growing in inlets or outlets, blocking flow? <input type="checkbox"/> YES <input type="checkbox"/> NO	Remove plants that are blocking flow. If the plant is a good plant (i.e. not invasive), you may be able to move it to another part of the basin/swale. If it is an unwanted plant, remove and dispose.	
2. Are there unwanted plants, such as invasive plants or weeds? <input type="checkbox"/> YES <input type="checkbox"/> NO	Remove unwanted plants manually, which may include desirable plants growing in areas where they are not wanted (i.e. a tree seedling growing in an inlet).	
3. Are there diseased or dead plants? <input type="checkbox"/> YES <input type="checkbox"/> NO	Replace diseased or dead plants with similar native species.	
4. Have new plants been added? <input type="checkbox"/> YES <input type="checkbox"/> NO	Make sure young plants get the irrigation they need.	
5. Are weeds growing in mulch (if present)? <input type="checkbox"/> YES <input type="checkbox"/> NO	Manually remove mulch and add additional mulch to refresh.	
6. Is organic mulch (if present) at least 3 inches thick? <input type="checkbox"/> YES <input type="checkbox"/> NO	If mulch is less than 3 inches thick, add additional mulch.	
<b>Frequency—Quarterly, after major storms (storms with 0.25" of rain or more)</b>		
1. Is there standing water 24 hours after storm events? <input type="checkbox"/> YES <input type="checkbox"/> NO	If there is clogging or poor drainage, remove the accumulated sediment/discholored material/debris. Till or rake the remaining soil as needed.	
2. Is there sediment, plant material, trash/debris blocking inlets or outlets? <input type="checkbox"/> YES <input type="checkbox"/> NO	Remove sediment/plant material. These materials can be placed in another part of the basin/swale. Remove trash/debris and dispose.	
3. Are any plants diseased, impacted by pests, or have other issues affecting their health? <input type="checkbox"/> YES <input type="checkbox"/> NO	Replace diseased or dead plants with similar native species.	
4. Is irrigation system functioning correctly? <input type="checkbox"/> YES <input type="checkbox"/> NO	Fix any issues with irrigation system and adjust irrigation as needed based on season and plant needs.	



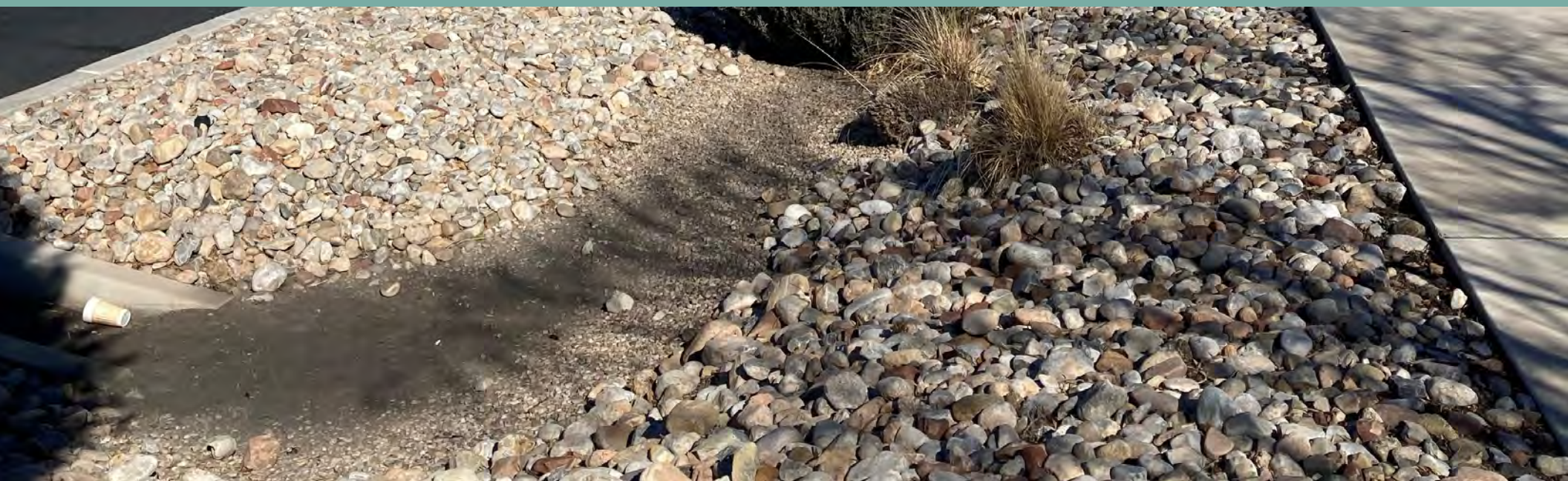
MAINTENANCE NEEDED	ACTION	COMMENTS
5. Do trees or shrubs have dead or damaged branches? <input type="checkbox"/> YES <input type="checkbox"/> NO	Remove any dead or damaged branches.	
6. Has mulch shifted or moved after storms? <input type="checkbox"/> YES <input type="checkbox"/> NO	Add additional mulch to refresh areas where much as been displaced.	
7. Is there erosion in any areas with organic mulch? <input type="checkbox"/> YES <input type="checkbox"/> NO	Inorganic (rock) mulch or riprap may be needed where erosion is occurring.	
<b><i>Frequency—Quarterly in the beginning, then biannually (adjust frequency as needed after 3 inspections)</i></b>		
1. Is there erosion? Impacts from animal burrows? <input type="checkbox"/> YES <input type="checkbox"/> NO	Repair soil erosion and repair the cause of erosion (i.e. is trash, debris, volunteer plant blocking the flow path?). Fill holes with lightly compacted soil.	
2. Is there more than 2 inches of accumulated material, like sediment, debris, and/or trash, in the bottom of the basin/swale (inundation zone) ? <input type="checkbox"/> YES <input type="checkbox"/> NO	If accumulated material is reducing infiltration, remove unwanted sediment/debris/trash. Add mulch or additional soil, if needed.	
3. Do plants look distressed? <input type="checkbox"/> YES <input type="checkbox"/> NO	During drought (longer periods without rain), adjust/increase irrigation as needed. Plants should be watered regularly until established (1–2 years for perennials, 3–5 years for shrubs, 7–10 years for trees) and as needed thereafter.	
4. Are inlets and outlets in good working condition? <input type="checkbox"/> YES <input type="checkbox"/> NO	Repair or replace any damaged structural parts of the inlets, outlets, sidewalls. Remove any sediment, debris, or volunteer plants blocking the inlet or outlet.	
<b><i>Frequency—Annually</i></b>		
1. Do plants need any pruning? <input type="checkbox"/> YES <input type="checkbox"/> NO	Prune plants ONLY AS NEEDED for clearance or health (dead, diseased, or damaged branches). Plants DO NOT need to be shaped or kept to size.	
2. Is there good plant coverage throughout the basin/swale? <input type="checkbox"/> YES <input type="checkbox"/> NO	Replace any dead or dying plants with similar native species.	
3. Are there complaints from residents? <input type="checkbox"/> YES <input type="checkbox"/> NO	Address complaints and/or discuss with supervisor	
4. Do you notice any hazards to the public? <input type="checkbox"/> YES <input type="checkbox"/> NO	If a hazard is observed, look for a way to fix the issue and discuss with supervisor.	
5. Are there any other issue or problems? <input type="checkbox"/> YES <input type="checkbox"/> NO	If yes, describe in comments and discuss with supervisor.	

Inspector's signature: \_\_\_\_\_



# MODULE 4

## Infiltration Conveyance





# Infiltration Conveyance

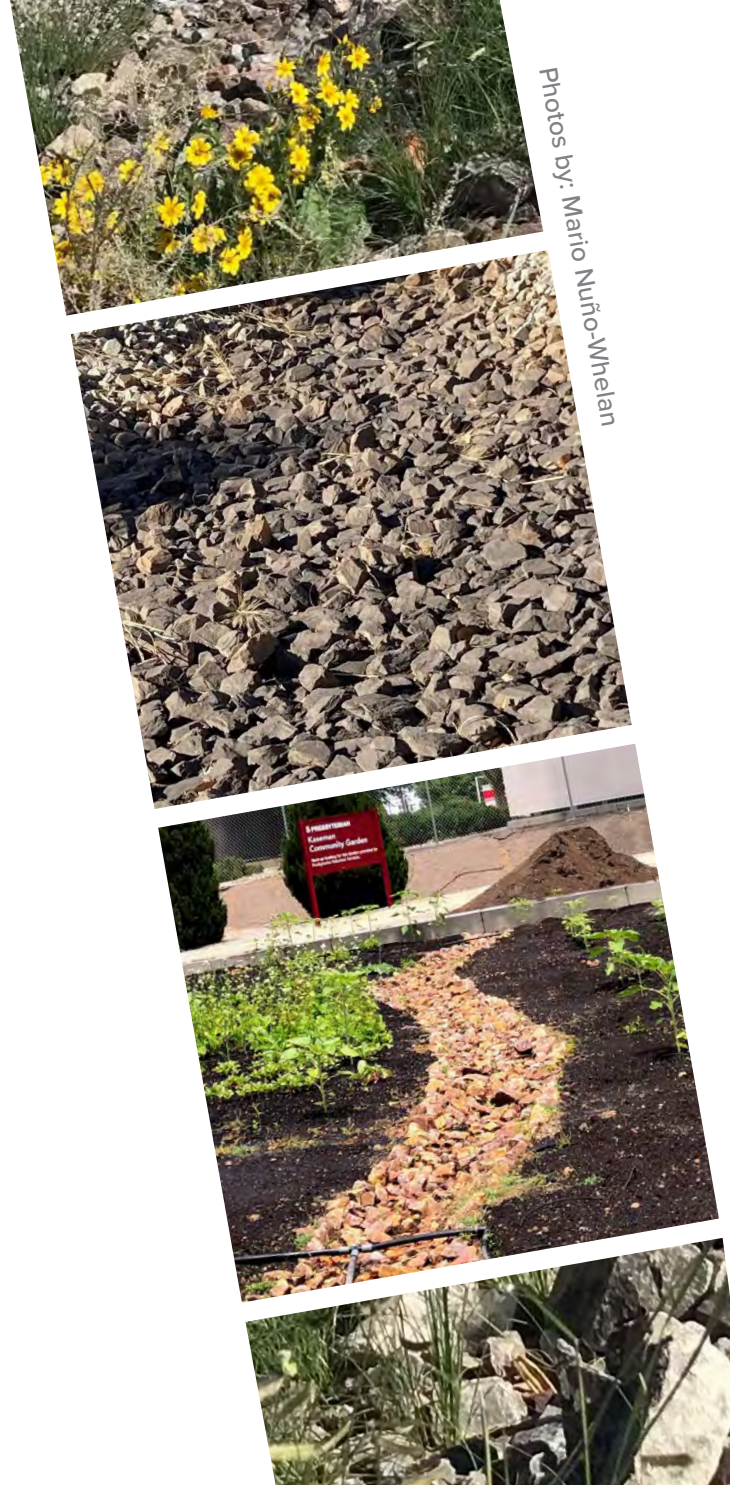
Infiltration conveyances are wide ditches that slow water velocity, direct stormwater flow, create temporary surface and subsurface storage of stormwater, and enhance the capacity of the ground to absorb stormwater, promoting groundwater recharge. Infiltration conveyances also aid in removing sediment and pollutants out of stormwater runoff.

Infiltration trenches are generally linear, stone-filled trenches that collect and infiltrate runoff and do not include plants.

Bioswales, another type of conveyance, are shallow, linear, or curved linear features that include organic (wood/plant material) or inorganic (rock) mulch and plants (preferably native). They are designed to improve water quality by carrying (conveying), slowing, and treating stormwater runoff. Bioswales allow pollutants to settle out and promote infiltration.

Infiltration conveyances should slow the water enough to allow it to infiltrate and should have regular inspection and maintenance to keep them functioning properly. Components of infiltration conveyances that need inspection and maintenance include:

- |                                       |                                  |
|---------------------------------------|----------------------------------|
| ☂ Inflow and outflow structures       | ☂ Plants/weeds                   |
| ☂ Sediment traps                      | ☂ Irrigation system (if present) |
| ☂ Infiltration rates (see ASTM D3385) | ☂ Mulch                          |
| ☂ Erosion control and repair          |                                  |



Photos by: Mario Nuño-Whelan





Stormwater Bumpout with Infiltration Conveyance



# Infiltration Maintenance

To control flooding and reduce pollutants carried to our rivers, infiltration conveyances should slow down velocity (how fast the water flows), allow water to soak into the ground, and support vegetation when present (bioswales). Maintenance tasks include:

- ☔ Remove accumulated sediment, debris, and trash within the channel and at inlets and outlets. Organic debris, such as leaves and plant material, can be left in place if it is not causing blockage. Use manual tools instead of a power blower or trimmer to remove sediment, debris, noxious weeds, and trash.
- ☔ Inspect engineered elements for undercutting or clogging.
  - Stormwater moving around concrete or other hard surfaces may erode surrounding soils.
  - Look for and remove any material clogging vertical overflow pipes, honeycomb grates, or other outflow structures.
  - Look for significant changes in channel depth following storm events that might affect how stormwater moves through the feature.
- ☔ Where organic mulch (wood and plant material) is used, maintain and refresh as needed (see Module 6 for more information on mulch maintenance).
- ☔ If water is standing for more than 96 hours, remove clogging material or increase infiltration in bioswales by installing soil sponges (see Module 3 for more detail) to move water more quickly down into the soil.
- ☔ Replace rocks that were dislodged during storm events making sure no bare soil is exposed.



Photo: Bernalillo County, Sarah Osterman

Infiltration trench in parking lot

# Maintenance: Plant Care

- ☔ Inspect the bioswale for areas that are receiving more or less stormwater by observing soil moisture, dry areas with stressed or dying vegetation, and areas where vegetation is thriving. Determine if regrading is needed to evenly distribute water throughout the channel.
- ☔ Infiltration trenches DO NOT include vegetation; remove any vegetation within the trench. Plant roots present in these conveyances reduce infiltration.
- ☔ Remove vegetation that is blocking or inhibiting flow in the inlet, outlet, and graveled central channel. Dense vegetation in these locations may cause backup and overflow in undesired areas.
- ☔ See Module 5 for detailed plant maintenance information.

## Visual inspection of the channel grade

- ☔ Check for any movement of sediment that changes the channel grade.
- ☔ If the channel grade is steep and water is flowing too fast, consider installing a check dam, Zuni bowl, erosion blanket, or other structure to help slow the flow of water. This may require renovation and is not part of regular maintenance.
- ☔ Remove and relocate sediment to maintain the channel grade and re-establish designed flow of water into appropriate areas. A flat shovel works well for this. A steel mesh screen placed over a wheelbarrow can help remove sediment from cobble or gravel.

## Erosion control repair

- ☔ Fill eroded areas with soil material similar to the existing material in place.
- ☔ Use a flat shovel or similar tool to relocate eroded sediment or material (i.e., rocks) to areas where they are needed, or to areas where they were formerly located.
- ☔ If planting seeds to reduce erosion, use an appropriate native seed mix.



Bioswale along Second St, Mountain View Neighborhood, South Valley, Albuquerque



# Maintenance:

## Soil amendments and mulch

- ☔ Do not use salt, fertilizers or pesticides in the stormwater management area.
- ☔ Add mulch to a minimum depth of 3 inches. See Module 6 for more details on mulch maintenance.
- ☔ If there are high flow rates into the basin and the organic mulch (wood/plant material) is regularly washed away, consider adding a check dam or Zuni bowl or changing to inorganic (rock) mulch on just the water flow path, retaining organic mulch on more upland areas.
- ☔ See Module 5 for detailed plant maintenance information.

## Tools and Specialized Equipment

Sediment/organic debris/trash should be removed most often by hand equipment. Only use heavy equipment as a last resort or when regrading and refreshing the entire site (no more frequently than every 5 years). The use of mechanized equipment may damage the system. To minimize impacts during maintenance activities:

- ☔ Have new plants and a native seed mix available to quickly re-establish vegetation where it has been damaged or removed.
- ☔ Do not stage or drive heavy/mechanized equipment on or across infiltration areas to avoid compaction of soil/media. If mechanized equipment is required, use wheeled rather than tracked equipment where possible.
- ☔ See the general tool list in Module 1.



Urban agriculture infiltration conveyance including a conveyance trench and soil sponges.

# MAINTENANCE INSPECTION CHECKLIST & SCHEDULE

## Stormwater Harvesting Basins and Conveyances

Location:

Weather: Rainfall over last 2–3 days?

Inspector:

Precipitation amount:

Date:

Time:

MAINTENANCE NEEDED	ACTION	COMMENTS
<b>Frequency—Monthly</b>		
1. Are there plants growing in inlets or outlets, blocking flow? <input type="checkbox"/> YES <input type="checkbox"/> NO	Remove plants that are blocking flow. If the plant is a good plant (i.e. not invasive, non-native), you may be able to move it to another part of the basin/swale. If it is an unwanted plant, remove and dispose.	
2. Are there unwanted plants, such as invasive plants or weeds? <input type="checkbox"/> YES <input type="checkbox"/> NO	Remove unwanted plants manually, which may include desirable plants growing in areas where they are not wanted (i.e. a tree seedling growing in an inlet).	
3. Are there diseased or dead plants? <input type="checkbox"/> YES <input type="checkbox"/> NO	Replace diseased or dead plants with similar native species.	
4. Have new plants been added? <input type="checkbox"/> YES <input type="checkbox"/> NO	Make sure young plants get the irrigation they need.	
5. Are weeds growing in mulch (if present)? <input type="checkbox"/> YES <input type="checkbox"/> NO	Manually remove mulch and add additional mulch to refresh.	
6. Is organic mulch (if present) at least 3 inches thick? <input type="checkbox"/> YES <input type="checkbox"/> NO	If mulch is less than 3 inches thick, add additional mulch.	
<b>Frequency—Quarterly, after major storms (storms with 0.25" of rain or more)</b>		
1. Is there standing water 24 hours after storm events? <input type="checkbox"/> YES <input type="checkbox"/> NO	If there is clogging or poor drainage, remove the accumulated sediment/dischored material/debris. Till or rake the remaining soil as needed.	
2. Is there sediment, plant material, trash/debris blocking inlets or outlets? <input type="checkbox"/> YES <input type="checkbox"/> NO	Remove sediment/plant material. These materials can be placed in another part of the basin/swale. Remove trash/debris and dispose.	
3. Are any plants diseased, impacted by pests, or have other issues affecting their health? <input type="checkbox"/> YES <input type="checkbox"/> NO	Replace diseased or dead plants with similar native species.	
4. Is irrigation system functioning correctly? <input type="checkbox"/> YES <input type="checkbox"/> NO	Fix any issues with irrigation system and adjust irrigation as needed based on season and plant needs.	



MAINTENANCE NEEDED	ACTION	COMMENTS
5. Do trees or shrubs have dead or damaged branches? <input type="checkbox"/> YES <input type="checkbox"/> NO	Remove any dead or damaged branches.	
6. Has mulch shifted or moved after storms? <input type="checkbox"/> YES <input type="checkbox"/> NO	Add additional mulch to refresh areas where much as been displaced.	
7. Is there erosion in any areas with organic mulch? <input type="checkbox"/> YES <input type="checkbox"/> NO	Inorganic (rock) mulch or riprap may be needed where erosion is occurring.	
8. Are there noticeable differences in channel grade? <input type="checkbox"/> YES <input type="checkbox"/> NO	If channel grade is too steep in some areas, adjust the grade or add a check dam or riprap to slow the flow of water.	
<b>Frequency—Quarterly in the beginning, then biannually (adjust frequency as needed after 3 inspections)</b>		
1. Is there erosion? Impacts from animal burrows? <input type="checkbox"/> YES <input type="checkbox"/> NO	Repair soil erosion and repair the cause of erosion (i.e. is trash, debris, volunteer plant blocking the flow path?). Fill holes with lightly compacted soil.	
2. Is there more than 2 inches of accumulated material, like sediment, debris, and/or trash, in the bottom of the basin/swale (inundation zone) ? <input type="checkbox"/> YES <input type="checkbox"/> NO	If accumulated material is reducing infiltration, remove unwanted sediment/debris/trash. Add mulch or additional soil, if needed.	
3. Do plants look distressed? <input type="checkbox"/> YES <input type="checkbox"/> NO	During drought (longer periods without rain), adjust/increase irrigation as needed. Plants should be watered regularly until established (1–2 years for perennials, 3–5 years for shrubs, 7–10 years for trees) and as needed thereafter.	
4. Are inlets and outlets in good working condition? <input type="checkbox"/> YES <input type="checkbox"/> NO	Repair or replace any damaged structural parts of the inlets, outlets, sidewalls. Remove any sediment, debris, or volunteer plants blocking the inlet or outlet.	
<b>Frequency—Annually</b>		
1. Do plants need any pruning? <input type="checkbox"/> YES <input type="checkbox"/> NO	Prune plants ONLY AS NEEDED for clearance or health (dead, diseased, or damaged branches). Plants DO NOT need to be shaped.	
2. Is there good plant coverage throughout the basin/swale? <input type="checkbox"/> YES <input type="checkbox"/> NO	Replace any dead or dying plants with similar native species.	
3. Are there complaints from residents? <input type="checkbox"/> YES <input type="checkbox"/> NO	Address complaints and/or discuss with supervisor	
4. Do you notice any hazards to the public? <input type="checkbox"/> YES <input type="checkbox"/> NO	If a hazard is observed, look for a way to fix the issue and discuss with supervisor.	
5. Are there any other issue or problems? <input type="checkbox"/> YES <input type="checkbox"/> NO	If yes, describe in comments and discuss with supervisor.	

Inspector's signature: \_\_\_\_\_



The background of the slide is a photograph. The top half shows a dense patch of tall, thin, yellowish-green grass. Below the grass is a horizontal band of orange color containing the text. The bottom half of the image shows a paved surface, likely asphalt or concrete, with long, dark shadows cast across it from the left.

