VILLAGE OF LOS RANCHOS DE ALBUQUERQUE, NEW MEXICO

2019 STORMWATER MANAGEMENT PLAN (SWMP)

Permit Reference	Permit Activity Description	Proposed Plan	Measureable Goal	Permit Required Implementation Schedule
	CONSTRUCTION SITE STORMWATER RUNOFF CONTROL			
I.D.5.a.(ii)(a)	The permittee shall develop, revise, implement, and enforce a program to reduce pollutants in any stormwater runoff to the MS4 from construction activities that result in a land disturbance of greater than or equal to one acre.	The Village has an ordinance which meets these requirements and is attached as **Exhibit A.**	complete	Eighteen (18) months from effective date of the permit. Compliance
I.D.5.a.(ii)(b)	Requirements for construction site operators to implement appropriate erosion and sediment control best management practices (both structural and non-structural)	These requirements are included in the ordiance and as part of the construction plan review.	complete	Eighteen (18) months from effective date of the permit. Compliance
I.D.5.a.(ii)(c)	Requirements for construction site operators to control waste such as, but not limited to, discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water	These requirements are included in the ordiance and as part of the construction plan review.	complete	Eighteen (18) months from effective date of the permit. Compliance
I.D.5.a.(ii)(d)	Procedures for site plan review which incorporate consideration of potential water quality impacts. The site plan review must be conducted prior to commencement of construction activities, and include a review of the site design, the planned operations at the construction site, the planned control measures during the construction phase (including the technical criteria for selection of the control measures), and the planned controls to be used to manage runoff created after the development.	The Village requires a site plan review for all construction programs that includes potential water quality impace and requires all runoff (except in the small area of the storm sewer) be held on-site. The written procedure is attached as **Exhibit B**	complete	Eighteen (18) months from effective date of the permit. Compliance
I.D.5.a.(ii)(e)	Procedures for receipt and consideration of information submitted by the public.	Information submitted is routed to the Planning and Zoning Department for review and action.	complete	Eighteen (18) months from effective date of the permit. Compliance

I.D.5.a.(ii)(f)	Procedures for site inspection (during construction) and enforcement of control measures, including provisions to ensure proper construction, operation, maintenance, and repair. The procedures must clearly define who is responsible for site inspections; who has the authority to implement enforcement procedures; and the steps utilized to identify priority sites for inspection and enforcement based on the nature of the construction activity, topography, and the characteristics of soils and the quality of the receiving water. If a construction site operator fails to comply with procedures or policies established by the permittee, the permittee may request EPA enforcement assistance. The site inspection and enforcement procedures must describe sanctions and enforcement mechanism(s) for violations	The Village has a procedure for site inspections and enforcement as defined in the Stormwater Ordinance.	complete	Eighteen (18) months from effective date of the permit. Compliance
I.D.5.a.(ii)(g)	Procedures to educate and train permittee personnel involved in the planning, review, permitting, and/or approval of construction site plans, inspections and enforcement. Education and training shall also be provided for developers, construction site operators, contractors and supporting personnel, including requiring a stormwater pollution prevention plan for construction sites within the permitee's jurisdiction.	The Village has a process for training permitee personnel that includes both in house and outside training. Records are kept of all training provided.	complete	Eighteen (18) months from effective date of the permit. Compliance
I.D.5.a.(ii)(h)	Procedures for keeping records of and tracking all regulated construction activities within the MS4, i.e. site reviews, inspections, inspection reports, warning letters and other enforcement documents. Summary of the number and frequency of site reviews, inspections (including inspector's checklist for oversight of sediment and erosion controls and proper disposal of construction wastes) and enforcement activities that are conducted annually and cumulatively during the permit term shall be included in each annual report.	The Village has a established a recordkeeping system in compliance with the permit requirements.	complete	Eighteen (18) months from effective date of the permit. Compliance

I.D.5.a.(iii)	Annually conduct site inspections of 100 percent of all construction projects cumulatively disturbing one (1) or more acres within the MS4 jurisdiction. Site inspections are to be followed by any necessary compliance or enforcement action. Follow-up inspections are to be conducted to ensure corrective maintenance has occurred; and, all projects must be inspected at completion for confirmation of final stabilization.	The Village has begun inspecting 100 percent of all construction projects cumulatively disturbing one (1) or more acres within the MS4 jurisdiction.	complete	Start 2 years from the effective date of the permit and thereafter. Compliance
I.D.5.a.(iv)	The permittee must coordinate with all departments and boards with jurisdiction over the planning, review, permitting, or approval of public and private construction projects/activities within the permit area to ensure that the construction stormwater runoff controls eliminate erosion and maintain sediment on site.	In the Village, a single department is responsible for planning, review, permitting, or approval of public and private construction projects. The department has 3 employees that are continually coordinating.	Continue to involve all staff in understanding and implementing the objectives of the Watershed Stormwater Permit.	Fourteen (14) months from effective date of the permit. Compliance
I.D.5.a.(v)	The site plan review required in Part I.D.5.a.(ii)(d) must include an evaluation of opportunities for use of GI/LID/Sustainable practices and when the opportunity exists, encourage project proponents to incorporate such practices into the site design to mimic the pre-development hydrology of the previously undeveloped site. For purposes of this permit, pre-development hydrology shall be met according to Part I.D.5.b of this permit. (Consistent with any limitations on that capture.) Include a reporting requirement of the number of plans that had opportunities to implement these practices and how many incorporated these practices.	The Village has, by necessity, utilized GI/LID Sustainable practices since it's inception. Having no storm collection system until 2007, all stormwater has historically, and by code, been retained on the property upon which it falls.	Continue the policy of requiring containment of runoff from any property not served by the 3,600 ft. storm sewer in the Village Center area.	Fourteen (14) months from effective date of the permit. Compliance
I.D.5.a.(ix)	The permittee may develop or update existing construction handbooks (e.g., the COA NPDES Stormwater Management Guidelines for Construction and Industrial Activities Handbook) to be consistent with promulgated construction and development effluent limitation guidelines.	The Village will work with the other co-permitees to update the NPDES Manual.		Update as needed

Permit Reference	Permit Activity Description	Proposed Plan	Measureable Goal	Permit Required Implementation Schedule
POST-CONSTRUCTION STORMWATER MANAGEMENT				
I.D.5.b.(ii)(a)	Strategies which include a combination of structural and/or non-structural best management practices (BMPs) to control pollutants in stormwater runoff.	The Village utilizes traditional BMPs for the valley area as well as newer non traditional BMPs brough forward by the development community. Also, through the TAG, the village has access to the "National Pollutant Discharge Elimination System Manual" prepared by the former Phase 1 permitees which shows a variety of BMPs.	Post-construction runoff compliance as monitored by inspections.	Fourteen (14) months from effective date of the permit. *Compliance*
I.D.5.b.(ii)(b)	An ordinance or other regulatory mechanism to address post-construction runoff from new development and redevelopment projects to the extent allowable under State, Tribal or local law.	The Village has an odinance which prohibits the discharge of nuisance water from any property in the village.	Post-construction runoff compliance as monitored by inspections.	Thirty six (36) months from effective date of the permit. Compliance
I.D.5.b.(ii)(c)	The permittee must ensure the appropriate implementation of the structural BMPs by considering some or all of the following: pre-construction review of BMP designs; inspections during construction to verify BMPs are built as designed; post-construction inspection and maintenance of BMPs; and penalty provisions for the noncompliance with preconstruction BMP design; failure to construct BMPs in accordance with the agreed upon pre-construction design; and ineffective post-construction operation and maintenance of BMPs.	The Village has a review process where any covered construction project submits a Grading and Drainage plan which is reviewed by an independent Village retained engineer. Followed by inspection to insure compliance with the engineered plans.	Post-construction runoff compliance as proposed and monitored by inspections.	Forty eight (48) months from effective date of the permit. Compliance

I.D.5.b.(ii)(d)	The permittee must ensure that the post-construction program requirements are constantly reviewed and revised as appropriate to incorporate improvements in control techniques.	The Village will continually review the post construction program.	Post-construction runoff compliance as monitored by inspections.	Thirty (30) months from effective date of the permit. Compliance
I.D.5.b.(ii)(e)	Procedure to develop and implement an educational program for project developers regarding designs to control water quality effects from stormwater, and a training program for plan review staff regarding stormwater standards, site design techniques and controls, including training regarding GI/LID/Sustainability practices. Training may be developed independently or obtained from outside resources, i.e. federal, state, or local experts.	With the very small number of developers/contractors who fall into this category, training is delivered in a one on one basis specific to the project. Training for staff includes programs available on-line or from other co-permitees.	The Village will work with the TAG to improve our knowledge of techniques and methods as well as outside sources as appropriate	Eighteen (18) months from effective date of the permit. Compliance
I.D.5.b.(ii) (f)	Procedures for site inspection and enforcement to ensure proper long-term operation, maintenance, and repair of stormwater management practices that are put into place as part of construction projects/activities. Procedure(s) shall include the requirement that as-built plans be submitted within ninety (90) days of completion of construction projects/activities that include controls designed to manage the stormwater associated with the completed site (post-construction stormwater management). Procedure(s) may include the use of dedicated funds or escrow accounts for development projects or the adoption by the permittee of all privately owned control measures. This may also include the development of maintenance contracts between the owner of the control measure and the permittee. The maintenance contract shall include verification of maintenance practices by the owner, allows the MS4 owner/operator to inspect the maintenance practices, and perform maintenance if inspections indicate neglect by the owner.	The Planning & Zoning Department staff and consultants perform all inspections and enforcement of stormwater BMPs at this point. The typical BMPs are ponds and infiltration systems that require minimal maintenance.	Due to the size and scope of projects in the Village we do not require as-built drawings. All projects requiring the installation of BMPs are inspected at the time of completion and will be inspected annually for a period of time to satisfy the BMPs are working appropriately.	Eighteen (18) months from effective date of the permit. Compliance

I.D.5.b.(ii)(g)	Procedures to control the discharge of pollutants related to commercial application and distribution of pesticides, herbicides, and fertilizers where permittee(s) hold jurisdiction over lands not directly owned by that entity (e.g., incorporated city). The procedures must ensure that herbicides and pesticides applicators doing business within the permittee's jurisdiction have been properly trained and certified, are encouraged to use the least toxic products, and control use and application rates according to the applicable requirements.	Commercial application of pesticides is regulated by the New Mexico Department of Agriculture (NMDA). NMDA has authority over the distribution and use of all pesticides in the state. NMDA establishes certification requirements for pesticide applicators including a requirement for continuing education. Additionally, under the Clean Water Act, pesticide applications to, over, or near water generally require a NPDES permit issued by the EPA.		Eighteen (18) months from effective date of the permit. Compliance
I.D.5.b.(ii)(h)	Procedure or system to review and update, as necessary, the existing program to ensure that stormwater controls or management practices for new development and redevelopment projects/activities continue to meet the requirements and objectives of the permit.	The Village will continually review the post construction program.		Eighteen (18) months from effective date of the permit. Compliance

I.D.5.b.(iii)	The permittee must coordinate with all departments and boards with jurisdiction over the planning, review, permitting, or approval of public and private new development and redevelopment projects/activities within the permit area to ensure the hydrology associated with new development and redevelopment sites mimic to the extent practicable the pre-development hydrology of the previously undeveloped site, except in instances where the pre-development hydrology requirement conflicts with applicable water rights appropriation requirements. For purposes of this permit, pre-development hydrology shall be met by capturing the 90th percentile storm event runoff (consistent with any limitations on that capture) which under undeveloped natural conditions would be expected to infiltrate or evapotranspirate on-site and result in little, if any, off-site runoff. (Note: This permit does not prevent permittees from requiring additional controls for flood control purposes.) Planning documents include, but are not limited to: comprehensive or master plans, subdivision ordinances, general land use plan, zoning code, transportation master plan, specific area plans, such as sector plan, site area plans, corridor plans, or unified development ordinances.	In the Village, a single department is responsible for planning, review, permitting, or approval of public and private construction projects. The department has 3 employees that are continually coordinating.	Continue to involve all staff in understanding and implementing the objectives of the Watershed Stormwater Permit.	One (1) year from effective date of the permit. Compliance

I.D.5.b.(iv)	The permittee must assess all existing codes, ordinances, planning documents and other applicable regulations, for impediments to the use of GI/LID/Sustainable practices. The assessment shall include a list of the identified impediments, necessary regulation changes, and recommendations and proposed schedules to incorporate policies and standards to relevant documents and procedures to maximize infiltration, recharge, water harvesting, habitat improvement, and hydrological management of stormwater runoff as allowed under the applicable water rights appropriation requirements. The permittee must develop a report of the assessment findings, which is to be used to provide information to the permittee, of the regulation changes necessary to remove impediments and allow implementation of these practices.	The Village has, by necessity, utilized GI/LID Sustainable practices since it's inception. Having no storm collection system until 2007, all stormwater has historically, and by code, been retained on the property upon which it falls.	Continue the policy of requiring containment of runoff from any property not served by the 3,600 ft. storm sewer in the Village Center area.	Two (2) year from effective date of the permit. Compliance
I.D.5.b.(v)	As required in Part I.D.5.b.(iv), develop and submit a report of the assessment findings on GI/LID/Sustainable practices.	The Village has prepare a report of the assessment findings on GI/LID/Sustainable practices.	Completion of the Report	Twenty seven (27) months from effective date of the permit. Compliance
I.D.5.b.(vi)	The permittee must estimate the number of acres of impervious area (IA) and directly connected impervious area (DCIA). For the purpose of his part, IA includes conventional pavements, sidewalks, driveways, roadways, parking lots, and rooftops. DCIA is the portion of IA with a direct hydraulic connection to the permittee's MS4 or a waterbody via continuous paved surfaces, gutters, pipes, and other impervious features. DCIA typically does not include isolated impervious areas with an indirect hydraulic connection to the MS4 (e.g., swale or detention basin) or that otherwise drain to a pervious area.	The Village, with the assistance of Bernalillo County, has completed an estimate the acres of impervious area (IA) and directly connected impervious area (DCIA).	Completion of the estimate	Thirty (30) months from effective date of the permit. Compliance

I.D.5.b.(vii)	Inventory and priority ranking of MS4 owned property that may be retrofitted as required in section in Part I.D.5.b.(vii)	The Village will inventory and assess property that may be retrofitted to reduce the potential of stormwater pollution.	Completion of the Report	Forty two (42) months from effective date of the permit. Compliance
I.D.5.b.(viii)	The permittee must incorporate watershed protection elements into relevant policy and/or planning documents as they come up for regular review. If a relevant planning document is not scheduled for review during the term of this permit, the permittee must identify the elements that cannot be implemented until that document is revised, and provide to EPA and NMED a schedule for incorporation and implementation not to exceed five years from the effective date of this permit.	The Village is located at the bottm of the watershed and as such can have minimal imact to the watershed. Further, as discussed previously, the Village has regulations in place to prevent discharge of stormwater and pollutants from properties within the Village.		Thirty (30) months from effective date of the permit. Compliance

Permit Reference	Permit Activity Description	Proposed Plan	Measureable Goal	Permit Required Implementation Schedule
	POLLUTION PREVENTION / GOOD HOUSEKEEPING			
I.D.5.c.(i)	The permittee must develop, revise and implement an operation and maintenance program that includes a training component and the ultimate goal of preventing or reducing pollutant runoff from municipal operations.	The Village will continue to implement an operations and maintenance program which includes a training component	Training Records for maintenance staff.	Eighteen (18) months from effective date of the permit. Compliance
I.D.5.c.(i)(a)	Development and implementation of an employee training program to incorporate pollution prevention and good housekeeping techniques into everyday operations and maintenance activities. The employee training program must be designed to prevent and reduce storm water pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and storm water system maintenance. The permittee must also develop a tracking procedure and ensure that employee turnover is considered when determining frequency of training.	The Village will continue to implement an employee training program	Training Records for maintenance staff.	Eighteen (18) months from effective date of the permit. Compliance
I.D.5.c.(i)(b)	Maintenance activities, maintenance schedules, and long term inspections procedures for structural and non-structural storm water controls to reduce floatable, trash, and other pollutants discharged from the MS4.	The Village will develop maintenance schedules for the stormwater controls to reduce floatable, trash, and ther pollutants	All flows from the Village storm sewer flow through a "stormceptor" Designed to remove floatables and sediment.	Eighteen (18) months from effective date of the permit. Compliance

I.D.5.c.(i)(c)	Controls for reducing or eliminating the discharge of pollutants from streets, roads, highways, municipal parking lots, maintenance and storage yards, fleet or maintenance shops with outdoor storage areas, salt/sand storage locations, snow disposal areas operated by the permittee, and waste transfer stations;	The Village does not discharge runoff from any of their facilities, roads have no curbs (except 3,600 feet of Fourth St.) and due to our location, do not have any snow/ice removal processes, nor do we have waste removal facilities..		Eighteen (18) months from effective date of the permit. Compliance
I.D.5.c.(i)(d)	Procedures for properly disposing of waste removed from the separate storm sewers and areas listed in art I.D.5.c.(i).(c) (such as dredge spoil, accumulated sediments, floatables, and other debris); and	The Village has developed procedures for the waste removed from Storm Sewer and areas listed in I.D.5.c.(i).(c)	Written Procedures	Eighteen (18) months from effective date of the permit. Compliance
I.D.5.c.(ii)	The Pollution Prevention/Good Housekeeping program must include the elements from I.D.5.c.(ii)(a) through I.D.5.c.(ii)(n).	The Pollution Prevention/Good Housekeeping program will include the elements from I.D.5.c.(ii)(a) through I.D.5.c.(ii)(n) as appropriate.	A program assessment of the elements included in I.D.5.c.(ii)(a) through I.D.5.c.(ii)(n)	Thirty (30) months from effective date of the permit. Compliance
I.D.5.c.(iii)	Comply with the requirements included in the EPA Multi Sector General Permit (MSGP) to control runoff from industrial facilities (as defined in 40 CFR 122.26(b)(14)(i)-(ix) and (xi)) owned or operated by the permittees and ultimately discharge to the MS4.	The Village does not own any industrial type facilities. Properties owned are for office or storage.		Eighteen (18) months from effective date of the permit. Compliance

Permit Reference	Permit Activity Description	Proposed Plan	Measureable Goal	Permit Required Implementation Schedule
ILLICIT DISCHARGES				
I.D.5.e.(i)(a)	Develop, if not already completed, a storm sewer system map, showing the names and locations of all outfalls as well as the names and locations of all waters of the United States that receive discharges from those outfalls. Identify all discharges points into major drainage channels draining more than twenty (20) percent of the MS4 area.	Map is developed and is attached as **Exhibit C.**	Creation of Map	Fourteen (14) months from effective date of the permit. Compliance
I.D.5.e.(i)(b)	Ordinance (or other control method) as required in Part I.D.5.e.(i)(b)	The Villages current Ordinance includes language to prohibit illlegal discharges but will be reviewed for possible strengthening.	Effective ordinance	Thirty (30) months from effective date of the permit. Compliance
I.D.5.e.(i)(c)	Develop and implement a plan to detect and address non-stormwater discharges, including illegal dumpling, to the MS4.	The Village has a program of regular street sweeping where inlets are inspected for illegal discharges, the program willl be reviewed for possible expansion/improvements.	Complete written Plan	Thirty (30) months from effective date of the permit
I.D.5.e.(i)(d)	Develop an education program as required in Part I.D.5.e.(i)(d)	Work with the Middle Rio-Grande Stormwater Quality Team to provide education regarding illegal discharges	Effecive Educational program as documented in an Outcomes Report as shown in **Exhibit D.**	Eighteen (18) months from effective date of the permit. *Compliance*
I.D.5.e.(i)(e)	Establish a hotline to address complaints from the public	The Village has a single phone number which serve as a hotline for all complaints.	Complete	Eighteen (18) months from effective date of the permit. *Compliance*

I.D.5.e.(i)(f)	Investigate suspected significant/severe illicit discharges within forty-eight (48) hours of detection and all other discharges as soon as practicable; elimination of such discharges as expeditiously as possible; and, requirement of immediate cessation of illicit discharges upon confirmation of responsible parties.	The Village has a procedure for investigating any identified illicit discharges.	Procedures were used to identify and halt illegal discharge of food truck cooking oil/grease.	Eighteen (18) months from effective date of the permit. *Compliance*
I.D.5.e.(i)(g)	Review complaint records for the last permit term and develop a targeted source reduction program for those illicit discharge/improper disposal incidents that have occurred more than twice in two (2) or more years from different locations. (Applicable only to class A and B permittees)	The Village will review complaint records for the last permit term.	During the past five years only 2 complaints have been received, at separate locations, and were resolved. Compliance	One (1) year from effective date of the permit. *Compliance*
I.D.5.e.(iii)	The permittee must screen the entire jurisdiction at least once every five (5) years and high priority areas at least once every year. High priority areas include any area where there is ongoing evidence of illicit discharges or dumping, or where there are citizen complaints on more than five (5) separate events within twelve (12) months.	The Village screens the Fourth St. Corridor (the commercial district) monthly during street sweeping. This is the only area where stormwater discharges are collected and discharged.	Continue with the screening process to meet the 3, 4, and 5 year requirements	Years 1 – 3: develop procedures as require in Part I.D.5.e.(i)(c) Year 4: screen 30% of the MS4 Year 5: screen 70% of the MS4. *Compliance*
I.D.5.e.(iv)	Waste Collection Programs: The permittee must develop, update, and implement programs to collect used motor vehicle fluids (at a minimum, oil and antifreeze) for recycle, reuse, or proper disposal, and to collect household hazardous waste materials (including paint, solvents, fertilizers, pesticides, herbicides, and other hazardous materials) for recycle, reuse, or proper disposal. Where available, collection programs operated by third parties may be a component of the programs.	In coordination with the co-permitees the Village will develop, update, and implement programs to collect various waste products.	Programs are in place for collecting solid waste, auto fluids, hazardous wastes and FOG.	Thirty (30) months from effective date of the permit. *Compliance*

I.D.5.e.(v)	Spill Prevention and Response. The permittee must develop, update and implement a program to prevent, contain, and respond to spills that may discharge into the MS4. The permittees must continue existing programs while updating those programs, as necessary, to comply with the requirements of this permit.	The Village, in conjunction with the Bernalillo County Fire Department, have a program to prevent, contain, and respond to spills.	Spill response records.	Eighteen (18) months from effective date of the permit. *Compliance*

Permit Reference	Permit Activity Description	Proposed Plan	Measureable Goal	Permit Required Implementation Schedule
CONTROL OF FLOATABLES				
I.D.5.f.(i)(a)	Develop a schedule for implementation of the program to control floatables in discharges into the MS4.	Floatables are controlled from entering the Village storm sewers by regular street sweping. Any floatables entering the system are removed in the "stormceptor" prior to discharge.	Volume of floatables removed from the stormceptor. In the past this has been 0 due to our aggressive cleaning schedule.	Eighteen (18) months from effective date of the permit. *Compliance*
I.D.5.f.(i)(b)	Estimate the annual volume of floatables and trash removed from each control facility and characterize the floatable type.	see above	see above	Thirty (30) months from effective date of the permit. *Compliance*

Permit Reference	Permit Activity Description	Proposed Plan	Measureable Goal	Permit Required Implementation Schedule
PUBLIC EDUCATION AND OUTREACH				
I.D.5.g.(i)	The permittee shall, individually or cooperatively, develop, revise, implement, and maintain a comprehensive stormwater program to educate the community, employees, businesses, and the general public of hazards associated with the illegal discharges and improper disposal of waste and about the impact that stormwater discharges on local waterways, as well as the steps that the public can take to reduce pollutants in stormwater.	The Village of Los Ranchos participates both financially and through participation in the Middle Rio Grand Strom Water Quality Team. This joint effort was initially conceived by the Phase 1 permitees (COA, UNM, NMDOT, and AMAFCA) as a means of combining resource and approach to delivering public education in overlapping jurisdictions. With the initiation of the "Watershed Based Permit" the group opened the membership to other co-permitees and the Village became an active member.	Through the MRGSWQT many educational programs are underway as illustrated in the Outcomes Report attached in **Exhibit D.**	Fourteen (14) months from effective date of the permit. *Compliance*

Permit Reference	Permit Activity Description	Proposed Plan	Measureable Goal	Permit Required Implementation Schedule
PUBLIC INVOLVEMENT				
I.D.5.h.(ii)	The permittee shall develop, revise, implement and maintain a plan to encourage public involvement and provide opportunities for participation in the review, modification and implementation of the SWMP; develop and implement a process by which public comments to the plan are received and reviewed by the person(s) responsible for the SWMP; and, make the SWMP available to the public and to the operator of any MS4 or Tribal authority receiving discharges from the MS4.	The Village has developed a plan to encourage public involvement and a process for requesting and receiving public comments for the SWMP development.	Written plan	One (1) year from effective date of the permit
I.D.5.h.(iii)	The plan required in Part I.D.5.h.(ii) shall include a comprehensive planning process which involves public participation and where necessary intergovernmental coordination, to reduce the discharge of pollutants to the maximum extent practicable using management practices, control techniques and system, design and engineering methods, and such other provisions which are appropriate.	The Village has developed a plan to encourage public involvement and a process for requesting and receiving public comments for the SWMP development.	Written plan	One (1) year from effective date of the permit
I.D.5.h.(iv)	The permittee shall comply with State, Tribal and local public notice requirements when implementing a public involvement/ participation program.	The Village has and will continue to comply with state and local public notice requirements.	Public Notices	Fourteen (14) months from effective date of the permit. *Compliance*

I.D.5.h.(v)	The public participation process must reach out to all economic and ethnic groups. Opportunities for members of the public to participate in program development and implementation include serving as citizen representatives on a local stormwater management panel, attending public hearings, working as citizen volunteers to educate other individuals about the program, assisting in program coordination with other preexisting programs, or participating in volunteer monitoring efforts.	The Villages public participation process includes all economic and ethnic groups, and is centered in the delivery of information and receiving comments at existing Public Meeting situations.	Stormwater reporting in Board of Trustee and Planning and Zoning Commission meetings.	Eighteen (18) months from effective date of the permit. *Compliance*
I.D.5.h.(vii)	The permittee shall assess the overall success of the program, and document the program effectiveness in the annual report.	The Village will assess the overall success of the program, and document the program effectiveness in the annual report, as the EPA form allows.	Annual report assessment	*Compliance*
I.D.5.h.(ix)	The permittee may integrate the public Involvement and participation program with existing education and outreach programs in the Middle Rio Grande area. Example of existing programs include: Adopt-A-Stream Programs; Attitude Surveys; Community Hotlines (e.g. establishment of a “311”-type number and system established to handle storm-water-related concerns, setting up a public tracking/reporting system, using phones and social media); Revegetation Programs; Storm Drain Stenciling Programs; Stream cleanup and Monitoring program/events.	As discussed under Public Education, working with the MRGSWQT the Village accesses the resources of several local groups including RiverXchange, Bosque Environmental Monitoring Program (BEMP), and other organizations to draw on their expertise and constituents.		*Compliance*

EXHIBIT A

STORMWATER MANAGEMENT ORDINANCE

ARTICLE 3. STORMWATER MANAGEMENT

§ 4.3.1 DEFINITIONS

BEST MANAGEMENT PRACTICES (BMPs) means activities or structural improvements that help reduce the quantity and improve the quality of stormwater runoff. Best management practices are schedules of activities, prohibitions or practices, maintenance procedures and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures and practices to control runoff, spillage, or leaks; sludge, waste disposal, or drainage from raw material storage. With regard to construction, these practices may include structural devices or nonstructural practices that are designed to prevent pollutants from entering water or to direct the flow of water.

CLEAN WATER ACT (WATER QUALITY ACT): (formerly the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972). Public law 92-500; 33 U.S.C. 1251 et. seq.; legislation which provides statutory authority for the NPDES program. Also known as the Federal Water Pollution Control Act.

COMPREHENSIVE PLAN means the Village of Los Ranchos Comprehensive Plan and amendments thereto.

CONCEPTUAL GRADING AND DRAINAGE PLAN means a plan prepared in graphical format showing existing and proposed grading, drainage, control, flood control and erosion control information in sufficient detail to determine project feasibility.

CONVEYANCE means the process of water moving from one place to another.

DIRECTOR means The Director of Planning and Zoning, the official designated to enforce the comprehensive zoning ordinance, as may be amended from time to time.

DISCHARGE means the volume of water (and suspended sediment if surface water) that passes a given location within a given period of time.

DESIGN STORM means a storm which deposits a stated amount of precipitation within a stated period over a defined area and which is used in calculating storm runoff and in designing drainage control, flood control and erosion control measures.

DEVELOPED LAND means any lot or parcel of land occupied by any structure intended for human occupation, including structures intended for commercial enterprise.

DEVELOPER means any individual, estate, trust, receiver, cooperative association, club, corporation, company, firm, partnership, joint venture, syndicate, or other entity

engaging in the platting, subdivision, filling, grading, excavation, or construction of structures or facilities.

DRAINAGE means storm drainage.

DRAINAGE MANAGEMENT OR TREATMENT means the treatment and/or management of surface runoff from all storms up to and including a ten-year design storm.

DRAINAGE PLAN means a short, detailed plan prepared in graphical format with or on a detailed grading plan addressing onsite and off-site drainage control, flood control, and erosion control issues for lots or parcels of less than five acres.

DRAINAGE REPORT means a comprehensive analysis of the drainage, flood control, and erosion control constraints on and impact resulting from a proposed platting, development or construction project.

EPA means United States Environmental Protection Agency.

EROSION CONTROL means treatment measures for the prevention of damages due to soil movement and to deposition.

EROSION CONTROL PLAN means a plan for the mitigation of damages due to soil erosion and to deposition.

EXCAVATION means the process of removing earth, stone, or other materials from land.

FLOOD CONTROL means the treatment measures necessary to protect life and property from the 100-year design storm runoff.

FLOOD HAZARD AREA means an area subject to inundation from the 100-year design storm runoff.

GENERAL PERMIT means a permit issued under the NPDES program to cover a certain class or category of stormwater discharges. These permits reduce the administrative burden of permitting stormwater discharges.

GRADING means the cutting and/or filling of the land surface to a desired slope or elevation.

GRADING PLAN means a plan describing the existing topography and proposed grading, including retaining wall locations and details, interfaces with adjacent properties, streets, alleys and channels, referenced to mean sea level (1929 or 1988 datum) such as city benchmark or NMDOT benchmark, and showing sufficient contours, spot elevations and cross sections to allow a clear understanding by reviewers, contractors, and inspectors.

ILLICIT CONNECTION means any discharge to a municipal separate storm sewer that is not composed entirely of stormwater and is not authorized by an NPDES permit, with some exceptions (e.g., discharges due to fire fighting activities).

MAINTENANCE means the cleaning, shaping, grading, repair and minor replacement of drainage, flood control and erosion control facilities, but not including the cost of power consumed in the normal operation of pump stations.

MAXIMUM EXTENT PRACTICABLE (MEP) means a standard for water quality that applies to all MS4 operators regulated under the NPDES Stormwater Program. Since no precise definition of MEP exists, it allows for maximum flexibility on the part of MS4 operators as they develop and implement their programs.

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) means a publicly owned conveyance or system of conveyances that discharges to waters of the U.S. and is designed or used for collecting or conveying stormwater, is not a combined sewer, and is not part of a publicly-owned treatment works (POTW).

NON-POINT SOURCE (NPS) POLLUTANTS means pollutants from many diffuse sources. NPS pollution is caused by rainfall or snowfall moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water.

NOTICE OF INTENT(NOI) means Notice of Intent.

NPDES: "National Pollutant Discharge Elimination System" the name of the surface water quality program authorized by Congress as part of the 1987 Clean Water Act. This is EPA's program to control the discharge of pollutants to waters of the United States (see 40 C.F.R. 122.2) Phase II.

NUISANCE WATERS means those waters leaving a site and entering a public right of way.

ONE HUNDRED (100) YEAR DESIGN STORM means that storm whose precipitation within a six-hour period and resulting runoff has a one percent chance of being equaled or exceeded in any given year. A special condition may require/allow use of storms of longer duration.

OUTFALL means the point where wastewater or drainage discharges from a sewer pipe, ditch, or other conveyance to a receiving body of water.

PHYSICALLY INTERCONNECTED MS4 means that one MS4 is connected to a second MS4 in such a way that it allows for direct discharges into the second system.

POINT SOURCE POLLUTANT means pollutants from a single, identifiable source such as a factory or refinery.

POLLUTANT LOADING means the total quantity of pollutants in stormwater runoff.

REGULATED MS4 means any MS4 covered by the NPDES Stormwater Program (regulated small, medium, or large MS4s).

RETROFIT means the modification of stormwater management systems through the construction and/or enhancement of wet ponds, wetland plantings, or other BMPs designed to improve water quality.

RUNOFF means drainage or flood discharge that leaves an area as surface flow or as pipeline flow. Has reached a channel or pipeline by either surface or sub-surface routes.

SEDIMENT means soil, sand, and minerals washed from land into water, usually after rain. Sediment can destroy fish-nesting areas, clog animal habitats, and cloud waters so that sunlight does not reach aquatic plants.

SITE RUNOFF means any drainage or flood discharge that is released from a specified area.

SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEM(MS4) means any MS4 that is not regulated under Phase I of the NPDES Stormwater Program and Federally-owned MS4s.

STORM DRAIN means a slotted opening leading to an underground pipe or an open ditch for carrying surface runoff.