# MODULE

5

## Plant Identification and Maintenance



# Plant Maintenance

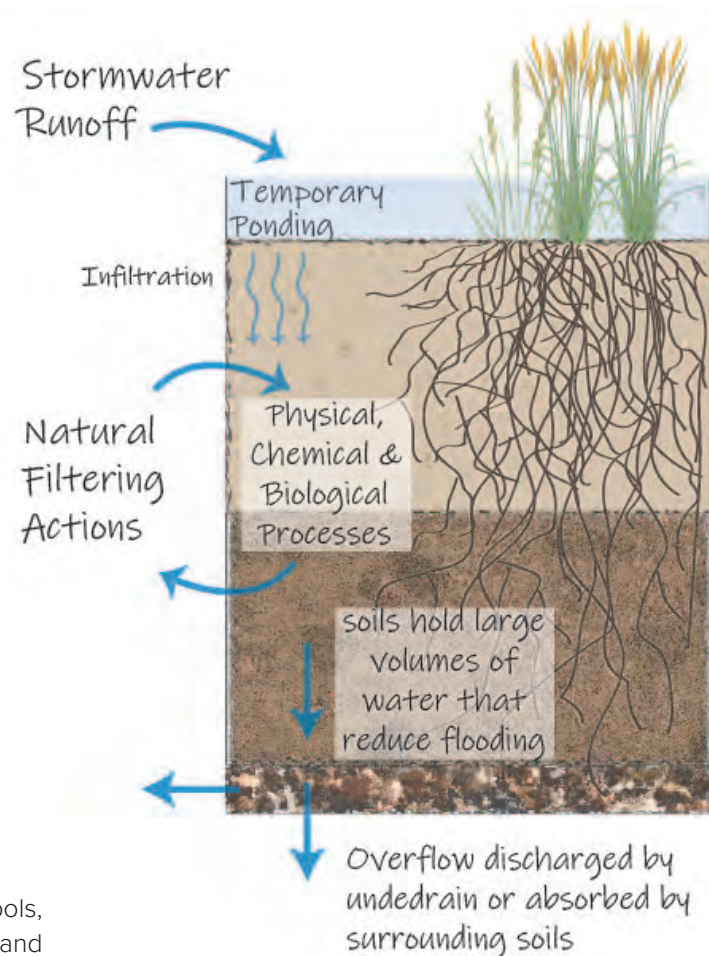
Plants are an important component of green stormwater infrastructure systems. When polluted stormwater passes through a biologically active filter (biofilter) or a plant community (referred to as a bioretention system), pollutants are reduced, and water quality improves. Plants and organic ground cover (e.g., mulch) are the most visible parts of a biofilter but much or most of the filtering happens below ground in healthy soils.

Healthy, native plant systems can:

- ☂ Reduce overall runoff volumes
- ☂ Reduce peak flows (preventing flooding)
- ☂ Increase and maintain infiltration rates
- ☂ Cool the soil surface (reducing heat islands)
- ☂ Reduce noxious weed establishment

Image Credit: Sarah Hurteau, TNC; IAN Symbols, University of Maryland

Schematic of plants serving as a biofilter



Photos by: Mario Nuño-Whelan

# Why are Plants Important?

Healthy plants are a vital component of green stormwater infrastructure to help:

- ☛ Control erosion
- ☛ Keep soils healthy — including soil fungi and microbes
- ☛ Promote natural filtering and breaking down of pollutants through biological and chemical processes
- ☛ Protect water quality by providing filtration and treatment for pollutants in stormwater runoff
- ☛ Provide habitat for wildlife
- ☛ Improve the urban environment for people
- ☛ Increase infiltration rates as water follows roots systems deeper into the soil

Plant maintenance can affect the optimal performance of green stormwater infrastructure in many ways:

- ☛ When vegetation dies and is not replaced, green stormwater systems lose the pollutant and water uptake benefits provided by the plants. Plant replacement is an important maintenance activity and will reduce/eliminate future renovation costs.
- ☛ Healthy soil microbes and bacteria that help break down pollutants die without healthy plants.
- ☛ Without vegetation, the soil holds less water, which in turn increases runoff.
- ☛ Clogged soil media prevents infiltration and can lead to a complete failure of a system, requiring replacement of the soil.

Bioretention systems are stressful environments for plant growth due to periods of flooding and pollutant loading, followed by long dry periods. Certain plant species are more capable of thriving in these extremes than others and can help to minimize the amount of maintenance needed due to plant die-off.

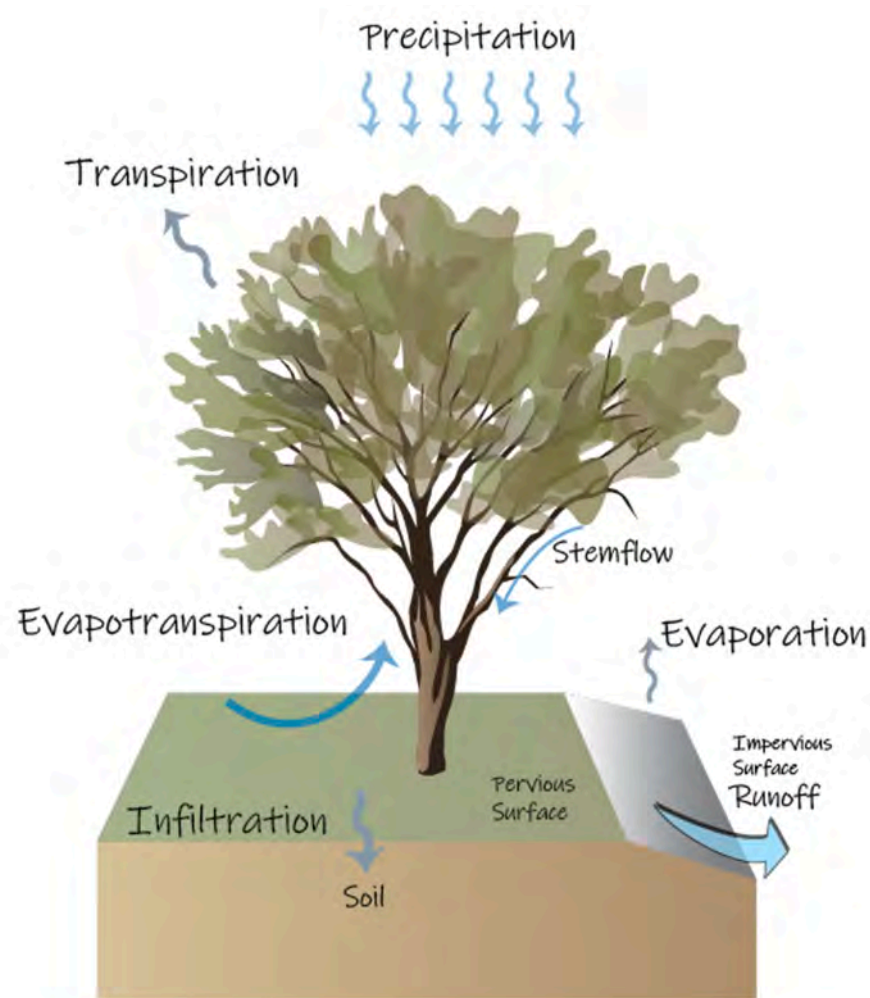


Image Credit: Sarah Hurteau, TNC; IAN Symbols, University of Maryland



# Different Plants Live in Different Soil Water Zones

Each planting zone will have a different community of plants that will do best under these really different soil water conditions.

- ☔ Inundation zones (where water accumulates on the surface) will require plants that can be submerged in water for up to 48 hours.
- ☔ Transition zones (slopes on the edges of the trench or basin) will function best with plants that like extra water and may be occasionally submerged.
- ☔ High ground/uplands (areas bordering the trench or basin) require plants that are drought tolerant and require less water overall.

For more information of which plants do best in our native systems, please visit:

[www.bernco.gov/plantlist](http://www.bernco.gov/plantlist).



Image Credit: Tess Houle



# Maintenance

- ☛ Check the design plan, if possible, so you know what plants should be there, and how the feature is supposed to function. If plants fail repeatedly, consult native plant list for appropriate substitute: [berncogov/plantlist](http://berncogov/plantlist)
- ☛ Inspect plants at the beginning of each season (quarterly) and after storm events, checking for healthy plants and pests/disease.
- ☛ Some plants may need to be removed so the feature can maintain function.
- ☛ Prune plants only as needed. Many plants, especially native plants, need little to no pruning. Many native plants, including grasses, need little or no pruning. Native grasses do not need mowing.
- ☛ Don't over-prune trees or shrubs; prune trees and shrubs only if they interfere with human pathways and to maintain sightlines for vehicles in features adjacent to roadways and intersections. Only trim for clearance, not to "shape" the plants!
- ☛ Prune trees for health. Pruning trees for health means:
  - Removing any broken limbs or branches.
  - Removing dead, diseased, and damaged branches.
  - Removing a branch if it is rubbing on another branch (crossing branches) or unwanted multiple leaders.
  - Trimming back one of the limbs when two limbs grow closely together, making a "V" in the branch union. This narrow angle makes for a weak branch attachment that could damage the tree later as the limbs grow larger.

For more information on pruning, please visit the Arid LID website for links to short video tutorials.  
<https://aridlidcoalition.org>



## Native Plant Roots Strengthen and Stabilize the Soil

**Some native plants have roots that extend as deep as 15 feet underground. These plants promote infiltration and reduce erosion.**

**Sod has a shallow root system and does not provide many ecological benefits.**



# Maintenance (cont.)

- ☂ Only remove major tree limbs in winter when the sap is NOT flowing. Deadwood can be removed anytime.
- ☂ DO NOT mound organic or inorganic (rock) mulch around tree trunks like a volcano. Make sure mulch is at least 4 inches away from the tree trunk. The root crown is beautiful and should be seen!
- ☂ Remove any unwanted plants, such as weeds and invasives, as needed and at least monthly and prior to seed set.
- ☂ Check for dead plants and replace them with similar plant types and prioritize the use of native species as they are better adapted to our desert climate.
- ☂ Increase irrigation for new plantings to help them get established. For native plants, establishment periods are 5 years for trees, 3 years for shrubs, and 1 to 2 years for perennials/herbs/forbs. For non-native plants, establishment periods will be longer.
- ☂ Adjust irrigation seasonally. Pay attention to monsoon and/or drought conditions and adjust irrigation frequency and duration as needed (more during hot/dry seasons and less during cool/wet seasons). Non-native plants usually require some winter irrigation.
- ☂ Gradually shift irrigation to less frequent and deeper watering, to maintain soil moisture.
- ☂ If replacing a tree, check the Climate Ready Tree List for an appropriate selection. Visit the Arid LID website for a link to this resource. <https://aridlidcoalition.org>
- ☂ Keep leaf litter and trimmings in place or in the basin bottom instead of removing if not causing blockages. This is free mulch and organic material that supports soil and plant health!
- ☂ Remove invasive weeds using species-specific guidelines (time of year, technique, etc.); for example, control silver nightshade where unwanted but leave in other areas for native pollinators.
- ☂ Weed less by using more organic (wood/plant material) mulch to reduce weed seed germination.
- ☂ Don't spray chemical herbicides; hand pull weeds when they pop up.
  - Pull weeds when they are small and after rain. Weeds are easiest to pull when roots haven't grown too deep yet and the soil is soft.
  - Remove weeds before they set seed to reduce future spreading.
  - Remove unwanted volunteer tree seedlings when they are young.
  - Pull or dig out the entire plant including the root system. If you just cut off the top, the plant will likely continue to re-sprout from the base. A trowel, hoe, or shovel should be sufficient to do the job.

## Tools and Specialized Equipment

Have new plants available to quickly re-establish vegetation in case plants are damaged or removed.

See the general tool list in Module 1

# MAINTENANCE INSPECTION CHECKLIST

## Plant Maintenance

Location:

Weather: Rainfall over last 2–3 days?

Inspector:

Site conditions:

Date:

Time:

### MAINTENANCE NEEDED

#### Frequency—Monthly

1. Check for and remove unwanted plants, such as weeds and invasive plants.  
☐ YES ☐ NO
2. Check for diseased or dead plants and replace them with similar native species.  
☐ YES ☐ NO
3. Check for and manually remove weeds and invasives. ☐ YES ☐ NO
4. Irrigate young plants. ☐ YES ☐ NO

*Comments:*

#### Frequency—Quarterly; after major storms

1. Inspect plants, checking for healthy plants, pests/disease, or other issues.  
☐ YES ☐ NO
2. Inspect irrigation system and adjust as needed.  
☐ YES ☐ NO
3. Remove any dead or damaged branches from trees and shrubs. ☐ YES ☐ NO

*Comments:*

#### Annually

1. Prune plants only as needed for clearance or health (dead, diseased, or damaged branches). ☐ YES ☐ NO

*Comments:*

Inspector's signature: \_\_\_\_\_





# MODULE 6

## Mulch Maintenance

# What is Mulch?

Mulch is a layer of porous material applied to the ground surface that helps to stabilize and reduce water loss from the soil by evaporation. It is an important part of green stormwater infrastructure. Mulch can be applied in stormwater harvesting basins, conveyance channels, or any area where retaining soil moisture, preventing erosion, and promoting healthy plant growth is desired.

Types of mulch include:

- ☛ **Organic mulch** is generally composed of chipped and/or shredded wood and plant materials. Organic mulch is appropriate for almost all applications.
- ☛ **Inorganic mulch** consists of gravel, crushed rock, lava rock, or pebbles and may be appropriate for areas where there are high stormwater flow rates, steep slopes, or where there is heavy foot traffic.

**Organic mulch** is preferable for most applications as it helps to suppress weed growth and contributes to pollutant treatment and healthy soils. Partially composted, shredded woody mulch is ideal because it locks together, making it more resistant to floating or blowing away. Mulch that is partially composted brings good bacteria and fungi that improve soil and plant health.



## Different Types of Mulch





## Organic mulch helps:

- ☂ retain soil moisture
- ☂ control weed growth
- ☂ limit big temperature swings in the soil
- ☂ prevent erosion
- ☂ support a healthy microbiome (a community of microbes, such as bacteria and fungi)
- ☂ treat pollutants through filtration

Organic mulch decomposes over time (which is good for the soil and microbiome) acting as a natural fertilizer for both soil and plants and consequently requires periodic refreshing. When using organic mulch within a GSI installation, use the following best practices (adapted from the DRAFT Bernalillo County Green Stormwater Infrastructure Low Impact Design Standards):



Healthy fungi “gluing” mulch and soil together.

Source: <https://edibleoasisidaho.blogspot.com/2014/10/mold-in-my-lungs-is-good-thing.html>

- ☂ Leaf litter does not need to be removed from the surface of areas with organic mulch.
- ☂ Avoid organic mulch products containing bark chips or products that are likely to blow or float away, such as pecan shells. Bark chips are naturally water repellant and resist decomposition.
- ☂ Keep all mulch at least 4 inches away from the base of trees and plants.
- ☂ Spread (or re-spread) mulch evenly across the site, especially when mulch has moved during storm events.
- ☂ Use wood chips, natural material erosion control blankets, or small rock mulch over drill seeded or hand broadcast seeded areas.



# Inorganic Mulch

Inorganic mulch (gravel, rocks) is not preferred, although it may be useful in some circumstances. It does not contribute to the treatment of runoff or to the biological health of soil and plants. It also stores and releases heat. Inorganic mulch is best used on steep slopes where stormwater runoff velocities may be high or where there is a lot of foot traffic, as it provides added stability, and may be paired with landscape fabric to help prevent erosion. If inorganic mulch is necessary, use the following best practices (adapted from the DRAFT Bernalillo County Green Stormwater Infrastructure Low Impact Design Standards):

- ☂ In depressed basins or swales, install a 3-inch depth of chipped wood mulch below a single layer of inorganic mulch of aggregate size of 1" to 2" or large. Chipped (non-composted) wood mulch is recommended to be used under rocks and inorganic mulch materials as it will degrade more slowly than shredded, partially composted wood mulch. OR install landscape fabric in place of chipped wood mulch.
- ☂ Use rock and inorganic mulch where there are high flow velocities (greater than 1 foot/second) to slow down the water and prevent erosion.
- ☂ Rock and inorganic mulch containing fine grains can create additional sediment accumulation and clogging and therefore should not be used.
- ☂ If rock and/or other inorganic mulch is used, plan for maintenance to remove sediment and debris from the mulch; weeds will grow in sediment that accumulates in the rock and inorganic mulch.
- ☂ Dark-colored rock and inorganic mulch materials, such as basalt, are preferred for areas that will be stained by urban runoff. Light-colored rock and inorganic mulch materials are preferred for other areas because they retain less heat than dark colored materials.

Landscape fabrics for weed control are not recommended for use in GSI installations. These fabrics generally prevent stormwater runoff from reaching the soil and plant roots and are only permeable when they are fully saturated. Permeability declines as sediment accumulates on the top of the fabric layer, and can't be corrected without digging up the overlying mulch. Weedblock fabric placed under organic or inorganic mulch collects sediment where weeds will grow, creating additional maintenance needs. Organic mulch, when applied appropriately, is much more effective at preventing weed growth.



TOP: Native mulch  
BOTTOM: Forest floor mulch  
Photos from Soilutions



# Maintenance for Organic Mulch

- ☔ Check for an even layer of mulch. If the mulch is piled up in some areas, move it around so that the depth is consistent.
- ☔ Organic mulch 3-inches in depth should last at least 3 years; mulch may be top-dressed annually to freshen the appearance. If the GSI facility receives frequent or high-volume flows, mulch may need to be refreshed more frequently.
- ☔ Leaf litter does not need to be removed from the surface of areas with organic mulch.
- ☔ If flow rates of runoff into the basin are high and the organic mulch is regularly washed away, consider installing inorganic mulch or riprap at the inlet to slow down the flow of water.

## Tools and Specialized Equipment

Replacement mulch (see discussion above for appropriate mulch)

See the general tool list in Module 1.



# Maintenance for Inorganic Mulch

- ☔ Sediment and debris will accumulate in inorganic mulch over time; remove sediment and debris as necessary.
- ☔ Weeds will grow in the accumulated sediment; manually remove weeds when present.

# Reference Materials

**Climate Ready Trees List, now available statewide:** <https://www.nature.org/content/dam/tnc/nature/en/documents/Climate-Ready-Trees-Report-Nov2020.pdf>

**Noxious and Troublesome Weeds of New Mexico:** [https://aces.nmsu.edu/pubs/\\_circulars/CR698.pdf](https://aces.nmsu.edu/pubs/_circulars/CR698.pdf)

**Native Plant List:** <https://www.bernco.gov/plantlist>

**Irrigation Quick Reference:** <https://www.youtube.com/watch?v=WWnwg1DpEsU>

**Tree Care Quick Tips:** <https://www.youtube.com/watch?v=hRs3EmjVw9U&list=PL-o5jtJniuba3Pk9sWN94LgHYCIPCaUro&index=2&t=4s>

**How to Plant a Tree:** <https://www.youtube.com/watch?v=sJmi99gxnfQ&list=PL-o5jtJniuba3Pk9sWN94LgHYCIPCaUro&index=4>

**Tree Pruning Intro:** <https://www.youtube.com/watch?v=tR1EUMzuFP8&list=PL-o5jtJniuba3Pk9sWN94LgHYCIPCaUro&index=5>

**Arid LID website** for short video tutorials on pruning: <https://aridlidcoalition.org>









## MIDDLE RIO GRANDE Green Stormwater Infrastructure Maintenance Videos

[WATCH TRAINING VIDEOS](#)





**Making Meaningful Connections by  
Integrating Water Resources Topics  
with Language Arts & Science**

***2022 Report***

Presented by  
Ciudad Soil & Water Conservation District  
Erin Blaz, Education Manager  
Saleema Robinson, Assistant Education Coordinator

**June 2022**

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## **SUMMARY**

This year, funding enabled 39 NM classes (866 students and 41 teachers) to participate in a combination of *virtual and in-person programming* RiverXchange® program. 38 classes were funded for the program, but 39 were placed in the program considering the likelihood that not all bus and substitute funding was going to be used due to the uncertainty of field trip approval and substitute availability. Eight of the fourteen schools we served were Title 1. All program costs and coordination are provided free of charge to teachers. The program required \$56,218.89 in cash and generated a total match valued at \$67,351.11 in the form of in-kind contributions including teacher workshop attendance, presenter time and preparation for virtual presentations, as well as volunteer time from students and adults on the field trips to plant 495 trees in the bosque. Student Capstone Projects reached a total of 3,090 community members about stormwater and watershed health related topics.

RiverXchange® continued to have a successful year, even in light of the on-going global pandemic. One of the challenges this year was managing diverse policies for presentations and field trips across schools and presenter preferences and capacity. The result of these variations meant that students experienced varying levels of contact with the program. For example Rio Rancho schools primarily had video presentations and virtual field trips with live presenters, while one Rio Rancho school actually went on a field trip to Candelaria Nature Preserve. APS students primarily had virtual presentations with a live presenter and almost all APS schools did pole planting. However, in evaluating the program metrics both districts demonstrated knowledge gains and improvements in positive water conservation behaviors and attitudes.

Another significant change to the program this year was the evolution from blogging to the Capstone Project. With the inundation of technology and virtual learning in schools as a result of the global pandemic, it was time to rethink the goals of the blogging component and determine if they really support making meaningful connections for students in water resource education. The goal of the Capstone Project was to pilot a language arts component that would support making meaningful connections with students' immediate community- such as the larger school community or neighborhood. Results from the Capstone Project are shared further on in this report. In summary, much of the work we see is similar to the work that was posted on the blog, except many of the teachers that were able to integrate the Capstone Project challenged their classes to share their work with other classes at the school or even the school administration. This meant the work wasn't going into a digital void where only RiverXchange® staff would view it, but that it rippled out to more local students and adults!