STORM DRAINAGE SYSTEM means arroyos, storm drains, roadways, culverts, bar ditches, ponds, pump stations, dams, detention ponds, retention ponds, inlets, and appurtenant structures and other facilities which convey stormwater.
STORMWATER means precipitation that accumulates in natural and/or constructed storage and stormwater systems during and immediately following a storm event.
STORMWATER MANAGEMENT means functions associated with planning, designing, constructing, maintaining, financing, and regulating the facilities (both constructed and natural) that collect, store, control, and/or convey stormwater.
STORMWATER POLLUTION PREVENTION PLAN (SWPPP) means a plan to describe a process whereby a facility thoroughly evaluates potential pollutant sources at a site and selects and implements appropriate measures designed to prevent or control the discharge of pollutants in stormwater runoff.
STORMWATER QUALITY CONTROL means the treatment methods necessary to protect and enhance the quality of stormwater.
SURFACE WATER means water that remains on the surface of the ground, including rivers, lakes, reservoirs, streams, wetlands, impoundments, seas, estuaries, etc.
TEN-YEAR DESIGN STORM means that storm whose precipitation within a six hour period and resulting runoff has a ten percent chance of being equaled or exceeded in any given year. A special condition may require/allow use of storms of longer duration.
TOTAL MAXIMUM DAILY LOAD (TMDL) means the maximum amount of pollutants which can be released into a water body without adversely affecting the water quality.
URBAN RUNOFF means stormwater from urban areas, which tends to contain heavy concentrations of pollutants from urban activities.
WET WEATHER FLOWS means water entering storm drains during rainstorms/wet weather events.

§ 4.3.2 GENERAL REGULATIONS

The Village shall, under direction of the Director of Planning and Zoning, develop, implement, and enforce, according to EPA standards, a Stormwater Management Plan designed to reduce the discharge of pollutants from a small MS4 to the maximum extent practicable (MEP), to protect water quality, and to satisfy applicable surface water quality standards.

(A) STORM DRAINAGE.

(1) Prevent the creation of public safety hazards and seek to eliminate existing problems.

(2) Prevent, to the extent feasible, the discharge of storm runoff from public facilities onto private property.

(3) Prevent the increased risk of damage to private property caused by storm runoff from other private property.

(4) Coordinate with the M.R.G.C.D., A.M.A.F.C.A., Bernalillo County and the City of Albuquerque the discharge of storm runoff into M.R.G.C.D. and A.M.A.F.C.A facilities and minimize impact on downstream facilities.

(5) Provide for timely and effective construction and maintenance of storm drainage facilities.

(6) Design storm drainage facilities, which provided effective storm drainage and flood control.

(7) Improve the quality of storm runoff.

(B) EROSION CONTROL.

(1) Protect the hydraulic capacity of flood control and storm drainage facilities from losses due to sedimentation and degradation.

(2) Preserve public health, safety, and convenience from jeopardy due to erosion and sedimentation in private and public facilities of all types.

(3) Preserve the quality of surface runoff.

§ 4.3.3 ILLICIT DISCHARGE

(A) NON-STORMWATER DISCHARGE. It is prohibited to discharge into the storm sewer system any form of pollutant, including but not limited to:

(1) Automotive oils, gasoline, grease, fluids, or other waste products;

(2) Floatables – such as plastic bags, fast food wrappers, Styrofoam cups, soft drink cans, or cups, etc.;

(3) Plant refuse – weeds, tree trimmings, leaves, etc,;

(4) Water line flushing;

(5) Landscape irrigation or sprinkler run off;

(6) Fertilizers, pesticides, or poisons;

(7) Diverted stream or ditch flows;

(8) Uncontaminated pumped groundwater;

(9) Discharges from potable water sources;

(10) Foundation drains;

(11) Open space or agricultural irrigation water;

(12) Car washing between Mullen and Schulte on 4th Street or where water flows into storm sewer outlets;

(13) Flows from riparian habitats and wetlands;

(14) De-chlorinated swimming pool discharges;

(15) Toxic spills;

(16) Street wash water;

(17) Animal waste;

(18) Grease from cooking, commercial and residential;

(19) Household cleaning products.

(B) ILLEGAL DUMPING. It is prohibited for any person or persons to deposit trash, household items, yard debris, appliances, or any such items on Village of Los Ranchos owned or controlled property.

(1) All possible investigative means may be utilized to determine the person or persons responsible for illegal dumping.

(C) GROUNDWATER CONTAMINATION. Any activity which contributes to groundwater contamination through the burying of animal waste, dead animals, and garbage or toxic chemicals is expressly prohibited.

(1) All possible investigative means may be utilized to determine the person or persons responsible for groundwater contamination.

§ 4.3.4 STORMWATER DISCHARGE

(A) NEW CONSTRUCTION.

(1) All construction, development, and redevelopment projects with land disturbances equal to or greater than one acre, including sites, which disturb less than one acre, but are part of a larger common plan of development, must, at the time of application to the Village, submit:

(a) A Notice of Intent permit issued by EPA.

(b) A Stormwater Pollution Prevention Plan (SWPPP) including Best Management Practices to prevent stormwater discharge in accordance with EPA NPDES Phase II regulations for construction site stormwater runoff control.

(2) The stormwater pollution prevention plan shall outline the BMPs to be undertaken by the operator/owner of the project to protect stormwater quality during the construction phase of the project.

(a) These BMPs shall be maintained by the owner of the property. Inspection of these BMPs shall be made at a minimum once a week by the owner and a log of this inspection shall be kept on-site for review by the Village. The Village shall also inspect these BMPs on a periodic basis. These BMPs shall be subject to the approval of the Planning and Zoning Department.

(3) Construction and development sites must control and properly dispose of construction wastes, trash, chemicals, etc.

(B) POST CONSTRUCTION.

(1) All development and redevelopment projects with land disturbances equal to or greater than one acre, including sites which disturb less than one acre but are part of a larger common plan of development and all construction of additions to buildings or of outbuildings over fifty percent (50%) of existing Floor Area Ratio, must submit a Grading and Drainage Plan with a Certified Engineer's stamp showing on-site water retention ponding volumes.

(2) For all development and redevelopment projects with land disturbances equal to or greater than one acre, including sites which disturb less than one acre but are part of a larger common plan of development, and all construction of additions to buildings or of outbuildings over fifty percent (50%) of existing Floor Area Ratio within the Village, post construction water quality BMPs are required. This requirement is in addition to any other requirements that may apply. These BMPs shall be subject to the approval of the Planning and Zoning Department.

(3) Contractors or developers must complete the on-site water retention ponding, berming, banking, ditching, or underground retention system prior to receipt of Certificate of Occupancy or in case of subdivision, sales of lots to the public.

(4) Maintenance responsibility of stormwater control is the responsibility of the property owner up to the point where stormwater enters public facilities.

(5) Where a site development, building permit, a major or minor subdivision, or a replat alters the elevation or location of any designated 100-year floodplain, as shown on current FEMA flood insurance rate maps, the developer shall be required to provide to the Village all necessary data needed to effect the flood boundary revision or amendment. Any required fees for processing shall be the responsibility of the developer.

(6) Site development and major or minor subdivisions or replats shall be designed and constructed such that non-stormwater discharges into storm sewers, ditches, or watercourses will not occur.

(C) STORMWATER DISCHARGE FROM INDIVIDUAL PARCELS.

(1) The discharge of nuisance waters from private property to public streets is prohibited. Arterial and collector streets shall be protected from damages to the surface and from the safety hazard created by surface flow of nuisance waters across them.

(a) Parking lots, yards, open fields, landscaped areas, developed and undeveloped lots shall be bermed, banked, ponded, ditched, or otherwise contoured for on-site water retention to prevent stormwater runoff onto Village streets and roads or ditches.

§ 4.3.5 ADMINISTRATION

(A) The design, construction, and maintenance of all drainage control, flood control, erosion control, and stormwater quality control facilities within the Village shall be performed in accordance with procedures, criteria and standards formulated by the Director of Planning and Zoning and in accordance with the policies established in this Article.

(B) All construction activities within the jurisdiction of the Village shall conform to the requirements of the Article with respect to drainage control, flood control, erosion control and stormwater quality control.

(1) Construction, grading or paving on any lot within the Village shall not increase the damage potential to adjacent properties or public facilities. Damages shall be defined as those caused by flooding, erosion, and sedimentation from the 100-year design storm and all smaller storms.

(2) Any grading shall provide for erosion control and the safe passages of the ten-year design storm runoff during the construction phase and until the permanent improvements are completed.

(3) Grading, cut, fill or importation of material in excess of 500 cubic yards or grading of any area of one acre or more, or any grading which will adversely affect other properties, ditches, watercourses or easements shall conform to drainage control, flood control, erosion control and stormwater quality control policies and to standards, criteria and procedures established by the Village with respect to drainage, flood control, erosion control, and stormwater quality control.

(C) The Village may participate with the private sector, other public bodies, and agencies operating within the jurisdiction of this Article in order to accomplish the goals and implement the policies adopted herein. This includes, but shall not be limited to, the development and adoption of master plans, participation in the construction of projects, and exercising control through the planning, platting, zoning, and permitting processes.

(D) It shall be the responsibility of the Director of Planning and Zoning to produce, approve, make and retain records of all drainage plans, drainage reports, design analyses, design drawings, as-built drawings, and maintenance schedules related to all drainage control, flood control, erosion control, and stormwater quality control facilities constructed within the Village.

(E) Application for all land use changes shall address drainage control, flood control, and erosion control in terms of the interaction of these parameters with other requirements and

needs produced by the proposed land use changes, and shall comply with an adopted drainage management plan.

(F) Requests for building permits, site plan approval, or the platting of land for the purpose of major or minor subdivision, and for replats, shall be accompanied by appropriate grading, drainage control, flood control, erosion control, and stormwater quality control information.

(1) Grading and Drainage plan. Drainage plans are prepared with or on the detailed grading plan and address both on-site and off-site drainage control, flood control and erosion control issues.

(2) Drainage report. A drainage report is a comprehensive analysis of the drainage control, flood control, and erosion control constraints on and impacts resulting from a proposed platting, development, or construction project. Drainage reports are required for major subdivisions containing more than five lots or constituting five acres or more, platting or construction within a designated flood hazard area.

(3) Erosion control plan. An erosion control plan is usually incorporated into the drainage plan or drainage report. Erosion control plans address all phases of each project from initial grading, through, and including final occupancy. The ten-year design storm shall be used to determine the treatment measures necessary for the prevention of damage due to soil movement for the on-site area of development.

(G) All drainage submittals shall be prepared under the direction of and signed by a registered professional engineer competent in surface hydrology and drainage, and shall include a statement that the engineer has personally inspected the land, and a statement as to whether it appears that grading, filling, or excavation has occurred thereon since the existing contour map was prepared.

(H) Submitted plans will be checked by the Village designated engineer and the applicant shall bear the cost per Resolution No. 2003-6-2.

(I) Drainage control considerations specifically address safety, convenience, and economics for both private property and public facilities.

§ 4.3.6 INSPECTIONS

(A) Whenever necessary to make an inspection to enforce any of the provisions of this Article, the Director of Planning and Zoning or his authorized representative may enter such premises at any reasonable time to inspect the premises or to perform any duty imposed upon him; provided, however, that if such premises is occupied, he shall first present proper credentials and demand entry. If such premise is unoccupied, he shall first make a reasonable effort to locate the owner or other persons having charge or control of the premises and demand entry.

(B) If entry is refused or if the owner or other responsible person is not found, the Director or his authorized representative shall proceed according to § 9.2.24(E).

§ 4.3.7 VIOLATIONS, NONCOMPLIANCE, PENALTY

(A) If the Director finds that any of the conditions of this Article are being violated, he shall notify in writing, the owner, tenant, agent, occupant, or person in charge of the premises, indicating the nature of the violation and ordering its correction within seventy two

(72) hours from the date of notification, or in case of severe overflow violation, immediate remedy.

(B) Where, after investigation, a notice has been issued by the Director or his authorized representative to the owner, tenant, agent, occupant, or person in charge of the premises on which a violation has occurred and the order is not complied with within the designated time, or if the responsible party or violator cannot be found or determined, the Director may cause such remedies as are necessary to be made. The reasonable cost of such remedies shall constitute a lien against the property on which the violation occurred and was remedied. The lien shall be imposed and foreclosed in the manner provided in §§ 3-36-1 – 3-36-6 NMSA 1978.

(C) For prohibited dumping or groundwater contamination, or a second violation of this Article, the Director or designated representative is hereby authorized to issue citations for violation of this Article. Such citations shall order the alleged violator to appear on a date certain in Village Municipal Court at the next regularly scheduled Court session or any special setting the Judge may designate. Violators will be prosecuted to the full extent of the law.

(D) Where, after investigation, a notice has been issued by the Director to the owner, tenant, agent, occupant, or person in charge of the premises of the property on which a violation has occurred and the order is not complied with, within such reasonable time as may be prescribed by the Director, the Village may revoke or refuse to renew or issue any permit to the violator and/or the property owner until such remedies, as are necessary, are made, or if remedy is made by the Village, until the cost of such remedies is paid to the Village.

(E) It shall be sufficient notice under the provisions of this Article to make delivery of such notices in person or by registered mail. If the name and address if the owner cannot be reasonably ascertained from the current county tax rolls and the premises are unoccupied, it shall be sufficient notice under this Article to publish the notice in English in a newspaper of general circulation once a week for four consecutive weeks. The owner of the property shall have the right to appeal pursuant to § 9.2.25(H) of the 2013 Codified Ordinances of the Village of Los Ranchos.

§ 4.3.8 ADDITIONAL PERMITS

The issuance of a permit by the Village does not relieve the owner/developer from obtaining any additional grading or fill permits that may be required by Bernalillo County, the State of New Mexico, M.R.G.C.D., A.M.A.F.C.A., City of Albuquerque, ABCWUA, agencies, or governmental bodies having jurisdiction over these areas of the Village by State Law, Joint Powers Agreements, or Memorandums of Understanding.

§ 4.3.9 APPEALS

An appeal of a determination of the Director may be made in the manner prescribed in § 9.2.25(H) of the 2013 Codified Ordinances of the Village of Los Ranchos.

§ 4.3.10 SEVERABILITY

Any section, subsection, sentence, clause or phrase of this Article or the Code that is held to be unconstitutional or invalid shall not affect the validity of the remaining portions of this Article or the Code, since the Board of Trustees expressly intended to pass each section,

subsection, sentence, clause, phrase, and part of this Article or the Code separately and independently or every other part.

Ordinance and State Law References regarding Chapter 4, Article 3:

Ordinance 134, Codification enacted February 14, 1996 codified ORD #108 as Chapter 2, and modified language;
Ordinance #211, August 8, 2007;

EXHIBIT B

PROCEDURES FOR PLAN REVIEW

Village of Los Ranchos, NM
Zone Review for Building Permits

Two sets of plans are required for all construction which requires building permits from Bernalillo County.

The application must be filled out completely.

If the plans do not list Los Ranchos as location, use BIG red stamp and stamp them (all pages).

1. Check that all structures are outside of the setback areas.

2. FAR – Measurements are OUTSIDE measurements of ALL enclosed space, not heated area. This measurement will often conflict with the square footage listed on the plans. Count all ancillary buildings, including car ports, as per ordinance.

   Calculate total FAR. Calculate total permeable surface. Review plans to ensure all setbacks, step-backs, height of building, solar, % of second story etc. ordinances are met.

   ALL AREA over 17 feet in height is counted as 2nd story space and is included in FAR.

3. Review all plans submitted for compliance with NPDES – require SWPPP on all projects disturbing one acre or more per Storm Water Management Ordinance.

   Review all site plans for potential water quality impacts, including erosion and sediment control, control of other wastes, and any other impacts that must be examined according to the requirements of the Storm Water Management Ordinance

4. For construction requiring automatic sprinkler systems, approve conditionally, attach Bernalillo County Fire Department approval required label. If plans are redlined, approve conditionally on whatever needed to be changed actually being changed

5. Stamp EVERY page of plans, label on front and stamp thereafter.

Fences, demolition and buildings of less than 120 square feet do not generally require Bernalillo County permits.

After approval, invoice (2 copies), keep Village copy with all accompanying documentation, return two to applicant with instructions to go to Bernalillo County for building permit and to schedule inspections.

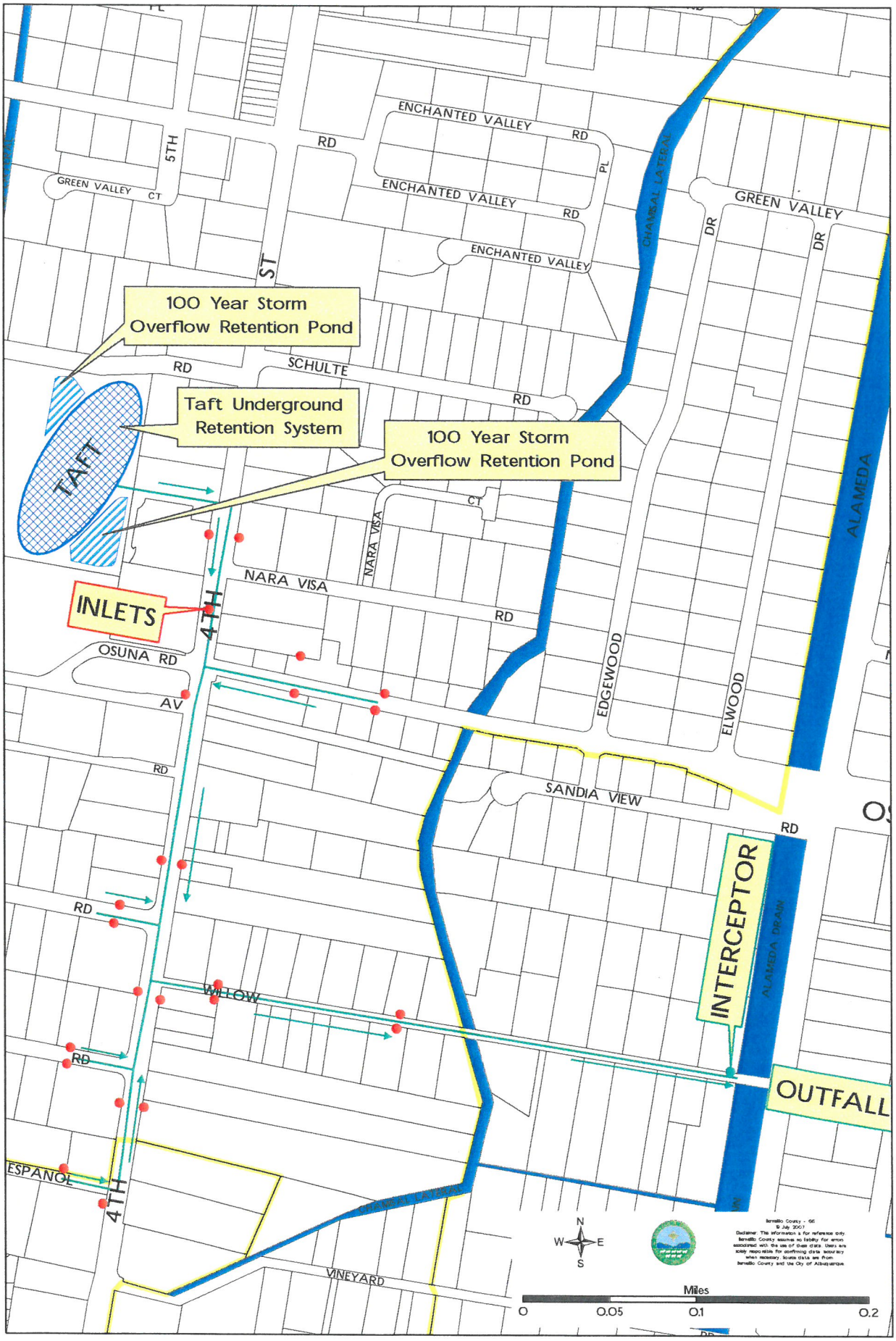
Note of caution: Never release plans without being paid. Never allow the Village set to leave the office.

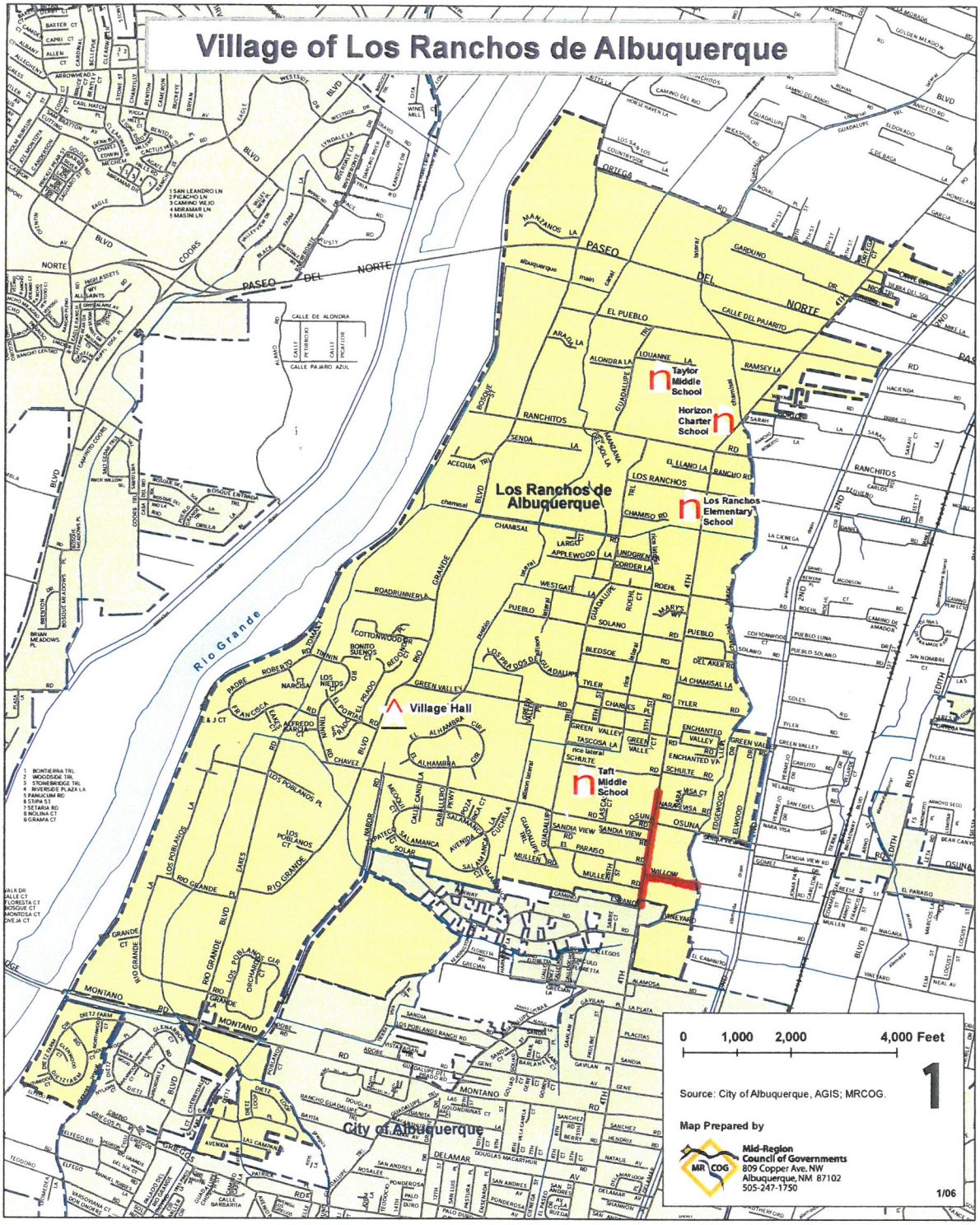
Bag, Tag (usually done by Administrative Assistant) and file.

EXHIBIT C

STORM SEWER MAP

Village of Los Ranchos Storm Sewer System





Village of Los Ranchos storm sewer (red line) in relation to Village limits.

EXHIBIT D

2018-2019 PUBLIC EDUCATION OUTCOMES REPORT

Mid Rio Grande Stormwater Quality Team

www.keeptheriogrand.org

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
NM Department of Transportation (NMDOT) • City of Rio Rancho • Sandoval County
Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA)

Outcomes Report

for

Fiscal Year 2018-2019

(July 1, 2018 - June 30, 2019)

presented by

Phyllis Baker and Cristofer Romero

CWA STRATEGIC COMMUNICATIONS

The Middle Rio Grande Stormwater Quality Team (MRGSQT) formed in 2004 for the purpose of providing education and outreach to the residents of the Middle Rio Grande on how to reduce stormwater pollution. The MRGSQT focuses its education efforts on children, adults, and businesses and how they can become stewards of our watershed by keeping trash and pollutants out of the Rio Grande. The MRGSQT provides an annual summary of education and outreach activities for each fiscal year (FY). During FY2019 (July 1, 2018 to June 30, 2019), the MRGSQT continued its educational outreach by:

- Partnering with the Bosque Ecosystem Monitoring Program (BEMP), Arroyo Classroom and RiverXchange
- Continuing to post relevant information to its website and Facebook page
- Participating in high-profile community events, including the Los Ranchos Lavender Festival, the NM State Fair Parade, the Corrales Harvest Festival, the Rio Rancho Children's Water Festival and New Mexico's Animal Humane Society's Doggie Dash and Dawdle
- Updating the team's interactive kiosk with robust analytics software to track participant interaction and installing it at Albuquerque's RudOlfo Anaya North Valley Library
- Participating in a variety of community events throughout the year
- Updating their matrix designed to address MS4-related topics and planning future programs and activities designed to correspond with permit-mandated topics, including proper hazardous waste disposal appropriate pet waste disposal, stormwater pollution reduction and awareness of hazardous chemicals
- Continuing to update and improve the team's website **keeptheriogrand.com.**

As required by the EPA, many team partners and supporters produced municipal water quality reports (also called Consumer Quality Reports) to their customers. These reports include information on stormwater quality and pollution prevention. Specialty advertising giveaways relating to stormwater quality awareness were ordered/reordered for use at public events. MRGSQT's annual budget is $50,000. This excludes Type 9 items, donated hours by team members and funding for Arroyo Classroom, RiverXchange and BEMP is $50,000. The contractor, CWA Strategic Communications (CWA), donated $1,965.15 in services during the 12-month period. Following is a review of the activities in which the Team has participated.

In calculating the number of people reached during each of the events summarized below, there is likely to be some duplication based on how the numbers were calculated, people attending more than one event, etc. However, this will be a small percentage and the estimates should be reasonably accurate.

WEBSITE (www.keeptheriogrand.org)

The team contracted with CWA to redesign the website; the new site was launched in October 2018. Content and links were updated and new material added. The site is now more user-friendly and offers Team members an easy way to upload, store and share materials.

FACEBOOK PAGE

In conjunction with the SQT website, a Facebook page continues to post information at: (https://www.facebook.com/Keeptheriogrand). The page has 151 "Likes" (a 7% increase from the previous year) and the team occasionally boosts posts during events to obtain more visibility.

Estimated number of individuals reached by this activity: 151
Permit Reference(s): Part 1.C.2.b(i)(e) Discharges to Impaired Waters with an Approved TMDL, Impairment for Bacteria; Part 1.C.3.a Endangered Species Act Requirements, Dissolved Oxygen Strategy; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.e Control of Floatables; Part 1.D.5.g, Public Education and Outreach on Stormwater Impacts.
Audience(s): Children, Adults

EVENTS

Between July 1, 2018, and June 30, 2019, MRGSQT members and their partner agencies reported participating in a total of 77 community outreach/educational events reaching adults and children. ***Details can be found in Exhibit 1 at the end of this report.***

Estimated number of individuals reached by these community outreach/education events: 73,130
Permit Reference(s): Part 1.C.2.b(i)(e) Discharges to Impaired Waters with an Approved TMDL, Impairment for Bacteria; Part 1.C.3.a Endangered Species Act Requirements, Dissolved Oxygen Strategy; Part 1.D.5.c(i)(f) and (h) Pollution Prevention/Good Housekeeping for Municipal/Co-permittee Operations; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.e Control of Floatables; Part 1.D.5.g, Public Education and Outreach on Stormwater Impacts.
Audience(s): Children, Adults

GENERAL MATERIALS DISTRIBUTION/STORMWATER AWARENESS SURVEY

As appropriate, team members distribute materials at events in return for event attendees filling out a stormwater awareness survey. Total distribution correlates to number of surveys completed.

STORMWATER QUALITY TEAM Inventory July 1, 2018 through June 30, 2019.

Item	Starting Qty as of 7/1/2018	Distributed	Ending Qty as of 6/30/2019
"Keep the Rio Grand" Bumper Stickers	750	500	250
"Reduce Stormwater Pollution at Home" Brochure	100	16	84
Dog-Shaped Poop Bag Dispensers	2,586	836	1,750
"Don't Contaminate the River" Oval Stickers	5,260	1,510	3,750
Poop Emoji Squeezies	3,840	2,376	1,464
Morphing Fish Bags	3,417	917	2,500
Silicone Pet Food Can Lids	1,767	456	1,311
New Pet Rack Cards	4,900	506	4,394
FOG Rack Cards	4,900	488	4,412
No Poop Fairy Rack Cards	4,900	473	4,427
Professionals Harmful Chemicals Rack Card	4,900	180	4,720
Reduce Stormwater Pollution at Home Rack Card	4,900	542	4,358
Large Stormwater display - 8 ft			1
Tabletop Stormwater display - 6 ft			1
SQT 6' x 3' banner			3
TOTAL DISTRIBUTION		**8,800**	

Sample surveys and survey analytics can be found in Exhibit 2 at the end of this report.

Total estimated number of people completing stormwater awareness survey: 394
Permit Reference(s): Part 1.C.2.b(i)(e) Discharges to Impaired Waters with an Approved TMDL, Impairment for Bacteria; Part 1.C.3.a Endangered Species Act Requirements, Dissolved Oxygen Strategy; Part 1.D.5.c(i)(f) and (h) Pollution Prevention/Good Housekeeping for Municipal/Co-permittee Operations; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.e Control of Floatables; Part 1.D.5.g, Public Education and Outreach on Stormwater Impacts.
Audience(s): Children, Adults

EDUCATIONAL ACTIVITIES

Educational Kiosk at Albuquerque's Rudolfo Anaya North Valley Public Library.

The team's interactive kiosk completed its successful run at Rio Rancho's Loma Colorado Public Library. The kiosk was updated with analytics software to enable the Team to better understand how it was used and which elements were used most frequently and when. In November 2018 the kiosk was installed in Albuquerque's Rudolfo Anaya North Valley Library, where it continues to educate citizens (primarily children) about stormwater issues. The kiosk features:

- An interactive stormwater system map of the Middle Rio Grande that allows children to press various points to learn the roles arroyos and channels play in the stormwater system and how to keep from polluting that system. The system stretches from Bernalillo on the north through Rio Rancho and into Albuquerque.
- A "Scoop the Poop" game that allows children to choose a dog and learn how to properly pick up after their dog. This is important because pet waste is a major source of *E. coli* contamination in the Rio Grande.

- An educational panel on common types of trash, debris and chemicals that pollute the Rio Grande including appliances and electronics; automotive products such as oil, batteries and gasoline; fertilizers and pesticides; household cleaners, yard waste; and prescription and over-the-counter medicines.
- A touchscreen that includes facts about each arroyo and the Rio Grande.
- A touchscreen that allows viewers to select and watch stormwater-related videos:
  - Rio the Duck
  - Keep the Rio Grande
  - Scoop the Poop!
  - 100 Billion Gallons
  - Arroyo Safety
  - Respect Your Arroyos

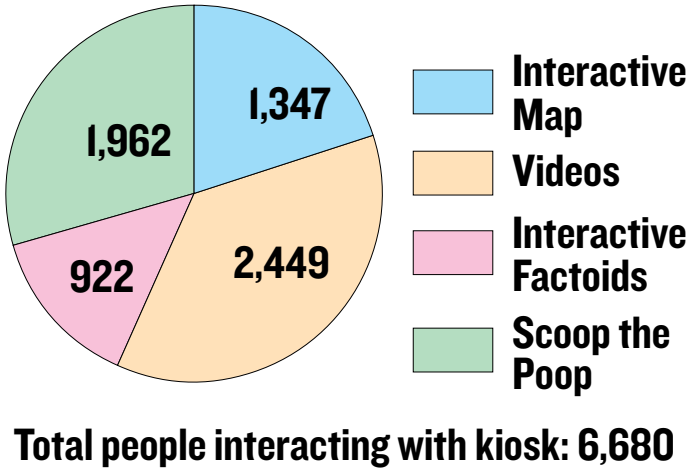
The software platform on the kiosk was upgraded to allow the games to be posted on websites and played online.

From November 1, 2018 to June 30, 2019, 48,256 people visited the Rudolfo Anaya North Valley Library and had the opportunity to view information presented by the kiosk and interact with the kiosk *(the kiosk was undergoing upgrades between July 1 and October 30.)*

Of the 48,256 visitors, approximately 6,680 (primarily) children interacted with the kiosk.

Total estimated number of people reached by these educational activities: 48,256
Permit Reference(s): Part 1.C.2.b(i)(e) Discharges to Impaired Waters with an Approved TMDL, Impairment for Bacteria; Part 1.C.3.a Endangered Species Act Requirements, Dissolved Oxygen Strategy; Part 1.D.5.c(i) (f) and (h) Pollution Prevention/Good Housekeeping for Municipal/Co-permittee Operations; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.e Control of Floatables; Part 1.D.5.g, Public Education and Outreach on Stormwater Impacts.
Audience(s): Children, Adults

Additional analytics can be found in Exhibit 3.



Total people interacting with kiosk: 6,680

Number of Views by Video

Date	Rio the Duck	Keep the Rio Grand	Scoop the Poop!	100 Billion Gallons	Arroyo Safety	Respect Your Arroyos
Nov-18	75	47	81	33	43	25
Dec-18	60	27	48	3	36	2
Jan-19	60	52	80	43	28	--
Feb-19	100	60	11	61	21	--
Mar-19	87	37	100	43	30	--
Apr-19	36	16	53	31	25	--
May-19	74	27	66	37	35	--
Jun-19	119	80	148	71	33	--

Stormwater Kiosk Interactive Metrics

Month	Metric	Map	Videos	Factoids	Scoop the Poop
Nov-18	People	173	306	12	218
	Touches	1720	306	366	533
Dec-18	People	122	223	84	162
	Touches	1587	223	252	409
Jan-19	People	167	283	12	235
	Touches	1743	283	32	598
Feb-19	People	178	376	13	263
	Touches	1928	376	39	675
Mar-19	People	198	327	13	280
	Touches	2331	327	360	730
Apr-19	People	132	18	75	211
	Touches	1536	18	12	378
May-19	People	158	270	10	259
	Touches	1862	270	22	567
Jun-19	People	219	483	15	334
	Touches	3436	483	356	822

STUDENTS AND TEACHERS REACHED THROUGH PARTNER EDUCATIONAL PROGRAMS – ARROYO CLASSROOM, RIVERXCHANGE AND BOSQUE ECOSYSTEM MONITORING PROGRAM (BEMP)

Arroyo Classroom

The Arroyo Classroom program utilizes natural arroyos as outdoor classrooms and brings native animals into the classroom to educate third grade students about the watershed and its importance as wildlife habitat. In the 2018-2019 school year, the program served 34 classes within the Rio Rancho Public School System, reaching approximately 34 teachers and 790 students.

For more information, see Exhibit 4, Arroyo Classroom's 2018-2019 report to the Mid Rio Grande Stormwater Quality Team.

RiverXchange

RiverXchange is an innovative, long-term outreach program that integrates water resource topics with computer technology, student writing and a hands-on curriculum to meet specific, measurable outcomes.

Since 2007, the program has enabled upper elementary classes from New Mexico to become "high tech pen pals" with classes outside the state to share what they learn about the geography, culture and ecology of their local river and watershed. Including these partner classes, the program has served over 18,000 students during the last 12 years. Each student spends about 25 hours engaged with the program over the course of the school year. The curriculum incorporates hands-on activities and multiple classroom presentations by local water resources experts. During the 2018-2019 season, 36 fifth-grade classes, 20 of which were Title I schools, participated in RiverXchange in New Mexico. RiverXchange worked with 22 classes (558 students) in Bernalillo County and 14 classes (396 students) in Sandoval County.

For more information, see Exhibit 5, RiverXchange's 2018-2019 report to the Mid Rio Grande Stormwater Quality Team.

BEMP

The main objective of the *Stormwater Science* outreach education program of the Bosque Ecosystem Monitoring Program (BEMP) is to teach students that the health of the Rio Grande is directly related to the health of the surrounding watershed. The *Stormwater Science* program includes a 1.5-hour classroom activity, and a 4-to 5-hour study trip to the Rio Grande. During the 2018-2019 school-year 2017 students and 547 teachers participated in *Stormwater Science* activities in their classrooms, in the field or both. The classroom program was delivered to 599 students in 33 classrooms at 13 different schools in Rio Rancho, Albuquerque and Belen.

For more information, see Exhibit 6, BEMP's 2018-2019 report to the Mid Rio Grande Stormwater Quality Team.

Total estimated number of people reached by these educational activities: 9,604
Permit Reference(s): Part 1.C.2.b(i)(e) Discharges to Impaired Waters with an Approved TMDL, Impairment for Bacteria; Part 1.C.3.a Endangered Species Act Requirements, Dissolved Oxygen Strategy; Part 1.D.5.c(i)(f) and (h) Pollution Prevention/Good Housekeeping for Municipal/Co-permittee Operations; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.e Control of Floatables; Part 1.D.5.g, Public Education and Outreach on Stormwater Impacts; Part 1.D.5.h Public Involvement and Participation.
Audience(s): Children, Adults

PUBLIC EDUCATION CAMPAIGNS ON PROPER DISPOSAL OF FATS, OILS & GREASE

In November and December 2018, the City of Rio Rancho ran a public education campaign on how to dispose of cooking grease properly. The campaign was timed to coincide with the holiday cooking season (Thanksgiving through Christmas). The FOG campaign included:

Digital Outdoor Boards – Alternating the red and green images, two boards ran for two weeks (11/12-11/25) and four boards ran one week (11/19-11/25). In December, all six boards ran the week before Christmas (12/17-12/23). A total estimated audience of 184,321 adults (18 years of age and older) with duplication was reached.

Movie Theaters – One 30-second spot played in Rio Rancho's 14-plex Premiere Theater for two weeks in November (11/16-11/22) and two weeks in December (12/15-12/28), reaching approximately 28,000 people with possible `duplication.

In addition, the City of Rio Rancho published an article in its Fall-Winter 2018 newsletter. *"Fats, Oils and Grease Can Harm Water Pipes"* offered information about the damage fats, oils and grease can do to sewer mains. The newsletter was mailed to 37,000 water utility customers.

Total estimated audience reached: 249,321
Permit Reference(s): Part 1.C.2 Discharges to Impaired Waters with and without an Approved TMDL; Part 1.C.3.a; Endangered Species Act Requirements, Dissolved Oxygen Strategy; Part 1.D.5.c(i)(f) Pollution Prevention/Good Housekeeping for Municipal/Co-permittee Operations; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.g, Public Education and Outreach on Stormwater Impacts.
Audience(s): Children, Adults

Fats, Oils and Grease Can Harm Water Pipes

PIPES CLOGGED WITH DISCARDED FAT can cause raw sewage to back up into your home or overflow into parks, yards and streets. They cause:

- Increased calls for a plumber.
- Unpleasant and expensive cleanups at your expense.
- Potential contact with disease-causing organisms.
- Increased cost for local sewer departments, causing higher sewer bills for all customers.

Avoid clogged pipes – never pour grease down a sink or into a toilet.

- Scrape grease and food scraps into a disposable container, or place in a trash can (after cooling).
- Don't put food scraps in the garbage disposal – this shreds solids into smaller pieces but doesn't prevent grease from going down the drain.
- Use a strainer in the sink to catch food scraps and other solids.

NEVER POUR
Fats, Oils or Grease
Down the Drain.
It Can Clog Sewer Pipes.

ALWAYS PUT
Cooled Fats, Oils or
Grease in the Trash.
Keep Sewer Pipes Clog-Free.

505.896-8715 · rrnm.gov

Get Your **FREE**
"Cease the Grease" Spatula*
Stop by the Utilities Department Environmental Programs
(City Hall Room 250)
**While supplies last*

Rio Rancho Utilities :: Fall-Winter 2018 :: 3

ARROYO SAFETY CAMPAIGN

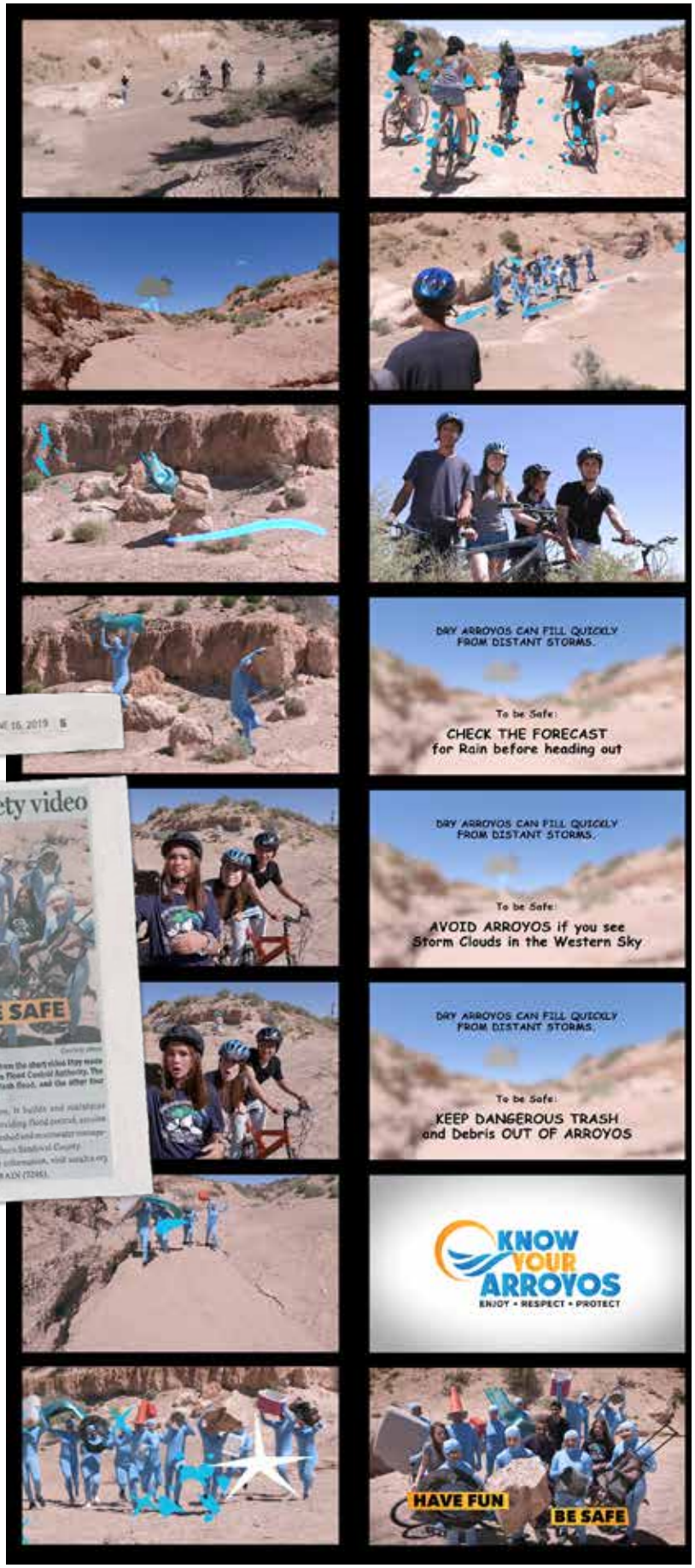
MRGSQT member SSCAFCA continued its Arroyo Safety Campaign by producing a one-minute video in collaboration with the Rio Rancho High School Tree Stewards group geared toward high school students. Conceptualized by the students, the spot uses humor to share arroyo safety messages and emphasize the importance of keeping trash and debris out of arroyos.

The video was posted on the Stormwater Quality Team's website **www.keeptheriograndе.org,** YouTube, Instagram, Facebook and, of course, SSCAFCA's website. Analytics indicate that the spot garnered 5,152 views on social media, earned 46 Facebook followers and 593 "likes." The spot also ran for two weeks in Rio Rancho's 14-plex Premiere Theater, where it reached 14,000 people. To see the spot visit: **https://www.sscafca.org/know-your-arroyos/**

In addition, the *Rio Rancho Observer* ran an article about the spot, reaching 23,500 people.


NEWS RROBSERVER.COM | SUNDAY, JUNE 16, 2019 5

SSCAFCA report creates humorous flash-flood safety video



Total estimated audience reached: 43,291
Permit Reference(s): Permit Reference(s): Part 1.C.2 Discharges to Impaired Waters with and without an Approved TMDL; Part 1.C.3.a Endangered Species Act Requirements, Dissolved Oxygen Strategy; Part 1.D.5.c(i)(f) and (h) Pollution Prevention/ Good Housekeeping for Municipal/Co-permittee Operations; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.g, Public Education and Outreach on Stormwater Impacts.
Audience(s): All ages, especially high school students

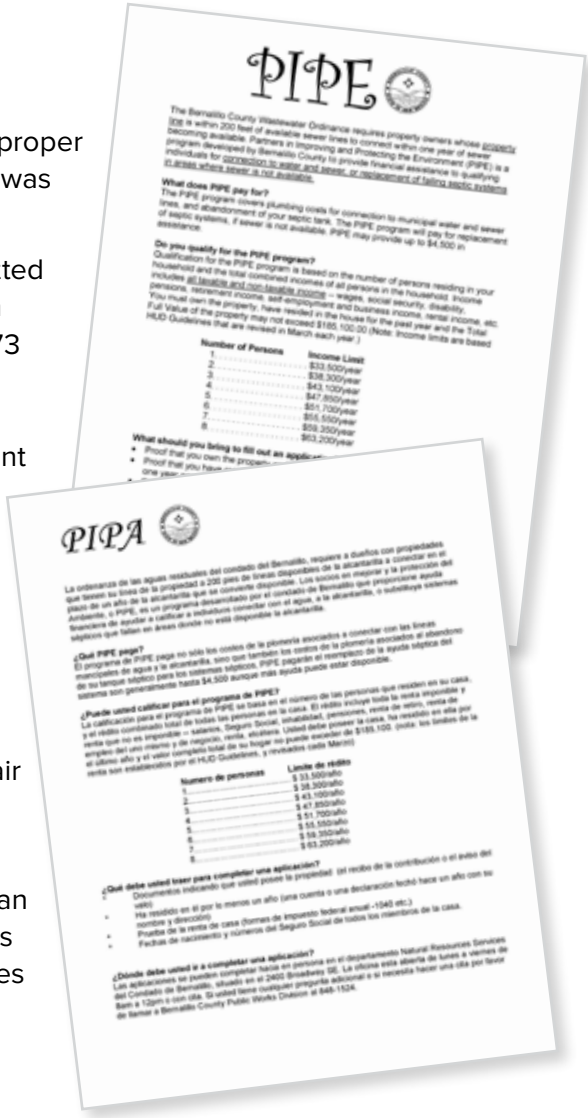
SSCAFCA also created and ran alternating ads in the *Rio Rancho Observer* during monsoon season.

Total estimated audience reached: 94,000
Permit Reference(s): Part 1.D Stormwater Management Program; Part 1.C.2 Discharges to Impaired Waters with and without an Approved TMDL; Part 1.D.5.c(i)(f) and (h) Pollution Prevention/Good Housekeeping for Municipal/Co-permittee Operations; Part 1.D.5.g, Public Education and Outreach on Stormwater Impacts.
Audience(s): All ages

SEPTIC SYSTEM EDUCATION, OUTREACH AND ENFORCEMENT PROGRAM

Bernalillo County administers the septic system permitting program in the unincorporated portions of Bernalillo County under the Bernalillo County Wastewater Ordinance, ensuring the proper disposal of septic waste and proper operation and maintenance of septic systems. The wastewater ordinance was passed in 2015.

The County began a campaign in 2012 to get unpermitted systems permitted or properly abandoned, with an established goal of contacting a minimum of 300 unpermitted system or aging system owners per year. To date, 1,773 system owners have been contacted, resulting in 813 responses and 727 resolved. Resolution means either no system was present or the property was vacant; resulted in permit or connection to sewer or repair/replacement to get into compliance; or intended/listed for clerk filing or future legal action (in process and determination). In FY19, the County targeted the East Mountain Area, including the Upper Tijeras Arroyo watershed, and closed 233 septic systems.



Beginning in 1993, the PIPE Program has provided assistance to income-qualified residents by providing contractors to connect residences to water and sewer services. Beginning in 1998, the TANK Program provides assistance to income qualified residents with the replacement and/or repair of failing septic systems in areas of the County without sewer availability.

Total estimated audience reached: 1,500
Permit Reference(s): Part 1.C.2.b(i)(e) Discharges to Impaired Waters with an Approved TMDL, Impairment for Bacteria; Part 1.C.3.a Endangered Species Act Requirements, Dissolved Oxygen Strategy; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.g, Public Education and Outreach on Stormwater Impacts.
Audience(s): Adults

NM STATE FAIR PARADE FLOAT

AMAFCA created a float for the State Fair Parade, which takes place every September in Albuquerque. With signs saying “Keep the Rio Grand” and “There is No Poop Fairy,” the team borrowed a concept developed by Greenville County Soil and Water Conservation District in South Carolina. A staff member dressed up as the “Poop Fairy” and tossed Poop Emoji Squeezies to the crowd.

Total estimated audience reached: 50,000
Permit Reference(s): Part 1.C.2.b(i)(e) Discharges to Impaired Waters with an Approved TMDL, Impairment for Bacteria; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.e Control of Floatables; Part 1.D.5.g, Public Education and Outreach on Stormwater Impacts; Part 1.D.5.h, Public Involvement and Participation.
Audience(s): All ages

CHILDREN’S WATER FESTIVAL

The 2018 Children’s Water Festival was held October 22-23, 2018 at the Santa Ana Star Center in Rio Rancho. An estimated 1,500 fourth-grade students attended from 64 classrooms and one group of home-schoolers.

The Festival serves to educate fourth-grade school children about water and its relationship to humans, animals and other natural resources in a fun and interactive atmosphere. Its vision is to introduce students and teachers to new ideas, options, and solutions so they will conserve and protect water for the future; lay the foundation for further learning; and reach as many students and teachers as possible.

Total estimated audience reached: 1,500
Permit Reference(s): Part 1.C.2.b(i)(e) Discharges to Impaired Waters with an Approved TMDL, Impairment for Bacteria; Part 1.C.3.a Endangered Species Act Requirements, Dissolved Oxygen Strategy; Part 1.D.5.c(i)(f) and (h) Pollution Prevention/Good Housekeeping for Municipal/Co-permittee Operations; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.e Control of Floatables; Part 1.D.5.g Public Education and Outreach on Stormwater ImpactsAudience
Audience(s): fourth-graders

For more information, see Exhibit 7, Children’s Water Festival Report, 2018-2019

HOUSEHOLD HAZARDOUS WASTE COLLECTION

Total estimated participants (includes City of Albuquerque, Bernalillo County and AMAFCA): 14,648
Permit Reference(s): Part 1.C.2.b(i)(e) Discharges to Impaired Waters with and without an Approved TMDL; Part 1.D.5.c(i)(f) Pollution Prevention/Good Housekeeping for Municipal/Co-permittee Operations; Part 1.D.5.e Illicit Discharges and Improper Disposal; Part 1.D.5.e Control of Floatables; Part 1.D.5.g Public Education and Outreach on Stormwater Impacts
Audience(s): Adults

For more detailed breakdowns please see Exhibit 8.

Diverted from Landfill by City of Albuquerque and Bernalillo County (includes recycled and destroyed) – Weight in pounds	
FISCAL YEAR 2018-2019	
July 2018	39,373
August 2018	42,054
September 2018	39,728
October 2018	29,818
November 2018	37,332
December 2018	14,723
January 2019	24,021
February 2019	34,877
March 2019	23,120
April 2019	34,670
May 2019	39,664
June 2019	44,389
TOTAL	**403,769 lbs.**

Diverted from River by AMAFCA	
FISCAL YEAR 2018-2019	
Trash Removed	**1,858 cubic yards**
Vegetation Removed	**150 cubic yards**
Sediment Removed	**53,948 cubic yards**
Homeless Debris Removed	**50 cubic yards**
Dog Waste Removed	**6,142 lbs.**

Diverted from Landfill at 10 Household Hazardous Waste collection events in East Mountains, Northeast Heights and South Valley by Bernalillo County	
FISCAL YEAR 2018-2019	
TOTAL COLLECTED	**11,570 lbs.**

DONATIONS/SPONSORSHIPS

Stormwater Team members donated $139,000 to organizations for additional educational and training programs:

MEMBER	AMOUNT DONATED	RECIPIENT	PURPOSE
City of Albuquerque	$43,000	The Nature Conservancy	For Education and Outreach
AMAFCA	$2,000	Land and Water Summit	For Public Involvement and Participation
AMAFCA	$5,000	2018 EPA Region 6 Stormwater Conference	For Public Involvement and Participation
Bernalillo County	$5,000	Land and Water Summit	For Public Involvement and Participation
Bernalillo County	$5,000	2018 EPA Region 6 Stormwater Conference	For Public Involvement and Participation
Bernalillo County	$75,000	BEMP	For Education and Outreach
City of Rio Rancho	$10,000	Children's Water Festival	For Education and Outreach
City of Rio Rancho	$2,000	Land and Water Summit	For Public Involvement and Participation
Mid Rio Grande Stormwater Quality Team	$5,000	Land and Water Summit	For Public Involvement and Participation
SSCAFCA	$2,000	Land and Water Summit	For Public Involvement and Participation
SSCAFCA	$1,000	Children's Water Festival	For Education and Outreach

ESTIMATED TOTAL NUMBER OF PEOPLE REACHED THROUGH ALL ADVERTISING, EDUCATIONAL AND PUBLIC OUTREACH ACTIVITIES DURING 2018-2019:

Obviously, some people were reached by more than one activity, but in gross numbers an estimated **581,448** people were reached with a stormwater quality/stormwater pollution prevention message during the 2018-2019 fiscal year.

Exhibit 1
Event Participation 2018-2019

NAME OF PROGRAM/EVENT	EVENT DATE	TYPE OF AUDIENCE	MS4 CATEGORY	TOTAL REACHED	NOTES
2018					
Rocky Mountain Youth Corp w/Rio Rancho for AMAFCA cleanup at North Diversion Channel	7/7/18	Youth, Adults	SWP	25	Rolling River presentation
National Association of Flood & Stormwater Management Agencies (NAFSMA) Annual Meeting in Santa Fe, NM	7/11/18	Adults	SWP	250	AMAFCA, SSCAFCA, and BernCo delivered presentations.
"There is No Poop Fairy" float in State Fair Parade	7/13/18	All Ages	AS, PW, SWP	50,000	Provided education information about Scoop the Poop, There is no Poop Fairy, why it is important to pick up after your pet as well as proper household hazardous waste disposal.
Environmental Fair at Isleta Youth Center	7/14/18	All Ages		400	
EPA Region 6 Stormwater Conference "Stormwater Permitting"	8/19-23/2018	Adults	SWP	350	AMAFCA delivered 5 presentations at the EPA R6 conference, and hosted field trips at two water quality facility and a design charrette at another water quality facility. Bernalillo County delivered 3 presentations including watershed-based plan implementation, outreach and education, and GI/LID impediments. AMAFCA and Bernalillo County also co-chaired planning of conference.
Welcome Day for UNM Students	8/21/18	College Students	SWP	106	Rolling River presentation
Cancer Services of NM Retreat at Marriott Pyramid	9/9/18	Adults	SWP	25	Rolling River presentation
RMYC/BCMN Rolling River training at Valle de Oro National Wildlife Refuge	9/15/18	Adults	SWP	10	Rolling River presentation
Enviroscape demo for NMED DOE Oversight at Los Alamos	9/18/18	Adults	SWP	10	Enviroscape presentation
East Mountain Celebration at Los Vecinos Community Center	9/23/18	Adults	SWP	500-600	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
Corrales Harvest Festival	9/29-30, 2018	All Ages	AS, PW, SWP	10,000	Booth handing out information, SWAG and collecting surveys to determine public knowledge regarding stormwater issues
Environmental Science class presentation at Nex+Gen Academy	10/2/18	Students	SWP	60	Enviroscape presentation
USFS Mexico Interdependence Day at NHCC	10/6/18	Adults	SWP	25	Rolling River presentation
CNM Environmental Science class ES presentation at Sanchez Farm	10/8/18	Students	SWP	25	Enviroscape presentation
RiverXchange watershed presentation at Bandelier Elementary	10/17-18, 2018	Children	SWP	100	RiverXchange presentation to four 4th grade classes
Rio Rancho Children's Water Festival	10/22/18	Elementary Students and Teachers	SWP	1,500	Students attended from 64 classrooms and one small group of home-schoolers; Bernalillo Elementary School, St. Thomas Aquinas, and all of the elementary schools in Rio Rancho Public Schools. The students attend three 30-minute presentations in a half-day format. Up to 17 classes from three to four schools were on-site at one time. Schools attended a morning or afternoon program.

AS: Animal Sources
CON: Construction
HHW: Household Hazardous Waste
ID: Illicit Discharges
PW: Pet Waste
SSS: Septic & Sanitary Sewer Systems
SWP: General Stormwater Pollution Prevention

NAME OF PROGRAM/EVENT	EVENT DATE	TYPE OF AUDIENCE	MS4 CATEGORY	TOTAL REACHED	NOTES
Children's Water Festival	10/21/18	Children	SWP	125	Rolling River presentation
Children's Water Festival	10/22/18	Children	SWP	125	Rolling River presentation
EPA R6 Manager's Meeting in Dallas, TX	10/25/18	Adults	SWP	50	AMAFCA and BernCo presented at the EPA R6 Manager's Meeting in Dallas, TX;
Animal Humane's Doggie Dash and Dawdle	11/4/18	All Ages	AS, PW, SWP	4,000	Animal Humane's signature event and largest fundraiser
John Baker	12/3/18	All Ages	SWP	31	Planted 27 poles
Colinas del Norte	12/7/18	All Ages	SWP	43	Planted 24 poles
CdN*	12/11/18	All Ages	SWP	53	Planted 45 shrubs
GOK	12/14/18	All Ages	SWP	49	Planted 42 poles
2019					
"GSI/LID in Transportation" at 56th Annual UNM Paving & Transportation Conference	1/7/19	Adults	SWP	645	Presentation in cooperation with Tess Houle, MRWM. GI/LID in transporation/streets, disconnected impervious areas, stormwater quality and quantity, stormwater regulations.
Earth Guardians	1/19/19	Students	SWP	15	Planted 70 poles
Troop 444	1/26/19	Students	SWP	9	Planted 48 poles
Jewish Congregation	1/27/19	All Ages	SWP	56	Planted 42 poles
Bosque school	1/30/19	All Ages	SWP	19	Planted 14 poles
KRQE TV interview on "GSI/LID improvements, stormwater qualiy"	1/30/19	Adults	SWP	4,500	KRQE 7am Morning Show | 2nd Street Corridor Projects Open House
Second Street SW Corridor Improvments Ribbon-Cutting Ceremony	1/30/19	Adults	SWP	75	Public ceremony that discussed the improvements along 2nd Street, including GI/LID improvements, with local community
Bosque School	1/31/19	All Ages	SWP	17	Planted 12 poles
Bosque School PM Session	1/31/19	All Ages	SWP	22	Planted 22 poles
Bosque School	2/1/19	All Ages	SWP	17	Planted 12 poles
Peace Corps	2/2/19	All Ages	SWP	35	Planted 70 poles
Bosque School	2/6/19	All Ages	SWP	19	Planted 9 poles
7 Bar	2/7/19	All Ages	SWP	59	Planted 17 poles
Sunport Commerce Center Public Meeting at Mountain View Community Center	2/7/19	Adults	SWP	50	The proposed design overlay will establish additional criteria in order to achieve quality development of this plan area beyond what is currently required under its existing industrial zone designation. The design overlay process includes but is not restricted to architecture, landscaping, fencing and walls. The public meeting will provide an overview of the design overlay process and the draft document. Included stormwater quality improvements.
Cub Scout Pack	2/9/19	All Ages	SWP	20	Planted 27 poles
Holy Ghost	2/13/19	All Ages	SWP	54	Planted 68 poles
Monte Vista (reschedule)	2/15/19	All Ages	SWP	22	Planted 38 poles
UNM Water Resources Class	2/15/19	College Students	SWP	20	AMAFCA gave presentation.
2019 BEMP Crawford Symposium	2/15/19	All Ages	SWP	500	AMAFCA mentored a student group that presented on water quality data.
Enterprise company	2/23/19	Adults	SWP	6	Planted 36 poles
Landscape for Life Training at Hubble House	2/23/19	Adults	SWP	55	Residential stormwater management- rain gardens, rainwater catchment, residential stormwater quality

AS: Animal Sources
CON: Construction
HHW: Household Hazardous Waste
ID: Illicit Discharges
PW: Pet Waste
SSS: Septic & Sanitary Sewer Systems
SWP: General Stormwater Pollution Prevention

NAME OF PROGRAM/EVENT	EVENT DATE	TYPE OF AUDIENCE	MS4 CATEGORY	TOTAL REACHED	NOTES
New Mexico Land and Water Summit	2/27-3/1/2019	Adults	SWP	137	Provided sponsorship of $5000 - Attendees included professionals, hydrology, landscape architecture, landscaping, engineering. AMAFCA hosted a field trip at a water quality facility and was a member of the planning committee for the 2019 Land and Water Summi
Whittier	3/22/19	All Ages	SWP	9	Planted 10 shrubs
Inez Elementary	3/28/19	All Ages	SWP	77	Planted 68 shrubs
Holy Ghost	4/3/19	All Ages	SWP	39	Planted 55 poles
Cancer Services of NM Retreat at Marriott Pyramid	4/14/19	Adults	SWP	30	Rolling River presentation
Earth Day Event	4/20/19	All Ages	SWP	300	
Annunciation Catholic School Earth Day	4/26/19	Students	SWP	25	Rolling River presentation
Bosque School Earth Day	4/26/19	Students	SWP	60	Enviroscape presentation
Earth Day Celebration, Forest Service	4/26/19	Adults	SWP	200	Spoke with Forest Service employees about water conservation programs in Bernalillo County, donated rain barrel for free drawing.
South Valley Pride Day at Westside Community Center	4/28/19	All ages	SWP	2,000	Provided education about land use impacts to stormwater and the river, human activities and their impacts, things kids can do to reduce SW pollution.
Singing Arrow Public Meeting re: Watershed protection	5/16/19	Adults	SWP	12	Meeting with local community to discuss signage project. Community feedback about signage for watershed protection/stormwater quality'
Abrazos Environmental Justice Community Day at Valle de Oro	5/18/19	Adults	SWP	250	Provided education about land use impacts to stormwater and the river, human activities and their impacts, things kids can do to reduce SW pollution.
Abrazos Justice Day	5/18/19	Adults	SWP		Honoring the rights to a healthy environment in which we live, work, play and go to school.
Paws and Claws Family Festival, Bernco County Animal Care and Resource Center Opening event	5/18/19	All ages	AS, PW, SWP	500	Provided education information about Scoop the Poop, There is No Poop Fairy, why it is important to pick up after your pet as well as proper household hazardous waste disposal.
Business outreach	5/19/19	Adults	SWP	530	Brochures developed with stormwater quality information specific to various sectors of business including automotive, parking lots, contractors' yards, landscaping, mobile carpet cleaners, fueling stations, printers.
Copper Spring Cleanup	Spring 2019	Adults	HHW, SWP	58	Collected 35 lbs. of dog poop, 4 bags of trash, 2 bags mixed recycling, 1 5-gal. bucket of glass, 0.5 bags of aluminum, 450 feet of eroded trails closed and planted with cactus, maintenance on 1/2 mile of trail, about 220 feet of trail rerouted
Indian School Spring Cleanup	Spring 2019	Adults	HHW, SWP	46	Collected 90 lbs. dog poop, 2.5 bags of trash, 1 bag mixed recycling, 2 5-gal. buckets of glass, 0.5 bags of aluminum, 1 pallet, 2 sections of wire mesh fencing, maintenance on 3 trails sections, cactus planted to close off several unofficial trails.
Menaul Spring Cleanup	Spring 2019	Adults	HHW, SWP	27	Collected 33 lbs. dog poop, 1 bag of trash, 1 bag mixed recycling, 1 5-gal. buckets of glass, 2 pieces of rebar, 11 golf balls, 420 feet of trail rerouted, 840 feet of trail maintained, cactus planted to close off one trail section

AS: Animal Sources
CON: Construction
HHW: Household Hazardous Waste
ID: Illicit Discharges
PW: Pet Waste
SSS: Septic & Sanitary Sewer Systems
SWP: General Stormwater Pollution Prevention

NAME OF PROGRAM/EVENT	EVENT DATE	TYPE OF AUDIENCE	MS4 CATEGORY	TOTAL REACHED	NOTES
Piedra Lisa Spring Cleanup	Spring 2019	Adults	HHW, SWP	53	Collected 35 lbs. dog poop, 1 bag of trash, 1 bag mixed recycling, 2.5 gal. of glass, 0.5 bags of aluminum, 1000 feet of trail maintained, cactus planted on 5 sections of social trails, several sections of rock steps built
River Cleanup	Spring 2019	Adults	HHW, SWP	60	Collected 9 bags mixed recycling, 3 5-gal. buckets of glass and 1.5 bags of aluminum. Also filled the dump trailer plus 4 pickup trucks with: 3 shopping carts, 1 bath tub filled with medical supplies, 23 tires, 3 mattresses and a jumble of rusty car parts.
Rt. 66 Spring Cleanup	Spring 2019	Adults	HHW, SWP	40	C+A35:F78sh, 1 tire, several pieces of sheet metal, 8 eroded roads closed
TOTAL REACHED				**73,130**	

AS: Animal Sources
CON: Construction
HHW: Household Hazardous Waste
ID: Illicit Discharges
PW: Pet Waste
SSS: Septic & Sanitary Sewer Systems
SWP: General Stormwater Pollution Prevention

Exhibit 2
Sample Surveys and Survey Analytics 2018-2019

Mid Rio Grande Stormwater Quality Team
www.keeptheriogrand.org

Please Tell Us What You Think!

What is your zip code? _____

Please tell us which category best describes your age:

- ☐ Younger than 18
- ☐ 18-30
- ☐ 31-50
- ☐ 51-65
- ☐ Older than 65

Storm water runoff is defined as rainfall that doesn't soak into the ground and collects on the ground surface. Do you think that storm water runoff affects the quality of water in the Rio Grande?

☐ Yes ☐ No ☐ Unsure

Which of the following would you be willing to do or are you currently doing at home or at work to improve the quality of storm water runoff? Check all that apply:

a. Pick up after your dog/pet and dispose of waste in the trash

☐ Currently Do ☐ Will Do ☐ Won't Do

b. Reduce, reuse, and recycle trash

☐ Currently Do ☐ Will Do ☐ Won't Do

c. Pay an additional minor monthly fee on your water bill

☐ Would Do ☐ Won't Do

Note: If you answered "Would Do" above, how much would you be willing to pay?