In addition last year RiverXchange®, Bosque Ecological Monitoring Program and Valencia SWCD staff met monthly to discuss watershed and stormwater education collaboration opportunities, such as program continuity across grades and program assessment strategies. This effort continues to help support and improve core aspects of our programs and outreach.

RiverXchange® has demonstrated that its collaborative efforts with partner agencies to bring effective presentations to schools, funding structure to support teacher professional development and field

trips, and management by the Ciudad Soil and Water Conservation District, has allowed it to be not only resilient during times of uncertainty but a valuable resources for teacher and students alike. In fact, RiverXchange® has emerged as a strengthened program that will continue to evolve for years to come and improve how it engages our local community with watershed health and stewardship.

## **PROGRAM DESCRIPTION**

### **Mission**

The mission of RiverXchange is to deepen students' and teachers' understanding and appreciation for their local river ecosystem, motivate participants to protect local water resources by conserving water and keeping their source water clean, and to provide a high quality, high impact outreach opportunity for funders and in-kind contributors.

### **The Big Water Questions**

The optional curriculum frames program outcomes as “guiding questions,” known as *Big Water Questions*. A long term goal of RiverXchange is that students understand these questions and can formulate logical, fact-based answers by the time they finish elementary school. We believe that students who can synthesize water facts to understand larger water issues will have the proper critical thinking skills and foundation for further discussion in middle and high school so that they will become informed citizens and voters on water issues.

#### *Understanding a Watershed*

- Is every place in the world part of a watershed?
- Where does your community's stormwater go?
- How can surface water become polluted?
- How does the water cycle relate to weather?
- How are groundwater and surface water connected?
- How can groundwater become polluted?
- What actions can all of us take to keep water clean?

#### *Water in Our Society*

- In what ways does our society use water?
- Where does your community's drinking water come from?
- Does everyone have the right to use as much water as they want?
- Where does your community's wastewater go?



- What actions can all of us take to conserve water?

### *River Ecosystem*

- How does water affect living things in an ecosystem?
- What role do forests play in a watershed?
- What role do wetlands play in a watershed?
- What are some of the ways scientists can determine the health of a river, lake, bay or ocean?
- What actions can all of us take to improve the health of our ecosystem?

## **Background**

As producers of children's water festivals and other grade K12 water resources outreach in NM since 2007, the RiverXchange program creators observed early on that NM elementary teachers rarely incorporated water concepts in the classroom beyond what is required by the state (e.g., water cycle), and that most elementary teachers considered "water" strictly as a science topic. While teachers personally acknowledged the importance of conserving water and keeping source water clean, they continued to find that upper elementary students had little or no understanding of major water resources topics unless the teacher specifically integrated a wide range of water topics into the curriculum. For this reason, as well as successful festival work with upper elementary students, this age level was selected as the focus for the RiverXchange program.

RiverXchange was created to provide a free program that is fun, interesting, and easy to integrate into the normal curriculum. The hope was to motivate participants to explore water resources topics in depth. The program was originally designed to be carried out over eight months so that students spend more time developing a sense of pride and personal connection to their own river ecosystem, as well as a personal connection to a distant river ecosystem and the students who live near it. Today RiverXchange runs over the course of 3-4 months, as a response to the challenges of implementing a year-long curriculum with the ongoing demands on teachers and students time and requirements for testing and other curriculum.

RiverXchange began in 2007 as a pilot project of Experiential EE, LLC (under a services agreement with the New Mexico Water Conservation Alliance) and the National Great Rivers Research and Education Center, featuring partnerships between two fourth grade classes in Albuquerque, NM, and two fifth grade classes in Godfrey, IL. A curriculum was developed, a field trip to the river was coordinated, and partner classes "met" three times during the year via video tele-conferencing to present what they had learned.

After the pilot project, RiverXchange transitioned to a web-based technology called a wiki. This enabled the program to overcome limitations such as the high cost, availability, and time zone logistical issues associated with video teleconferencing – and easily involve more classes. The curriculum was updated to incorporate the writing component and classroom guest speakers were introduced to reduce teacher workload and bring up-to-date technical information into the classroom. In 2017, the program switched to a blogging platform called Kidblog and in 2021 Kidblog rebranded to Fanschool. Due to the inundation of technology from virtual learning in the global pandemic and the continued barriers to connecting classes on Kidblog/Fanschool, RiverXchange piloted integrating a Capstone Project into the

program instead of the blog in 2021-2022.

In 2012, ownership of RiverXchange transferred to Amy White of Orilla Consulting, LLC, who managed the program through July 2015. In August 2015, RiverXchange became part of the Ciudad Soil & Water Conservation District. In 2020, ownership and the trademark registration of RiverXchange® was transferred fully to Ciudad Soil and Water Conservation.

Since 2007, we have served over 20,166 students!

This year, the program featured the following components:

- Optional standards-based curriculum including hands on science, math, and social studies lessons, as well as writing assignments
- Teacher training on curriculum and Capstone Project implementation
- Ongoing motivational support and Capstone Project monitoring
- End of year teacher survey
- Pre and post student surveys
- Coordination of at least four guest speakers into the classroom
- Coordination of a virtual field trip or in person field trip to the local river or important watershed feature
- Field trip leadership and activity planning

## **2021-2022 PROGRAM OVERVIEW**

### **I. Program Management and Financial Support**

The program timeframe was July 1, 2020 through June 30, 2021. All components including fundraising, design, planning, implementation, and analysis were carried out by employees and contractors of Ciudad Soil & Water Conservation District, including:

Erin Blaz  
Jenny Lloyd-Strovas  
Astrid Hueglin  
Saleema Robinson

### **SPONSORS**

- Southern Sandoval County Arroyo and Flood Control Authority (SSCAFCA)
- Middle Rio Grande Stormwater Quality Team (MRGSQT)

**Sponsors provided a total of \$56,218.89 in cash.**

**MRGSQT - \$38,532.98 | SSCAFCA - \$17,683.04**

Program expenses included:



- Technology services
- Office and educational supplies
- Teacher workshop materials and food
- Coordination services (planning, implementing and assessing all program components)
- Bus funding
- Substitute funding

## **IN-KIND PARTNERS**

- Albuquerque Water Utility Authority
- City of Albuquerque – Open Space Division
- City of Rio Rancho – Environmental Programs Office
- City of Rio Rancho — Parks, Recreation and Community Services Department
- Sandia Labs
- Sandoval County Cooperative Extension
- Bernalillo County Cooperative Extension
- Rio Grande Return

### **In-Kind contributions totaled \$67,351.11**

In-kind contributions included virtual guest speaker coordination, prep and presentation time. The City of Albuquerque significantly increased their match this year by including a pre-lesson kit and/presentation to classrooms. Additionally, in-kind match was able to return to a pre-2020 range due to the allowance of pole planting field trips, where student and adult time and trees are counted as match through volunteer time and materials.

## **PARTICIPANT SELECTION**

All 39 participating NM classes were fifth grade classes, distributed as follows:

<b>FUNDER</b>	<b>MRGSQT</b>		<b>SSCAFCA</b>	
	<b>SCHOOL - Number of classes</b>	<b>Number of Students</b>	<b>SCHOOL - Number of classes</b>	<b>Number of Students</b>

*Title 1 school	La Mesa* - 4	92	Colinas del Norte* - 5	109
	Valle Vista* - 3	53	MLK* - 4	98
	Duranes* - 1	19	Sandia Vista - 4	92
	Seven Bar - 3	79		
	John Baker- 3	67		
	Zia- 2	40		
	Monte Vista - 2	52		
	Cochiti* - 2	27		
	North Valley Academy - 2	52		
	Manzano Mesa* - 3	61		
	Maggie Cordova* - 1	25		
<b>TOTALS</b>	<b>26 classes</b>	<b>567</b>	<b>13 classes</b>	<b>299</b>
<b>RX Total Classes</b>	<b>39 classes</b>	<b>RX Total Students</b>	<b>866 students</b>	

## **PRESENTATION TOTALS**

Program presentations were completed as follows:

Agriculture: 39/39

Stormwater: 39/39

Wastewater: 39/39

Drinking Water: 39/39

Landfill Presentation: 14/14 (Rio Rancho only)



## Field Trips

Virtual: 14/14

Pole Planting: 21/21

Candelaria Nature Preserve: 4/4

## **I. Program Components**

The core curriculum of RiverXchange® is delivered through a series of in-class presentations provided by our partner agencies that are guided by the “Big Water Questions” that aim to build an understanding of watershed health. Additionally the field trip, in partnership with City of Albuquerque Open Space, has remained a core component of our program by offering students the opportunity to participate directly in a restoration project to understand the value of action and stewardship as a community effort. The field trip also offers an opportunity for participating students, who come from diverse backgrounds and have varied relationships with the outdoors, a chance to connect with an important, local watershed feature and build a connection to their local river. Furthermore, beyond the core components of RiverXchange®, the program also supports a more robust understanding of watershed health through teacher facilitation of the Capstone Projects and other additional lessons that are demonstrated at the teacher workshop. Extensive resources can be found on the RiverXchange® website but we have found teachers are at their capacity often don’t utilize those resources. Each year we continue working on developing a more streamlined program.

A review of this year’s program components follows.

## **PARTNER AGENCY PRESENTATIONS**

### **APS**

The Water Utility Authority has a new presenter, Rhea Trotman, who is replacing Theresa Dunn - the long time WUA educator for RiverXchange. Ms. Trotman provided the drinking water and wastewater presentations. Brittany Johnson at Bernalillo County Coop Ext. provided the virtual agriculture presentation. The stormwater presentation will continue to be offered via a video recording from Sandia Labs.

### **RRPS**

The city of Rio Rancho offered pre-recorded videos of their drinking water, wastewater and landfill presentations as this year's presentations. Students will also receive the stormwater video from Sandia Labs. The agriculture presentation will be offered virtually by Steve Lucero and Nicole Lujan from the Sandoval County Coop Ext.

### **Field Trip Pre-lesson**

City of Albuquerque Open Space Division Educator Ellie Althoff provided significant support to students understanding the “why” behind planting cottonwoods and willows in the Bosque by offering a River of Change Kit (a model and lesson derived from the Bosque Education Guide). This kit and lesson was provided to classes for their own use or as an in-person presentation with Ellie to explore the first two segments of the lesson - Rio Bravo and Rio Manso - which discuss the pre-settlement ecology of the Middle Rio Grande and flood control impacts due colonization and non-native settlement of the Middle Rio Grande Valley. The final segment of this lesson called Rio Nuevo, where students are prompted to consider the possible restoration and mitigation strategies for flood control impacts on the ecosystem, was completed either on site at the field trip or during the virtual field trip presentation.

## **FIELD TRIPS**

### **POLE PLANTING**

A total of 417 students and 56 adults attended pole planting field trips from APS schools. With the support of Albuquerque Open Space, 495 total trees were planted in an area of the Bosque just north of I-40 on the east side of the Rio Grande. Images of students pole planting are in Appendix XXXX.

### **VIRTUAL FIELD TRIPS**

This year we continued to offer virtual field trips for schools that were not allowed to go on in-person field trips. City of Albuquerque Open Space generously contributed another educator, Ellie Althoff to join Erin Blaz in facilitating these field trips. The virtual field trip spanned 1.45 hours and explored evidence of the flora and fauna in the existing riparian ecosystem, identification of invasive species, strategies for managing forest health and the Rio Nuevo activity.

### **CANDELARIA NATURE PRESERVE (CNP)**

In March, Martin Luther King Elementary School notified RiverXchange® staff that they were just approved for in-person field trips. Pole planting does not have demonstrated success rates into the warming spring months, so we had to come up with field trip location and activities that would work in April. As Ciudad SWCD is now the land manager of Candelaria Nature Preserve in partnership with COA OSD and Rio Grande Return, we collaborated to deliver two field trip dates to serve four classes at this site. Students were able to contribute some hands-on work by mulching berms alongside basins created for nucleated habitats, as well as nature journaling to envision the future of CNP as an agricultural land converted to wildlife habitat, and the Rio Nuevo activity. Wildlife Biologist Kyle Faig also gave a wildlife talk to students. The event was a great success!





Top row: Ellie Althoff and Kyle Bality from Open Space teaching students to pole plant properly. Middle rows - students from various schools planting in varying weather. Bottom 3 pictures: Field trips to Candelaria Nature Preserve

## **CAPSTONE PROJECT**

This year RiverXchange piloted a new approach to maintain the language arts component that has been meaningful to teachers across the years and to strive to achieve a new kind of meaningful connection between RiverXchange students and their community. The coordination budget that has been used in the past for blog support and evaluation went to supporting teachers in the process of completing this capstone project and acquiring documentation of their class projects. The criteria for the capstone project are:

- (1) Students create something new that teaches other about what they learned in RiverXchange
- (2) Students communicate what they learned beyond their classroom in their community (i.e. other classes at school, your neighborhood or city)
- (3) Students design a stewardship project of their own that includes aspects of conservation and sustainability in their community.

Teachers were asked to update staff on their projects in December and March and to share the context of the project as well as who the project would reach and impact. In April teachers submitted their projects via email to staff and 6 classes were awarded with pizza parties to celebrate their project completion. In total, student capstone projects reached 3,090 community members about stormwater and watershed health topics.

## **RIVERXCHANGE COMMUNITY DAY**

As a strategy to both motivate and celebrate the Capstone Projects, staff offered a Community Day at the end of the year where the class projects were highlighted. The event was held on April 23 in conjunction with the Earth Day Celebration at Agri-nature Center in Los Ranchos. The event was publicized to all RiverXchange® classes and families were encouraged to attend.

## **TEACHER WORKSHOP**

Teacher workshops were held Sept 24, 2021 and October 1st, 2021 at the Open Space Visitor Center with RiverXchange facilitators Jenny Lloyd-Strovas and Erin Blaz. The teacher workshops were highly successful, with 19 participants on the 9/24 and 15 participants on 10/1. We found that there were a lot of new teachers this year, not only new to RiverXchange but also new to the field of teaching. The RiverXchange program was introduced and reviewed, with many returning teachers expressing their appreciation for and confidence in the program. The capstone project was introduced, was well-received, and teachers spent time working in groups to plan their projects. We ran through a few teaching strategies for lessons about the watershed using a 3-D model of the Middle Rio Grande Watershed for integrating geographical mapping and layering of life zones, historical development, biological features, etc, with the final layer demonstrating pollution on our watershed model. City of Albuquerque Open Space education staff ran through activities that supported the field trip learning objectives and reviewed the field trip experience and pre-lesson. Dyane Sonier of Rio Rancho Parks, Rec and Community Service introduced



resources and materials available to teachers on the Rio Rancho workshop date (Oct 1). Teachers enjoyed lunch overlooking migrating birds and explored the visitor center. Everyone left with swag-bags!



Teachers from Valle Vista, MLK, Colinas del Norte and Maggie Cordova map the middle Rio Grande Watershed. (top left and center). Dyane Sonier presents CoRR education programs (top right). Teachers rain on their polluted watershed model of the MRG (middle left). Teachers share their capstone project ideas (middle center). Teachers from Duranes and Zia brainstorm capstone projects together (middle left).

## II. EVALUATION

### TEACHER FEEDBACK

Teacher feedback is an invaluable resource for program evaluation and it continues to help us understand what teachers value and where we can improve. This year's feedback continues to reinforce that RiverXchange® remains relevant and impactful in curriculum and content. Feedback demonstrates the RiverXchange program is highly valued by teachers for its ability to provide hands-on and experiential activities that expose students to local watershed issues, reconnect them to the natural world, and demonstrate career opportunities in the science and conservation fields. RiverXchange continues to be a valuable curriculum that teachers use to stimulate the personal and collective growth of their students by encouraging them to use teamwork, adaptability, and communication skills to engage in and build an understanding in complex and new topics. In addition, the capstone project has provided an additional opportunity for teachers and students to engage their greater school community in project based learning that occurs in the program through education, research, and community service. Feedback also demonstrates the RiverXchange continues to be valued for its ability to bring hands-on science in the classroom and teach about water resources issues, while addressing both Common Core English Language Arts Standards and Next Generation Science Standards.

Additionally, when asked to share what successes teachers and the students had with integrating the capstone project, teachers reported that students really enjoyed using the capstone to engage with RiverXchange by creating deeper connections to water issues through direct action and demonstration. Teachers described how their students used the project to educate others about environmental issues,

organize campus-wide clean-ups, and build interactive models to demonstrate key watershed science concepts.

Lastly, when asked how RiverXchange could be improved to support teachers in future years, teachers reported difficulty with virtual programming due to COVID and a desire to return to more in person presentations and field trips next year. Teachers also indicated that more physical supplies for hands-on learning and greater support for the capstone project would help them with supporting their students in meeting program objectives.

Below are a few highlights from the teachers:

**What are the greatest learning outcomes for your class as participants in RiverXchange?**

The exposure to the environmental issues and understanding the environmental issues in the state of New Mexico. - Detrick, Colinas Del Norte

Seeing career opportunities outside of what they know. Giving them the chance to interact with environments that they may not have. - Shafer, Maggie Cordova

Understanding the science of conservation and the importance of valuing life. - Hodges, MLK

My students are more aware of how their behaviors impact the environment.- Granstrom, Seven Bar

I think the hands-on learning approach is the greatest learning outcome. -Filkins, MLK

**Please share any feedback you have concerning your experience with the program this year.**

RiverXchange was extremely successful because my students were enthusiastic to learn about several ways to take care of our natural resources. Example: fixing water leaks, conserving energy by turning off lights and technology, picking up their animal's waste. - Sanchez, Duranes

This has been a wonderful and helpful way to teach about our local water system. It makes a difference if students can see the river itself and know they have a part to play in keeping the Rio Grande! - Beer, Cochiti

We love the program and would like to continue participating in it, hopefully doing it entirely in person for the following school year. - Ceballos, La Mesa

I would like to see a more streamlined, organized program. Having the presentations in person would be best as well. - Marquez, John Baker

Each year, it seems the program continues to improve. The resources and activities were invaluable.- Turrietta, MLK



Great job and thank you for everything you did for us RiverXchange! - Hornbecker, Colinas Del Norte

## **CAPSTONE PROJECT**

In RiverXchange, our goal is that students not only understand their local watershed but that they use their voice to advocate for conservation and proper management of our watershed in their community. This year we integrated the capstone projects to provide a fun and engaging opportunity for students to learn about and advocate for their watershed.

To provide a variety of opportunities for teachers to meet the capstone project requirements, teachers selected from 3 different capstone project levels, each with its own set of criteria. Each level is tied to a particular level of engagement achieved by each class's capstone project. The different levels are described below.

Level 1: In RiverXchange, we want students to be as aware of their local watershed as they are about other environmental issues like climate change. Through creating hands-on projects, students are able to demonstrate what they learn in a fun and tangible way.

- Criteria: Create something new that teaches others about what you learned

Level 2: RiverXchange was founded on the idea that learning is more powerful when students make meaningful connections between their local ecosystem and themselves and then communicate what they learn with others.

- Criteria: Create something new that teaches others about what you learned, Communicate what you learned with your community

Level 3: What sets RiverXchange Excellence projects apart from the others is that they have a stewardship component along with a communication component. We want to support and celebrate classrooms that take education outdoors and convert what they learn into a hands-on, community-based project.

- Criteria: Create something new that teaches others about what you learned, Communicate what you learned with your community, Design a stewardship project that includes aspects of conservation and sustainability in your local community

## **Engagement**

Of the teachers that completed the capstone, most projects addressed criteria 1&2, while only a few extended to criteria 3. Being that this was the first year of integrating capstone projects, staff understood the need to create a ladder system of capstone project engagement for the teachers and students. Having multiple levels of engagement facilitated various kinds of participation based on teacher and student interest and capacity- from presentations and posters to campus-wide clean ups. Some teachers used the capstone project to assess if students achieved the NM Stem Ready/Next Generation Science Standards. Students were engaged by the different capstone projects offered by their teachers, practicing skills in leadership, stewardship, and teamwork. One teacher expressed how the capstone project gave the students the chance to use their talents in new ways.

Beyond the impact to the students, the projects engaged the local community. When asked who in the community the class capstone project reached, teachers shared that often the entire 5th grade, students' families, or in some cases the whole school were reached during the course of the project. Students also expressed wanting to increase their reach to the greater public.

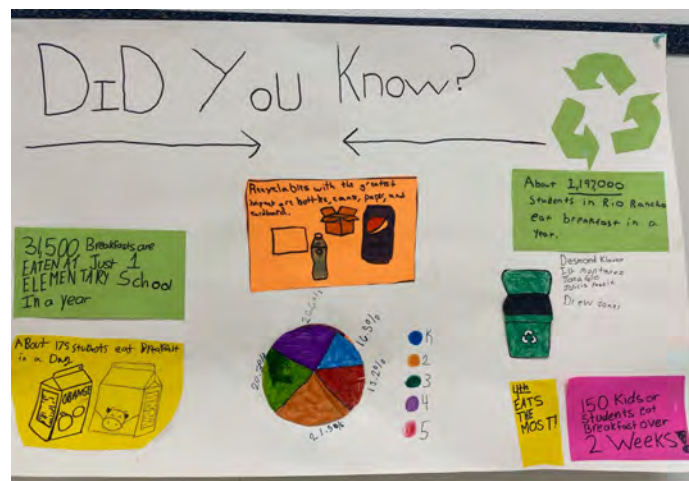
The challenging circumstances of virtual learning the last couple of years made it difficult for some teachers to complete the capstone project with their students. Some teachers expressed how their students had fallen behind in particular content areas and they weren't able to focus on the project due to the extra effort needed to bring students back to grade-level knowledge. One teacher requested additional support in designing and carrying out the capstone project.

Overall, the majority of teachers appreciated the hands-on and outdoor education focus of the capstone project criteria and felt their students gained meaningful experiences in the process.