☐ $1 ☐ $2 ☐ $3 ☐ $5 ☐ more than $5

Turn over to complete the survey ↩

d. Reduce use of toxic chemicals outdoors (pesticides, herbicides, overuse of fertilizers)

☐ Currently Do ☐ Will Do ☐ Won't Do

e. Fix oil leaks on cars or trucks

☐ Currently Do ☐ Will Do ☐ Won't Do

f. Wash vehicle(s) at full- or self-service car wash

☐ Currently Do ☐ Will Do ☐ Won't Do

g. Dispose of household hazardous waste (such as paints or batteries), appliances and electronic devices properly at a collection facility or during a recycling event

☐ Currently Do ☐ Will Do ☐ Won't Do

h. Keep chemicals and trash, including leaf litter from blowers and swimming pool water, out of street gutters

☐ Currently Do ☐ Will Do ☐ Won't Do

Please make any comments below:

_____

_____

_____

_____

_____

_____

_____

_____

If you would like a reply, please list your name and email or daytime phone number:

_____

_____

_____

Stormwater Quality Survey Trends

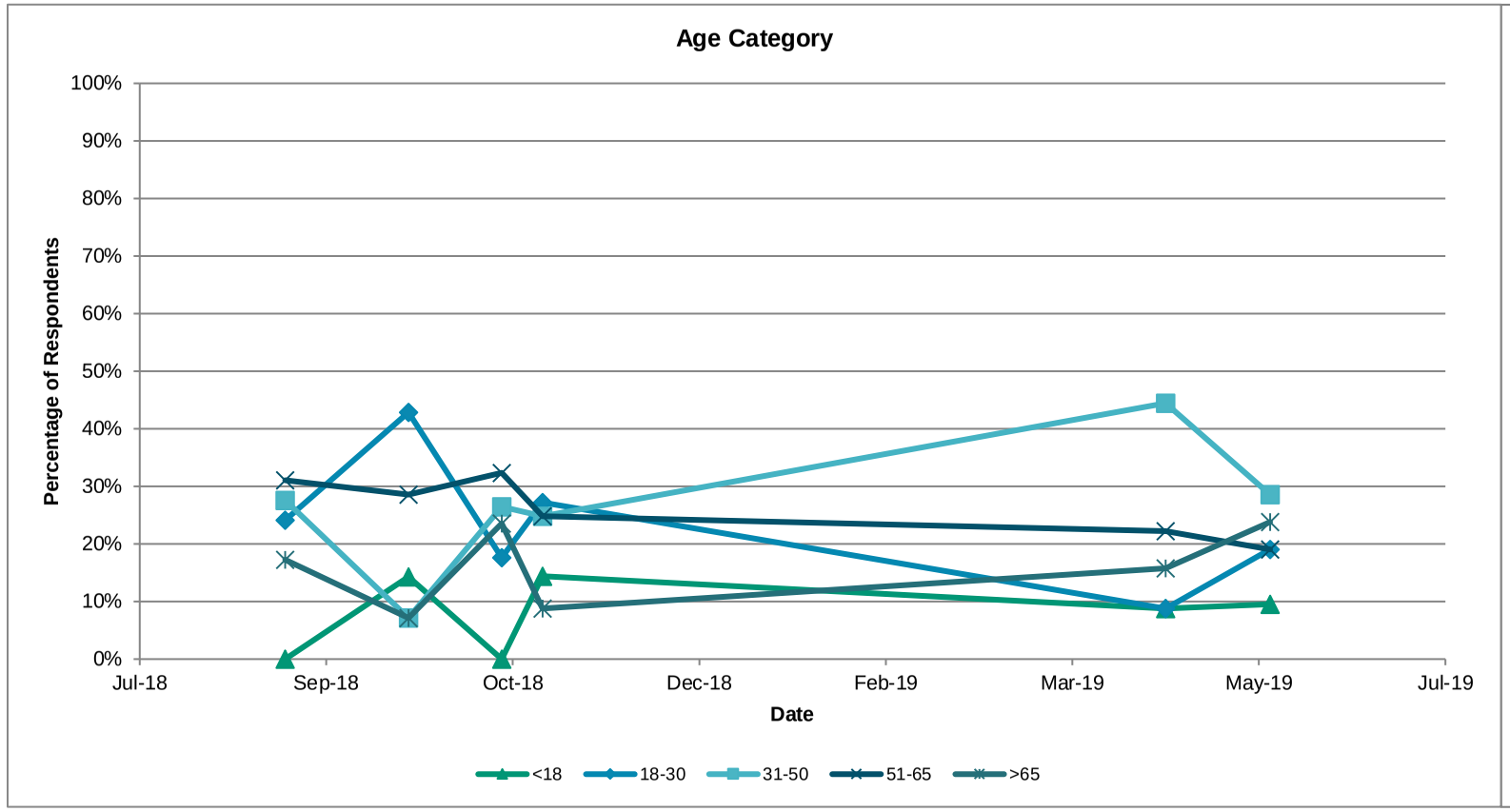
The Middle Rio Grande Storm Water Quality Team organized a short survey addressing various water quality issues affecting the Rio Grande. The following table reflects the tallied results of the 10-question voluntary questionnaire from July 1, 2018 – June 30, 2019.

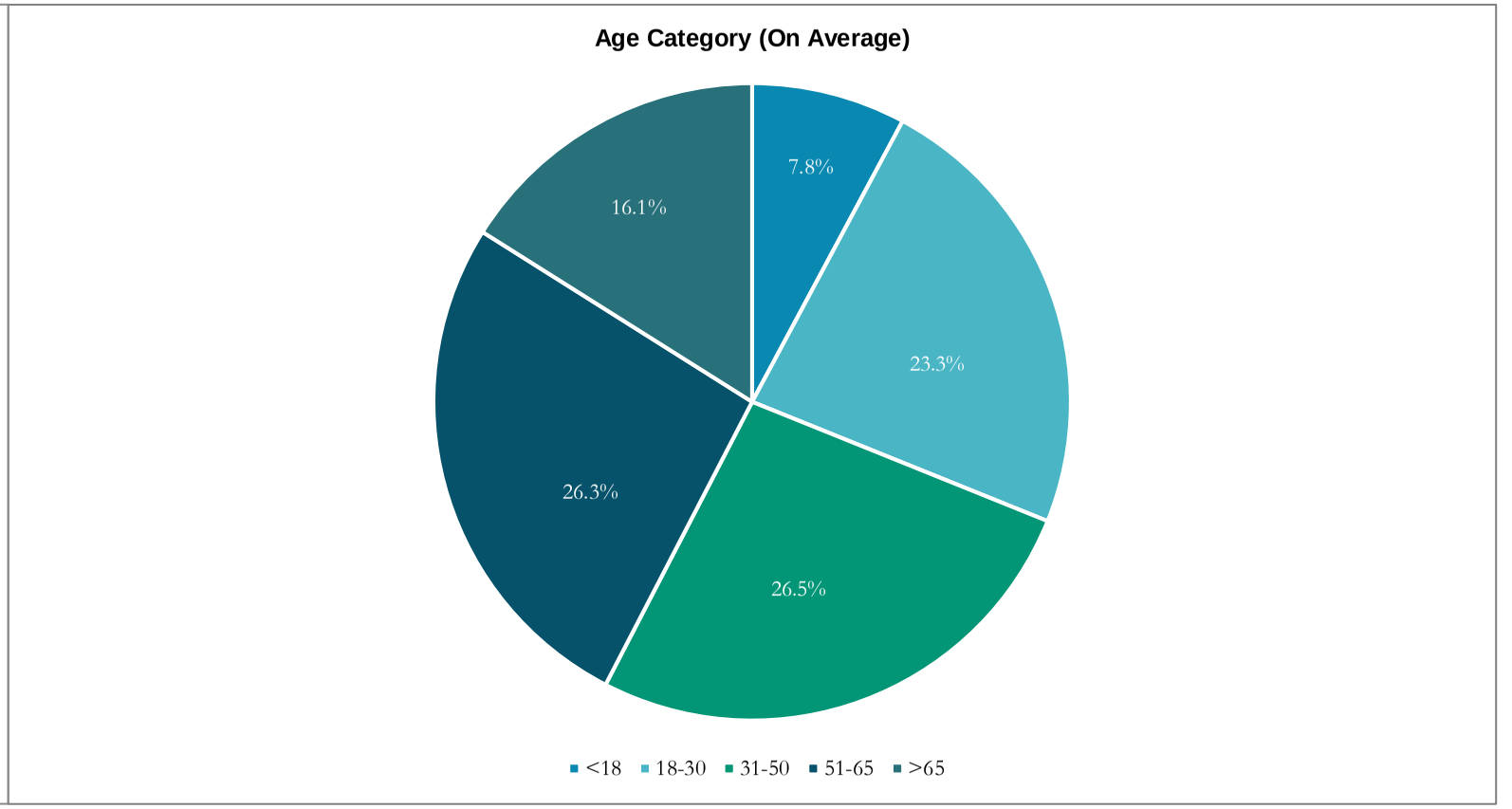
NAME OF EVENT HERE →		*El VdO 2018*	*2018 Harvest*	*Mayors Summit*	*2018 Doggie Dash*	*Earth Fest*	*Vdo 2019*	*AVERAGE % OF RESPONDENTS*
DATE OF EVENT HERE →		**Aug-18**	**Sep-18**	**Oct-18**	**Nov-18**	**Apr-19**	**May-19**	
Survey Question	Answer	% Of Respondents						
Age Category	<18	0%	14%	0%	14%	9%	10%	7.0%
	18-30	24%	43%	18%	27%	9%	19%	19.9%
	31-50	28%	7%	26%	25%	44%	29%	34.7%
	51-65	31%	29%	32%	25%	22%	19%	26.1%
	>65	17%	7%	24%	9%	16%	24%	12.4%
Stormwater Runoff	Yes	72%	85%	82%	79%	82%	86%	80%
	No	7%	8%	9%	4%	5%	0%	5%
	Unsure	21%	8%	9%	17%	13%	14%	15%
Pick up after pet	Currently do	85%	92%	84%	95%	84%	85%	82%
	Will do	15%	8%	16%	4%	11%	15%	14%
	Won't do	0%	0%	0%	1%	5%	0%	4%
Reduce, Recycle, and Recycle Trash	Currently do	83%	85%	94%	94%	83%	95%	89%
	Will do	17%	15%	3%	6%	16%	5%	10%
	Won't do	0%	0%	3%	0%	2%	0%	1%
Pay Minor Fee	Would Do	68%	100%	65%	70%	76%	89%	69%
	Won't Do	32%	0%	35%	30%	24%	11%	31%
If Would Do, How Much?	$1	15%	17%	30%	31%	45%	25%	29%
	$2	35%	17%	30%	27%	23%	13%	24%
	$3	20%	17%	15%	14%	10%	25%	16%
	$5	20%	33%	15%	25%	13%	19%	24%
	>$5	10%	17%	10%	3%	8%	19%	7%
Reduce Use of Toxic Chemicals	Currently do	88%	83%	81%	71%	77%	86%	75%
	Will Do	8%	8%	13%	23%	19%	14%	21%
	Won't Do	4%	8%	6%	6%	5%	0%	5%
Fix Oil Leaks on Vehicle(s)	Currently do	83%	83%	84%	76%	77%	95%	78%
	Will Do	17%	17%	9%	9%	19%	5%	17%
	Won't Do	0%	0%	6%	3%	4%	0%	4%
Wash Vehicles at Full or Self Service Car wash	Currently Do	64%	50%	72%	77%	73%	90%	72%
	Will Do	24%	42%	13%	15%	18%	10%	18%
	Won't Do	12%	8%	16%	8%	9%	0%	10%
Dispose Household Hazardous Waste	Currently Do	72%	67%	94%	71%	73%	81%	75%
	Will Do	28%	33%	3%	26%	25%	19%	21%
	Won't Do	0%	0%	3%	3%	1%	0%	4%
Keep Chemicals/Trash Out of Street Gutters	Currently Do	83%	75%	88%	79%	76%	90%	76%
	Will Do	17%	25%	9%	20%	24%	10%	21%
	Won't Do	0%	0%	3%	1%	1%	0%	3%
Percent of Zip Codes w/in AMAFCA Jurisdiction		88%	71%	96%	83%	90%	85%	72%

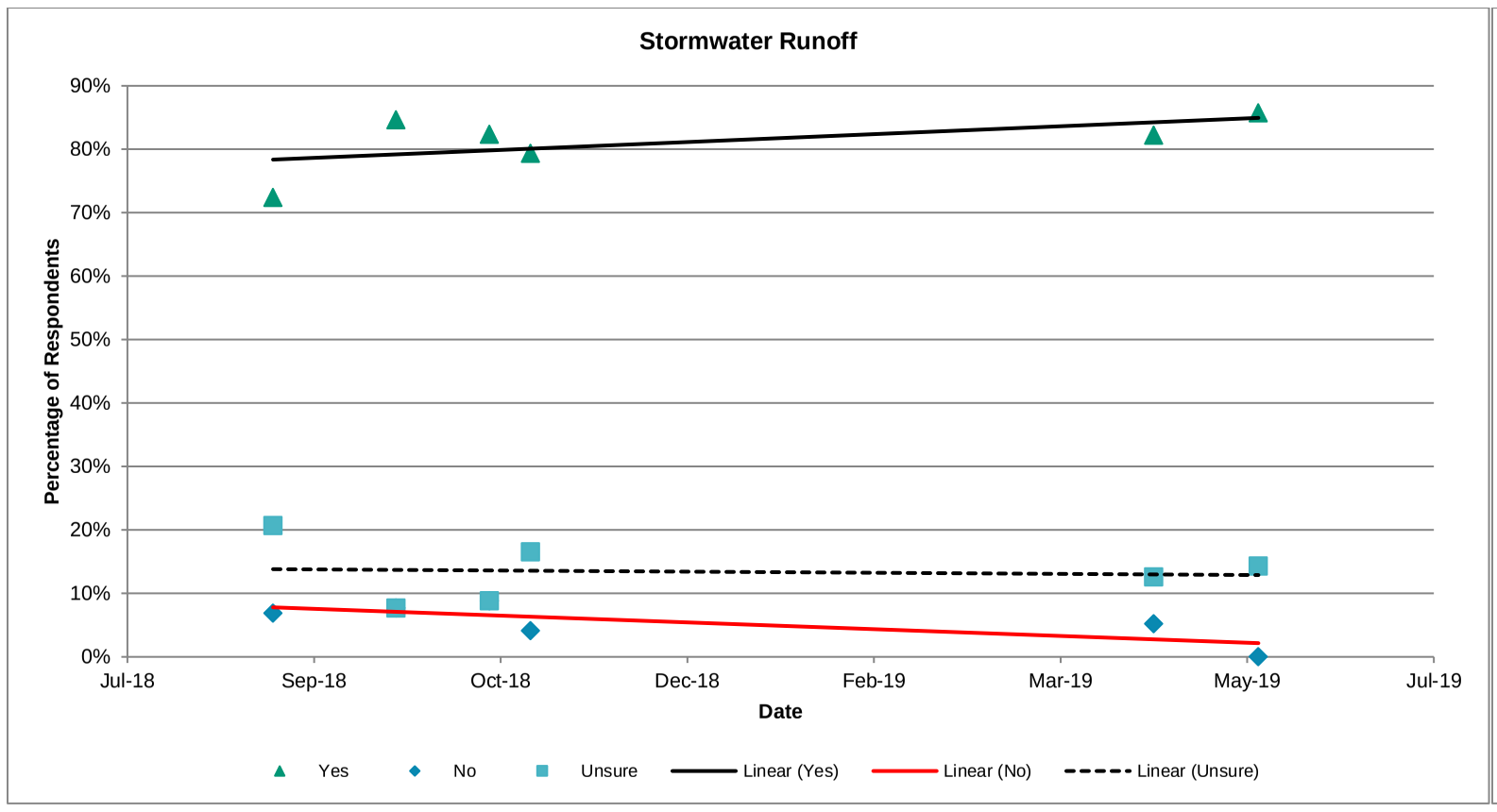
Total Number of Surveys Recorded: 394

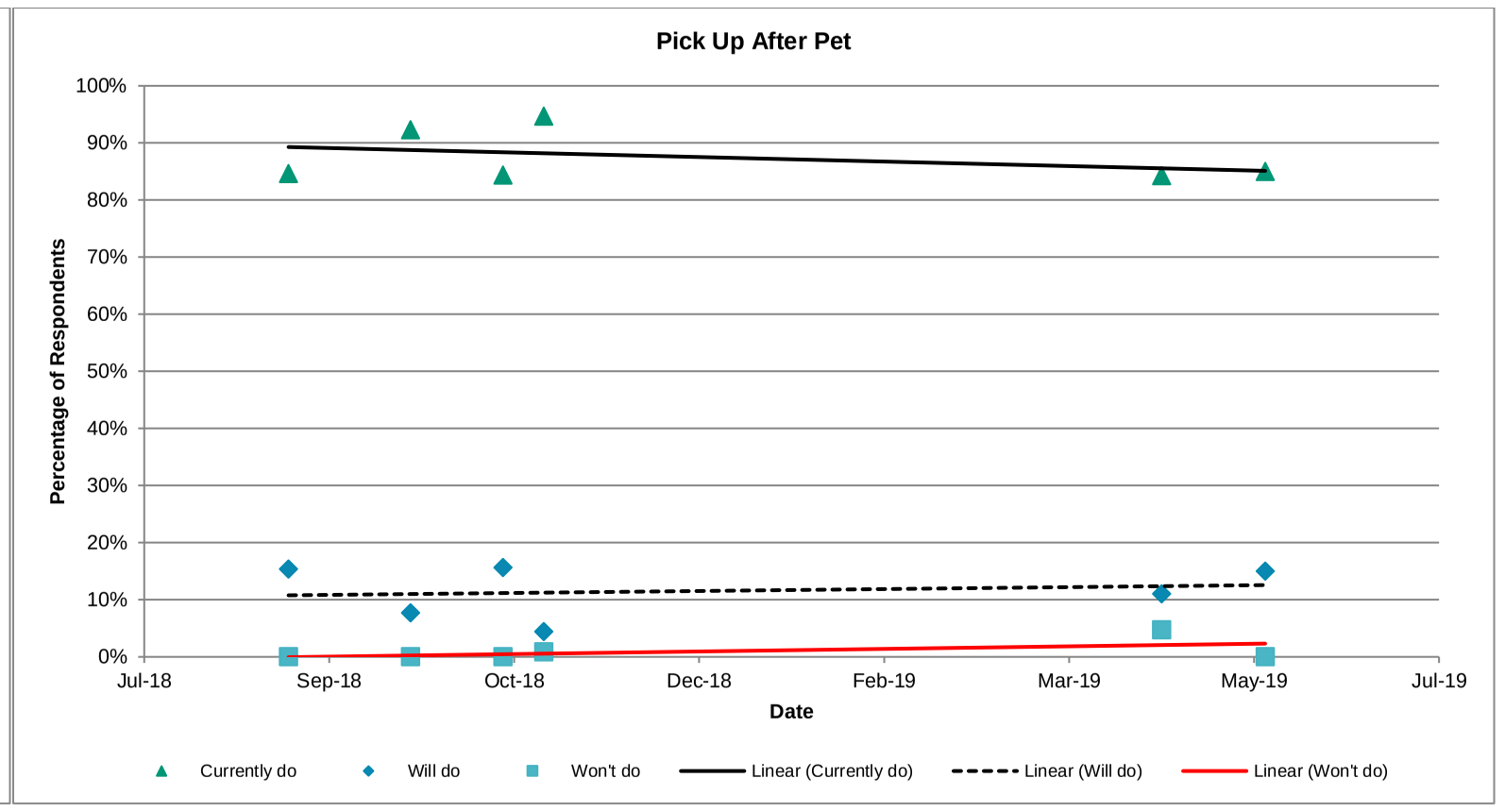
Stormwater Quality Survey Trends

The following graphics show how tallied results vary from event to event over the course of July 2018 to June 2019. A simple linear regression is computed to visualize a very general direction of trend. A more sophisticated confidence analysis is proposed at the end of this report.

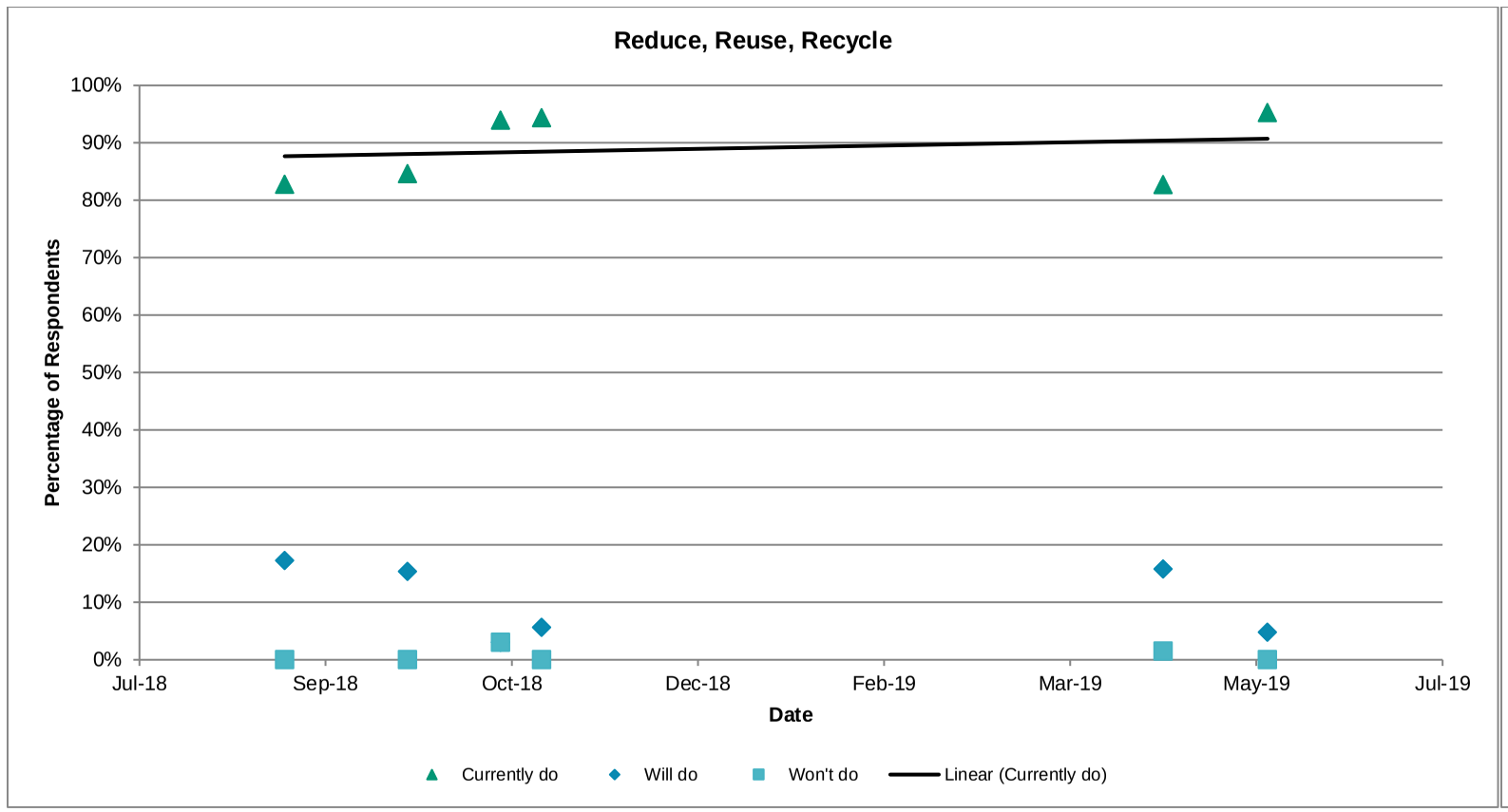


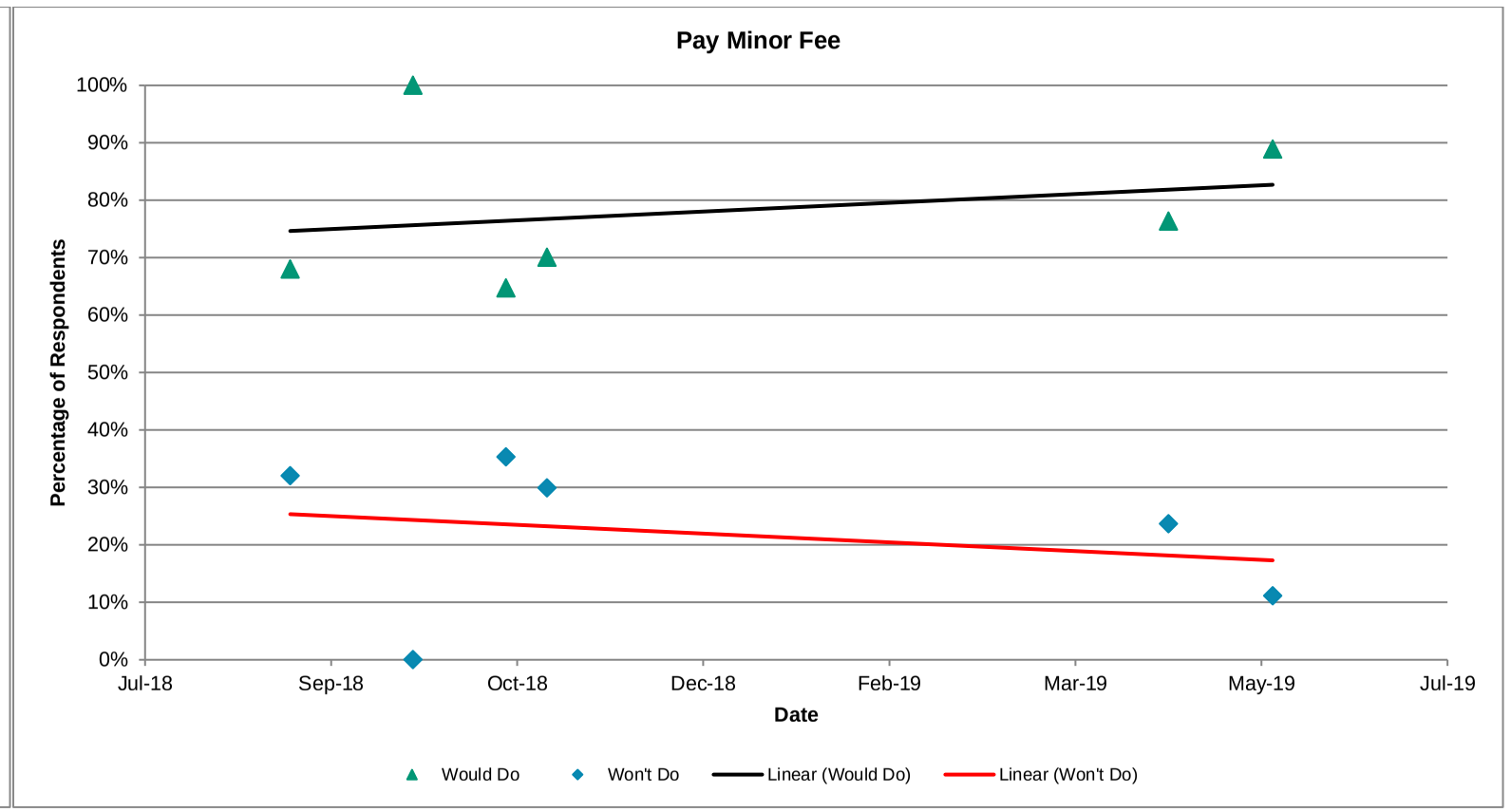


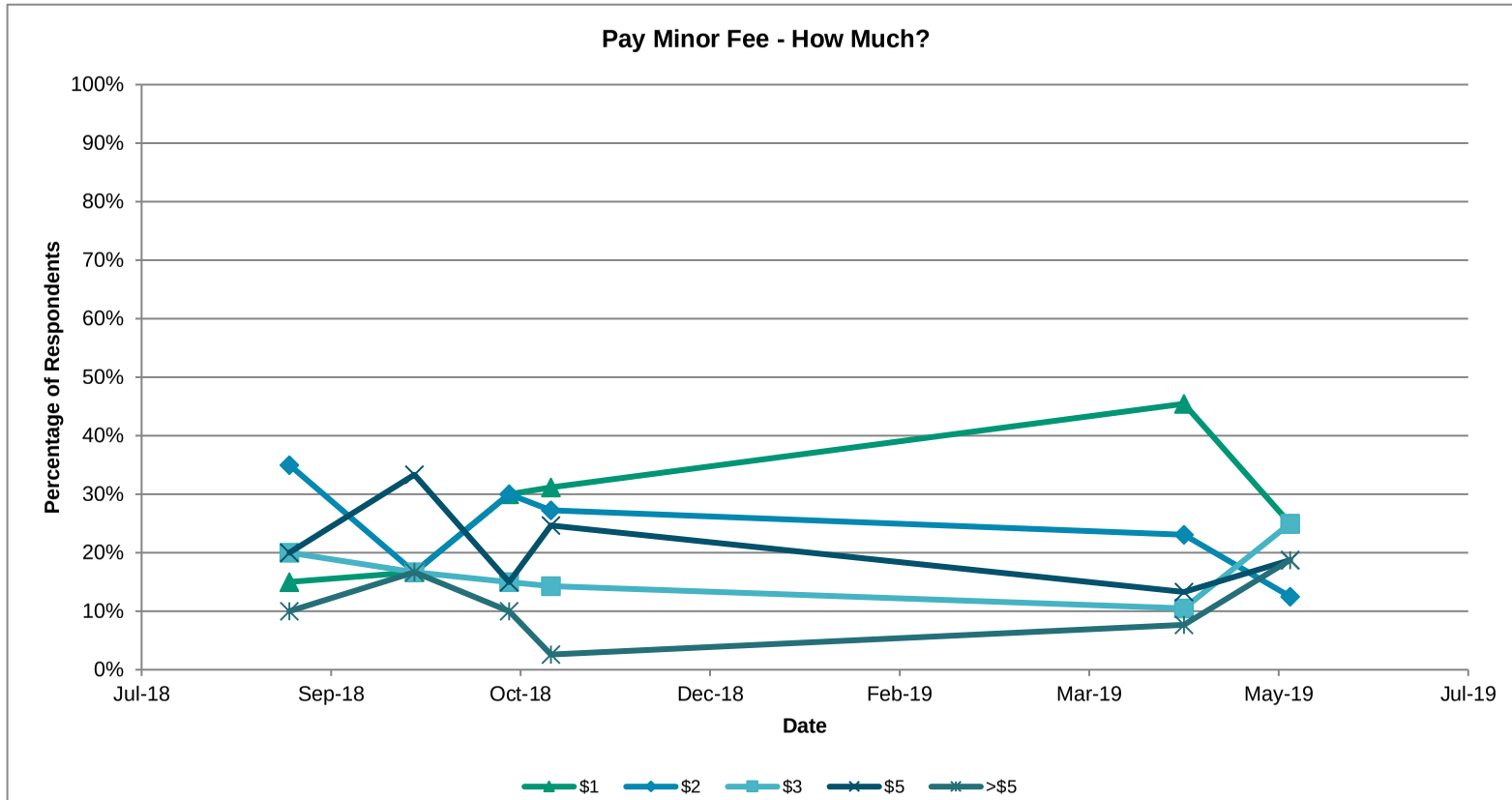


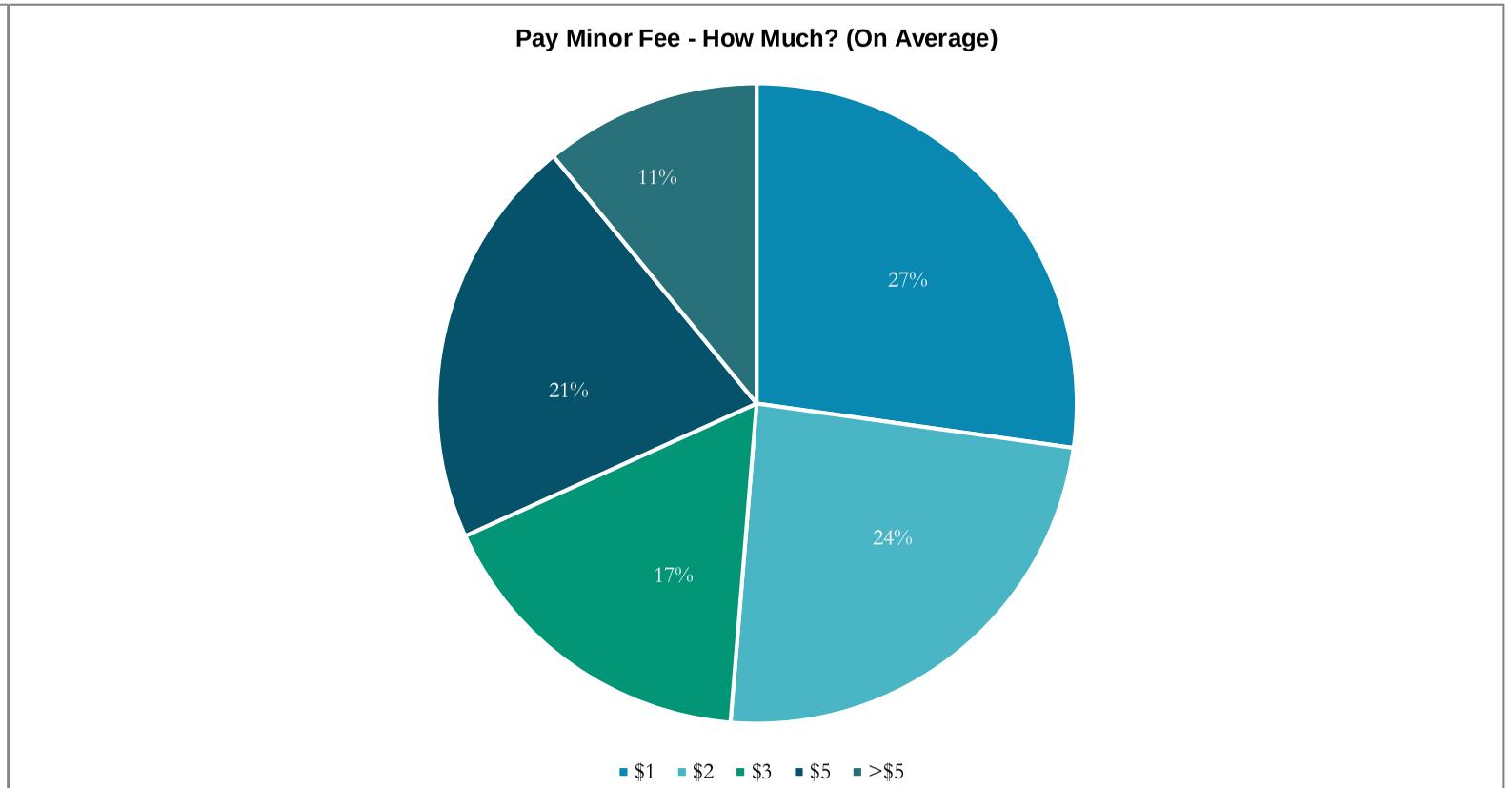


Stormwater Quality Survey Trends

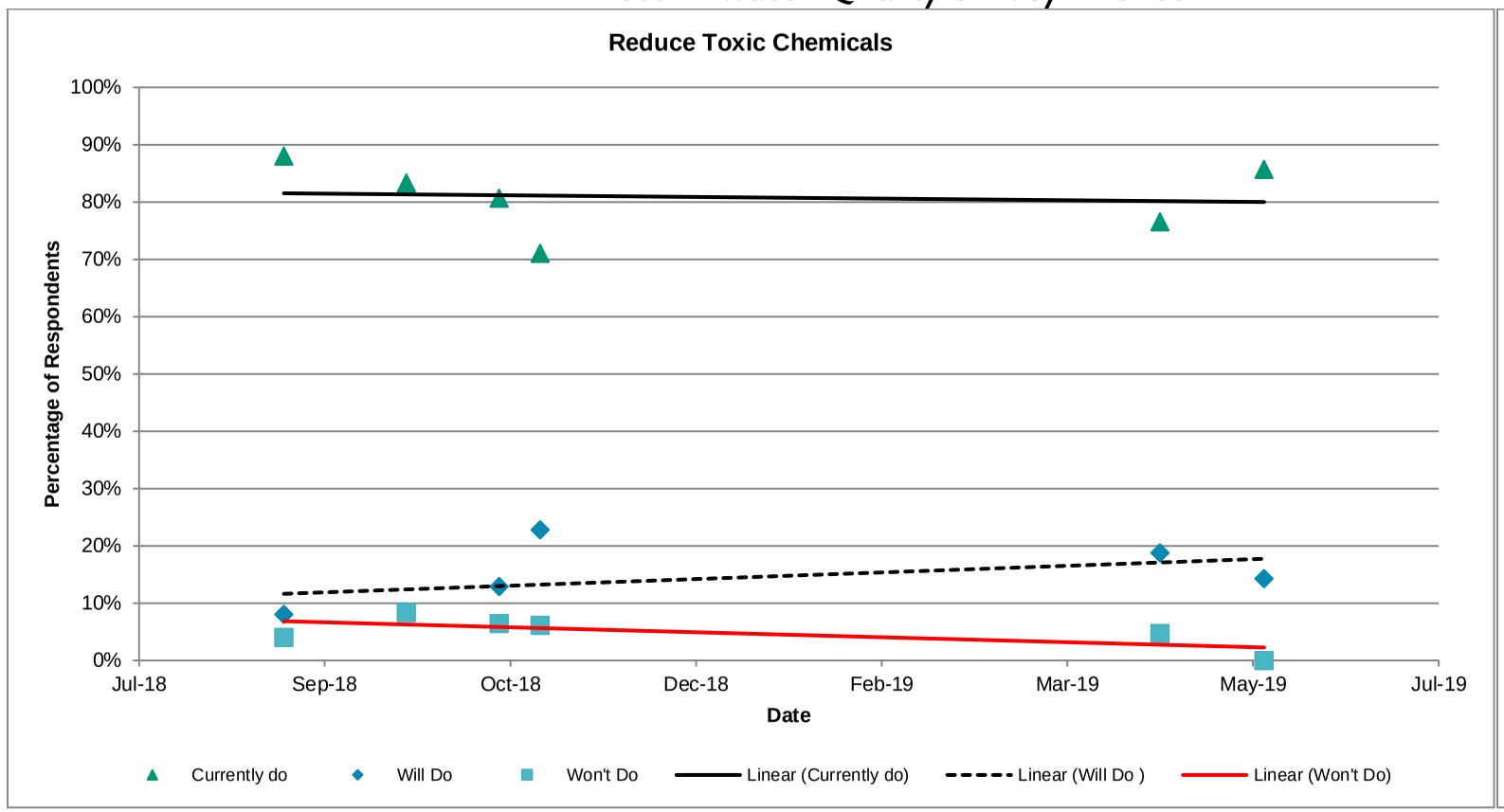


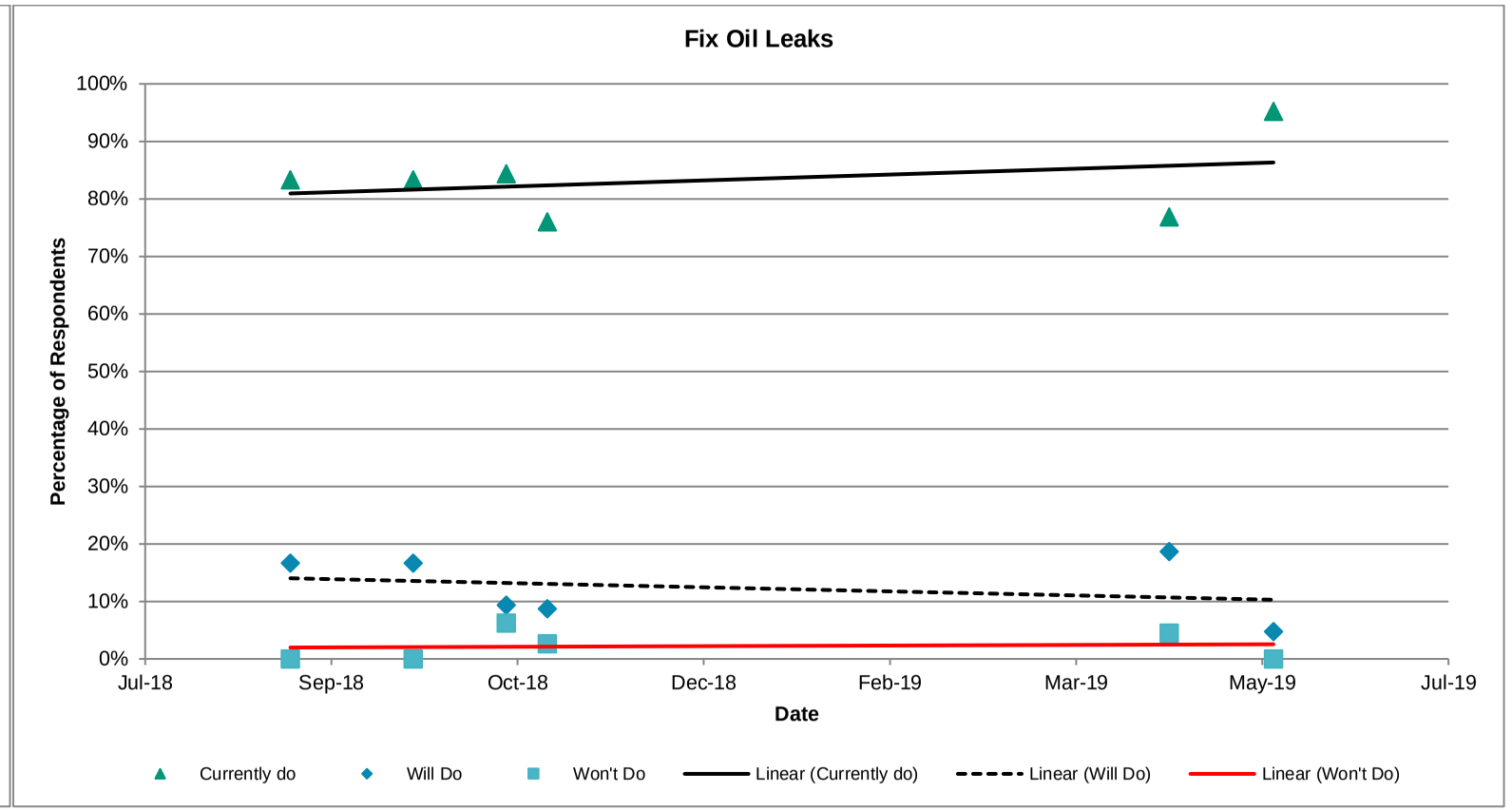


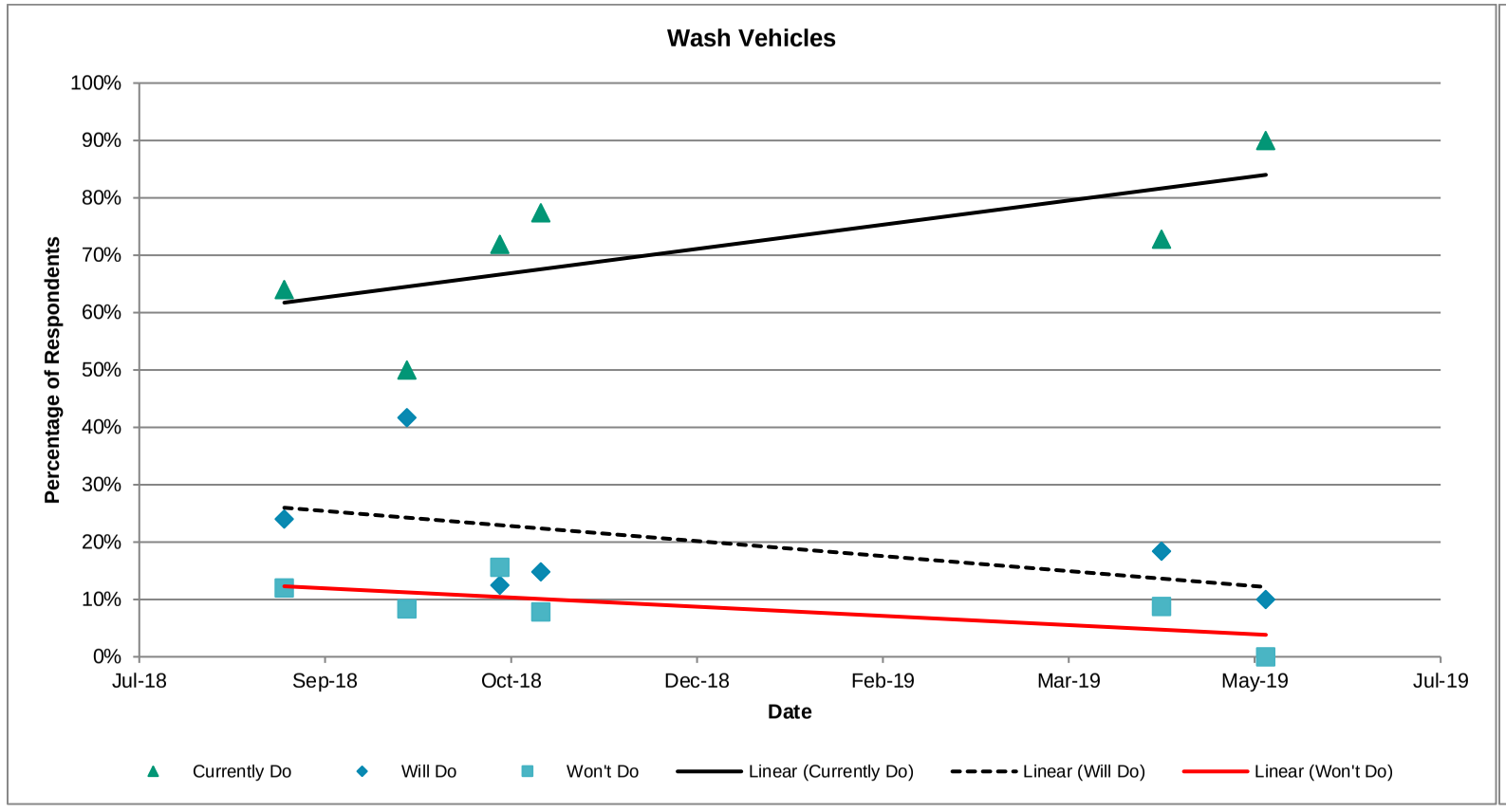


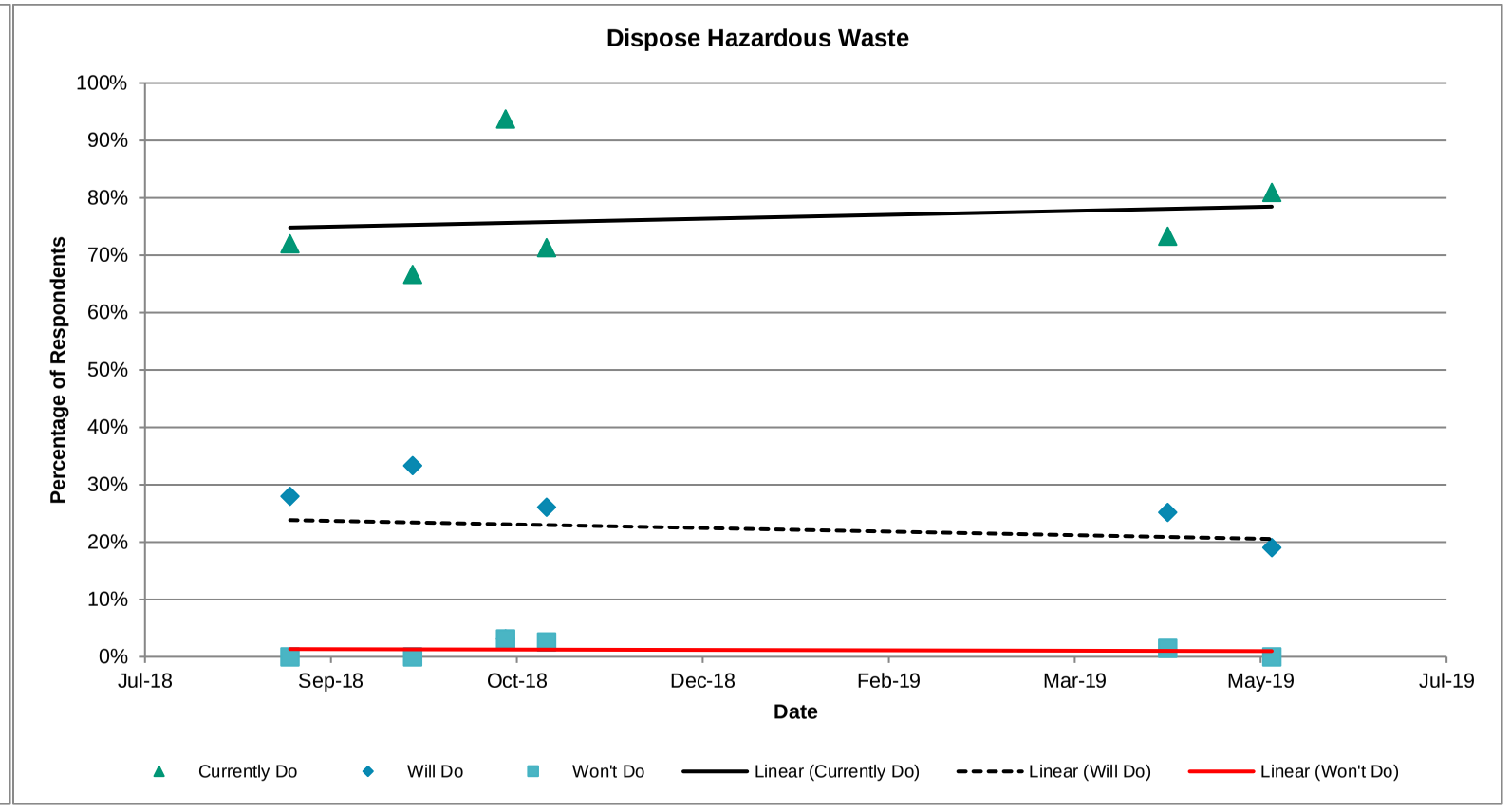


Stormwater Quality Survey Trends

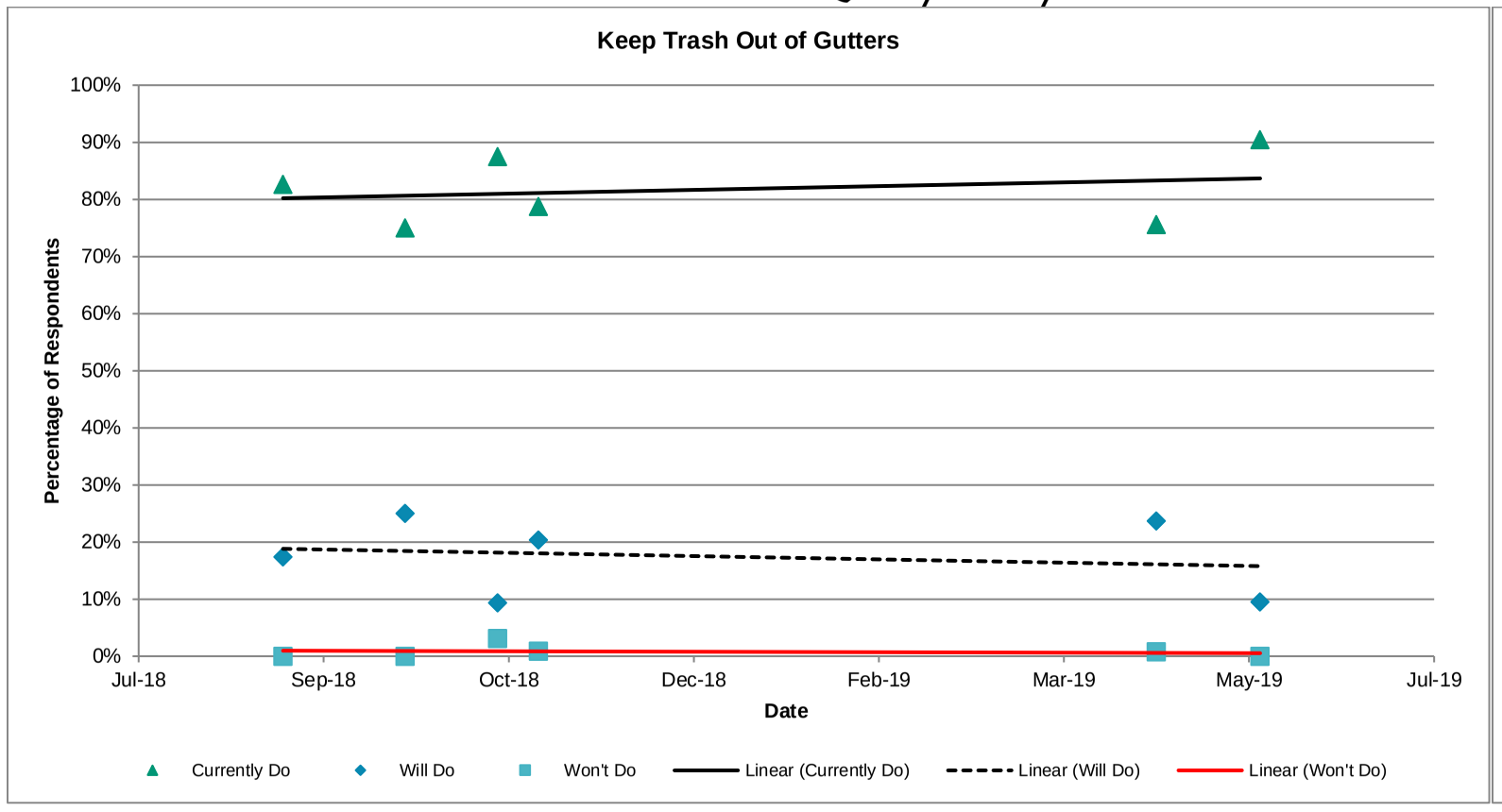


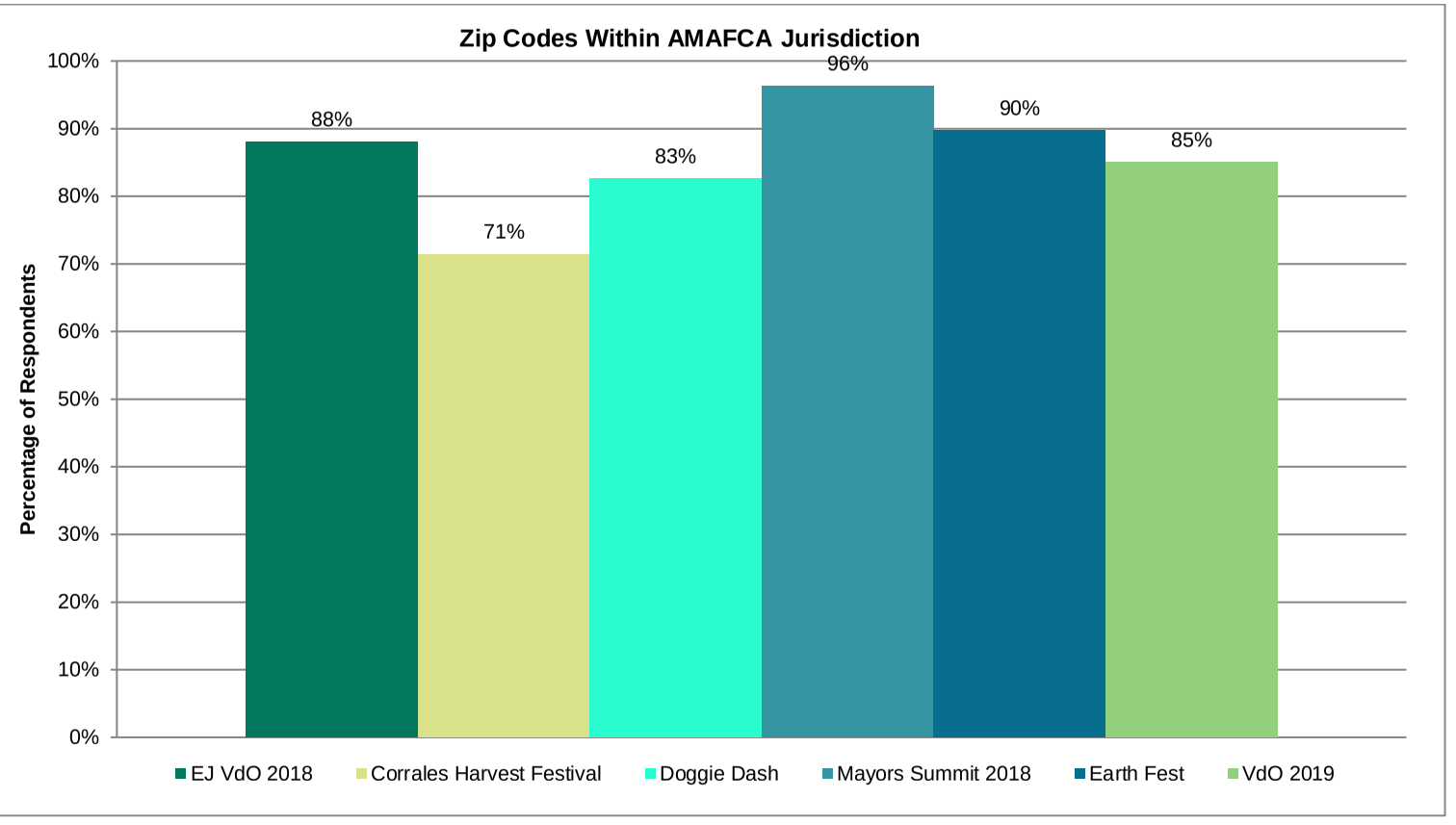




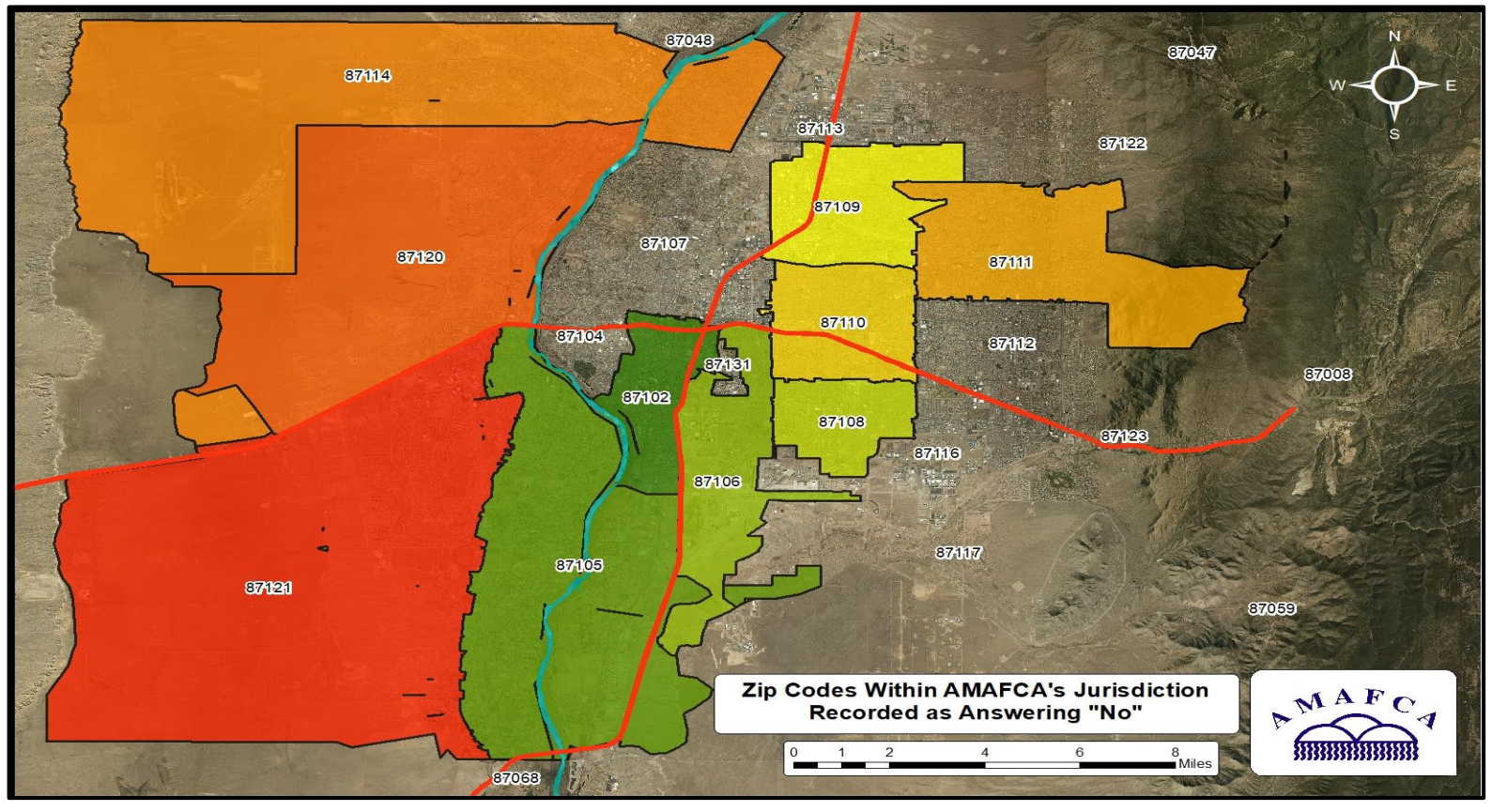


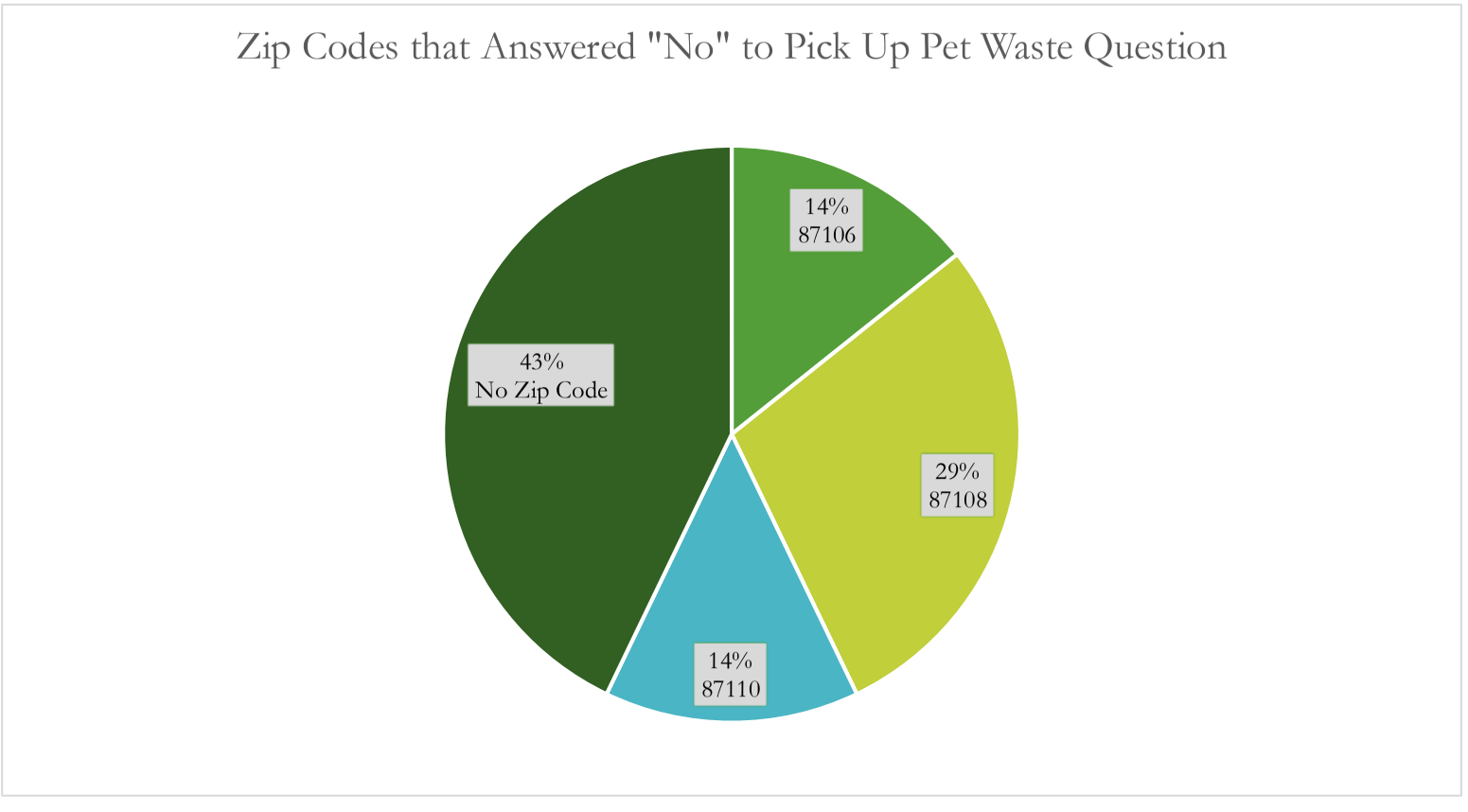
Stormwater Quality Survey Trends





The following graphic describes the tallied results for respondents who answered “No” to the question concerning picking up after pet





Stormwater Quality Survey Trends

Statistics for Pet Waste Question

Answered No to Pick up Pet Waste	Number of Votes	% of Votes
79109		0%
79782		0%
87008		0%
87043		0%
87044		0%
87047		0%
87048		0%
87059		0%
87068		0%
87102		0%
87104		0%
87105		0%
87106	1	14%
87107		0%
87108	2	29%
87109		0%
87110	1	14%
87111		0%
87112		0%
87113		0%
87114		0%
87116		0%
87117		0%
87120		0%
87121		0%
87122		0%
87123		0%
87124		0%
87131		0%
87144		0%
87528		0%
87557		0%
88310		0%
No Zip Code	3	43%

Item	*# of Respondents*	*% of Respondents*
Total Number Who Answered No	7	
Total % w/in AMAFCA Jurisdiction		57%
Total Who Answered "Pet" Question	292	
% of Total "Pet" Votes		2.11%
Total "Already Do"	292	88.22%
Total "Will Do"	32	9.67%
Total "Won't Do"	7	2.11%
Total Question (Summation)	331	100.00%
Error		0%

Stormwater Quality Survey Trends

The following describes the thought process for determining a more statistically relevant analysis of the survey results. A normal distribution was assumed because the average number of survey respondents is n=159 (n>30 generally accepted to assume normal distribution). By using the following equations, we can statistically derive a Margin of Error (MoE) for each question. The following describes the results of the analysis:

- Decided on 80% confidence interval (w/in 1.28 Standard Deviations)
- The following describe the equations used to calculate margin of error:

$$Standard\ Error = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

Where $\hat{p}$ is the estimated population proportion (# of respondents), and n is the sample size (total # of people who responded to the survey)

$$Margin\ of\ Error = (1.28 * Standard\ Error) \pm 0.5n$$

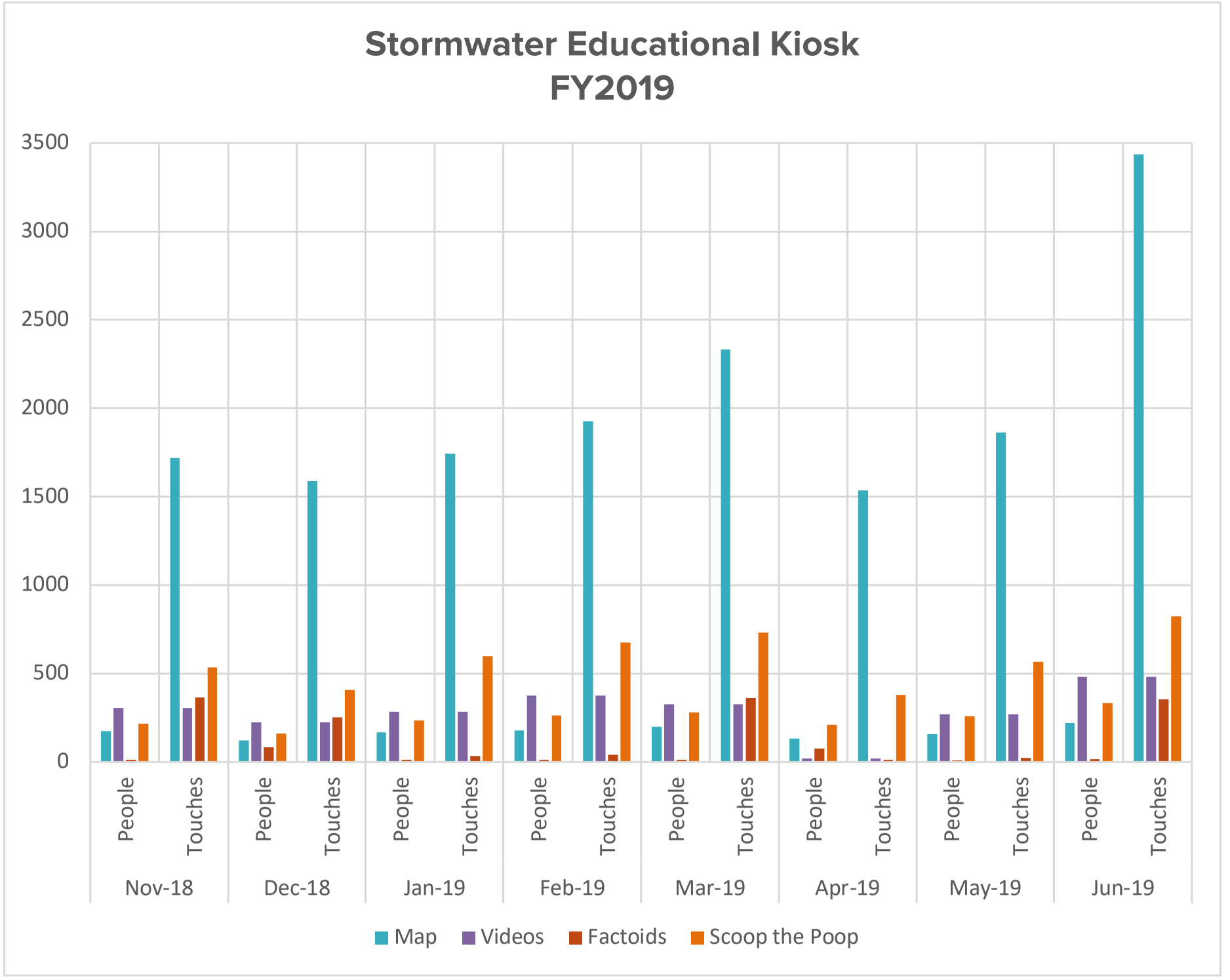
Where 1.28 is the critical value for an 80% confidence interval (z=1.28)

- 19/26 Q's have Standard Error < 5%
- Only 7/26 have Margin of Error < 5%
- Same 7/26 have total Margin of Error < 10%

The third column is read as "81 % sure next event will fall within ± Margin of Error% of the mean"

Survey Question	Answer	Mean ± MoE	Individual (±)		Mean
Stormwater Runoff	Yes	81%±10%	10.1%	BAD	81.1%
	No	05%±7%	7.1%	GOOD	5.5%
	Unsure	13%±9%	8.5%	BAD	13.4%
Pick up after pet	Currently do	88%±8%	8.4%	BAD	87.5%
	Will do	12%±8%	8.2%	BAD	11.5%
	Won't do	01%±2%	2.4%	GOOD	0.9%
Reduce, Recycle, and Recycle Trash	Currently do	89%±9%	8.7%	BAD	88.9%
	Will do	10%±8%	8.3%	BAD	10.3%
	Won't do	01%±3%	2.7%	GOOD	0.8%
Pay Minor Fee	Would Do	78%±8%	8.2%	BAD	78.0%
	Won't Do	22%±8%	8.2%	BAD	22.0%
Reduce Use of Toxic Chemicals	Currently do	81%±10%	9.8%	BAD	80.9%
	Will Do	14%±8%	8.4%	BAD	14.2%
	Won't Do	05%±7%	6.8%	GOOD	4.9%
Fix Oil Leaks on Vehicle(s)	Currently do	83%±10%	9.8%	BAD	83.2%
	Will Do	12%±9%	9.1%	BAD	12.5%
	Won't Do	02%±4%	3.6%	GOOD	2.2%
Wash Vehicles at Full or Self Service Car wash	Currently Do	71%±12%	11.7%	BAD	71.0%
	Will Do	20%±11%	10.6%	BAD	20.2%
	Won't Do	09%±8%	8.2%	BAD	8.8%
Dispose Household Hazardous Waste	Currently Do	76%±11%	10.5%	BAD	76.3%
	Will Do	22%±10%	10.2%	BAD	22.5%
	Won't Do	01%±3%	3.1%	GOOD	1.2%
Keep Chemicals/Trash Out of Street Gutters	Currently Do	82%±10%	10.1%	BAD	81.7%
	Will Do	18%±10%	9.9%	BAD	17.6%
	Won't Do	01%±3%	2.8%	GOOD	0.8%

Exhibit 3
Kiosk Statistics
2018-2019


Stormwater Educational Kiosk
FY2019
3500
3000
2500
2000
1500
1000
500
0
People
Touches
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19
Map
Videos
Factoids
Scoop the Poop

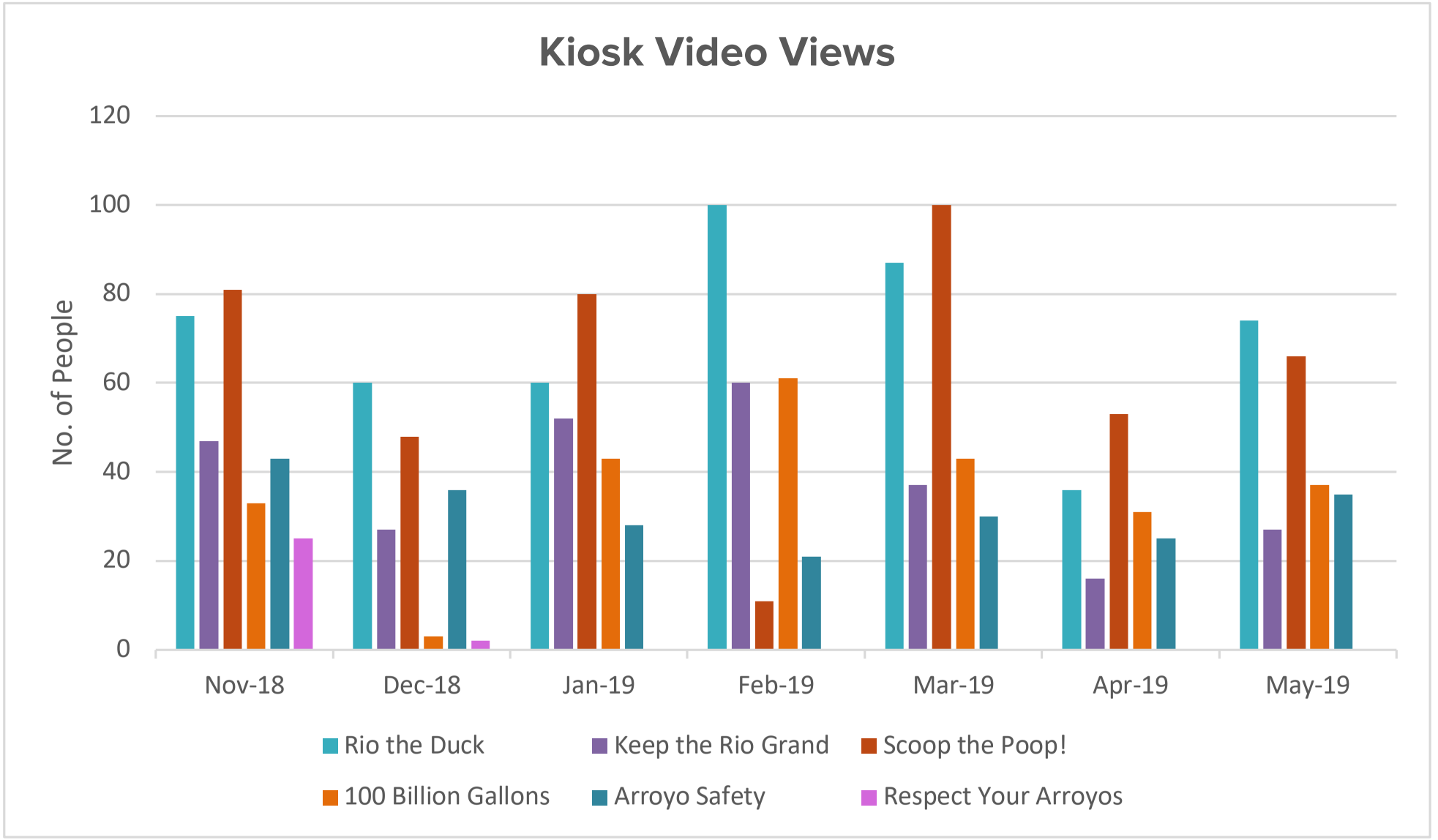

Kiosk Video Views
120
100
80
60
40
20
0
No. of People
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Rio the Duck
Keep the Rio Grand
Scoop the Poop!
100 Billion Gallons
Arroyo Safety
Respect Your Arroyos

Exhibit 4
Arroyo Classroom 2018-2019

Arroyo Classroom

2018 - 2019 final report

submitted by
Melissa McLamb, CSWCD
June 2019

The Arroyo Classroom program utilizes our natural arroyos as outdoor classrooms and brings local animals into the classroom to motivate 3rd 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 1st, 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 2018-2019 school year, we served 34 classes within Rio Rancho Public Schools, reaching approximately 34 teachers and 790 students.

Participating Schools

SCHOOL	Number of classes	Number of Students
Enchanted Hills Elem.	5	140
Martin Luther King Elem. *	6	158
Sandia Vista Elem.	4	84
Maggie Cordova Elem. *	7	162
Cielo Azul Elem. *	6	124
Puesta del Sol Elem. *	6	120
TOTALS	**34**	**790**

* Title 1 school

Deliverables to date:
All complete

- Watershed Presentations: 34:34
- Arroyo Walk: 34:34
- Bat Presentations: 34:34
- Owl Presentations: 34:34

Task 1: Recruit and select classes.
Complete by September 2018. **Status: completed.**

All classes are returning classes and the program has a waiting list.

Task 2: Review and revise evaluation and curriculum.
Complete by May 2019. **Status: completed.**

The pre and post survey was revised by classroom teachers and AC staff to better suit 3rd graders. We received positive feedback from teachers on new and updated presentations offered to their classrooms this year.

Task 3: Coordinate classroom guest speakers.
Begin September 2018. On-going through May 2019. **Status: completed.**

Guest speakers have been confirmed with up to date Professional Services Agreements. All presentations have been conducted.

Task 4: Collect and analyze teacher feedback.
Complete by May 2019. **Status: completed.**

Staff has developed a feedback form for teachers to issue out to teachers in April.

Task 5: Reporting to sponsors. **Status: completed.**

Midyear report by January 31, 2019. - *submitted Jan 2019*
Final report by June 14, 2019.

Project Summary

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. Educators Melissa McLamb and Erin Blaz delivered two of the lessons – an introductory lesson about watersheds, and a walking field trip to nearby arroyo habitat. Justin Stevenson of RD Wildlife Management, LLC delivered a lesson using live microbats. Tavo Cruz of Envirological Services, Inc. delivered presentations with a live Burrowing Owl.

The watershed lesson expounds on the water cycle, already integral in 3rd grade curriculum. This year, we developed a hands on lesson where students were able to build a model of a watershed. This lesson introduces the concept of a watershed to students, demonstrates how surface water becomes polluted through a variety of waste, and discusses the importance of keeping our arroyos clean.

The arroyo walk is a highlight for students and teachers, as the majority of participating classes only receive one other field trip during the school year, and students always come away learning something new and interesting about the uniqueness of arroyo habitat. This lesson is about the unique adaptations of arroyo animals and plants, incorporates a walk out to a nearby arroyo (when available) and extensive discussion about arroyo safety *(see lesson plan in Appendix A.)* Melissa first talked to students about the difference between concrete-lined channels and sandy-bottomed arroyos, and emphasized 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, and looked for certain adaptations of desert plants to minimize water loss in the desert.

In the lesson about bats, Justin discussed common myths about bats while pointing out how these myths can pose issues for bat populations as he addressed each one. He taught students about species common in their area, including what habitat they prefer, what they eat, the challenges they face, and what to do if one sees an injured bat. He talked about how important bats are in keeping insect populations under control, shared ways to encourage and protect bats and emphasized that kids should not be frightened of them, but also should never touch a bat if they find one. Students were able to view two different species of live microbats.

In the owl presentation, Octavio talked with students about what time of year burrowing owls are in our arroyos, what habitat they need, and what we can do to support and protect them. Tavo emphasized the impact of riding ATVs up the sides of arroyos and encouraged ways to care for burrowing owl habitat. He taught students that burrowing owls are protected by federal law, and that 3rd graders could be ambassadors and protectors for the owls. Each student was able to observe the burrowing owl up close, one at a time. We worked in coordination with Wildlife Rescue to bring in the live burrowing owl for each presentation.

Evaluation

All 34 participating classes, participated in previous years and each teacher expressed interest in returning next year. Teacher feedback from this year also showed that teachers find that each presentation helped increase students understanding of local ecology while educating them about what they can do to protect wildlife habitats and/or water quality. Some teachers have requested extension activities to help them expand on content presented to their class. We plan to integrate additional lesson plans that teachers can easily use next year. We are also working on correlating our presentations to the newly adopted science standards, NM STEM Ready! This correlation will be complete by the start of next school year.

We were unable to confirm with Cielo Azul Elementary to plan for another Arroyo Clean Up event. We hope to work with the City of Rio Rancho next year by promoting their Campus Clean Up Contest and encouraging our participating classes and schools to organize such events.

Highlights from teacher feedback:

“Every year this program adds so much to our classroom and student engagement. The excitement of the owls and bat is amazing for our kiddos. The Arroyo walk is also exciting. I thought the changes to the watershed presentation was a great improvement to capture 3rd graders attention.” - Evans, Sandia Vista Elementary

“They were able to identify how they fit into the habitat surrounding them and how they can help preserve different aspects of it. They were able to apply different ideas taught (water conservation, animal identification, ect.)” - Eisenberg, Martin Luther King, Elementary

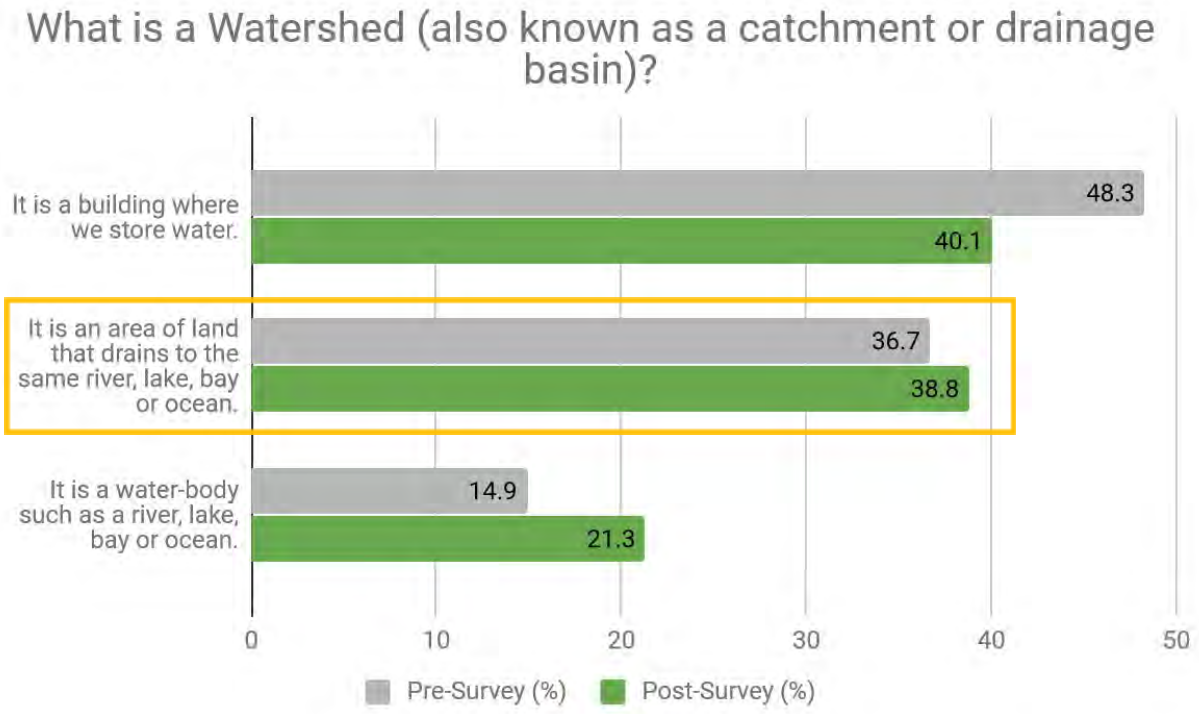
“My kids always love the animals and what they learn about them. I love that the kids get a better understanding of arroyos and how the water shed works.”- Florez, Maggie Cordova Elementary

Survey

We developed the survey this year in collaboration with select 3rd grade teachers to make it as relevant and age-appropriate for students. This is the first year we have had a single pre and post survey to distribute to students.

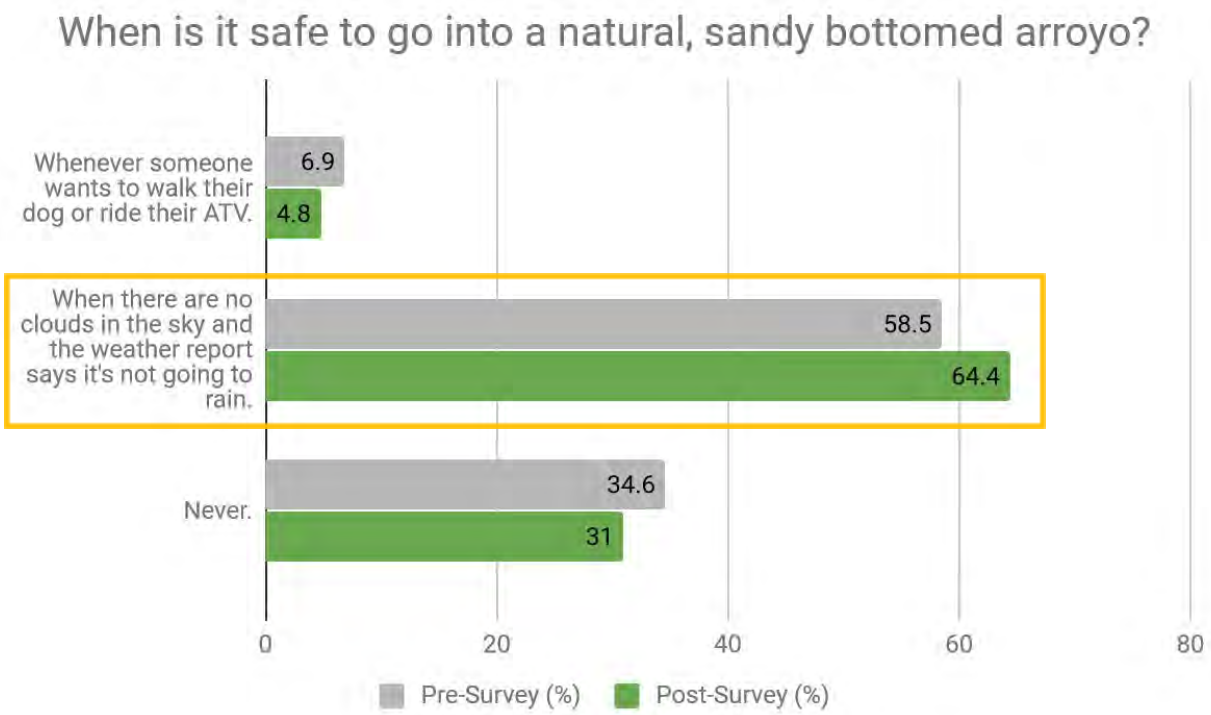
Survey Metrics:

Item 1



This age group of students are often very literal and may find the concept of a "watershed" confusing. We will find ways of making this more age appropriate for 3rd graders. It may require an adjustment to our incorrect answer options. We plan to implement extension activities next year as well, which will offer teachers the opportunity to review and expand on presentation content with students afterwards.

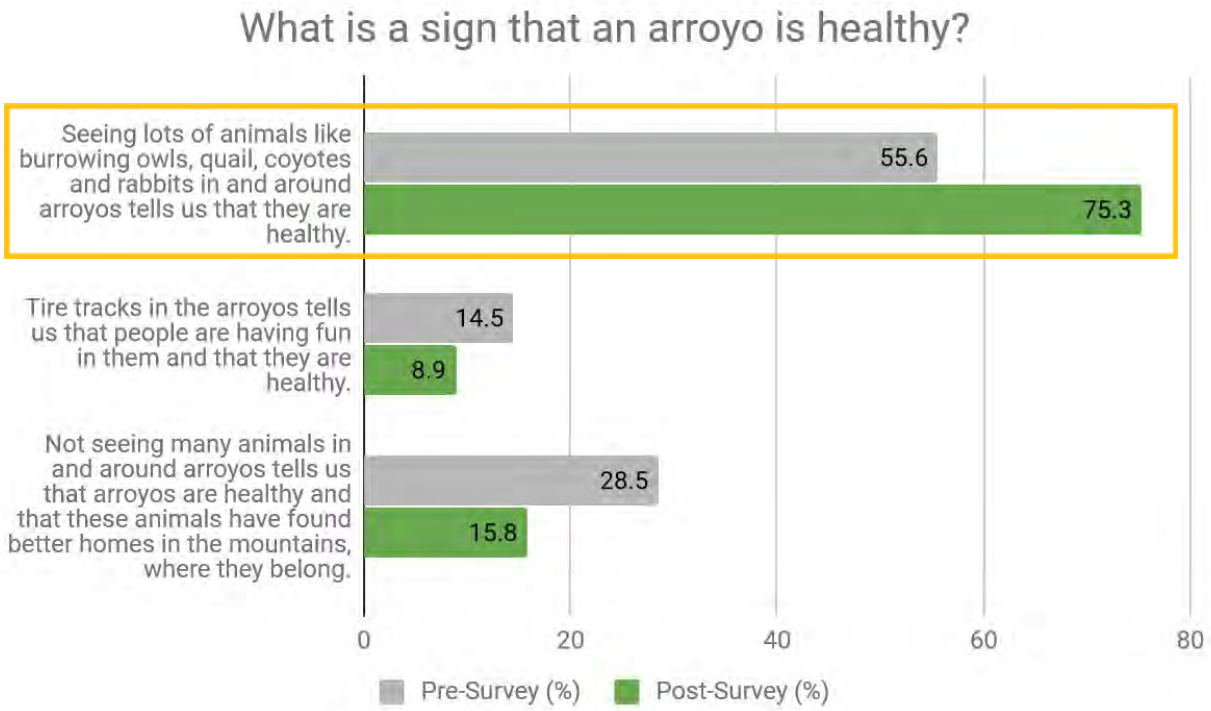
Item 2



When

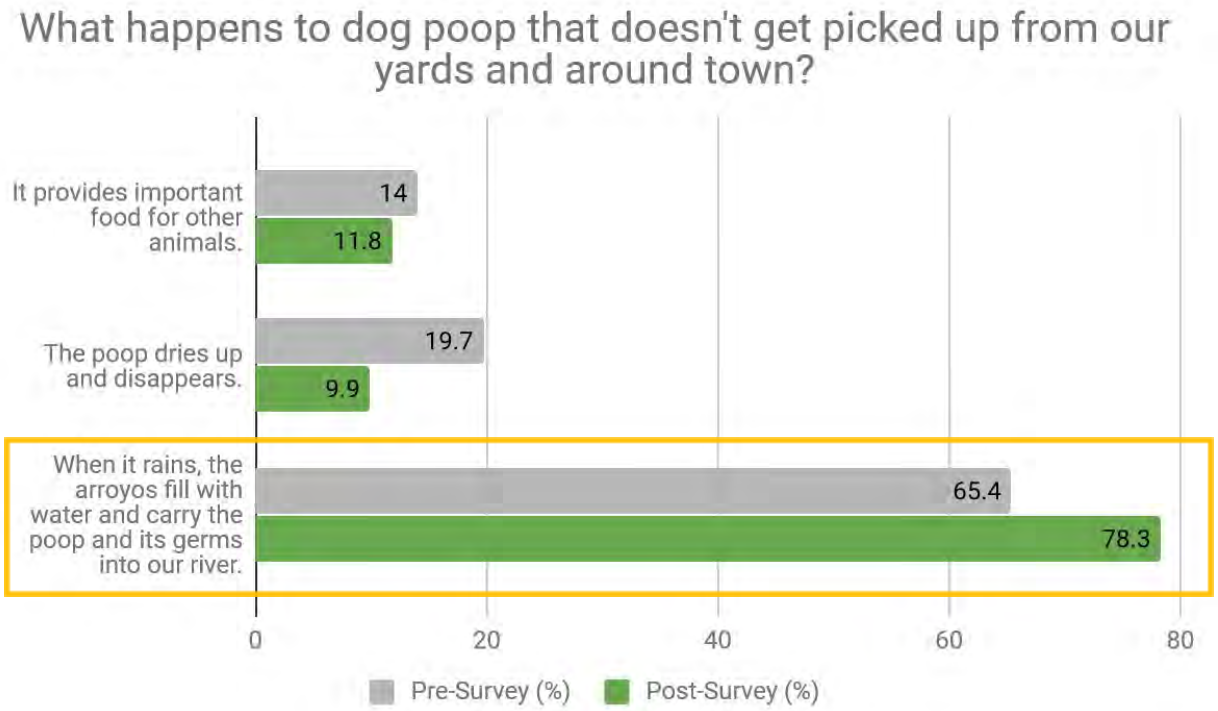
The majority of students seem to understand when it is safe from the beginning of the program, perhaps in contrast to the other answer options. It is interesting to see that 30% of students still consider it is "never" safe to into a natural arroyo. This could be an idea that students are receiving from parents or guardians understanding of arroyo safety.

Item 3



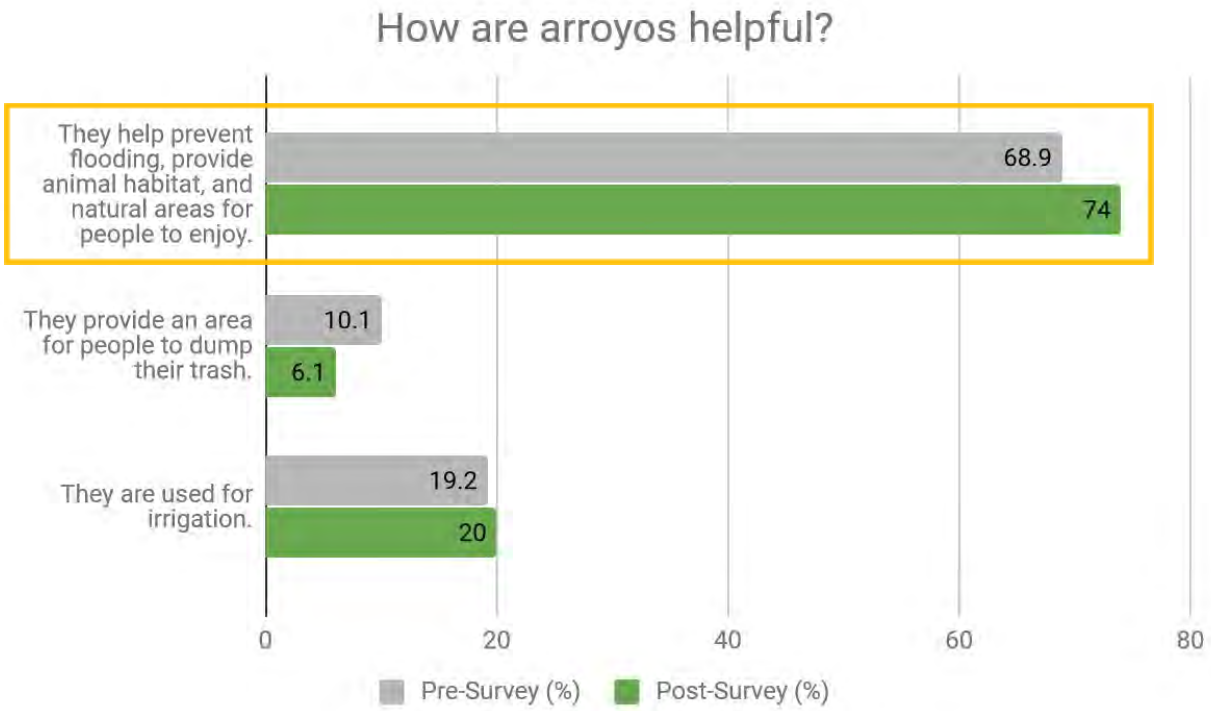
We see a 20% increase in student knowledge of species diversity being an indicator of arroyo health.

Item 4



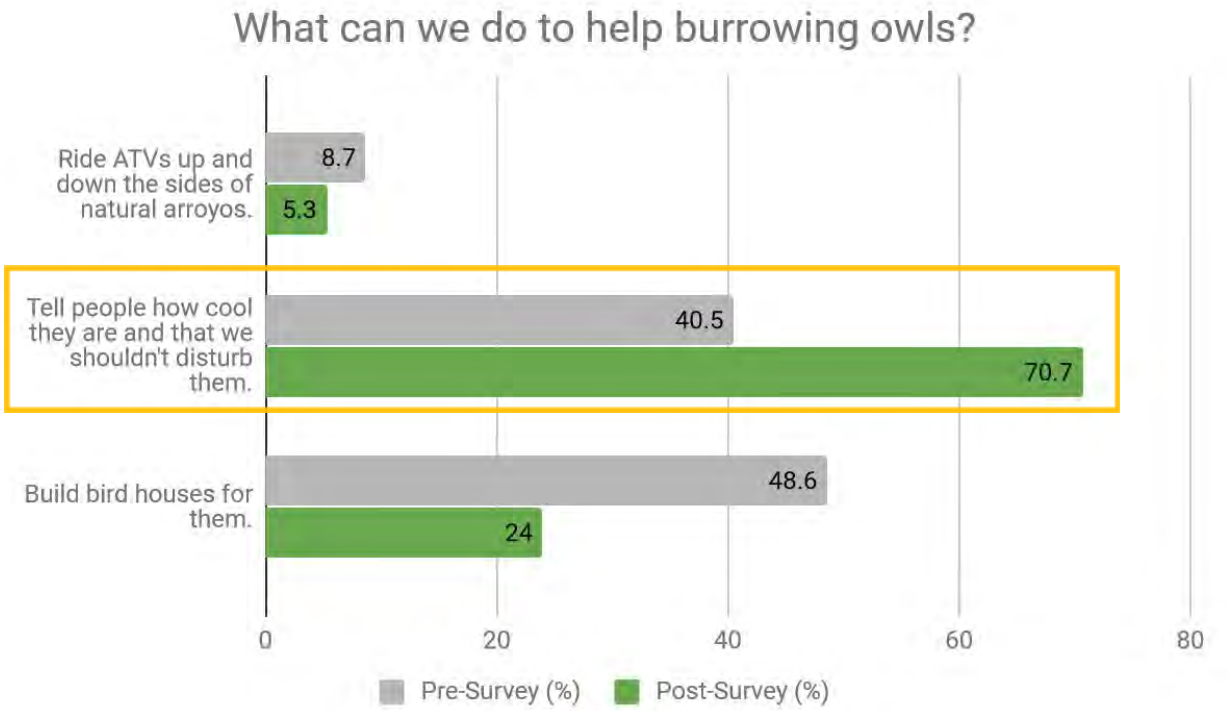
We see a decrease in the incorrect answers from the pre to post survey as well as a 13% increase in students understanding of how dog poop can impact the water quality of the river.