### Capstone Project Images



**Campus Clean Up- Whole team, Cochiti Elementary**

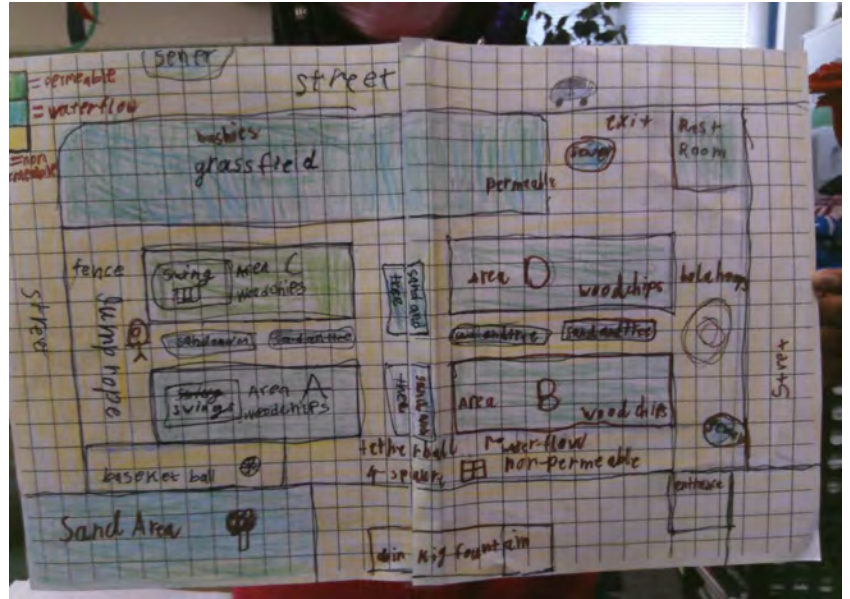


**Recycling Project and Posters- Schapekahm, MLK**





## Green City Design- Chacon, Zia



## Watershed mapping - Ackerman, La Mesa



**The Rio Grande Gazette,  
Whole team, Monte Vista**

### Plantings using recycled plastic bottles- Gold, La Mesa



## **STUDENT SURVEYS**

A key component of RiverXchange is its measurable goals relating to student performance. We collected quantitative data on student performance by way of a pre and post survey and qualitative data by observing the work submitted via the Capstone Projects. The survey includes questions that relate to environmental attitudes and behaviors as well as knowledge gained relating to our learning objectives.

### **Pre/Post Behavior Survey**

In order to quantify the learning outcomes achieved through RiverXchange, we ask our teachers to have their students fill out a survey prior to and upon completion of the program. Below, you will find a series of graphs used to illustrate the perfect change in responses between the pre and post surveys, as well as some breakout pie charts for further clarification on important topics. This year, 673 students completed the pre-survey, while 669 completed the post-survey. We continue to refine the survey and our programming year after year based on teacher feedback and metrics gathered from these surveys. To view this year's survey questions, use the following hyperlink: [RX 21-22 Survey](#).

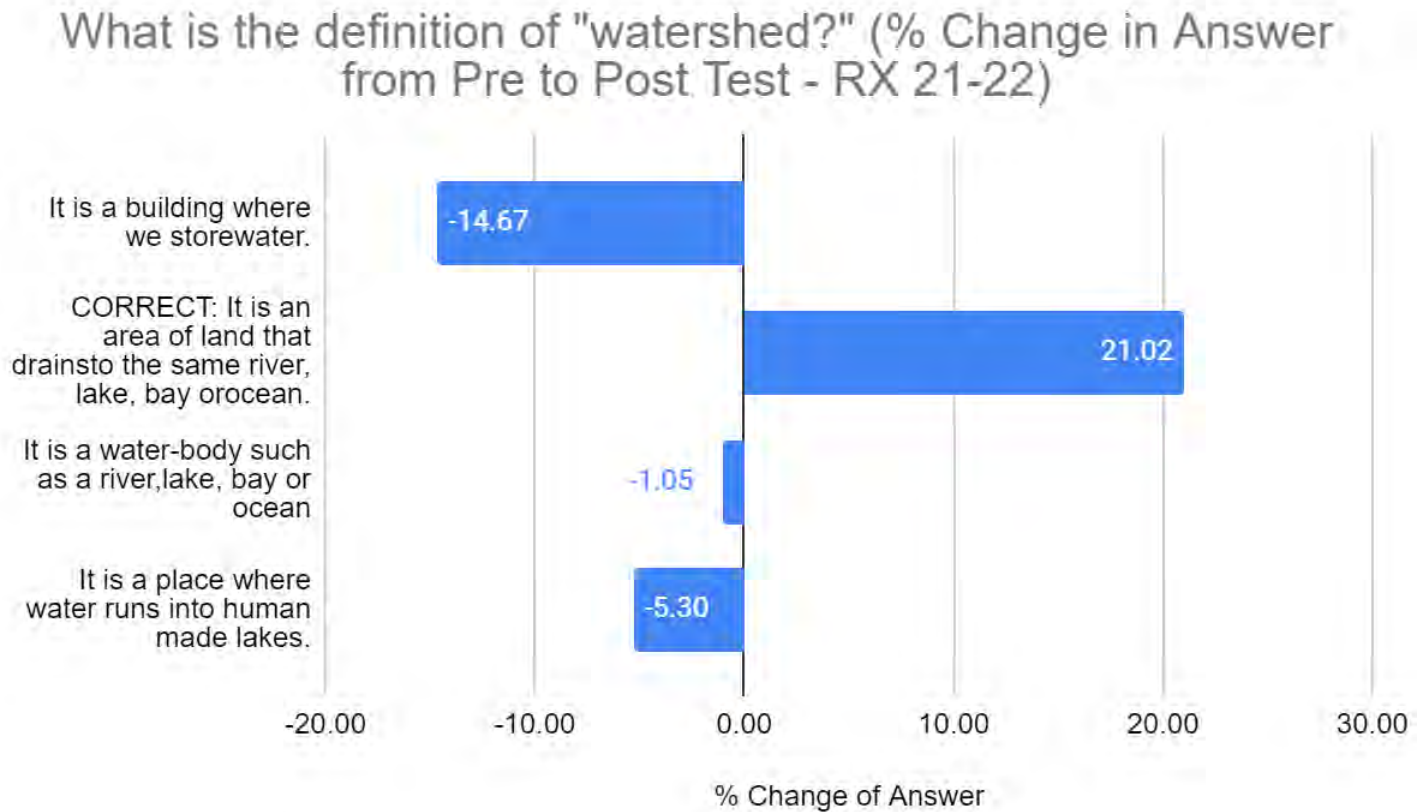
This year, we reframed the survey questions using a likert scale (with varying responses) with the hopes of demonstrating more range in growth across knowledge, attitudes and behaviors. In viewing other similar watershed program surveys, like the Watershed Project from the Bay Area in California, we hoped to look beyond our learning objectives and explore what kind of beliefs students had around water conservation behaviors. For example, in the question that asks how important/impactful are the following actions in protecting and conserving water, we were hoping to see increases from some or mild importance to high importance. Since the questions students had to respond to were all individual actions they could take, this movement to high importance, in theory, would demonstrate that they would feel more conviction to take those actions since they find them important and impactful.

As discussed with the MRGSQT general public survey, beyond collecting general knowledge about stormwater issues or watershed health, surveys can be educational tools as well. For example, asking students to select the positive water conservation behaviors they do “often” suggests that both these behaviors are important and desired. So even if students are answering how they think they should behave versus their action behaviors, this is still an effective tool to increase knowledge about behaviors that are positive for water conservation and watershed health.



## RiverXchange Percent Change Graphs for Pre-Post Surveys for 2021-2022

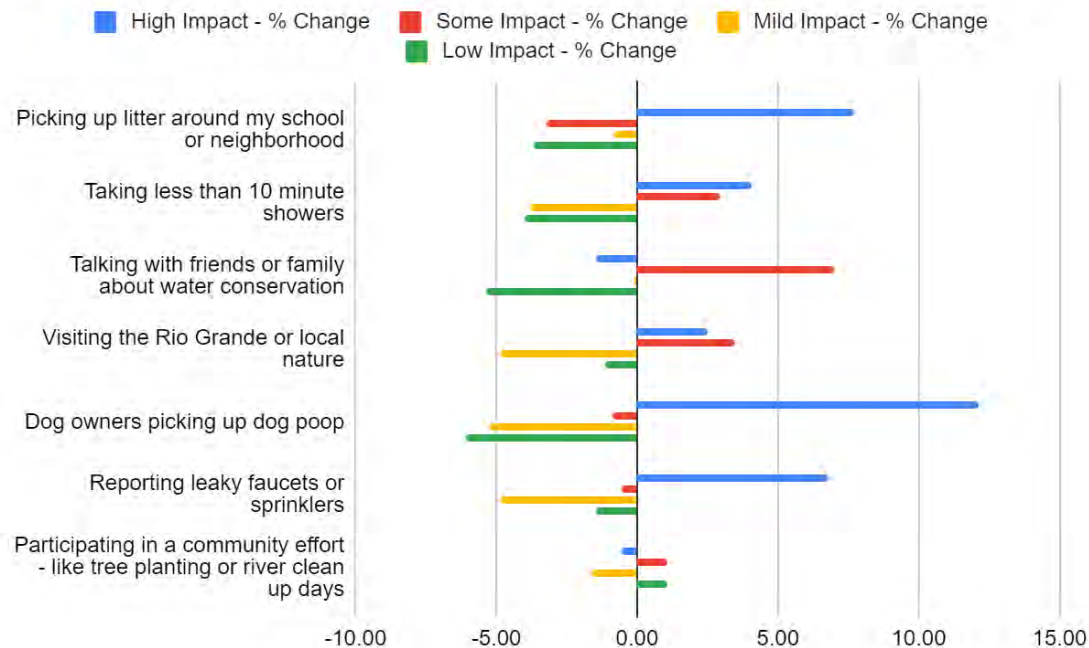
### Watershed Definition



**Results:** We see over a 20% increase of correct answers for a watershed.

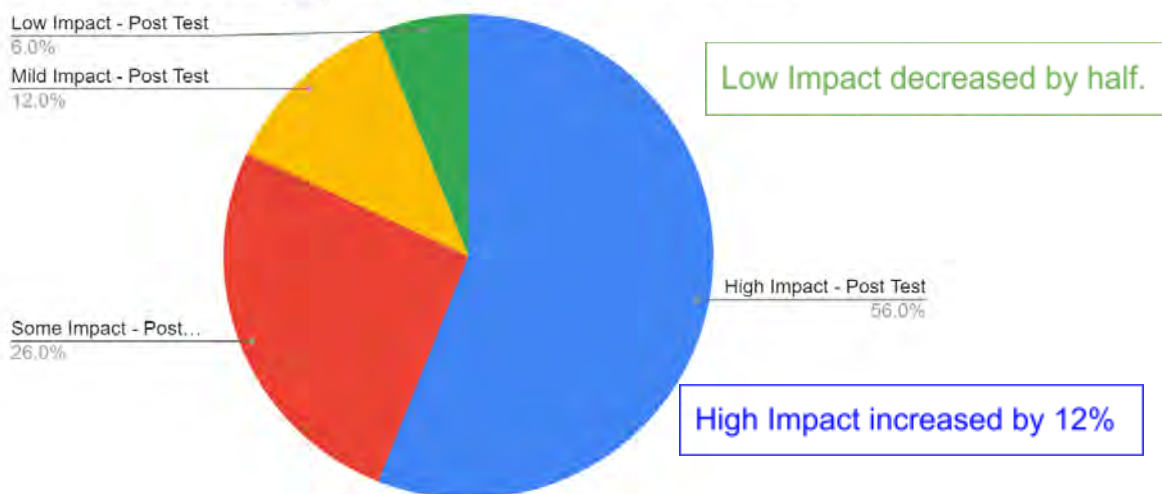
## RX Stormwater & Pollution

How important/impactful are the following actions in helping to conserve and protect our water (choose the level of importance/impact that applies for each statement): (RX 21-22)



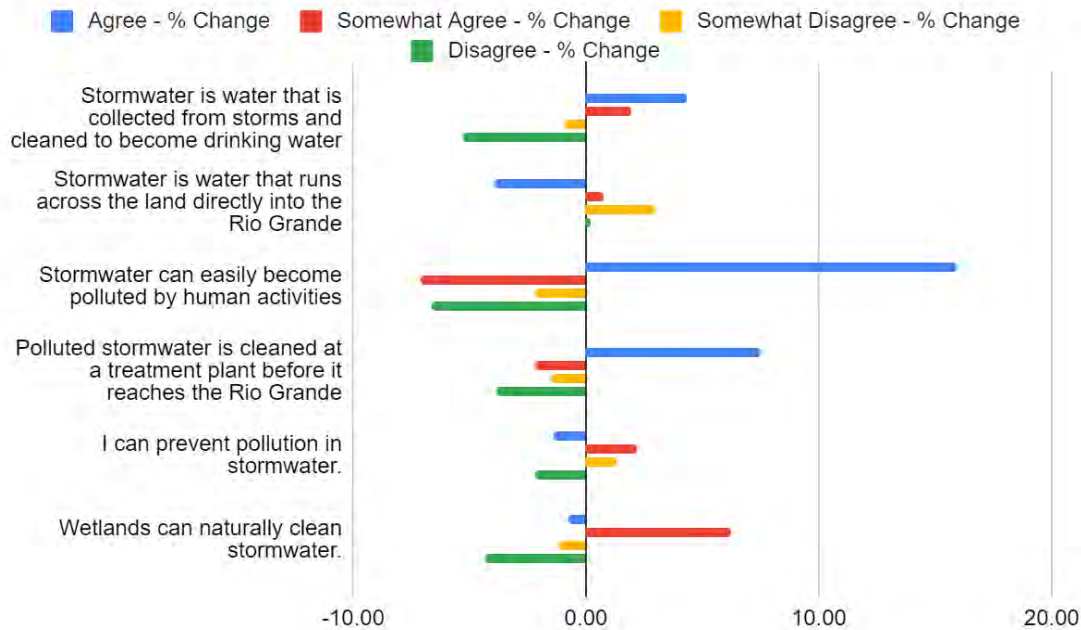
**Results:** Positive attitudes about picking up litter, taking shorter showers, picking up dog waste and reporting leaky faucets all increased after the program. There was also an increase in the belief that talking with friends and family can have some impact in water conservation. Breakout pie chart: In total over 90% of students believe picking up dog poop is impactful in helping protect water.

Dog owners picking up dog poop (Post-Test RX 21-22)





Please select whether you agree, somewhat agree, somewhat disagree or disagree with following statements about stormwater: (RX 21-22)



**Results:** Over the past few years, students seem to struggle with understanding the definition of Stormwater. However, more students agreed that stormwater can be polluted by human activities after the program and over 85% of students agree in total.

Stormwater can easily become polluted by human activities (RX 21-22)

Disagree - Post Test

3.7%

Somewhat Disagree - ...

11.7%

Somewhat Agree - Po...

21.9%

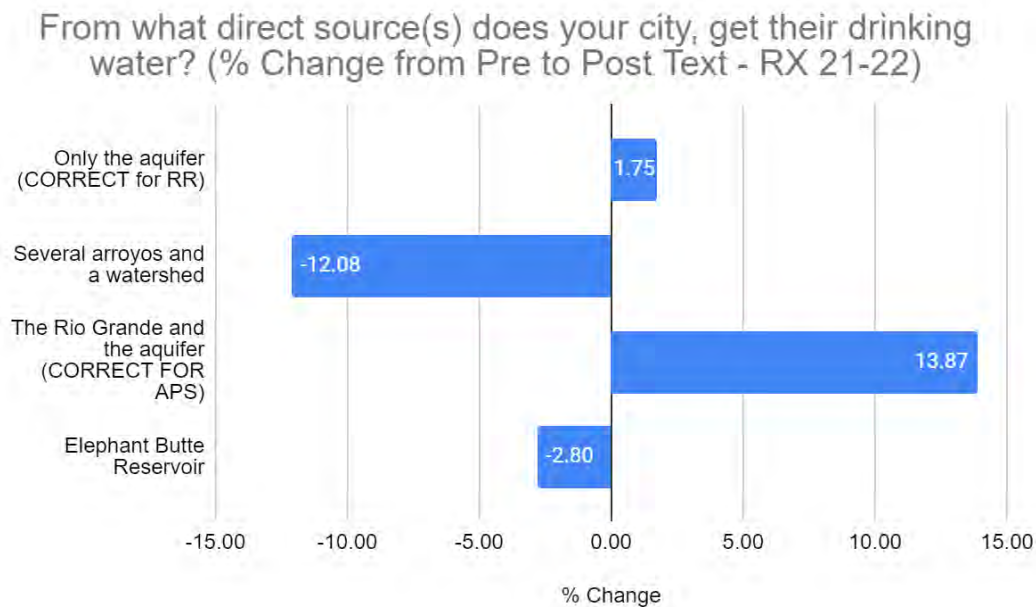
Agree - Post Test

62.7%

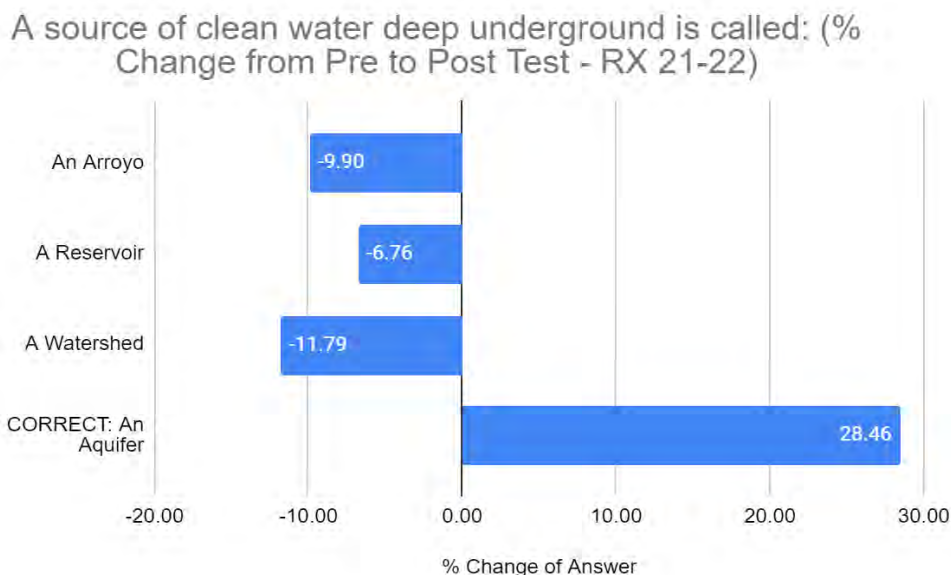
Overall, after Riverxchange 85% of students agree that stormwater can be polluted by human actions

"Agree" increased by 16%

### RX Watersource



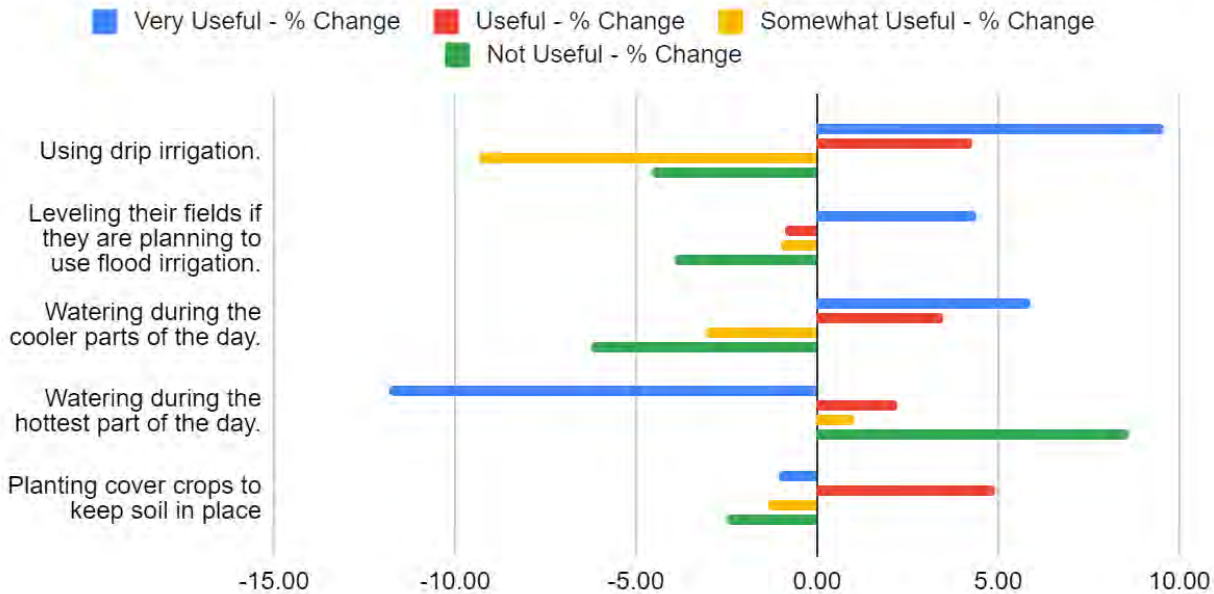
**Results:** In looking at the totals separate by school district, APS overwhelmingly answered the drinking water question correctly. RRPS did not do as well selecting only the aquifer, this could possibly be because this isn't reinforced as much as it is in APS with other programs like The Water Utility Authority Rio Field Trip, and could also be because this lesson was in a pre-recorded video format. However, over 75% of students correctly answered the definition of an aquifer, with a 28% increase post-program.