Item 5



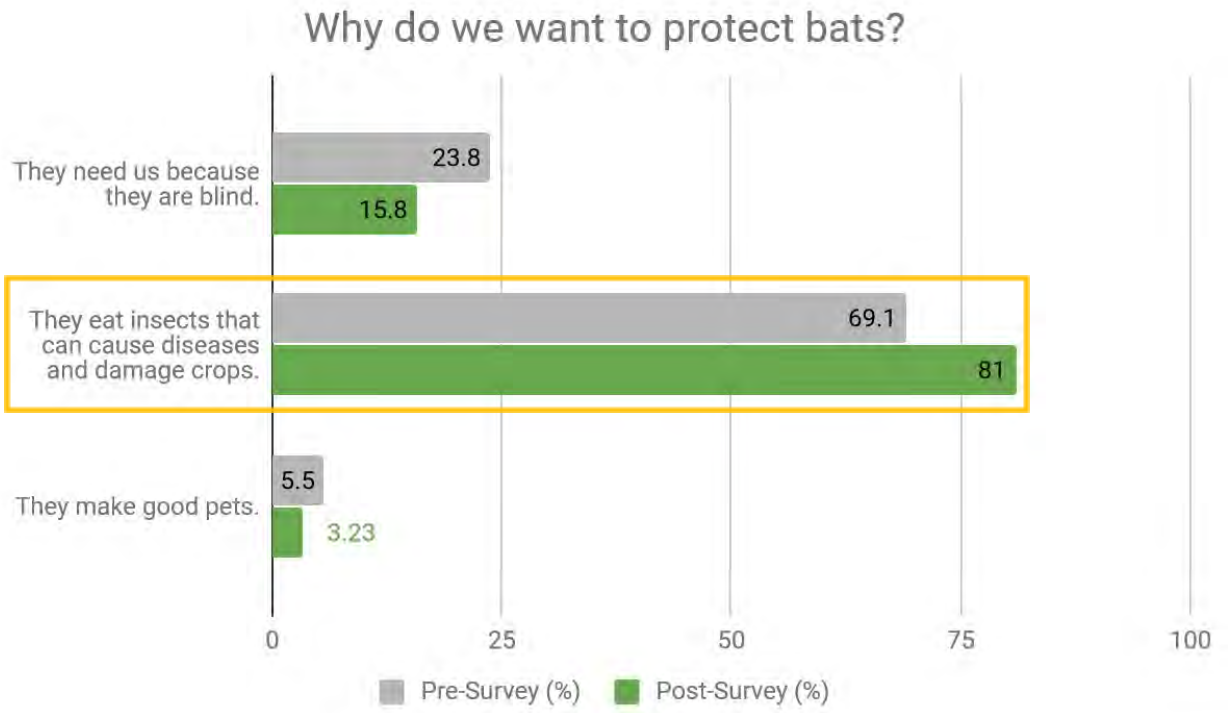
Students either already knew this or is was an easy assumption based on the answers. We will make one of the answers seem more probable next year and replace “They are used for irrigation” with “They help farmers water their crops”.

Item 6



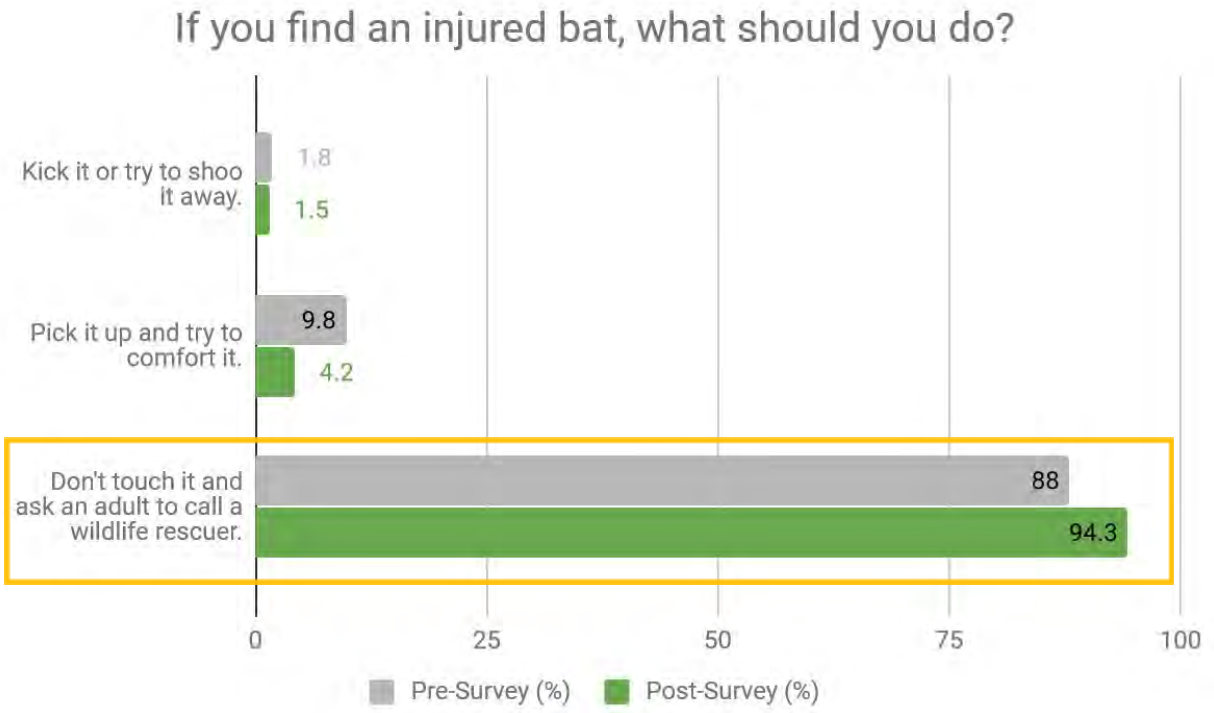
This shows how the live animal presentations introduce students to the importance of not disturbing wildlife and that burrowing owls wouldn't utilize bird houses.

Item 7



It seems that most students either already know this or they can figure it out based on the answer choices. Next year we will make the other choices more probable.

Item 8



Survey Summary

Overall, the survey findings are positive. This was a pilot year with using a single pre and post survey and we will continue to refine our questions with feedback from teachers. It is important that students understand the concept of a watershed. Next year we intend to support our classes with pre and post activities that will help teachers review and explore concepts from the presentations, which will strengthen learning outcomes for students.

Appendix A contains lesson plans; Appendix B contains supplemental materials; Appendix C contains photos.

Appendix A
Lesson Plans

Activity Guide for 3rd Grade – Animal and Plant Adaptations

1. What are we trying to teach the students in this activity?
Arroyos are cool places where animals live, animals and plants are adapted to live in the desert.

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

Our Goals	Where we can relate our goals to this activity
Animals live in arroyos	Look for evidence of animals.
We should visit arroyos carefully	Talk about when it is safe.
Picking up dog poop keeps germs out of our river	We'll probably see poop, talk about how it can make animals sick.

Supplies:
- Thermometers
- Clipboards
- Poster of leaf adaptations
- Wax paper
- Paper towels
- Tape

3. How can we tie this activity to standards?
- Measure energy (temperature change)
- Posing a question, using numerical data, various methods to display results
- Animals and plants have adaptations that improve chances of survival
- Classifying animals and plants
- Living things cause changes to their environment, some detrimental, some beneficial

5. How should this activity be organized?

I. Pre-activity (10 minutes)
- Do you ever visit/play in arroyos? What do you do?
- What are arroyos for? Managing stormwater to keep our town from flooding when we get a heavy rain. **Show first flush video.**
- Talk about arroyo safety – don't go into arroyos when you see clouds in the sky.
- Because our arroyos are natural, with sandy sides and bottom, they are safer.
- In Albuquerque, the arroyos have concrete sides and water travels so fast, it is really dangerous to ever go in arroyos. Some arroyos come from the canyon where it might be raining but you can't see.
- Our arroyos are home to all kinds of animals and plants, so they are a wonderful place to enjoy nature. What kinds of animals do you think might live in the arroyo?
- Walk out to arroyo

II. Lizard activity (15 min)
- 5min Look for evidence of animals. What kind of evidence? Scat, tracks, holes.

- What kind of animals live in holes (besides snakes)?
- What do you think makes it difficult to live out here? Heat, sunburn, not much water, cold at night. Animals and plants have special **adaptations** (special things about their bodies) that make it easier for them to live in this habitat.
- How do they get water? From plants, from condensation under rocks.
- How could they avoid heat? Stay in burrows or shade during the day, active at night.
- Some animals love the heat, though! Lizards are cold-blooded, which doesn't mean they are actually cold. It means their body temperature is determined by the environment. They need to absorb heat from their surroundings to function.
- Each student take a thermometer. This is a lizard, and it needs to maintain its body temperature at a certain level: fence lizard 35C (95F), whiptail 38.6C (101F). How can it keep from getting too hot? How can it keep from getting too cold? Lizards regulate their body temperature through behavior.
- Plants do kind of the same thing – hold one palm out flat, one sideways. Which feels hotter? Prickly pear cactus pads grow sideways instead of flat to keep themselves cool!

IV. Plant activity (15 min)

- What do plants need in order to survive? Water, sunlight, air, soil
- What makes it difficult for plants in the desert? It's so hot and there's so little rain.
- How do plants get water? **Show evapotranspiration diagram.** It's kind of like when we're hot, we sweat. But if we lose too much water from sweating we get dehydrated.
- How do they keep cool? Remember prickly pear? **Show pictures of hedgehog and prickly pear cacti.** Desert plants can **s**hade themselves! Hedgehog cactus has lots of spines that shade the surface and also blocks the wind.
- The leaves of many desert plants are **adapted** so that they don't lose too much water.
- Show leaf adaptations poster (fuzzy, small, curled, waxy, green stems but no leaves)

If weather is ok:

- Out in arroyo, we'll do an investigation.
- How many of the plants we see will have these adaptations? Hypothesize.
- To be fair, we can't just pick the plants we like. Standing in one spot, collect the first 6 *different* leaves you see.
- Draw each one, and describe what adaptation it has.
- How many of your 6 leaves have one of the adaptations listed?
- Why don't all have it? Some plants avoid the heat by just growing and producing seed really fast before the weather gets hot, and then they just die off and leave their seeds to grow next year!
- Search for seeds.

If windy, inside activity:

- Let's investigate one way they keep water. **Dab water on board, cover one spot with paper towel, one spot with wax paper.** Which do you think will evaporate faster?
- **Show prickly pear picture.** Make model of prickly pear pad: paper towels with wax paper taped around the outside. **Show cut prickly pear pad.**
- Maybe do an experiment: soak wax-covered and non wax-covered leaves in water and time how long they take to dry.

V. Conclusion (10 min)

- Arroyos are for flood control, and we shouldn't play in them when clouds are in the sky.
- But they are cool places where animals and plants live, and we can visit when it's clear weather.
- Animals and plants are adapted to live in the desert climate.
- What we do in arroyos affects the plants, and animals' habitats. Should we ride ATVs up the sides? That's something humans do to change our environment for the worse.
- Picking up dog poop is important because it can make animals sick. Where does the water go when it flows down the arroyo? The Rio Grande! Keeping dog poop out of the river is one way humans can change our environment for the better.
- Walk back to classroom

Leaf Adaptations

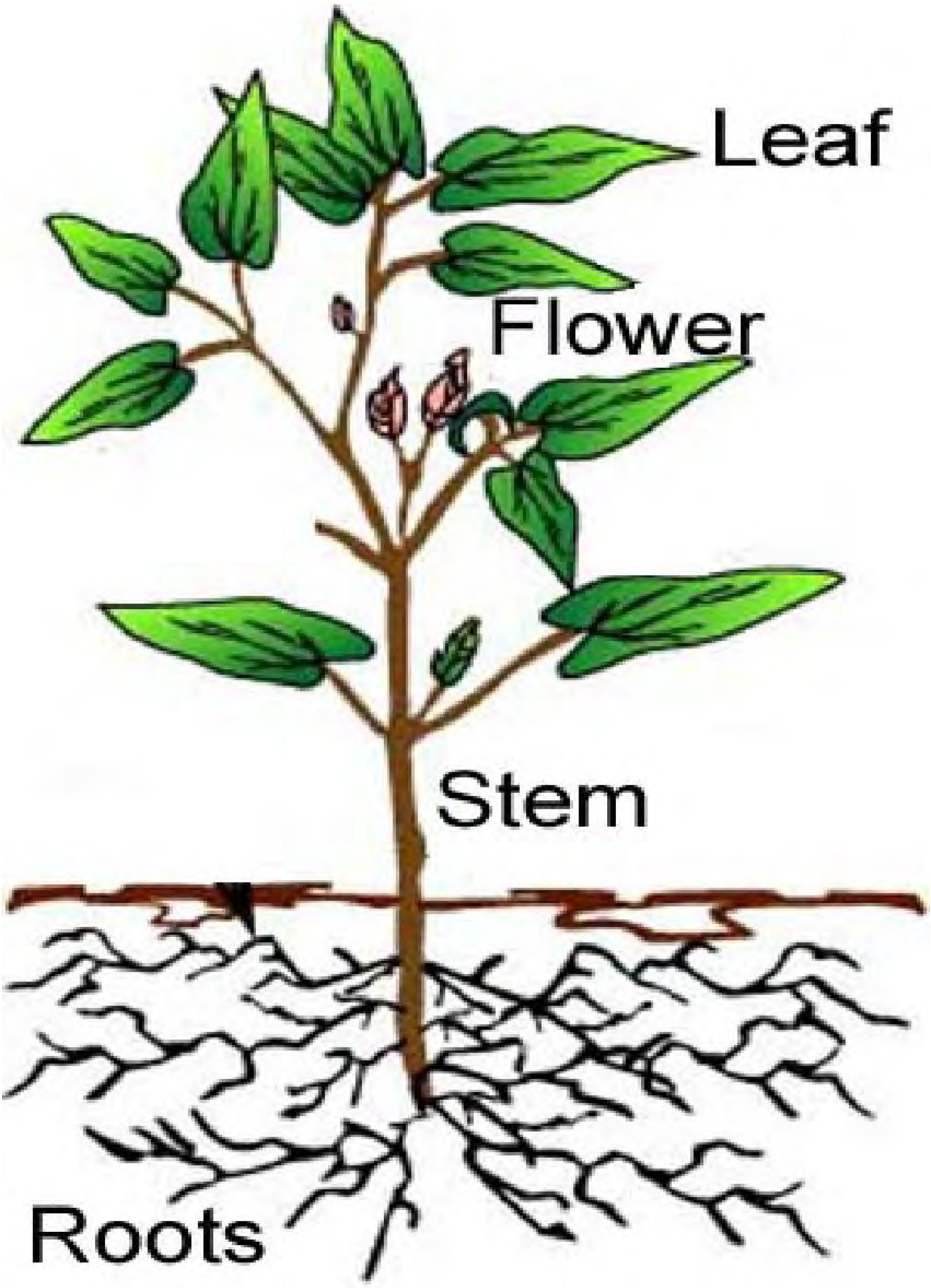
1. **Fuzzy leaves or lots of spines**

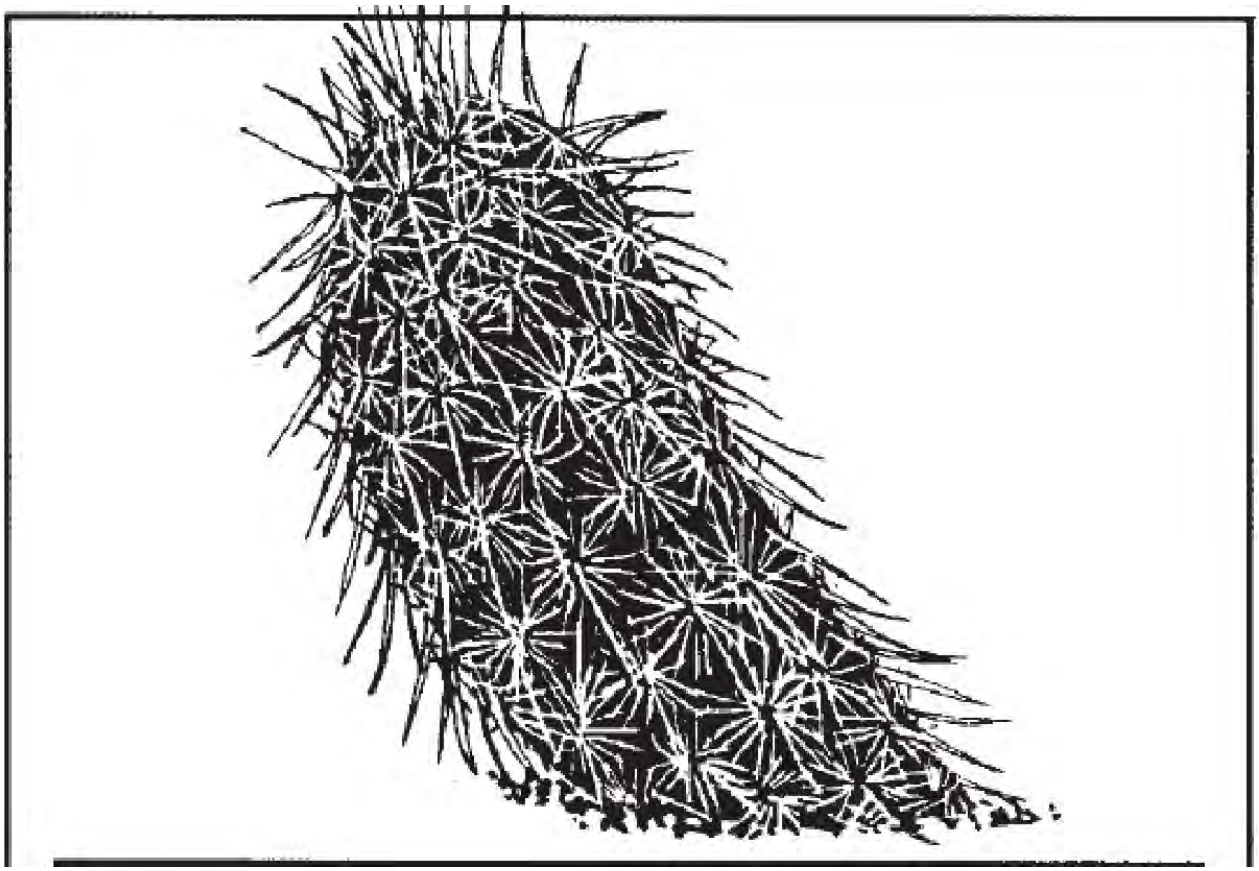
2. **Small leaves**

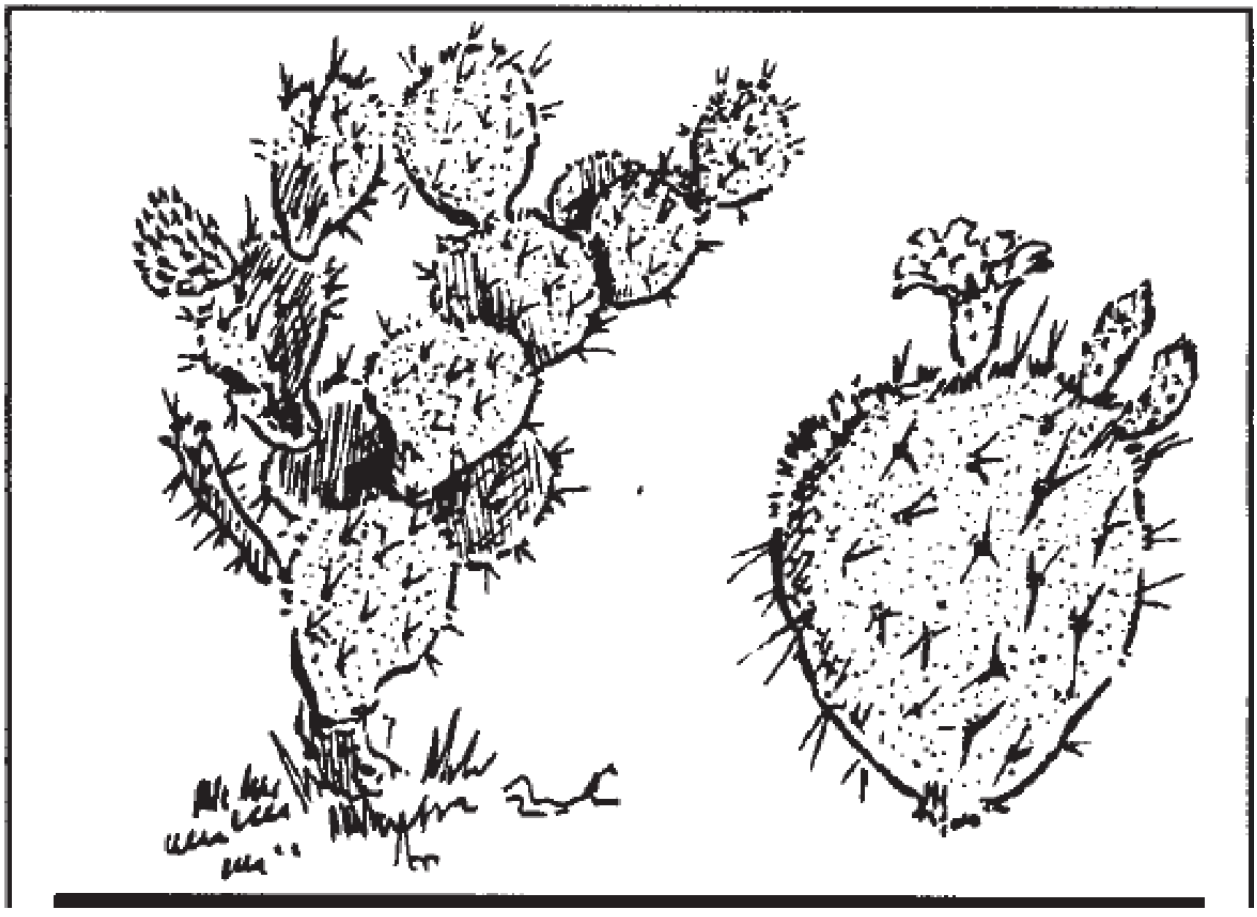
3. **Curled leaves**

4. **Waxy leaves**

5. **Green stems but no leaves!**


Leaf
Flower
Stem
Roots





Build a Watershed Activity Guide for Arroyo Classroom

1. What are we trying to teach the students in this activity?
What is a watershed? How does the water cycle work? What are different forms of pollution and how does it impact our river? Arroyos lead to the river and carries different types of pollution with it.

NM State Science Standards:

3rd Grade
Water cycles through the atmosphere, plants, soil, and bodies of water in various forms.
Describe pollution and identify different types (can be naturally occurring or human made materials). Pollutants can get into our water and harm living things.
Some animals can survive better in certain environments, some will not survive at all.
Describe how roots take up water and soil nutrients, and leaves make food from sunlight.

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

Our Goals	**Where we can relate our goals to this activity**
How does the water cycle work?	Describe the processes of the water cycle: evaporation, condensation, precipitation, collection, run-off and infiltration.
What is a watershed?	A watershed is all the land that drains into a river or other body of water, from mountain forests to riparian zone.
What makes water dirty?	Pollution comes from all over the watershed, and erosion is one form of pollution.
Why are arroyos important?	Arroyos provide important drainage in a storm event and provide unique and critical habitat for wildlife and plants.
How does vegetation help our river?	Forests, wetlands and healthy arroyos help keep the river clean and prevent flash floods. Plants in these areas slow the runoff of water into the river, reducing erosion and flooding. They can also remove nasty chemicals from the water by taking them up through their roots.

3. What is effective in this activity? Being in small groups, students enjoy creating the model and discussing what they are observing.

4. What makes this activity difficult to teach? Students get excited and want to play with materials while you are talking.

Activity Materials

- Blank paper, markers, aluminum pans to capture water
- markers (ex: black for oil, brown for dog poop, red for trash)

- a watershed map (ex: SSCAFCA watershed map, It's All Connected in a Watershed poster)
- NM relief map

Preparation

- Post watershed map
- Draw sketch of the water cycle
- Have materials laid out and desks arranged (papers, trays, sets of markers)
- Optional: write out key for marker colors (keep hidden until time to show students)

I. Intro – 5 minutes

1. Introduce yourself and the Arroyo Classroom program: Respect and Know your Arroyos
2. Cover guidelines/expectations in order to be able to have a good time and learn together
3. Introduce what we will be learning: What is a watershed? Where does it go when it rains? We are going to find out how water moves across land, and through our arroyos, when it rains or snows. And learn about how it carries things with it as it flows.

II. Warm Up – 10-15 minutes

1. How many of you used water before you came to school today? How did you use it?
2. How else do people use water on a daily basis?
3. Where do you think all this water comes from? (Discuss the aquifer and it's connection to precipitation). Point out groundwater shown on the "It's All Connected in a Watershed" poster.
4. Pull out the NM relief map. Discuss the purpose of a map. Walk through so each student can view. Introduce the concept of a "key". Have them help you find ABQ on the map and the Rio Grande. Point out the area of Rio Rancho. Explore the map together.

Ask: (Really engage with students and listen to their ideas)

- Has anyone heard of the term "watershed" before? You can highlight that it is a compound word. Have students share what they think of when they hear this word usually, "a shed full of water." It's kind of like that! Except the shed (or container) is an area of land. *Everyone lives, plays and works on land that draws to a body of water, like a river, lake, bay or ocean.*
- Point out the Rio Grande Watershed through the middle of the NM relief map.
- Where are there mountains and hills? Where do you see rivers and lakes?
- What would happen if we sprayed water on the mountain peaks, what will happen to it? *It will flow downhill.*
- Where does the water come from in nature? *Rain or snow*

III. Activity – 25 minutes

Where does the water go? Let's find out by making our own model/map, similar to the relief map.
Part A: 10 min
While students are still sitting, demonstrate activity → crumpling paper to drawing on the ridges. Identify the ridges. Ridge as high point of range of hills or mountains. Point out that it is where the

paper has a peak pointing up not down. Maybe identify the difference between a peak and a valley using the paper.

1. With your imagination, imagine that this piece of paper is a piece of land.
2. Crumple up the piece of paper and then smooth it back out most of the way. Leave it a bit crumpled, showing small ridges (high points) and valleys (low points).
3. Find the ridgelines (tops of the fold lines). Use the blue marker to color along the ridgelines on your "land".

Model this for students briefly. Be sure everyone understands the activity. Ask students to crumple their paper and draw their ridgelines. Once they are complete - Hands on their hand so we know they are ready for the next step.

Pair students (groups of 2 or 3), with teachers help. Assign roles 1-2, or 1-3.

Give Roles***: We're all observers, everyone will have a turn.

Have groups gather around their tray. Drawers can begin drawing their ridgelines. Announce that students have 30 more seconds when it seems that each group has enough ridgelines.

Next, demonstrate a "rain event". Model for students the distance we want them to aim from as they spray (i.e. the length of your elbow to hand, vertically placed on the tray). And 4 sprays. (idea: Students can be drill sergeants about the three sprays, acknowledge that sometimes the spray bottles act funny but that we are trusting our classmates to count for themselves to do only four full sprays...).

Ask:

- What do you think will happen to your land when it "rains"?
- What will happen to the blue ridge lines? / Where will the "rainwater" travel?

1. Altogether, sprayers squirt your model a few times to create a "rainstorm" over your land.
2. Observe what happens.
3. As your rainfall accumulates, watch the pathways where the excess "rainfall" travels.

With teachers, walk around to ask each pair to explain what the water is doing and show you rivers and streams in their model.

Have teachers help pick up all the spray bottles, and ask everyone to place their hands on their head and have a small group discussion about their observations.

Part B: 15 min

Have pairs switch roles, “disposers” can throw out previous model. Tell students they will keep the same number assigned earlier and tell them what role they will be playing. You could write these on a whiteboard.

What’s In the Water?
Experiment with how “pollutants” might travel through their watersheds.

With a new piece of “land”, imagine this represents the City of Rio Rancho or the Rio Grande Watershed. Show one of the Watershed posters and point out all the human activity that happens in a watershed (driving cars, making things (manufacturing), farming, walking our dogs, etc.)

Ask:

- What might be on this land that we wouldn’t want in our water?
- What is pollution?
    - Have you ever seen it? What does it look like?

As students share, note the types of pollution on a poster or white board and create a key for groups to use. (Roads/Cars - black, Trash - Green, Dog poop-brown (and/or orange if you have more groups than markers)) Depending on the group, you could also identify Factories - Red

Before crumpling, have drawers (with their support drawers) mark their papers with the brown, red and black marker to represent farms, factories, houses, streets, dog poop and trash.
Announce that students have 30 more seconds when it seems that each group has drawn enough. Then ask all students to put their hands on their head.

Then have crumplers -crumple paper and then partially smooth it out.

Altogether, have sprayers spray the piece of paper.

Ask:

- What happened to the pollution when it rained?
- Describe what happened at the highest and lowest point in your watershed.
- How quickly did it spread? Are there any places on the land where it didn’t go?

WRAP UP: -5-10min
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. (*I like to emphasize to this age group that **being responsible is powerful** and they can make a difference by caring and picking up their own trash. I also tell them that last year a whole grade level of 3rd graders at Cielo Azul Elementary helped pick up 1.8 tons of trash!)

Thank the class for their attention and participation. Tell them we look forward to seeing them again and expect that they show the wildlife biologists the same respect they have shown us.

*****Groups of 3: Each person gets to spray 3x. Model this for them.**
For groups of 3, you'll need two blue markers for Part A.

May be helpful to tell students each turn has a Lead Role and a Supporting role (Supporting role noted in parentheses).

Part A Roles:
1 - Drawers (+ spray)
2 - Crumplers (+ drawing / spray)
3 - 1st Spray (+ disposers) -- Spray 3, 2, 1

Part B Roles:
1 - 1st Spray (+ disposers)
2 - Drawers (+ spray) --Spray 2, 1, 3
3 - Crumpler (+ draw)

Groups of 2:

Part A Roles:
1 - Crumpler / Drawer
2 - Sprayer / Disposer

Part B Roles:
1 - Sprayer / Disposer
2 - Crumpler / Drawer

Appendix B
Supplemental Materials

-SSCAFCA Activity Book and Educational Videos:

KNOW YOUR ARROYOS
ENJOY • RESPECT • PROTECT

-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:

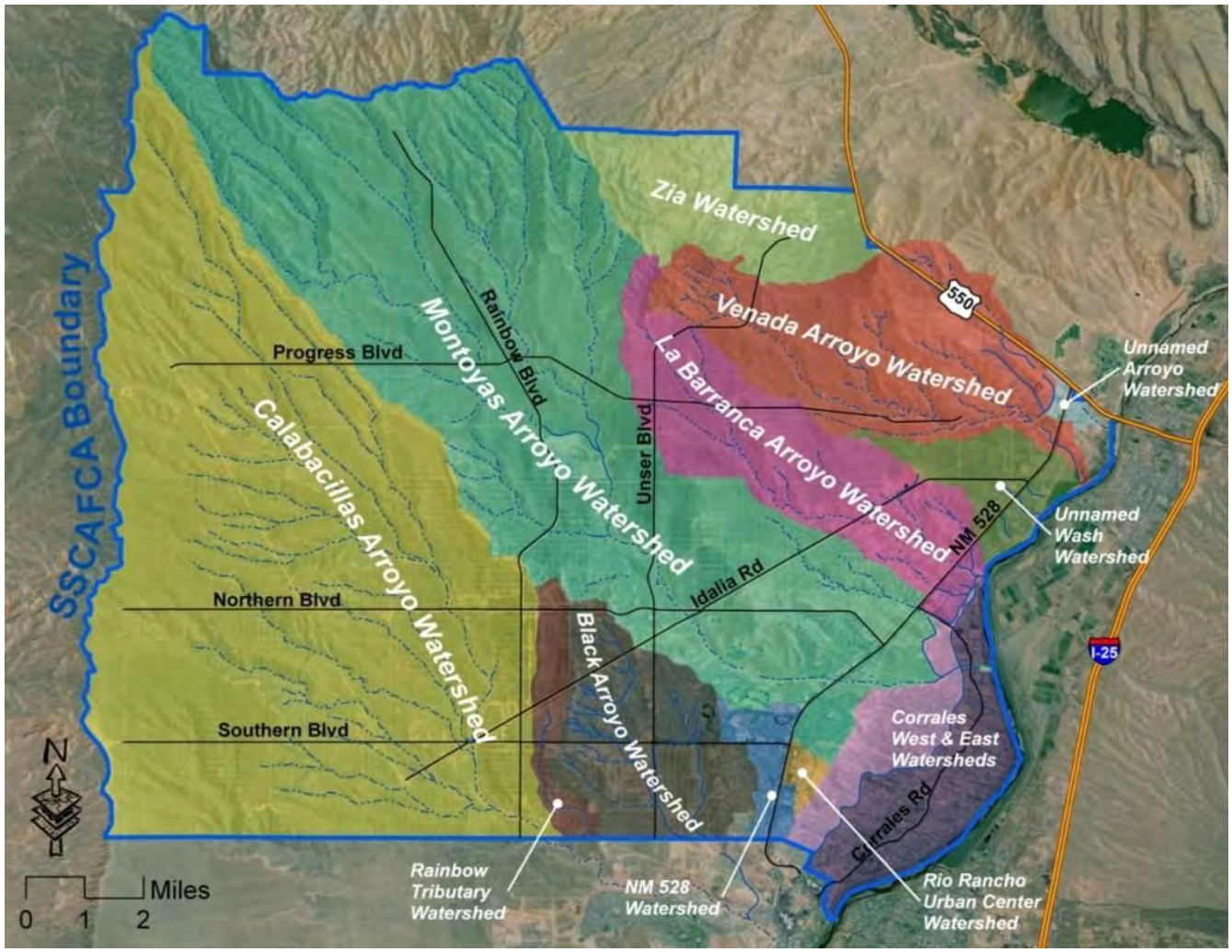
SSCAFCA

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 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:



Appendix C
Program Photos

LEFT - Melissa McLamb discussing desert animal and plant adaptations by Maggie Cordova Arroyo.