## RX Farmers

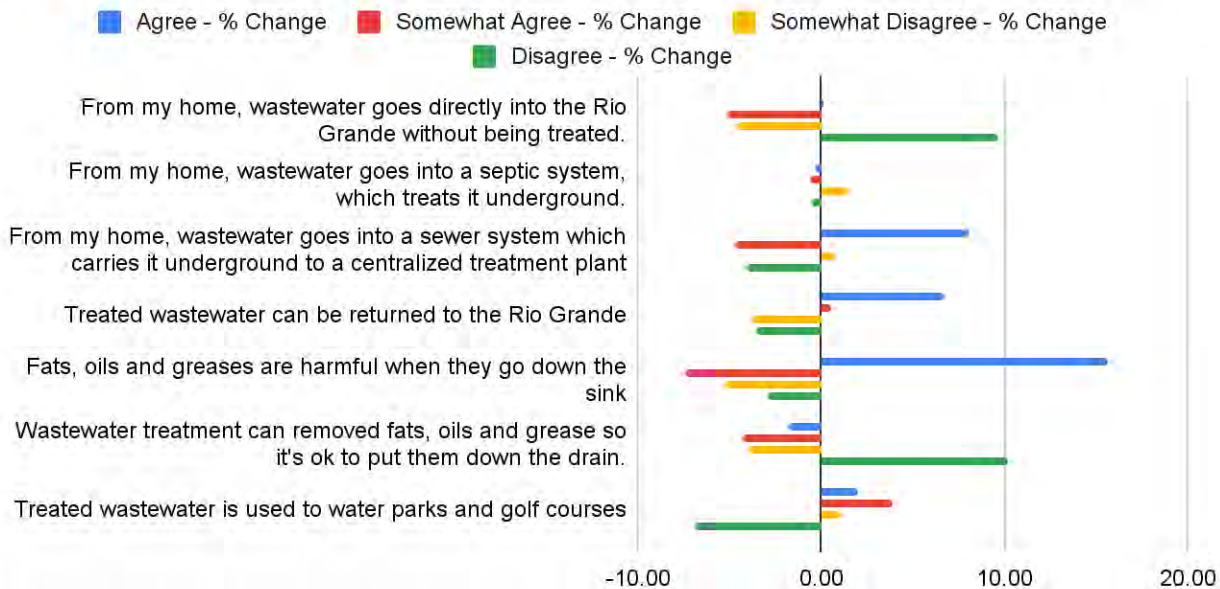
Please select which methods are very useful, useful, somewhat useful, or not useful for farmers to conserve water (RX 21-22)



**Results:** Generally speaking students demonstrate an increase in selecting water conservation strategies in agriculture as “very useful” or “useful” post-program. They also increased the choices of not useful and decreased their choice of highly useful for watering during the hottest part of the day. The agriculture presentations may have touched briefly on the use of cover crops for soil health as a water conservation topic, so while selections of “very useful” decreased, “useful” increased more students may have been considering the topic in the moment, relying on previous knowledge to answer that question.

## RX Wastewater

Select all if you agree, somewhat agree, somewhat disagree or disagree with the following statements about wastewater: (RX 21-22)

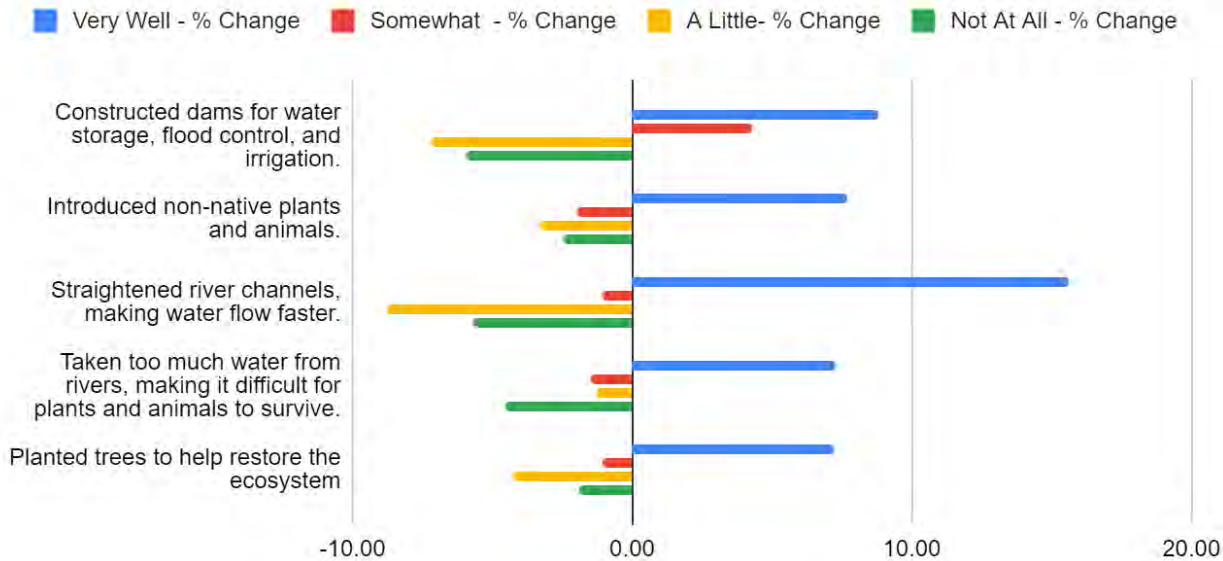


**Results:** Positive growth is demonstrated across all questions except the septic question which may just be confusing because it doesn't apply to every student.



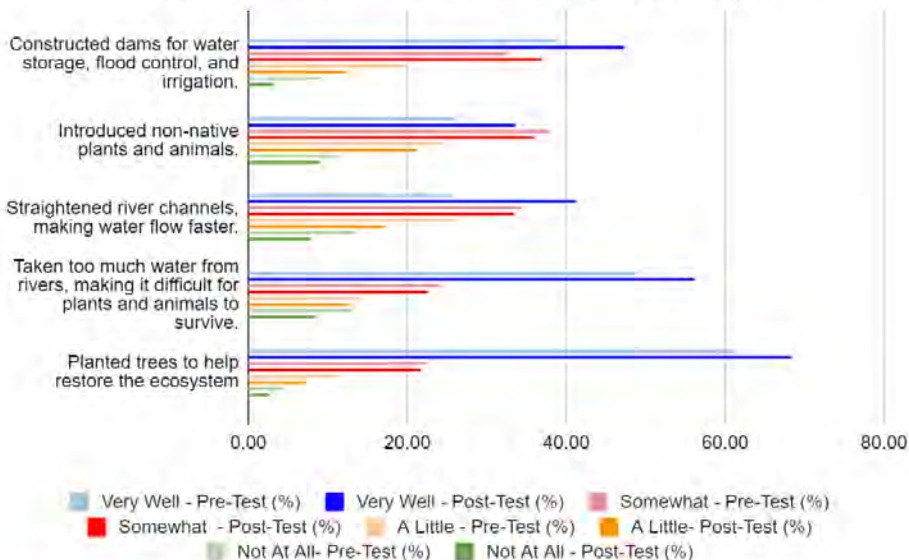
## RX Confidence

Humans have changed our local ecosystem quite a lot. Do you understand the impact of the following changes very well, somewhat, a little or not at all. (RX 21-22)

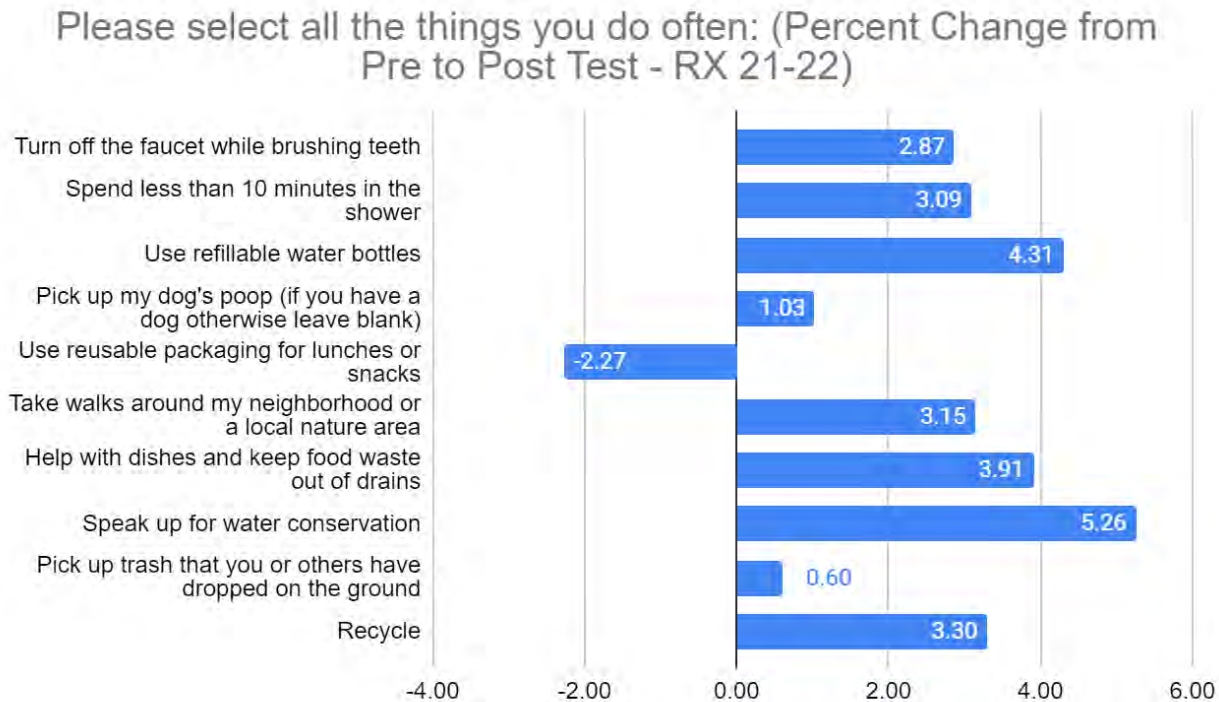


**Results:** The goal of this question was to determine student confidence in RiverXchange learning outcomes. When you look at the percentage of total responses below a lot of students seemed pretty confident that they understood these concepts before the program - which is great! It is also great that after the program in general students increased their confidence and decreased their lack of confidence across all topics. This demonstrates they found the program helpful in supporting their understanding of human impacts on our ecosystem.

Humans have changed our local ecosystem quite a lot. Do you understand the impact of the following changes very well, somewhat, a little or not at all. (RX 21-22)



## RX Behaviors



**Results:** Seeing around 5% change in behaviors from pre to post surveys has been consistent with past years findings. As a fifth grader you might not be changing your behaviors significantly due to family and community behaviors and culture. However, it is exciting to see that the largest percent change was in students speaking up more for water conservation. At this age, this has the potential to shift family and community behaviors more than other behaviors due to the rippling effects of more people taking other actions to conserve and protect water.

The decrease in using reusable packaging could be due to students' increased awareness of food packaging in the cafeteria or home packed lunches or an increased use of single use plastics due to covid concerns.



## Appendix A

### RiverXchange Virtual Field Trip 2021-2022

#### 1. What are we trying to teach students in this activity?

Essential questions:

- What is a floodplain and why is it important? (Rio Bravo)
- How has the Rio Grande floodplain been changed by humans? (Rio Manso)
- What efforts are being made to conserve the Rio Grande Floodplain? (Rio Nuevo)

#### 2. How can we tie this activity to our teaching goals:

Learning Objectives	Methods
The riparian ecosystem of the Rio Grande is shaped by natural flooding.	Observation and finding evidence of: <ul style="list-style-type: none"> <li>• riparian habitat - plants and animals that depend on the ecosystem.</li> <li>• the role of the Cottonwood tree as a keystone species and its dependence on flooding for its life cycle.</li> </ul>
Human impacts have reduced or eliminated flooding.	Observation and finding evidence of: <ul style="list-style-type: none"> <li>• Human impacts</li> <li>• Reduced flooding</li> </ul>
Conservation efforts are now being made to rehabilitate and strengthen the riparian ecosystem	<ul style="list-style-type: none"> <li>• What monitoring methods can be used to determine the health of the ecosystem?</li> <li>• What is being done to restore this ecosystem?</li> </ul>

#### 3. How can we tie this activity to standards?

Using the NGSS framework to explore **Phenomena** and support **Claims** based on **Evidence** and **Reasoning**.

Performance Expectations	DCIs
5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers and the environment	LS2.A Interdependent Relationships in Ecosystems
5-ESS2-1 Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	ESS2.A Earth Materials and Systems ESS2.C The Roles of Water in Earth's Surface Processes
5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment	ESS3.C Human Impacts on Earth Systems

#### 4. How should this lesson be organized?

## I. Introduction

- a. First, the presenters should introduce themselves by name, position, and organization.
- b. A presenter will take the students through the agenda.
  - i. Ask students what they have already done in class—this should be the Rio Bravo and Rio Manso activities. Today, we will be taking them through the timeline again, reviewing and demonstrating aspects of both models that are still present in the Bosque still today. Then, we will be introducing a new concept—Rio Nuevo and doing the model with the river as it is today!
- c. Pan the camera around, can students identify where we are? It is the Bosque!
  - i. Give the students a brief history of the Open Space Division and its connection to the Bosque and other public lands.
  - ii. Describe the importance of understanding and connection to the land. The land needs us just as much as we need it. Part of understanding the land is making observations and questioning the world around us. This will lead directly into the next activity “I notice, I wonder, it reminds me of”

## II. “I notice, I wonder, It reminds me of”

- a. This activity is meant to engage students' observational and thinking skills - to turn on their “nature” brains!
  - i. Let students know you will describe the activity first and then bring the camera to focus on a smaller, up-close frame of our object to be observed.
  - ii. Walk students through each prompt. Describe how these prompts relate to the scientific method (observation, questioning, hypothesis)
  - iii. I notice (the foundation of an observation): shape, size, texture, color, location, etc. These are simply what we see, without labeling their function or what we assume is the function. ) Ex: “I notice a long, thin shaped object that is bumpy, brown colored with small lines on it.”
  - iv. I wonder (the foundation of questioning): Take any statement that we think applies to our object and turn it into a question. “I wonder if something was eating this object that caused the lines? I wonder if this is a plant? I wonder if it is alive? I wonder if it is dormant?”
  - v. It reminds me of: (the foundation of a hypothesis): Making connections to what we already know or can remember helps us make an educated guess to answer our questions. For the purpose of this exercise, we are simply practicing making connections. “It reminds me of a spiral. It reminds me of the colors of sunsets in Albuquerque.”
  - vi. Complete the activity, prompting and modeling as you go.

## III. Rio Bravo

- a. Discussion: Students will have been taken through the Rio Bravo exercise. RX presenter will ask:



- i. Do you remember what Rio Bravo means?
- ii. How was the river shaped?
- iii. What did you place down in and around the river?
  1. Yes! You placed down animals and plants in and around the river. We can still find evidence of the wild river today even though it has changed. Can you name some of the plants or animals that you placed in the Rio Bravo?
- b. Activity: What evidence can we find of the Rio Bravo and ecosystem in the floodplain? (A floodplain is a riparian ecosystem so what we are looking for is evidence of a variety of plants and animals that depend on the river).
  - i. Plant #1 - Coyote Willow (walk around and “see” your first plant)
    1. “Look at this plant! Wow, it’s everywhere here in the Bosque. It’s here... over here... and even over there! (point camera.) Let’s get a closer look. It has long skinny leaves and smooth bark on the branches.
    2. What do you think it is? Vote with your card or write the name on a paper and hold it up.
    3. You’re right! It’s a coyote willow! The way you can tell is that it’s a shrub that always grows next to water, it’s short, and it has long skinny leaves. It’s one of the most common shrubs around water (riparian ecosystems) in New Mexico. Beavers LOVE to eat its branches, but it’s also eaten by porcupines, deer, and rabbits.
  - ii. Animal #1- Beaver (walk to an old beaver chew)
    1. “What do you think has been here?” It looks like something has used long incisors to chew horizontally through the bark. It is a beaver!
    2. Introduce the beaver skull and discuss other adaptations that beavers have that allow them to live in this riparian ecosystem.
      - a. Castor oil that they use to waterproof their fur
      - b. Ear flaps that close so they don’t get water in their ears
      - c. Extra eyelid to see underwater
    3. Could you live in a riparian ecosystem? What adaptations do you have?
    4. Coyote Willow is not the only plant that beavers will rely on!
  - iii. Plant #2- Cottonwood
    1. “If the porcupine is living and eating this tree, we should probably know what it is. Let’s look at the leaves and see if we can figure it out. The leaves aren’t on the tree right now because it’s winter, so let’s find one on the ground. (get leaf). Okay, here it is - it has a heart-shaped (or triangular shaped) leaf with a flat stem that’s also called a petiole. And if I look around, I see them everywhere in the Bosque. I can even see them on the other side of the river! (Span the Bosque then point camera to other side of river.)”
    2. “What do you think it is? Vote with your card or write the name on a paper and hold it up.”
    3. “You’re right! It’s a cottonwood. And not just any cottonwood, but a Rio Grande cottonwood. These trees are a very important species in the Bosque. They provide food for many animals, like the porcupine, beaver, deer, rabbits, and insects. Birds eat the insects that feed on the cottonwood. PLUS, many animals use them for their homes! Porcupines sleep in them, and so do great horned owls. Birds make their nest in them. Squirrels live in them. They are a

very important part of a healthy Bosque ecosystem. And the way you identify them is by looking for their heart shaped leaves.”

iv. Animal #2- Porcupine

1. Look up in the cottonwood tree: do you see anything there?
  - a. Option 1: I see a porcupine! It is just a small bundle of quills that is resting in the nook between two branches!
  - b. Option 2: I see a bunch of branches without bark on them. Who did that? It was a porcupine!
2. Porcupines live in the canopies of cottonwood trees because that is where their food is! Porcupines eat the same thing as beavers, which is the cambium, or inner layer, of the tree behind the bark. Beavers are chunky and unable to climb, so they cut down trees to get to their food, whereas porcupines are able to climb trees.
3. Can we find any evidence of porcupines on the ground?
  - a. Option 1: I found a track! This track has a bunch of texture on its paw pad. Do you have socks that have texture on the bottom? That helps you stick to the floor and not slide. I bet the texture on its paw pad will help it climb!
  - b. Option 2: I found some scat! How do I know that it came from the porcupine? It's located in the middle of the trail, which is right under a big branch of the cottonwood tree. We can also distinguish scat by its shape, size, and color!

c. Conclusion

- i. Even though the river might not be as wild as it used to be in Rio Bravo, we still have an interconnected system of animals and plants that still live here today! Let's investigate how humans have altered this system in our next section, Rio Manso.

IV. Rio Manso

- a. Discussion: Students will have been taken through the Rio Bravo exercise. RX presenter will ask:
  - i. Do you remember what Rio Manso means?
  - ii. How did humans alter this ecosystem?
    1. Yes! They used jetty jacks, added homes, dams, acequias, and invasive species.
  - iii. What happened to the river?
    1. Yes! The river was channelized and no longer was the braided, meandering river that we once knew.
- b. Activity: What evidence can we find of the Rio Manso in the Bosque today?
  - i. Plant #3- Ravennae grass. Ravennae grass is an invasive species that was brought to New Mexico from Africa as an ornamental and also for soil stabilization. Ravennae is drought tolerant, deer tolerant, and frost tolerant so it thrives in New Mexico. Although it doesn't allow other plants to thrive alongside it. It does such a good job, it outcompetes our native grasses.
    1. Can you name some ways in which invasive species can travel?



- a. Underneath boats/aircraft, hikers' shoes, bringing them on purpose (ornamental, biological control, soil stabilization)
  - b. So many more invasive species have made their way to the Middle Rio Grande, but most came on purpose. We just didn't know at the time how problematic they would be.
- ii. What happened in the Rio Manso activity that allowed for the invasive species to move in? Yes, they took away vegetation like the cottonwood trees and native shrubs to make room for the expanded population and their homes! Let's take a closer look at the cottonwood trees here.
  - 1. Cottonwood trees are a keystone species, which means this ecosystem largely depends on their existence and their removal would be catastrophic.
  - 2. To understand better how our cottonwood trees are doing I want to measure their height. Height in a cottonwood tree doesn't necessarily determine its age, but rather how many resources are available to it.
    - a. Explain to students how we use a tangent gauge in order to measure a tree's height. All staff to measure distance to a tree, have students guess the presenter's heights, and then have the students add the measurements to get a calculation.
    - b. Trees that are between 60-70 feet are full grown cottonwoods, but with limited resources. Those old cottonwoods that were close to the water will reach up to 90 feet tall! We can't determine if the whole forest has insufficient resources by just one tree. Let's measure the height of another!
      - i. Proceed with the same process with another nearby tree.
    - c. See how those two trees have a very similar height? Look around at the canopy, what do you notice about the height of all of these trees? Yes, they are mostly the same! We have a very uniform canopy in the Rio Grande Bosque. What resource do you think the trees are not getting enough of? Yes, water! Let's take a look at why these cottonwoods are not getting enough water.
- iii. Do you remember what the impact of jetty jacks, levees, and dams did to the Rio Grande in the Rio Manso activity? Yes! They channelized the river or made it straight.
  - 1. One reason that these cottonwood trees are not getting enough water anymore is because the river does not flood as it would have naturally done before construction.
  - 2. I need your help to run a little science experiment! I want to see whether a meandering river or a channelized river goes faster.
    - a. I want you to form a hypothesis, can you share what you predict will be the answer?
    - b. Now, I am going to run two different tests. One in which I will walk in a curved line and one in which I walk in a straight line, both the same length. When I say go, begin counting with [presenter #2]

- c. Was your hypothesis correct? The meandering river does run slower! When our river is allowed to meander in cycles slowly and then quickly throughout any given year, the outside to those curves it allows for sand to be deposited and then for cottonwood seedlings to grow. But without those sandbars and moist soil in the floodplain, what happens to our cottonwoods? The seeds cannot grow!

c. Conclusion

- i. Humans have fundamentally altered the Middle Rio Grande, but all it not lost! Humans have also begun to take measures to support a new relationship between our lives and the river. This next section, we have not discussed yet and it is called Rio Nuevo or new river.

V. Rio Nuevo

- a. In the last two models, we were describing what had happened in the past. Rio Nuevo is happening right now and you will ultimately be the ones that get to decide what our river looks like in the future. I want you to be the engineer for me. What would you do to restore the river and make it look more like Rio Bravo?
  - i. As the students submit their answers, we will go one by one and explain how that would alter the model. The model will have been already set up as Rio Manso prior to the field trip starting.
  - ii. Overbank flooding: during years with high winter snowpack there will be lots of water melting and flowing down into the watershed. Engineers could decide to allow for overbank flooding, which would give the Rio Grande cottonwood seedlings a chance to grow! It would also allow for a better cycling of nutrients so that native species have a better chance of competing with the invasive ones.
  - iii. Pole plantings: one way to counteract the decreasing number of cottonwoods is by cutting a long, young branch of an existing cottonwood tree and planting it directly into the ground so that it touches the water table. This branch will then grow roots and form its own, independent tree without the need to grow the trees from seeds.
  - iv. Wetland construction: land managers can create new ponds and wetlands that support the variety of wildlife that used to have a home in the Bosque. Some of these are created by allotting space, constructing the ditch with big machines, and providing water as has been done at the Open Space Visitor Center.
  - v. Fuel-wood reduction: in earlier years, the overbank flooding that would occur would saturate the branches and leaves that had fallen on the ground and allow them to decompose. It would also act as fire suppression. We now need to manually need to stop these fires because the Bosque is dry and has a lot of fuel. One way to stop these fires is by cleaning the area of downed trees and branches, reducing the fuel.
  - vi. Creation of secondary channel: the river used to have many channels as it flowed down the valley. In areas in which a bank may be too high, land managers can remove the excess bank and create a side channel that has enough flow to allow cottonwoods



- to germinate and establish themselves. Sediment from these banks can be replaced in the river to provide for sandbars, which is habitat for certain species (silvery minnow).
- vii. Removal of exotic species: Many different groups have taken to removing a number of invasive species such as saltcedar, Russian olive, Siberian elm, and others. The Open Space Division hosts spring cleanups every Saturday from April through mid-May in which families are welcomed to come out and help remove invasive species. This is something you can learn how to do!
  - viii. Water conservation: the amount of water that people use along the river has a large impact on the health of the Bosque and river life. Pumping more water than is being replenished each year has caused the water table to drop and has made it more difficult for native species to survive. Planting low-water use landscaping, installing rain barrels, low-flow toilets, turning off the water while brushing teeth, and taking shorter showers are things that we can do personally. We can also ask businesses and other entities to self-impose water-use limits so that we are all working together.
  - ix. Jetty Jack Removal: Today, the riverbanks and levees are quite stable. The jetty jacks are seen as a danger to emergency vehicles moving through fires, eye sores, and ultimately the channelization of the river does not benefit the Bosque. Land managers can try to remove the jetty jacks, although it is difficult to do given their size, weight, and difficult access.
  - x. Monitoring: an important part of managing the Bosque is to understand what is happening to the plants, animals, water table, and other ecological functions. Monitoring is the process of collecting, compiling, and analyzing that information. There are many organizations that will do monitoring throughout Albuquerque in order to ensure that what we do going forward will only benefit the Bosque. So many of our previous actions had unintended consequences and monitoring is one way of making sure that we do not repeat mistakes.

## VI. Conclusion

## **RiverXchange Virtual Field Trip Synopsis 2021-2022**

- I. Introduction (Ellie: 10 minutes)
- II. “I notice, I wonder, It reminds me of” (Erin: 10 minutes)
- III. Rio Bravo
  - a. Discussion: (Ellie)
  - b. Activity
    - i. Plant #1 - Coyote Willow (Ellie: 5-7 minutes)
    - ii. Animal #1- Beaver (Ellie: 5-7 minutes)
    - iii. Plant #2- Cottonwood (Erin: 5-7 minutes)
    - iv. Animal #2- Porcupine (Erin: 5-7 minutes)
  - c. Conclusion (Erin)
- IV. Rio Manso
  - a. Discussion (Ellie)
  - b. Activity:
    - i. Plant #3- Ravennae grass. (Ellie: 5-7 minutes)
    - ii. Plant #4- Cottonwood tree / Tangent gauge (Erin: 7-10 minutes)
    - iii. Model of river shape- (Erin: 5-7 minutes)
  - c. Conclusion (Ellie)
- V. Rio Nuevo (Ellie- 30 minutes)
- VI. Conclusion (Erin)





## Southern Sandoval County Arroyo Flood Control Authority



Poop fairy signage placed throughout SSCAFCA flood channels.

# Arroyo Classroom

## 2021-2022 final report

submitted by  
Erin Blaz, CSWCD  
June 2022

### SUMMARY

The Arroyo Classroom program utilizes our natural arroyos as outdoor classrooms and brings local animals into the classroom to motivate 3<sup>rd</sup> graders to respect the arroyos as important wildlife habitat. Orilla Consulting, LLC developed the program in 2012 and initially implemented the program for 7 classes at Maggie Cordova Elementary in Rio Rancho. In 2013, the program grew to serve 20 classes. On July 1<sup>st</sup>, 2015, Orilla Consulting, LLC transferred the program to Ciudad Soil and Water Conservation District as part of the larger education and outreach efforts we are involved in throughout Bernalillo and Sandoval Counties. In the 2021-2022 school year, we served 31 classes within Rio Rancho Public Schools, reaching approximately 32 teachers and 638 students. Funding was provided for 35 classes, however one school did not follow through on the registration process. Communication was made until December of 2021, but it was clear there were significant obstacles to getting the school onboard. Beyond that, Arroyo Classroom had a successful year and continued to bring important watershed education to local schools.

### Participating Schools

<b>SCHOOL</b> * Title 1 school	<b>Number of classes</b>	<b>Number of Students</b>
Enchanted Hills Elem.	5	122
Martin Luther King Elem.*	5	114
Sandia Vista Elem.	6	134
Maggie Cordova Elem.*	5	106
Puesta del Sol Elem.*	5	89
Colinas del Norte*	5	73
<b>TOTALS</b>	<b>31</b>	<b>638</b>



## **Sponsor**

- Southern Sandoval County Arroyo and Flood Control Authority (SSCAFCA)

**Sponsor provided a total of \$19,300.63 in cash.**

## **Deliverables:**

*All presentations were offered virtually or in-person and completed.*

- Watershed Presentations: 31:31
- Arroyo Walk: 30:31
- Bird Presentation: 31:31
- Reptile Presentations: 31:31

## **Program Description**

***Essential Questions:*** What is a watershed and how does water move across it? What important functions do arroyos provide for humans and other creatures? In what ways can we enjoy arroyos safely and learn new things?

- Students characterize arroyos as ecosystems as well as drains
- Students identify arroyo features that support wildlife
- Students describe the plants, animals, birds and insects that depend on the arroyo ecosystem
- Students explain the ways in which arroyos receive water and the dangers of arroyos
- Students recite the rules for arroyo safety

The program consists of a four-part series of lessons, based on grade-level science standards and addressing areas of interest to SSCAFCA, such as bats, burrowing owls, ATV use, pet waste, and arroyo safety. Erin Blaz delivered two of the lessons – an introductory lesson about watersheds, and either an in person arroyo walk or a virtual arroyo walk that tours an arroyo via Google Earth. Hawks Aloft, Inc. provided the virtual bird presentations as they were prepared to and experienced in delivering virtual presentations with live birds. All lessons were adapted for the virtual setting.

This year the virtual watershed lesson expounded on the water cycle and aimed for students to recognize how water moves across hard (impermeable) or soft (permeable) surfaces. Students made predictions about how water sprayed on a sponge and a stone tile (both at an angle) would move differently to represent the function of a watershed. Then we added more to the stone tile to elaborate on the built environment, including buildings, cars and dogs. Finally, we added “pollution” using similar materials to the enviroscape to create oil, dog poop, pesticide and construction waste. In summary, this lesson introduced the concept of a watershed to students, demonstrated how surface water becomes polluted through various human impacts, and discussed the importance of keeping our arroyos clean.

The virtual arroyo walk this year began with a google earth tour of an arroyo to observe its pathway through Rio Rancho, any visible human impacts and demonstrate the draining power of arroyos into the Rio Grande. We also observed tire tracks in the arroyos and talked about not using motorized vehicles in arroyos, as they are not permitted or allowed in the arroyos, and discussed the impacts of illegal use of arroyos. We observed where the mouth of the arroyo meets the Rio Grande and observed that there was not any kind of infrastructure to clean the water as it enters the river on this particular arroyo. All classrooms received a link to SSFAFCA's [Arroyo Safety video](#) as a follow-up to the final presentation.

The in-person Arroyo Walk was approved and completed with 17 total classes. This lesson is about the unique adaptations of arroyo animals and plants, incorporates a walk out to a nearby arroyo from the school and extensive discussion about arroyo safety. The walk starts with a safety discussion about the difference between concrete-lined channels and sandy-bottomed arroyos, and emphasizes that it is never safe to go into concrete-lined channels, while sandy-bottomed arroyos can be visited when there are no clouds in the sky. Students searched for evidence of animals living in the arroyo banks, learned about how lizards and other cold-blooded animals are adapted to the desert environment by moving about to regulate their temperature. They also looked for certain adaptations of desert plants to minimize water loss in the desert. This year, students were extremely excited to go on the walking field trip, as many schools only approved the field trips in spring. A few classes even had a gray fox sighting in a stand of Elms in a drainage area used for the walking field trip.



Top left- Gray fox in Elm spotted by students at Puerta del Sol. Middle top and bottom: Students from Puerta read thermometers to learn about reptile adaptations. Right top and bottom: Students from Colinas look for wildlife evidence on Arroyo.



## Evaluation

Teacher feedback for 2021-2022 was collected from 18 participating teachers. Teachers overwhelmingly say they choose to participate in Arroyo Classroom to teach about local ecology and conservation issues, incorporate more science in the classroom, to offer experiential learning opportunities and to offer learning opportunities that connect to the community. They find the presentations to be uniquely engaging and meaningful for their students, however, across the board, teachers requested for the return to in-person learning. Teachers find that Arroyo Classroom is complementary to other 3rd grade units of study such as life cycles and animal and plant adaptations. Teachers cite that the program is particularly helpful in achieving or developing the following skills: critical thinking and problem solving, communication, assessing and analyzing information, and curiosity/imagination.

### Highlights from teacher feedback:

#### What are the greatest learning outcomes for your class as participants in Arroyo Classroom?

- “That students can take what they learned and apply it to their daily lives.”
- “Students truly enjoy learning about their environment, animals and how to actively educate others.”
- “My class really seemed to learn the most about how the water system within Albuquerque worked.”
- “My class has become more aware of how humans can impact wildlife. They remember the animals we have learned about and are determined to keep the environment clean for them.”
- “They learned a lot about their local area from habitats for rivers to arroyos.”
- “Most of my students could share that the arroyos were important animal and plant habitats and that they had a responsibility to keep them clean, free of pollution and that it wasn't an area for off roading.”
- “My students are more aware of their environment and are more knowledgeable.”
- “They learn about arroyo safety and also about the local animals. They grow their understanding in conservation as well.”
- “That they learn about the environment around them and are more aware of how to take care of it.”
- “Students understand their place in protecting our arroyos.”
- “Learning about the environment in which my students live. Being able to take what they learn and see it around their houses and school.”

### Survey Summary

This is the third year that we've administered the pre and post surveys for Arroyo Classroom. Due to some changes in the program content for this year's virtual program, such as the availability of certain species and specimens offered by our presenters for their virtual presentations, we made some adjustments to the pre and post survey to reflect the content of the program. The survey questions were slightly more generalized and used a “check all the apply” format to address different learning

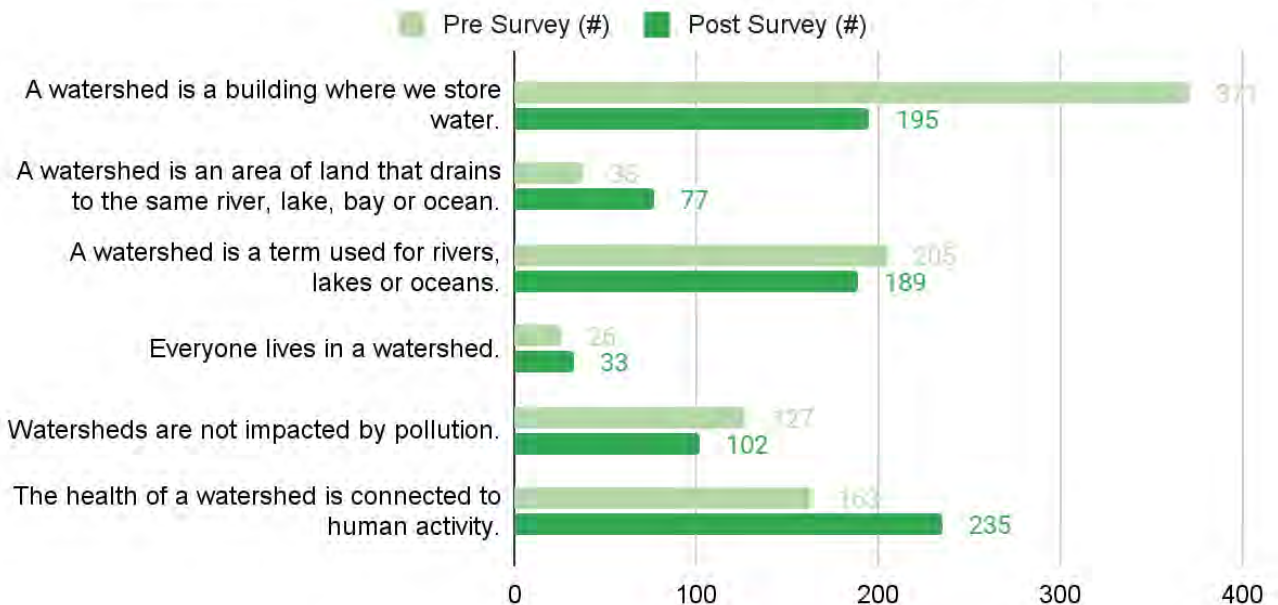
objectives.

This year we had 605 pre-survey responses and 492 post-survey responses. This we formatted the survey responses by total number of responses, rather than percentages.

## Survey Metrics:

### Item 1 Watersheds

#### Select all that is true about a Watershed. (AC 21-22)



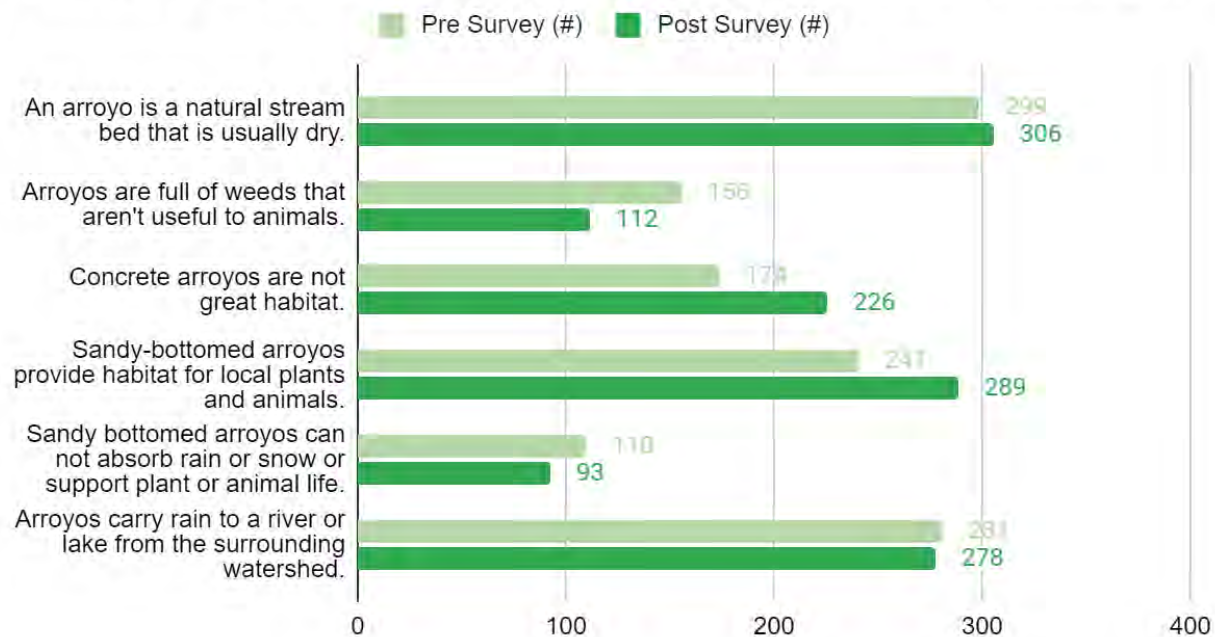
### Comments

This year we do see an increase in correctly defining a watershed (an area of land that drains to the same waterbody) and a decrease in the wrong answer (a building that stores water) but not a lot of students choose the correct definition of a watershed. More students seem to understand that watershed health is connected to human activity, with almost 50% of students choosing this response. This is an important success as ultimately we want them to see themselves as a part of the watershed and that their actions matter.



## Item 2 Arroyo Function and Environment

Select all that is true about the arroyo environment. (AC 21-22)

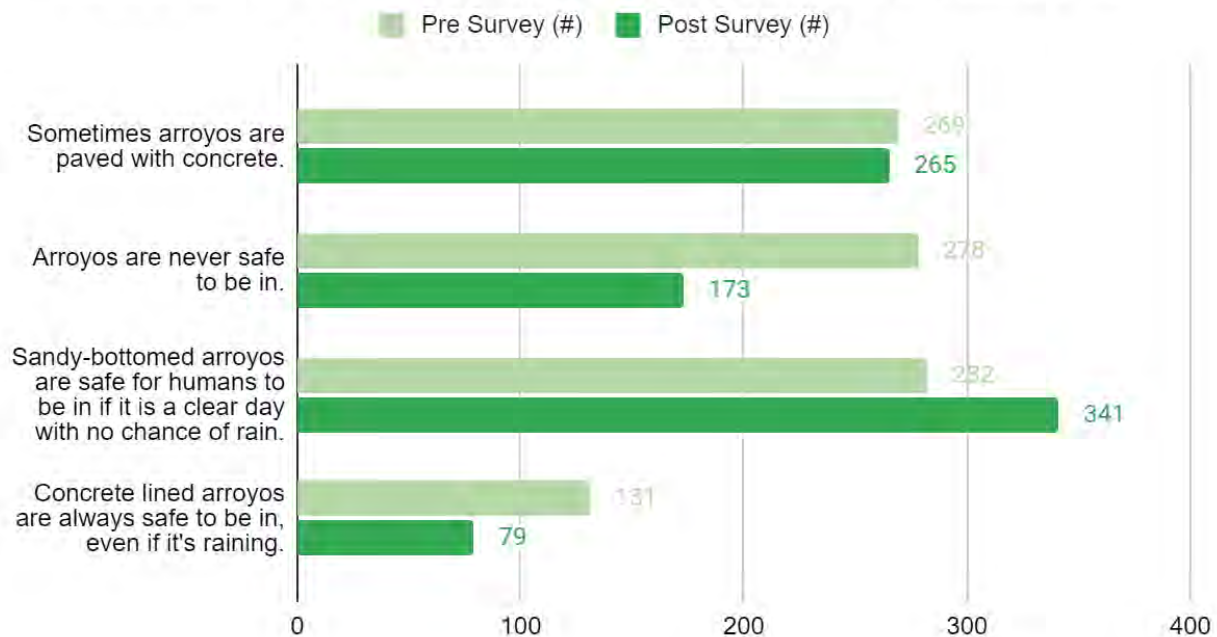


### Comments

Based on pre and post answers, it looks like the students already know what arroyos are or can easily assume based on “natural stream bed” and “carry rain” responses. There wasn’t much movement from pre to post test. However, with an increase in responses about habitat and concrete arroyos not being beneficial to animals, along with a decrease in the question about weeds, students did demonstrate more knowledge about arroyos post program.

### Item 3 Arroyo Safety

Select all that is true about arroyos and safety. (AC 21-22)



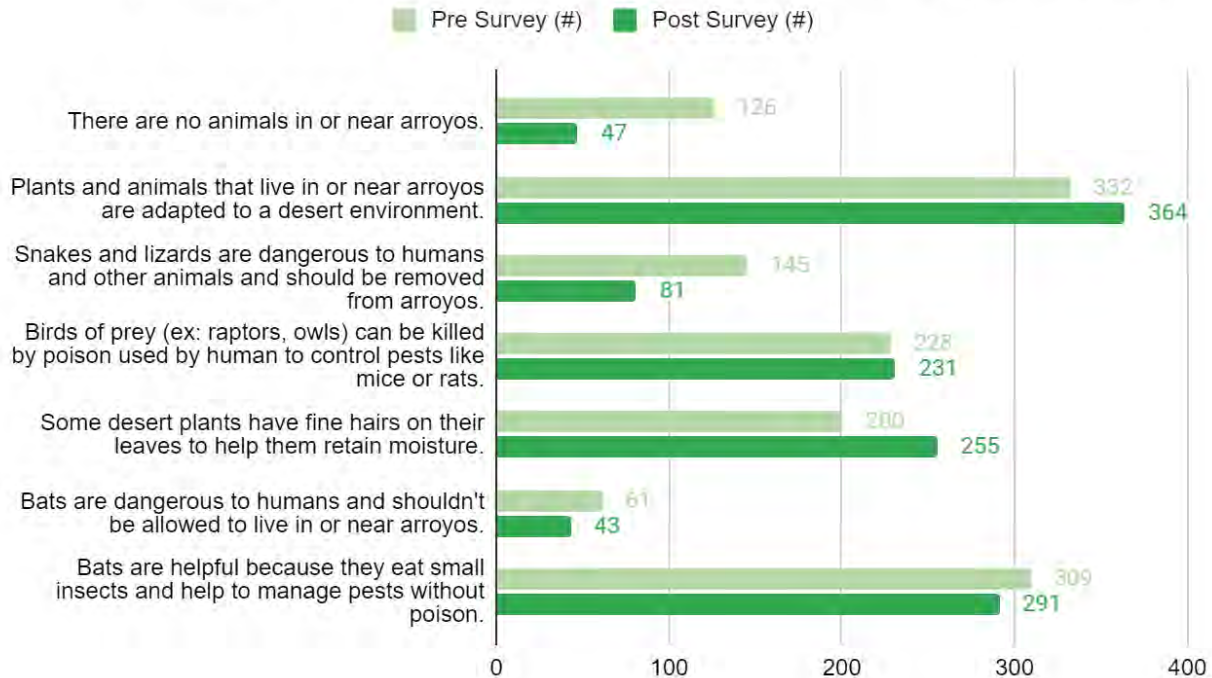
#### Comments

Positive outcomes of this graph are that more students understand the specifics of arroyo safety, demonstrated by a decrease in answers “arroyos are never safe” and an increase in “arroyos can be safe when there is no chance of rain.” However, cultural beliefs and folklore may continue the narrative that arroyos or ditches are never safe to be in, as La Llorona might come for you!



#### Item 4

Select all that is true about local plants and animals. (AC 21-22)

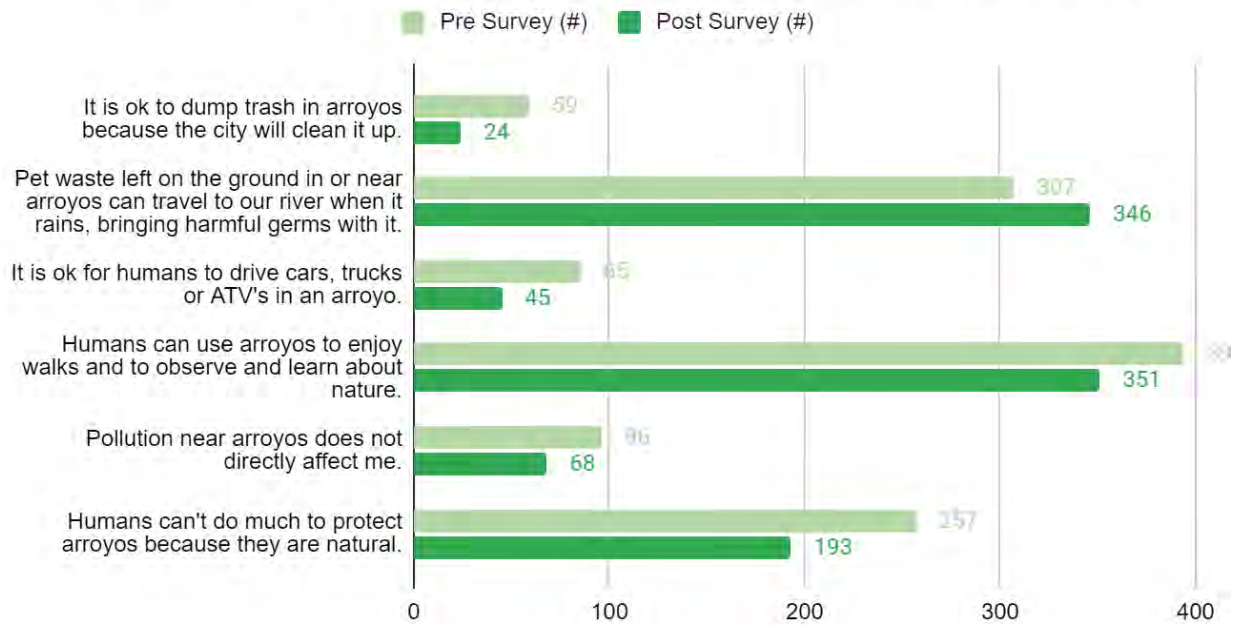


#### Comments

Generally positive outcomes are displayed from these results. Possibly since the 3rd grade curriculum covers adaptations and habitats students are already primed to answer correctly on the pre-survey.

## Item 5 Arroyos and Human Use

Select all that is true about arroyos and human use. (AC 21-22)



## Comments

Positive outcomes for this question sequence are that there was an increase in students answering more correctly about pet waste as a river contaminant.



## Appendix A

### Lesson Plans (Ciudad SWCD delivered lessons)

#### ***Activity Guide for 3<sup>rd</sup> Grade – Building a Watershed***

##### **1. What are we trying to teach students in this activity?**

A watershed is an area of land where all the water flows (or sheds) into a common body of water. We live in the Middle Rio Grande watershed. A natural watershed has many permeable surfaces that help to clean water. Human's build a lot of hard-scapes. As water moves downhill, it carries sediments and other materials to the river. Water is a precious resource and we can help improve the quality of the river by picking up after our pets and not littering or throwing trash on the ground.

##### **2. How can we tie this activity to our teaching goals:**

<b>Learning Objectives</b>	<b>Methods</b>
We all live in a watershed. A healthy watershed keeps water clean.	Using models to demonstrate: <ul style="list-style-type: none"><li>• elements of a “watershed” and how natural watersheds help to clean water and move water around.</li><li>• Humans have impacts on the watershed (i.e. Hardscapes, Pollution)</li></ul>
The amount of permeable and impermeable surfaces in an area impact the watershed.	We observe and make claims about: <ul style="list-style-type: none"><li>• What happens as water moves across “Hard” vs “Soft” surfaces</li><li>• The proportion of hard and soft surfaces around us.</li><li>• How this may impact our watershed.</li></ul>
Pollution increases in human environments. What we can do about it.	Using models we aim to demonstrate: <ul style="list-style-type: none"><li>• Water can be polluted in human areas and is harder to clean with impermeable surfaces. All this polluted water flows to the river.</li></ul> Through discussion we: <ul style="list-style-type: none"><li>• Talk about the importance of being responsible and how caring for the watershed in this way not only protects the water, but also helps the people and plants and animals that depend on the water as well.</li><li>• Picking up after our pets and minimizing our trash, and the trash on the ground helps keep our river clean</li></ul>

##### **3. How can we tie this activity to standards?**

<b>Performance Expectation</b>	
<b>5-ESS2 Earth's Systems</b>	<b>Disciplinary Core Ideas</b>

<b>3-ESS2-1</b> Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. <b>3-ESS2-2</b> Obtain and combine information to describe climates in different regions of the world.	<b>ESS2.C:</b> The roles of water in Earth's surface processes <b>ESS2.D:</b> Weather and climate
<b>5-ESS3 Earth and Human Activity</b>	
<b>3-ESS3-1</b> Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	<b>ESS3.A:</b> Natural resources <b>ESS3.B:</b> Natural hazards <b>ESS3.C:</b> Human impact on Earth systems

<b>What we do (Science and Engineering Practices)</b>	<b>How we think (Crosscutting Concepts)</b>
Developing and Using Models Analysing and Interpreting Data Using Mathematics and Computational Thinking Constructing Explanations Engaging in Argument from Evidence	Patterns Cause and Effect Scale, Proportion and Quantity Structure and Function Systems and Systems Models Stability and Change

#### 4. How should this activity be organized?

##### Supplies:

- Large Sponge
- Baking tray
- Filter model (2 liter bottle, upside down with cotton ball, sand, rocks, leaf litter)
- Spray bottle with colored water
- hard surface (flat piece of tile, stone, concrete)
- Slideshow

**I. Introduction (5 minutes):** Hi everyone, I'm ----- and I'm here from a program called **Arroyo Classroom** - a program where you get to learn about your local environment. We are going to learn about your local environment and what you can do to protect and conserve it (Define conservation). You can ask what kids do to help the environment as an ice-breaker.

### **Open Presentation**

**1. Ask if they know what an Arroyo is. Picture on 1st slide.**

An **Arroyo** is a dry stream bed. We don't get a lot of rain here, but water can flow here when it rains. Arroyos flow to the Rio Grande. Arroyo's are a part of the watershed, but we will define that shortly.

**2. First, let's get a discussion going:**

- How many of you used water before you came to school? How did you use it? Where do you think all this water comes from?
- Where do you get your water? How is it cleaned? (Rio Rancho = Aquifer)
- Can we all agree it is important to have clean water for all (including plants and animals)?

### **II. What is a Watershed? What role does it play in the water cycle? (20 min)**

Part A: (5 minutes) We are going to learn about how the land around us helps to clean water.

**1. Review the Water Cycle - precipitation, evaporation, condensation (water cycle dance video)**

- **Important to remember water can't be created or destroyed. We are drinking the same water dinosaurs used. We have to keep what we have clean.**

Part B: (5 minutes)

**2. Introduce the Watershed**

- **What is Watershed video**
- Anywhere water falls on land is a watershed. What isn't absorbed will continue to run or shed downhill until it collects in a body of water. A watershed is an area of land that drains to the same body of water.
- Watershed has different names based on the body of water water ends up in. We live in the **Middle Rio Grande Watershed**. Write down the name of our watershed.

### **STOP PRESENTATION**

Part C: (10 minutes)

**3. Natural Watershed Helps to Clean Water. Ask students, before each demo what they think will happen and why? What evidence or prior experiences inform them?**

- Absorbs- permeable surfaces (spray water on sponge)



- Moves and Collects Water- (saturation of sponge) Arroyos, Wetlands, Rivers
  - Wetlands attract water loving plants that help filter and clean the water
- What happens to water that soaks in the ground- Filter demonstration - connect it to the aquifer.

**Learning Objective: Permeable surfaces are important for filtering and cleaning water, and slowing it down.**

- **Human impacts** - less natural features in watersheds, more impermeable surfaces, density of pollution
  - Demonstrate water sprayed on hard surface
  - Water doesn't absorb and it moves faster.

4. Compare water in a concrete arroyo and sand-bottomed arroyo, which moves faster?

**Learning Objective:** Concrete Arroyos are never safe. Sandy bottomed arroyos are ok to go in if no chance of rain.

**III. Activity: What is the proportion of permeable to impermeable surfaces outside our home or school? (10 minutes)**

1. **Observe outside** - look at the ground. How much is covered by surfaces that can absorb water like soil, sand, dirt, grass, small rocks, etc. How much is covered by hard surfaces- pavement (driveways, streets, etc). Talk about compacted soils.
2. **Guess the percentage of hard vs soft based on observations.** Students create their own pie chart- labeled Hard and Soft.
3. **What claims can we make about our watershed? What evidence supports our claims**

**IV. What's In the Water?**

*(10 minutes)*

1. **Discuss pollutants. Discuss what happens to polluted water.**

*Experiment with how "pollutants" might travel through their watersheds.*

- What is pollution?
- What forms of pollution exist in our city? Discuss each pollutant:
  - Plastic
  - Factories
  - Motor Oil (suggest a tray under or cat litter to clean it up)
  - Fertilizers (use recommended amount) - eutrophication
  - Herbicides or Pesticides (use recommended amount)
  - Dog Waste
  - Construction Erosion/Sediment

**Learning Objective: With more hard surfaces** - water moves faster, picks up pollutants and heads to Rio Grande without being cleaned.

## **V. Conclusion (10min)**

- What do you think this means for our watershed - the Middle Rio Grande?

*The water we drink comes from our watershed. Animals and plants also depend on this water. That's why it's important that we try not to pollute either the water or the land. Anything that pollutes the land will eventually wind up in the water.*

- What might be ways we could reduce pollution in our watershed?

*By picking up trash and picking up dog poop if we have dogs.*

## **Activity Guide for 3<sup>rd</sup> Grade – Virtual Arroyo Walk**

### **1. What are we trying to teach students in this activity?**

Arroyos function as an important flood control measure and are essential landforms in the upland desert of Rio Rancho. Arroyos are also habitat to plants that have specific adaptations for living in a desert environment that experiences infrequent flooding. We can protect arroyos as habitat and take care of them so they help with flood control.

### **2. How can we tie this activity to our teaching goals:**

<b>Learning Objectives (Students will be able to:)</b>	<b>Methods</b>
Describe arroyos function as flood control.	Using visual models (google earth and drone fly-overs) to demonstrate: <ul style="list-style-type: none"><li>• Arroyos are caused by water flows from precipitation.</li><li>• Arroyos are dry when there is no precipitation.</li><li>• Arroyos lead to a larger water source- the Rio Grande</li></ul>
Describe who arroyos are habitat for.	Using their experience from previous Arroyo Classroom presentations: <ul style="list-style-type: none"><li>• Student recall animals that live in or near arroyos</li></ul> Using models of different climates: <ul style="list-style-type: none"><li>• Students can state plant needs in an arid climate</li></ul>
Desert plants have adaptations that allow them to survive in a climate with a great temperature range, high solar impact and little precipitation. Name a local plant species	Using models we aim to demonstrate: <ul style="list-style-type: none"><li>• Various plant adaptations such as deep vs wide roots, small leaves, fine hairs and spines.</li></ul> Through discussion we: <ul style="list-style-type: none"><li>• Explore how plants can survive in the desert climate, unique traits of cactus, name a specific native plant- Four Wing Saltbush and some ways to identify and find it.</li></ul>

### **3. How can we tie this activity to standards?**

<b>Performance Expectation</b>	
<b>5-ESS2 Earth's Systems</b>	<b>Disciplinary Core Ideas</b>
<b>3-ESS2-1</b> Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. <b>3-ESS2-2</b> Obtain and combine information to describe climates in different regions of the	<b>ESS2.C:</b> The roles of water in Earth's surface processes <b>ESS2.D:</b> Weather and climate



world.	
<b>5-ESS3 Earth and Human Activity</b>	
<b>3-ESS3-1</b> Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	<b>ESS3.A:</b> Natural resources <b>ESS3.B:</b> Natural hazards <b>ESS3.C:</b> Human impact on Earth systems

<b>What we do (Science and Engineering Practices)</b>	<b>How we think (Crosscutting Concepts)</b>
Developing and Using Models Analysing and Interpreting Data Using Mathematics and Computational Thinking Constructing Explanations Engaging in Argument from Evidence	Patterns Cause and Effect Scale, Proportion and Quantity Structure and Function Systems and Systems Models Stability and Change

#### 4. How should this activity be organized?

##### Materials:

- [Google Earth maps slideshow](#) of arroyo in Rio Rancho
- [Native Plant and Desert Adaptation slideshow](#)

I. **Introduction:** This is our final presentation for Arroyo Classroom. Today we are going to learn more about the geography of arroyos and native plants that live in arroyos. Icebreaker: What have you learned so far?

##### II. Google Earth Arroyo Tour

- Introduce map and landmarks (Albuquerque, Rio Rancho, Sandia Mountains, Have students recall the name of our river)
- Review Watershed: discuss where the water flows to from different points in the land, begin to draw attention to arroyos on the map.
- Upper Watershed: Discuss how the arroyos are converging from smaller arroyos, note the area around the arroyo has roads but isn't developed yet. Remind students how

important our voices can be to help share what we've learned in Arroyo Classroom so everyone who lives here and might eventually live here can do their part in caring for our environment.

- D. Middle Watershed: Point out that there is more housing, development and hard (impermeable) surfaces at this point in the watershed. Bring their attention to the tire tracks in the arroyo.
  - What are these tracks from?
  - What might the impact be from driving motorized vehicles in the arroyos?
  - Share that it is illegal and why. Discuss other options for those kinds of activities where it is legal.
- E. Lower Watershed: Show the mouth of the arroyo meeting the Rio Grande
  - Ask: Do you see anything in place that would remove garbage?
  - Poll students: 1. Who has seen trash in an arroyo? 2. Who has seen trash larger than a television or microwave? 3. Who has seen trash larger than a couch?
  - What can we do to help keep our arroyos clean and safe for all?

### **III. Adaptations of native and drought-tolerant plants**

- A. Introduce desert plants, share some fun facts about Yucca - state flower, edible roots - yucca fries.
- B. Compare climates - show side-by-side of a tropical climate (dense vegetation, cloudy, waterfall) vs. arid climate (sparse vegetation, sunny, no water). Talk about how plant's needs are different in these climates.
- C. Plant Adaptations
  - i. Dormancy
  - ii. Root systems (tap root or surface)
  - iii. Small leaves
  - iv. Fine hairs on plants
- D. Cactus
  - i. True or False Game
  - ii. Why do Cacti have spines video
  - iii. Photosynthesis and stomata
- E. Four Wing Saltbush
  - i. Adaptations and traditional uses of fourwing saltbush.

# Arroyo Classroom Scavenger Hunt



**Draw or describe each finding**, such as size, color, shapes, texture, smells, location and more. You can even write questions you have about what you found! Please respect the wildlife and take an adult. Good luck!

☐ Wild animals tracks

☐ A plant without leaves

☐ A rock that feels warm or cold

☐ Cactus

☐ A plant with a color other than brown or green. What color?

☐ A wild animal on the ground

☐ A narrow leaf on a plant

☐ A hole in the ground made by an animal

☐ A bird in the sky

Arroyo Classroom 2020-2021



## Appendix B Supplemental Materials

### -SSCAFCA Activity Book and Educational Videos:



### -SSCAFCA handouts:



## Did you know?



SSCAFCA protects our community from flooding and erosion caused by big rain storms, and works to keep **stormwater** clean. Stormwater flows down **arroyos** into the **Rio Grande**.

Bugs like to live in **stagnant water** that collects in ponds and low places in the arroyos. Insects like mosquitoes can carry diseases that make us sick.

Brought to you by:

Almost all U.S. bats feed exclusively on bugs, and 1 bat can eat between 600 and 1,000 mosquitoes and other insect pests in just one hour. One bat can eat its own weight in insects in a single night!

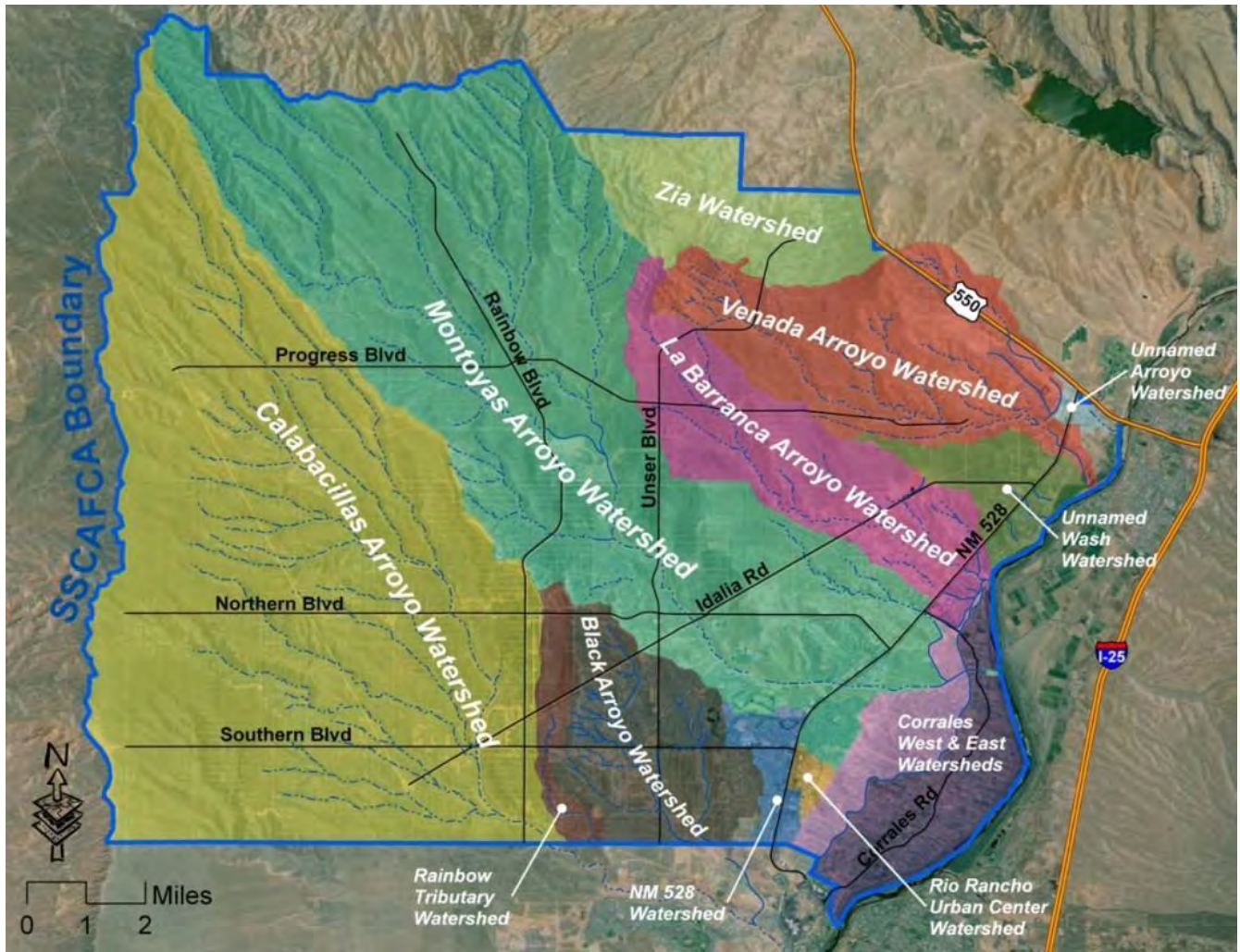
**SSCAFCA**

SSCAFCA provides **bat houses** to encourage bats to make their homes near our arroyos, and especially near **detention ponds** where stormwater runoff is captured and allowed to slowly drain.



The more we help bats, the more pests they eat, so we don't have to spray pesticide that could wash down to the Rio Grande and **pollute** it.

## SSCAFCA watershed map:



Arroyo Safety Video:





Water Authority distributed educational bill stuffers, ran radio ads and television advertising.



See the Water Authority television advertising at <https://youtu.be/AJojsyJfnK4>.





# Town of Bernalillo

"The City of Coronado"

Stormwater tips are printed and distributed in the town's water bills throughout the year.  
This includes 3,500 copies each month.



Town of

## BERNALILLO

SEPTEMBER 2022

"The City of Coronado"

MAYOR  
JACK TORRES

COUNCILMEMBERS  
DALE PRAIRIE  
SHARON TORRES-QUIJANA  
PHILLIP VALVERDE  
VINCENT MONTOYA

Town of Bernalillo Recreation Department Presents:

### BERNALILLO YOUTH

#### BASKETBALL PROGRAM 2022-2023

Registration begins Monday, September 12, 2022  
Last Day to Register: Friday, September 30, 2022  
PROGRAM OPEN TO BOYS & GIRLS AGES 5-13 YEARS OLD  
Participants must be 5 years old by October 1, 2022.

Participants turning 14 before  
January 1, 2023 will not be eligible.  
PREVIOUS BASKETBALL EXPERIENCE IS NOT REQUIRED.  
No late registration applicants will be accepted.

#### PROGRAM FEES:

\$60.00 per participant (Due at Registration)

#### SEASON DURATION:

10 game regular season

#### DIVISIONS:

Peewee Division - Ages 5 & 6  
Junior Division - Ages 7 & 8  
Minor Division - Ages 9 & 10  
Senior Division - Ages 11-13

#### Register at:

THE TOWN OF BERNALILLO  
RECREATION CENTER  
370 Rotary Park Road  
Call for more information:  
(505) 771-2078 or  
(505) 771-1262



Town of Bernalillo's Annual

### SCHOOL SUPPLY DRIVE

Accepting school supply donations for the young students of Bernalillo. Supplies are given to students at La Escuelita, Carroll Elementary, and Bernalillo Elementary.

Drop off supplies at Town Hall.

ALL BRAND NEW SUPPLIES SUCH AS: BACKPACKS, COLORED PENCILS, CRAYONS, MARKERS, PAPER, GLUE STICKS, AND SO MUCH MORE IS NEEDED! CALL 867-3311 FOR MORE INFO

### BERNALILLO KIDS COAT DRIVE

We are collecting new coats for the youth of Bernalillo. Please drop off donations at Town Hall now through November 18<sup>th</sup>

All child sizes are needed! If your child needs a coat, please contact 867-3311 or stop by Town Hall at 829 Camino del Pueblo, Monday-Friday, 8am-5pm.

SHARE THE WARMTH!



### -NOTICE - ROAD RUNNER WASTE - TRASH SERVICE FEE INCREASE

There will be a service fee increase of for trash services for each resident in the Town.

This is due to fee increase in several areas:

- Cost of fuel per gallon
- Disposal at landfill
- Disposal for recyclables

The new price for residential cart fee is \$18.42.

**THIS WILL GO INTO EFFECT ON SEPTEMBER 1, 2022 & WILL BE REFLECTED IN THE BILL PROVIDED IN OCTOBER 2022.**



### YOU MIGHT SEE A CREDIT ON YOUR WATER BILL!

The Town's Utility Billing Department has been hard at work auditing our history files and making sure our customers are being charged correctly on their billing statements. This audit process has indicated that *some* customers will be receiving a credit to their account. If you are one of the customers who will receive a water credit, you will see that reflected beginning in the statement for this month! The Utility Billing Department will not be issuing checks or cash for these credits, we will be applying them directly to the account - which is why your bill may be a little lower than you expected. Any further inquiries about this can be made in writing to [joshua.lujan@tobnm.gov](mailto:joshua.lujan@tobnm.gov), you must include your utility billing account number, name, contact information, and inquiry request. Disclaimer: not every utility billing customer will be receiving this credit.

### KEEP IT CLEAN BERNALILLO

Did you know that fats, oils and grease are draining our drains and sewers? Avoid pouring FOG (Fats, Oil, Grease) down the drain!

Fats, Oils, and Grease are bad for the community. When FOG is washed down pipes, it sticks and hardens. Water in the sewer slows down and starts to produce a foul odor. The FOG can block up the entire pipe, causing sewer backups which are dangerous and cost you a lot of money. Follow these simple steps:

- Pour all greasy/oily waste from pots/pans/fryers into a grease waste container (like a recycled coffee tin can).
- Scrape all food wastes into the trash
- Clean spills with towels and absorbent materials, then throw into trash
- Get on a schedule for regular grease cleaning.

Fats, Oils, and Grease (FOG) can:

- Congeal in underground pipes, cause blockages, and possibly damages pipes and cause sewage to contaminate the area.

For more info contact Public Works Department at 505-771-4832





Middle Rio Grande Stormwater Quality Team  
Final Report prepared by the Bosque Ecosystem  
Monitoring Program

JULY 30, 2022



## 1.1 COMPREHENSIVE OVERVIEW

Historically, culturally, ecologically - the Rio Grande is the heart of our region and the primary resource by which New Mexico's young people familiarize themselves with water. Utilizing its ecosystem as "classroom", BEMP's stormwater science outreach education program aims to teach young people how the health of the Rio Grande is directly related to the health of the surrounding watershed and how they can be stewards in helping to keep the Rio "Grand".

To this end, **7,840 students** throughout Bernalillo and Sandoval counties connected with their local watershed through participation in BEMP activities throughout the 2021-2022 school year. 845 contacts of this total were engaged through purely stormwater science specific lessons.

Due to ongoing pandemic restrictions in the 2021-22 school year, our curriculum shifted to virtual and physical formats to make our activities more equitable and accessible, including adaptations to our stormwater science curriculum to best fit the ongoing COVID-19 scenario. However, as in-person programming became more possible in the 2021-22 school year, in-person visitation to school campuses and the bosque once again became a successful venue for stormwater science education.

In consideration of the implications of COVID-19 on our communities, BEMP's stormwater science program featured synchronous and asynchronous learning resources, as well as in-person programming opportunities. Synchronous resources are remote, live, lessons that include stormwater science concepts and/or projects. Asynchronous curricular components are self-led, virtual lessons that represent a version of the regular stormwater science class and 1-page summer activities; BEMP currently offers five different, 30-minute asynchronous lessons.

Throughout the pandemic, BEMP has continued to support students with accessible, equitable education, including community disseminated educational materials that are actively featured on BEMP's website and social media platforms (See sections 2.2 and 3.0 of this document for more

detailed information). Successful adaptation of BEMP annual events into virtual formats was again necessary to ensure the safety of its participants (Luquillo-Sevilleta Virtual Symposium and Crawford Symposium; see section 2.3). All activities and materials, virtual and printable, are available in English and Spanish to better support inclusion and accessibility to STEM resources for New Mexico's diverse communities.

### 1.1.1 *Delivery of BEMP Annual Report*

The Bosque Ecosystem Monitoring Program (BEMP) mailed out the BEMP 2021 Annual Report on June 11, 2022. This provides a comprehensive overview of the work done during the performance period up through December 31, 2021. The key sections of that report for MRGSQT include:

Pg. 60            Total outreach numbers and list of schools served

Pg. 61            Community Events and Student Presentation Outreach

## 2

### 2.1 STORMWATER SCIENCE EDUCATION AND CURRICULUM

#### 2.1.1 *In-person and synchronous learning.*

#### **3,117 students served**

In response to the COVID-19 pandemic, BEMP education continues to pivot to better support the diverse needs of New Mexico's students, teachers and families by offering a multi-level educational pathway to engage with BEMP programming.

For students able to access the field, classes returned to monthly monitoring whereby lessons were taught in data collection procedures, phenological changes, and stewardship initiatives. Additionally, lessons focused on the geographical origins of the Rio Grande and our local drinking water, watershed

dynamics, and the stability of the Rio Grande's water composition throughout the year. Water input fluctuation was discussed in relation to pollution impacts and other bioindicators of watershed health.

For students who were restricted in ability to leave campus, listening to the needs of its audiences, BEMP education re-envisioned in-person classroom sessions to in-person, outdoor lessons on students' campuses. This was done in conjunction with remote lessons that leverage learning and connection within a student's own place-based residence. For example, for students unable to attend monthly data collections onsite in the bosque, a modified version was established to engage students in precipitation, litterfall and arthropod data collections on their own school campuses. Via exposure to data collection in their own neighborhoods, students gain first hand scientific experience while broadening their awareness of the ecosystem all around them rather than as something distant. Other curriculum development examples include a modified stormwater science activity for elementary ages to invent an arthropod while highlighting the connectivity of macroinvertebrate communities to water health, and an asynchronous series analyzing multiple years of groundwater monitoring data in the Rio Grande Valley to discuss the relationship of resource depletion and potential pollution influences.

Additionally, through this multi-level pathway, stormwater science curriculum was offered during the 2021-22 school year paired as an in-person school visit alongside a remote classroom lesson series. Students engaging in these lessons investigate how storms impact river health by looking at a watershed model, varying community sizes, and the pollutants each one produces. Students then utilize data analysis and data visualization components to learn about permeable and impermeable surfaces to better understand how storms impact the overall water quality of the Rio Grande. Through a cumulative in-person activity, students test water quality samples and macroinvertebrate populations hands-on while learning about environmental justice and water health in downstream communities.

Previous in-person lessons that were re-envisioned to become remote, multi-part, synchronous lessons (Exploring the Outdoors and Bosque Data Jam) remained a success. Both lessons focus on water quality and storm impacts, phenological observation, ecosystem monitoring, climate change, scientific processes, graphing and data analysis, encouraging a deeper understanding of nature in students' backyards while developing career-based skills in the sciences, public-speaking and presentation delivery. As in previous years, at the end of their educational process, students come up with a creative piece to represent the results of their scientific projects that are then presented at one or both of our annual events, BEMP Crawford Symposium (April-May) and/or the Luquillo-Sevilleta Virtual Symposium (April-May - presentations in Spanish). This year, College Career High School focused their research



projects on water quality/storm impact topics where students collected and analyzed their own data as a way to better understand first hand the impacts of storms in their own neighborhoods. Through their projects, students broadened community awareness about this topic with the hope of empowering future generations to make a more positive impact.

Throughout the 2021-2022 school year, BEMP served 3,117 students in 32 different schools and community organizations within Bernalillo and Sandoval counties through these lessons.

Funds that would have covered partial costs for some BEMP educational outreach events (Student Congress or Otter Day) were reallocated for the development and execution of new educational resources, printing and other materials, additional translation efforts to support accessible and equitable education, and staff time in order to continue to support the stormwater science program.

### *2.1.2 Asynchronous learning.*

#### **4,209 students served, 88,973 indirect interactions**

Asynchronous curricular components continue to be designed to meet the diverse needs of students and teachers that otherwise cannot interact with BEMP directly due to timing, scheduling, or pandemic restrictions. As self-led, virtual or printable lessons, BEMP's asynchronous lessons cover a broader array of water quality concepts through various means.

Throughout the 2021-2022 school year, BEMP served 4,209 students within Bernalillo and Sandoval counties through these lessons.

*Virtual Lessons* **233 students** This year, BEMP educators have been expanding on previous remote stormwater science lessons to include groundwater datasets, including what it is, how it is measured and why it is important. Through use of an aquifer model, students look at several years of data to discuss the relationship between groundwater and river health. Additional lesson concepts include watershed model before and after storm events, environmental justice in downstream communities and stewardship components. These lessons are remote, multi-part, asynchronous lessons offered through Edpuzzle, an interactive video lesson platform.

*Self-directed Printable Activities* **3,976 downloads** BEMP has been creating and distributing self-led, printable activities to help students and their families become engaged outside and explore their yards, neighborhoods and public lands while also collecting their own data. Subject examples include stormwater pollution sources and watershed health via the observation of trash accumulation. All activities created have been translated in both English and Spanish and have been uploaded to our website for increased accessibility. Educational resources can be found [here](#).

*Social media* **88,403 interactions** In maintaining initiatives to make educational materials more accessible to members of our community, BEMP has increased its presence on social media channels and continues to grow. Every day of the week, BEMP staff highlight ecological findings, time in the field, educational activities, and resources from partners. Stormwater science related concepts are consistently presented in Water Wednesday posts including topics such as educational resources from RiverXchange, evidence of water pollution and its effect on wildlife, aquatic invertebrate populations and water health, and stewardship opportunities to reduce impacts on water quality and consumption habits. All materials are provided in English and Spanish.

*YouTube channel activity videos* **570 views** BEMP's YouTube channel contains videos of our events as well as instructional videos that supplement activities to help guide students through their lessons. Those videos can be found on our YouTube channel, [BEMP \(Bosque Ecosystem Monitoring Program\)](#).

### 2.1.3 Events

#### **281 students served**

Providing the community with an opportunity to learn how important student-collected data are for informing the management of our urban riparian system, BEMP's annual community events were successfully adapted for another year to include both virtual and in-person components. Featuring a culmination of student presentations that relied heavily on student collected data and employed their professional development and presentation skills, both the Luquillo-Sevilleta Virtual Symposium and Crawford Symposium were a success in emphasizing the importance of water quality and Stormwater Science concepts.

Additionally, BEMP participated in several other community events and educational festivals to spread community awareness of watershed health, monitoring efforts, and inspire stewardship therein. Some examples include participation in Environmental Justice Week with Valle De Oro, tabling events at Jefferson Middle School, and Valencia Soil and Water Conservation District's Earth Day Science Fiesta.

#### *2.1.4 Watershed Education Collaboration Group*

Ongoing collaboration with the Ciudad Soil and Water Conservation District and the Valencia Soil and Water Conservation District as part of the Watershed Education Collaborative Group continues. Mutual collaboration rests on the goal of increasing student awareness about water, watersheds and other related components (historical, present and future) related to stormwater in New Mexico.

Of particular note, two separate activities were developed to support student learning throughout Outdoor Learning Week 2021, Environmental Justice Day with Valle De Oro, and Valencia Soil and Water Conservation District's Earth Day Science Fiesta. These lessons encouraged students' awareness of the water cycle, emphasizing the journey of raindrops and the various point and nonpoint pollution sources encountered on their way to the river. Students also participated in a scavenger hunt to become familiar with stormwater control structures, evidence of erosion, and potential sources of water waste.

Moving forward, we would like to continue building a K-12+ water curriculum that scaffolds student learning about stormwater and water related concepts by age group. In utilizing our partnership, we will collectively discern where each of our organizations educational programming best fit within student's experience and build from those strengths while attending to any gaps in student learning we discover. Our collective aim is to offer continuous exposure to stormwater and water quality subjects throughout each grade level while improving New Mexican youth's accessibility to these subjects.

#### *2.1.5 Assessment tool - IRB update*

This addresses section 2.1.10 in previous reports: Assessment tool of overall effectiveness. BEMP continues to pursue IRB certification so as to officially assess our educational programming and its effectiveness amongst student populations. It is currently being edited to more narrowly refine



questions asked of participants and will again be submitted for review by the IRB governing board; we anticipate its successful acceptance.

# 3

## 3.1 OUTREACH NUMBERS

### 3.1.1 Table(s) of Educational and Indirect outreach numbers for FY 21-22

#### Education and Curriculum

	<b>Synchronous</b>	<b>Asynchronous</b>		<b>Events</b>	<b>Total</b>
		<b>Virtual Lessons</b>	<b>1-page Activities</b>		
Students	3,117	233	3,976	281	<b>7,607</b>
Adults**	859	N/A	N/A	83	<b>942**</b>
Total (Including Adult Contacts)	3,976	233	3,976	364	<b>8,549**</b>

\*\* Adult contacts not included in total contacts reported

#### Social Media

	<b>Reaches</b>	<b>Engagements</b>	<b>Views</b>	<b>Total</b>
Instagram	43,697	7,574	N/A	51,271
Facebook	33,925	3,207	N/A	37,132
Youtube	N/A	N/A	570	570
Total	77,622	10,781	570	<b>88,973</b>



Albuquerque Metropolitan Arroyo Flood Control Authority

# Middle Rio Grande Watershed-Based MS4 Permit General Permit Requirements

## Special Conditions

- Compliance with water quality standards ([Download PDF](#))
- Discharges to impaired waters with and without TMDLs ([Download PDF](#))

## Monitoring and Assessment

### SWMP Minimum Control Measures

- Construction site stormwater runoff control ([Download PDF](#))
- Post-construction stormwater management in new development and redevelopment ([Download PDF](#))
- Illicit discharges and improper disposal ([Download PDF](#))
- Control of floatables discharges ([Download PDF](#))
- Public education and outreach ([Download PDF](#))
- Public involvement and participation ([Download PDF](#))

# Watershed Stewards

## 2021-2022 Final Report

Submitted by  
Erin Blaz, Ciudad SWCD  
June 2022

### SUMMARY

The overall intent of this program is to educate the public on the all-encompassing importance of watershed health, SSCAFCA's role in local watershed management, and to encourage personal commitment to watershed stewardship. This year's program focused on delivering watershed stewards in partnership with activity coordinators at the Meadowlark Senior Center in Rio Rancho and Del Webb Alegria Community in Bernalillo. The program consisted of lecture-style presentations and field trips to local open spaces and other sites of interest, and also included an outreach activity for Pollinator Day at Meadowlark Senior Center in the spring.

The program required funding in the amount of \$10,249.05 generated \$599.00 in-kind match, and reached 135 senior citizens, significantly more than our original target of 25 seniors. A few of the participants returned for multiple events. There were 17 presentations/field trips that lasted from 1-2 hours for participants, reaching beyond our target of offering 25 hours of program this year.

### 2021-2022 Themes and Locations

The theme of this year's fall program centered on Green Stormwater Infrastructure (GSI) and included educational presentations and field trips that were specific and relevant to the concepts of GSI and the role of GSI in watershed health. The theme of spring's program was "Walks and Talks" which focused on local wildlife, native and medicinal plants, and brought participants to Arroyo and Riparian areas located within Rio Rancho Open Spaces. All presentations were able to integrate and connect watershed stewards learning objectives to the content, such as stormwater pollution prevention and local habitat protection.

We also offered two events at the Rio Rancho WaterWise Garden, which is an excellent demonstration space for a range of topics. In the fall, the Master Gardeners gave a tour of the garden with a focus on water conservation, plant selection for drought tolerance with a preference on native species and green stormwater infrastructure. In addition to the tour, Sandoval County presented the Rolling River, and discussed the importance of residential and municipal GSI in watershed health. In the spring, Dara Saville of the Yerba Mansa Project completed a very well received talk and tour at the Waterwise garden about native and medicinal plants.

In addition to our normal programming, we also celebrated pollinators at the Meadowlark with a talk about honey bees and a presentation by ABQ Backyard Refuge. During this time we also made bee hotels with participants and passerby's out front of Meadowlark.



## **Building Partnerships**

This year we increased partner support from Sandoval County Master Gardeners and Cooperative Extension office, Dyane Sonier of City of Rio Rancho Parks, Recreation and Community Services and Dave Gatterman of SSCAFCA, which generated some in-kind match to support the program. Discussions with Dyane Sonier focused on taking a reciprocal approach to engaging the local community in areas where our different programs align. There was hope to invite watershed stewards to help plant the new pollinator garden at the WaterWise Garden, but timing did not allow for this event to include Watershed Steward participants this fiscal year.

## **Stewardship Opportunities**

One of the goals of the Watershed Stewards Program is to encourage personal commitment to watershed stewardship, and while the presentations and field trips offered build knowledge around stewardship strategies, program staff continue to seek out ways to engage our participants in hands-on projects that support watershed health.

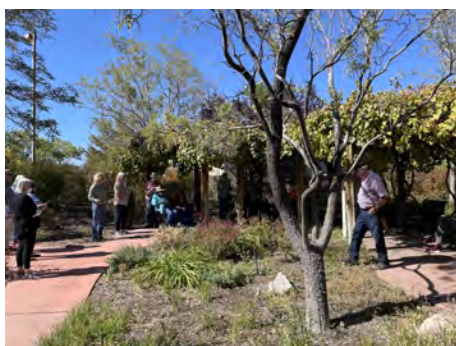
This year one participant was interested in applying some GSI techniques to an erosion problem behind his house. Dave Gatterman and Erin Blaz met with this participant and Mr. Gatterman was even able to get City of Rio Rancho approval to apply some mitigation and restoration strategies. This was an exciting opportunity to engage participants in a project, however during the process of planning the city applied an erosion treatment to the hillside and it was determined best to wait and see the results of that effort.

During the pollinator day, we also hosted ABQ Backyard Refuge at Del Webb Alegria. This was a very interesting and fruitful conversation. 11 community members participated from Alegria and discussed the need for support in some of their open spaces within the Del Webb development. There was high interest in creating wildlife refuges in these spaces, but they cited challenges within their own HOA and community perceptions - like a desire for lawns and manicured spaces.

## **Evaluation**

Considering we were able to bring in-person programming back safely to this community after a year of virtual programming due to the pandemic, this year's program reached a larger than expected audience and offered more hours of program than anticipated. However, there are certainly ways to improve. Watershed Stewards will benefit from continued support or partnership with other local entities in Rio Rancho and Town of Bernalillo so that we can collectively reach more people with a wider range of content. Watershed Stewards would also benefit from tracking participant contacts across all programs by Ciudad to be able to maintain correspondence, build community around action and stewardship, and survey folks to increase our understanding of our audience and impacts. In response to this FY22 funding was used to purchase a tablet that can be used in the field to track participant signs-in and survey participants. Additionally, finding ways that are of interest and well-suited to the senior community to engage with hands-on projects will need to continue through relationship and rapport building within the community and local partners.

## **Program Pictures**





Prior page: WWG program with tour and rolling river. Top this page: Mikal Deese with a local bird. 2nd row: Justin shows bats & scat comparisons. 3rd row: Justin does Bosque and Arroyo Habitat walks. Bottom row: Dara Saville at WWG and Bee Hive for Pollinator Day.