RIGHT - Students observing and discussing the watershed model.

LEFT - Students having fun during the arroyo walk on school property. Students gather in between activities to discuss findings such as looking for evidence of wildlife (scat, tracks, burrows, etc.).

Exhibit 5
RiverXchange 2018-2019

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

2019 Report

Presented by
Ciudad Soil & Water Conservation District

June 2019

CONTENTS

SUMMARY

This year, funding enabled 36 NM classes (954 students and 39 teachers) to participate. The majority of participating classes were from Title I schools. Each NM class was partnered with another NM class and when possible another class outside the state for a total of over 1,338 participants. All program costs and coordination are provided free of charge to NM teachers. Training, technical support, and curriculum materials are provided free of charge to partner teachers. The program required $51,881.62 in cash and generated total match valued at $90,344.90 in the form of in-kind contributions including workshop space, classroom resources, presenters' time in the classroom, field trip docents, donated trees and shrubs, as well as teachers' and students' time.

With the support of two contract hires this year, we were able to focus more on strengthening our program in ways we haven't been able to in the previous three years with unanticipated personnel changes. Our primary accomplishments include: strengthening partnerships with teachers and volunteers who support us with in-class presentations, developing an effective place based lesson on acequias and agriculture, and offering consistent blog support and encouragement in order to increase the efficacy of the technology component. Also, we refined our extension activities this year and are on target to have all RiverXchange presentations correlated with the recently adopted New Mexico science standards, NM STEM Ready! by the end of the summer. Teachers commended us throughout the year on the value of the presentations and curriculum in their class experience.

Strengthening Partnerships

Understanding how RiverXchange meets the needs of participating teachers, students, in-kind donors, as well as how RiverXchange fits into the larger efforts of watershed education in our community, is critical for keeping RiverXchange relevant and impactful. This year, we met with a wide variety of educators and stakeholders in our field. We met with organizations including: Albuquerque Water Utility Authority (ABCWUA), Sandia Labs, Bosque Ecosystem Monitoring Project (BEMP), RiverSource, Sandia Mountain Natural History Center (SMNHC) and Center for Social Sustainable Systems (CESOSS). These meetings, as well as shadowing a few presentations offered by others, gave us and our collaborators an opportunity to establish or reconfirm program expectations, help us evaluate our educational offerings and find ways we can better support common learning objectives in watershed education. Strong partnerships are critical in informing us as we work to strengthen the program, remain relevant, and navigate unexpected changes.

For example, one long term collaborating agency, Bernalillo County Extension, was unable to participate with us this year. In the past, they have offered the agriculture related presentation to all APS schools. Consequently, our staff designed and delivered a similar presentation that engaged students in a regional history of agriculture and irrigation techniques that highlighted acequia culture and the effects of human settlement on the Rio Grande. In our search for resources in the community, we discovered CESSOS, a possible future in-kind partner, who could offer a presentation more culturally relevant and significant for students.

Blog Support

We noticed an increase in blog postings, including postings of class projects this year. We held a contest for excellent and creative blogging with specific criteria and saw more class engagement due to this. Though a few teachers continue to report they face challenges with access to computer labs, many of our classrooms this year are already using technology such as Google Classroom or many have individual tablets for students. With technology being integrated into more classrooms worldwide, the blogging component of RiverXchange continues to be a unique, important offering of our program. The blog offers a protected, educational platform for teachers to guide and review student work, as well as an opportunity for the class to learn about digital citizenship. Using the blog, allows classes to experience the importance of meaningful communication to a broad, digital audience, while practicing creative collaboration and self-responsibility in the submission of work.

Teacher Workshop

Noticing a need for professional development for our teachers with the newly adopted science standards, we took the opportunity to educate teachers about NM STEM Ready! at our teacher workshop and show how the RiverXchange program and curriculum can help their students meet these in their classroom experience. With support from the Environmental Education Association of New Mexico (EEANM) and Seleana Connealy of NM EPSCoR (Established Program to Stimulate Competitive Research), we offered an introduction to the standards, offered practical tools to plan and demonstrate lesson correlation, using RiverXchange activities, and shared resources for learning more throughout the school year.

Teacher Feedback

Every year, we receive invaluable feedback from our teachers. Feedback this year continues to be positive. All participating teachers want to return and a few have asked to add other teachers from their fifth grade team. We are finding that the majority of our teachers choose our program to teach more about water resource issues and to incorporate more science into the classroom. This shows a major shift since the program's conception, at that time teachers were more drawn to the program as a way to incorporate more language arts curriculum. While the program still focuses on reflective and creative writing, we are also responding to current needs by emphasizing how RiverXchange can help teachers include more experiential learning and science in their classroom. Nearly 50% of teachers are also attracted to the program because the blog enables them to connect with other teachers and students in a thematic learning environment. Here are a few highlighted responses from our teachers on the greatest learning outcomes for their class:

> "I was able to add experiential learning in science into my classroom lessons and truly engage the students." - Anonymous
>
> "Students were able to fully understand where our water comes from, what a watershed is, how humans have impacted the environment and ecosystems. And maybe, more importantly, what we can do to help." - John Turrietta, MLK Elementary
>
> "Awareness of their role in conserving and protecting water resources."- Dwayne Norris, Bandalier Elementary
>
> "Working as a team and real life connection to science topics through our local watershed." - Tris Carty, Seven Bar Elementary

"What a wonderful way to have students directly involved in their own watershed while learning hydrosphere concepts. The teamwork and concrete lessons were a great enhancement to our classroom." - Anonymous

"This group in particular, has learned so much from the experience. Many of them have never been to the bosque, or reflected upon the components and how/why they might have come to be there." -Anonymous

"The presentations were engaging and interactive. The demonstrations helped the students to understand more of our environment. I really enjoyed the speakers. The pole planting field trip was amazing! The kids felt very accomplished!"- Randi Sevigny, Seven Bar Elementary

Presentations

Program presentations were completed as follows:

Agriculture: 36/36
Stormwater: 36/36
Wastewater: 36/36
Drinking Water: 36/36
Planting Field Trips: 34/36
Landfill Field Trips: 5

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, we 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, we continued to find that upper elementary students had little or no understanding of major water resources topics unless the teacher specifically integrates a wide range of water topics into the curriculum. For this reason, as well as our successful festival work with upper elementary students, this age level was selected as the focus for the RiverXchange program.

We created RiverXchange to provide a free program that is fun, interesting, and easy to integrate into the normal curriculum. Our hope was to motivate participants to explore water resources topics in depth. The program is 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.

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. The upper elementary level was chosen because of our successful festival work with this age group.

After the pilot project, we transitioned to a web-based technology called a wiki. This enabled us 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 we introduced classroom guest speakers to reduce teacher workload and bring up-to-date technical information into the classroom.

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. Since 2007, we have served over 18,000 students!

This year, the program featured the following components:

- Optional standards-based curriculum including hands on science and social studies lessons, as well as writing assignments
- Coordination of class partnerships
- KidBlog online posting and communication
- Teacher training on curriculum implementation and use of KidBlog
- Ongoing technical and motivational support
- Online class postings
- End of year teacher survey
- Pre and post student surveys (NM only)
- Payment for teacher workshop substitute teachers (NM only)

- Coordination of at least four guest speakers into the classroom (NM only)
- Coordination of a field trip to the local river or important watershed feature (NM only)
- Field trip bus transportation payment (NM only)
- Field trip leadership and activity planning (NM only)

Program Management and Financial Support

The program timeframe was July 1, 2018 through June 14, 2019. All components including fundraising, design, planning, implementation, and analysis were carried out by employees and contractors of Ciudad Soil & Water Conservation District, including:

Melissa McLamb
Jessica Garduño
Erin Blaz
Jenny Lloyd-Strovas

Sponsors

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

Sponsors provided a total of $51,881.62 in cash.
MRGSQT - $31.768.40 | SSCAFCA - $20,113.22

Program expenses included:

- Substitute teachers for NM teacher workshops
- Teacher workshop space rental and meals
- Field trip bus transportation for NM classes
- Field trip portable toilet rentals for NM classes
- Technology services
- Office and educational supplies
- Coordination services (planning, implementing and assessing all program components)

New Mexico In-Kind Partners

- Albuquerque Water Utility Authority
- Bernalillo County - Public Works Division
- CDM Smith, Inc.
- City of Albuquerque – Open Space Division
- City of Rio Rancho – Environmental Programs Office
- City of Rio Rancho — Parks, Recreation and Community Services Department
- Daniel B. Stephens and Associates
- New Mexico Acequia Association
- Sandia Labs
- Sandoval County Cooperative Extension
- Southern Sandoval County Arroyo and Flood Control Authority

- UNM Maxwell Museum of Anthropology

In-Kind contributions totaled $90,345. For NM classes, in-kind contributions included classroom guest speakers, field trip docents, planting materials, workshop space and computer lab use, and teachers' and students' time attending the presentations and field trips. For partner classes, in-kind contributions were not calculated this year. Sponsors and in-kind partners were recognized on our website and in presentations.

Participant Selection

All 36 participating NM classes were fifth grade classes, distributed as follows:

Bernalillo County	**Sandoval County**
Bandelier Elementary (4)	Colinas del Norte Elementary (5)*
Cochiti Elementary (3) *	Martin Luther King, Jr. Elementary (7)*
Duranes Elementary (1) *	Sandia Vista Elementary (1)
Georgia O'Keeffe Elementary (2)	Santo Domingo Elementary (1)
John Baker Elementary (1)	
Monte Vista Elementary (3)	
Seven Bar Elementary (5)	
Zia Elementary (4) *	
22 classes, 558 students	**14 classes, 396 students**
* Title 1 school	**TOTAL - 36 classes, 954 students**

Curriculum

A component of RiverXchange is the hands-on optional curriculum, which is offered to all participating teachers. It was developed to help students reach for deeper meaning through hands-on learning and reinforce what they have learned through the process of writing to their pen pals. Over the years, we have developed a curated list of activities from the curriculum, along with reflection prompts

specific to each presentation. Organizers strive to incorporate emerging water resources issues into the curriculum, increase networking opportunities for teachers, reduce teacher workload, and align the curriculum with public school curriculum priorities.

Each class learns about its own local water resources issues through hands-on activities, classroom guest speakers, and a field trip. Students write about what they are learning via a private educational website that can be viewed by their partner classes. The computer technology and writing components provide a unique opportunity to reinforce what was learned, increase student motivation to learn, and collect valuable metrics about student performance.

Through RiverXchange, students take pride in sharing their knowledge of the local ecosystem and learning from their peers about another river ecosystem. Comparing the two geographical areas gives students a broader understanding of the importance of a river ecosystem to human and other life. Students gain the unique opportunity to share personal experiences and ask questions about a distant place. Teachers feel this kind of personal connection is a big deal for kids – many of whom have never traveled beyond their city limits.

All activities are correlated to NM state standards and benchmarks for Social Studies. All activities (because they require that students communicate information on the KidBlog) address Common Core Language Arts standards for writing. Some activities also address Common Core Mathematics and Science standards. For a summary of the RiverXchange Curriculum, see Appendix 1. For a summary of the extension activities, see Appendix 2.

Guest Speakers

We coordinated at least three guest presentations to visit each NM classroom. In all cases, guest speakers were water resources professionals from local agencies. Topics included:

- watershed/nonpoint source pollution
- drinking water
- wastewater
- water and agriculture (Our staff had to provide the majority of these presentations as we were unable to find an in-kind partner to do so, after we received notice that our previous provider, Bernalillo County Extension, would be unable to in the foreseeable future. We expended more coordination hours than usual due to this. We anticipate having an in-kind partner to offer this come next school year.)

Field Trips

The program requires that all classes attend at least one field trip to their local river or important watershed feature, which should incorporate a service learning component if possible. We coordinated all NM field trips. Throughout the winter and spring, students planted 518 native trees and 128 shrubs and helped restore critical riparian habitat along the Rio Grande in Albuquerque. In-kind funding from Rio Rancho Public Schools (RRPS) and Waste Management allowed us to offer an additional field trip to our RRPS classes which included a visit to the Sandoval County Landfill and Willow Creek Bosque.

<u>Field Trip Locations</u>

Alamo Farm
Candelaria Farms Open Space Preserve
Sandoval County Landfill / Willow Creek Bosque

EVALUATION

Blog Evaluation

Engagement

Of our total number of classes, Kidblog was used by 77% of RiverXchange teachers this year. Blog posts ranged from 1 to 41 per class over the year. We helped teachers who reached out with any need for technical support. As we did not hear of any issues from most of the teachers who did not blog, we can not be sure why they did not participate in this area. It is likely however, since many of these teachers have blogged in the past, that unpredictable circumstances made it challenging to integrate KidBlog into the classroom. One class did not blog because they did not have sufficient internet access (Santo Domingo ES). In general, we are satisfied that the majority of teachers utilize KidBlog in the specific method we train them on for RiverXchange. In addition, classes continued to use reflection groups for posting and this seemed to work smoothly for teachers.

We ran a contest this year for creative and excellent blogging. We used a rubric to score posts for each class to determine the winner. The results from this rubric demonstrated that about half of classes posts met a satisfactory level of blogging. 32% of classes demonstrated above satisfactory posting and 13% of classes were exceptional. Four winners were chosen, two 1st place and two 2nd place winners, who won gift certificates to Acorn Naturalists and a River of Change model from the Bosque Education Guide (1st place only). In observing the quality of postings from the majority of classes, we determined the use of the KidBlog platform is an effective means to meet our education and outreach objectives.

Student Voices

The blog is not only a platform for student voices to be heard, it also provides a rare opportunity to informally assess student learning from RiverXchange. Even with a range of quantity and quality of postings, across the board, students voices resounded messages of water conservation and protection. While they might not always have a perfect grasp on the technicalities of water distribution and use in our community, we can see they are building knowledge about their watershed and water as a local resource.

This year we continued to encourage group collaboration by setting up reflection groups at the start of the year with the hope that blog posts are a product of that collaboration. We also have tried to encourage teachers to get creative with posts - to do videos, pictures, or even voice recordings. We still see a majority of written-only posts, though some teachers integrated powerpoint projects, drawings and videos to posts. This is encouraging as the blog has the potential to truly catalyze project-based, hands-on, experiential learning by being a multimedia platform.

Blog Images

No Trash

By Gallegos Watery cycles on Oct 31, 2018

Keep our Environment Clean

Hello fellow water users. We have an issue with our trash. The plastic bag is one of the worst threats to our environment. It can destroy our watershed and we can lose all of the water and die. Trash can pollute the sea and can kill the animals. For example a plastic bag can look like a jellyfish and it can trick the turtle into eating it, and then the turtle will suffocate.

If we don't litter than our lakes and seas will not be so DIRTY! Some other ways to save our drinking water is to pick up dog poop, don't take long showers, turn off the water when you're done with it, fix leaky faucets, don't use pesticides, and only use a little fertilizer.

Fifty years ago people in Albuquerque believed that there was a lake under us. But no, we have a small portion of it and must use it carefully. If we don't take care of it we will not have enough of it to drink, water plants, and bathe.

Some facts are:

- The earth is made up of 70% salt water (not usable).
- There are people all over the world who litter in our water.
- The Pacific garbage patch is twice the size of Texas.
- Everyday the Rio Grande goes straight through New Mexico to the Gulf of Mexico.

Thanks for helping us save the environment!

"Learning about the Water Cycle" (image and quote below by Whitlock McGonagal)

"We made diagrams of our local water cycle, the Sandias to the Gulf Of Mexico as our main body of water."

Kidblog Quotes

"On the 13th of December we went to the Rio Grande bosque. When we went on our field trip we felt like this field trip was about friendship. We had fun with people we did not usually hang out with. We made some stronger friendships. It felt really good. We planted three trees and named them Skittles, RIP Mickey Mouse and Paw. We had to use shovels, an auger, and trees. The trees were cottonwoods. We did this so we can help our bosque. We also saved a live mouse. We were happy because our teacher got to help and she was in our group. Unfortunately, we also found a dead mouse and our chaperone got to take a picture. A lot of the tree starters varied from deep to like not even deep at all! Cottonwood trees are special because they can grow from a branch cut from another tree. They can live up to about 80 years old! Beavers like to eat young cottonwoods so the Open Space people use a metal fence around the trunk. This field trip was the best! It meant a lot to give back. We would love to come back!" (Gonzalez Contagious Intelligence)

"I will never forget that if you have a leaky faucet and do not know about it or just don't want to pay money to fix it, in a year over 86,000 gallons of water will be wasted." (Gomez Water Rush)

"A permeable surface means that water can soak into the top, such as grass or dirt. A impermeable surface means that water cannot soak into the top, such as a road or sidewalk. The problem with impermeable surfaces is that there is a lot more runoff from rain or water flowing down the streets." (Gomez River)

"When we learned about storm water we were surprised that just one storm can wash away all of our pollution into our watershed." (Rodriquez Africa)

"Wastewater comes from toilets, sinks, baths, showers, and drains. In Rio Rancho, this wastewater goes to a wastewater recycling plant where it is cleaned and put back into the aquifer. In order to be cleaned, people help the reclaimed water go through the plant." (Turrietta Galilei)

"When we went on the field trip we learned that the Rio Grande used to overflow. When it stoped, other plants took over like salt weed and tumble weeds. So when we planted the trees it helped. Our favorite part was planting them and feeling the accomplishment. Our whole group planted 10 TREES! We also learned that when a cottonwood tree branch falls in the mud it will sprout roots." (Yu Wonderwoman)

"The dust bowl impacted the people because it destroyed peoples farm and crops it was a time of depression and drought." (Shafer Storm)

Kidblog Partners

Due to staff transitioning at the start of the school year and other outside factors, we closed out the year with only two partner teachers who were actually set up on KidBlog and posting. One partner teacher was returning from the previous year and was able to post frequently without support. Two new partners were successfully trained over the phone in February, one of which did end up posting in late April. Detailed instructions for KidBlog were sent to all partner teachers who registered, however since none of them followed through it seems that over- the-phone training is the most effective way to ensure initial partner

success on the blog. We also plan to record a video training for partner teachers for next year to better assist them with integrated the blog in their classrooms.

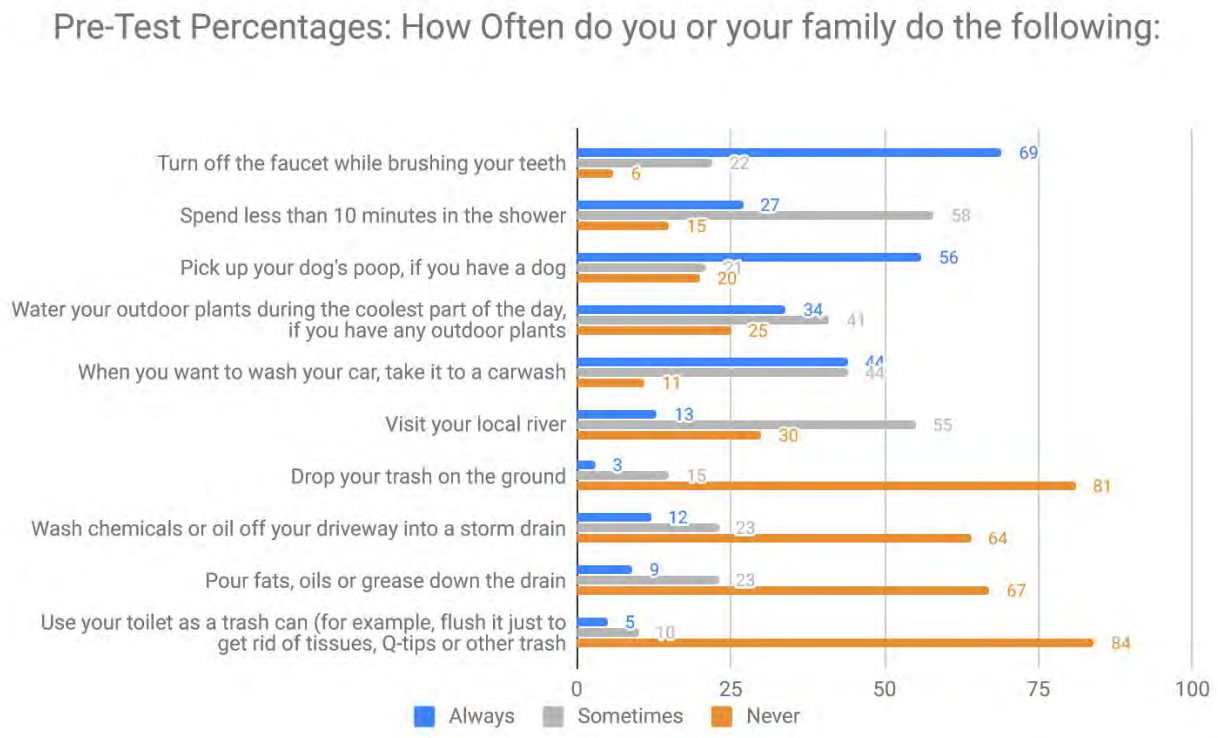
Student Surveys

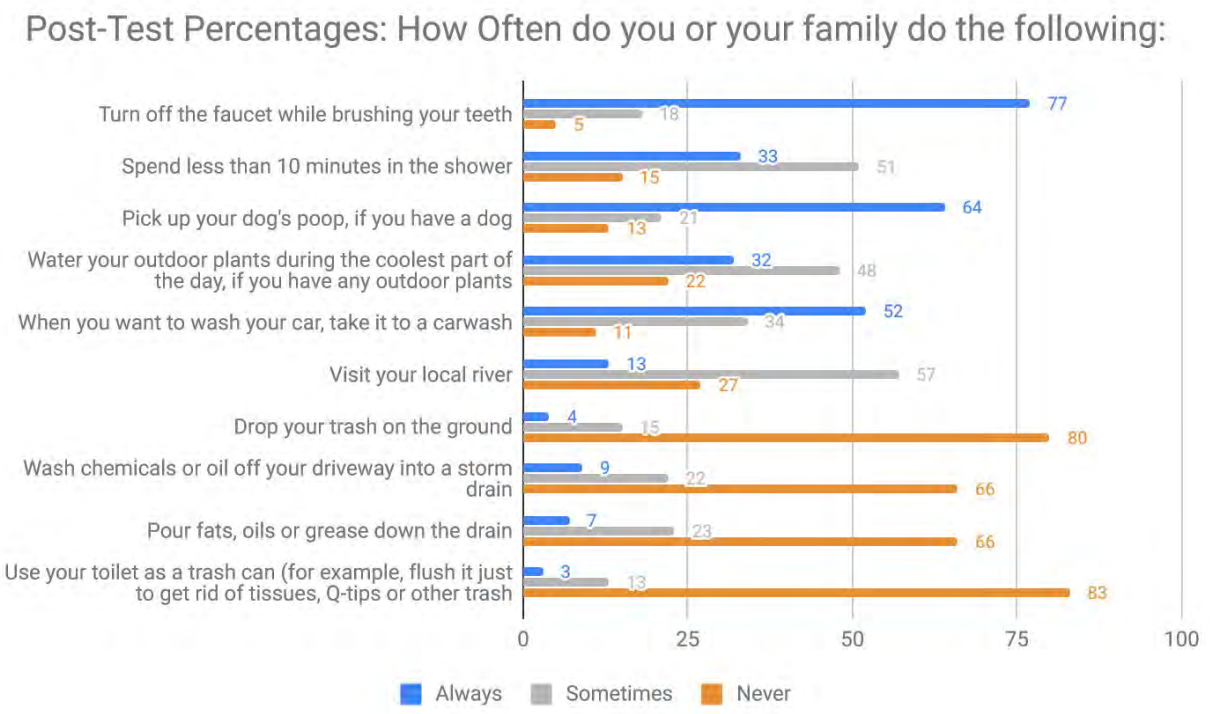
A key component of RiverXchange is it's measurable goals relating to student performance. We collected quantitative data on student performance by way of a pre and post survey and qualitative data by reading what students submitted on KidBlog. We also surveyed students about their actions before and after participating in RiverXchange.

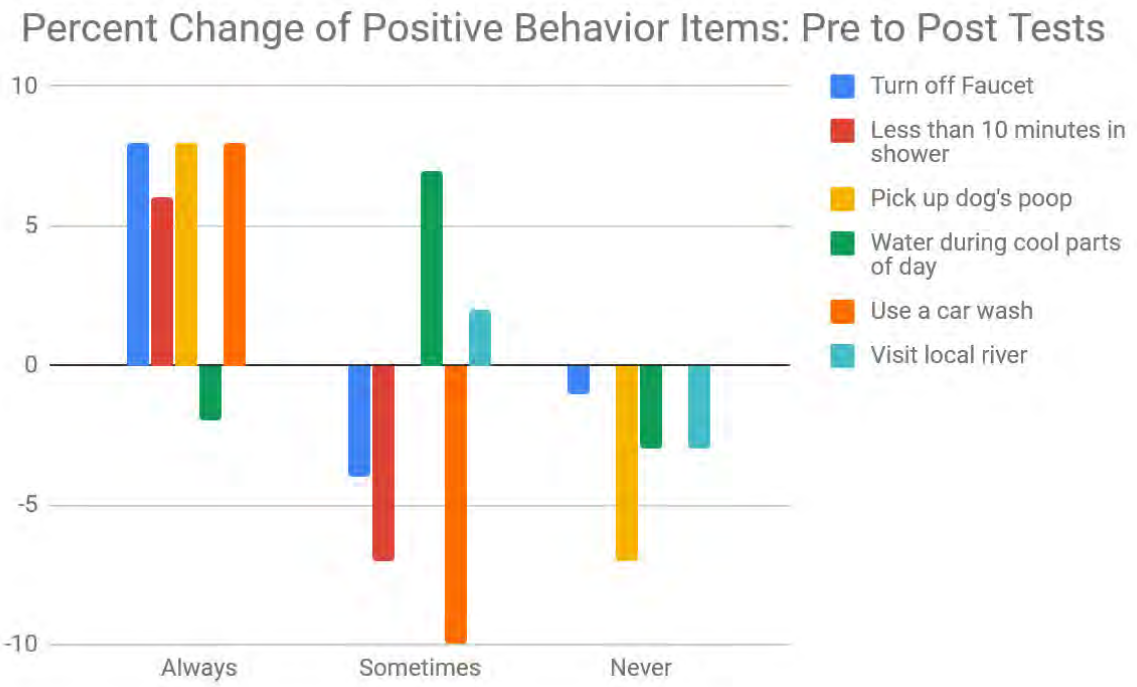
Pre/Post Behavior Survey

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 change in responses between the pre and post surveys. This year, 721 students completed the pre-survey, while 718 completed the post-survey. In order to account for this small discrepancy in participation, the number of each given answer has been calculated as a percent of the total number of responses received for each given survey. We continue to refine the survey and our programming year after year based on teacher feedback and metrics gathered from these surveys. We are also evaluating our metrics over the past six years to see how and if the results have been changing year to year. We have included a graph showing the changes for the behavior survey, at the end of Item 1. We expect to have more questions assessed by August 2019.

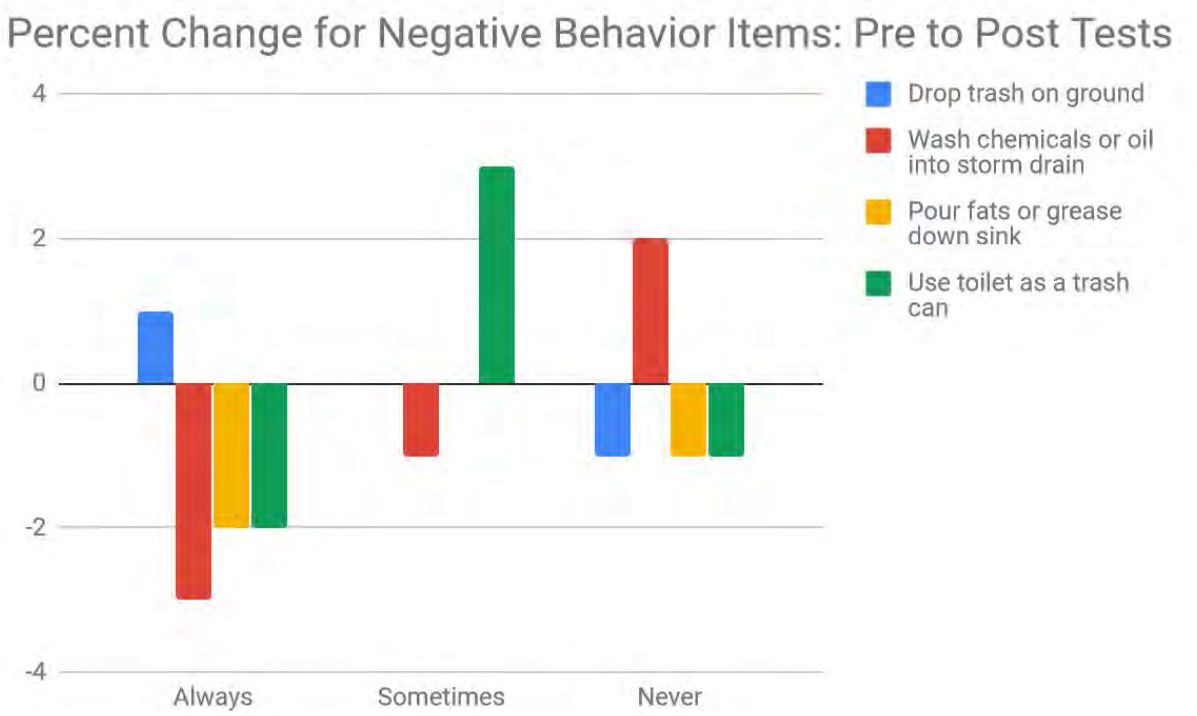
Item 1





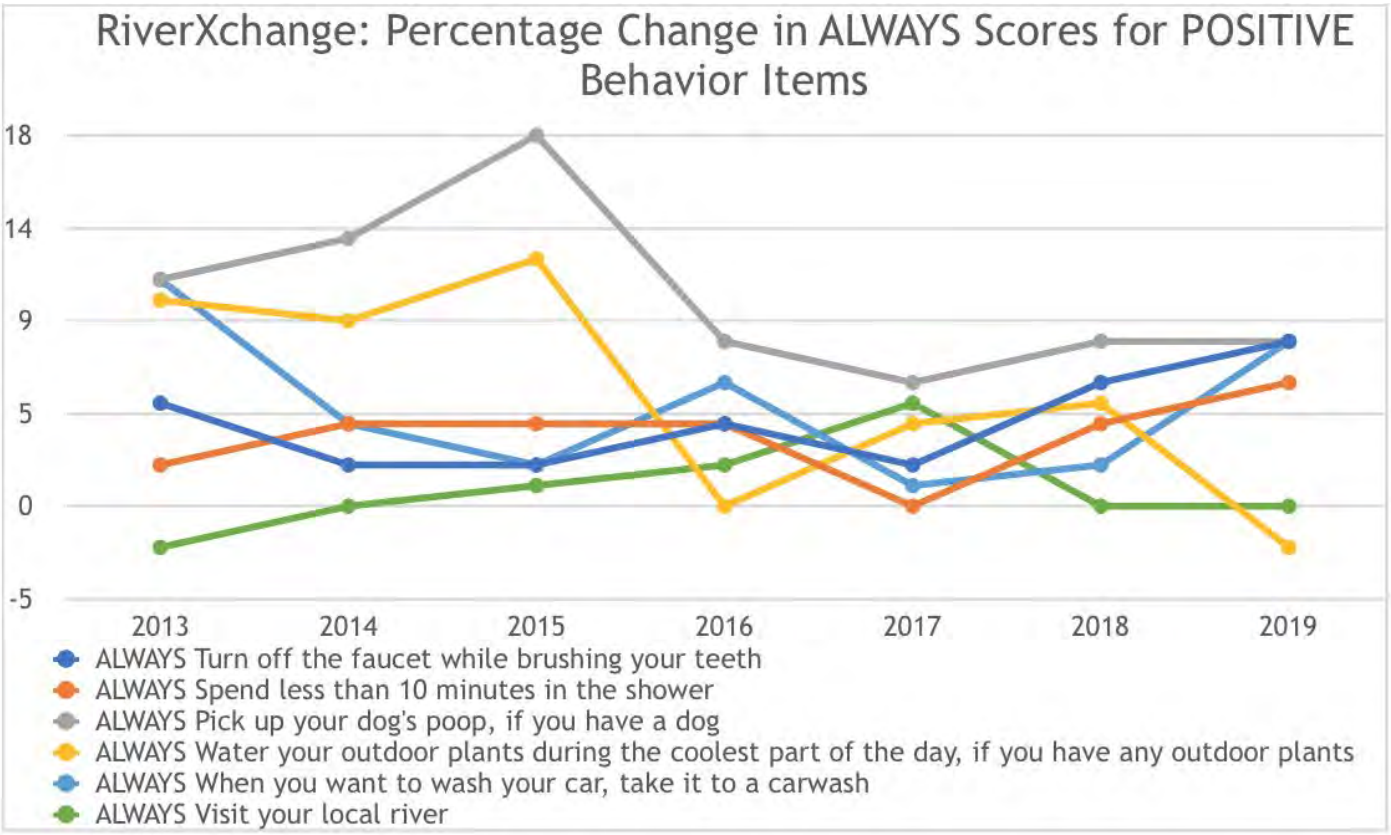


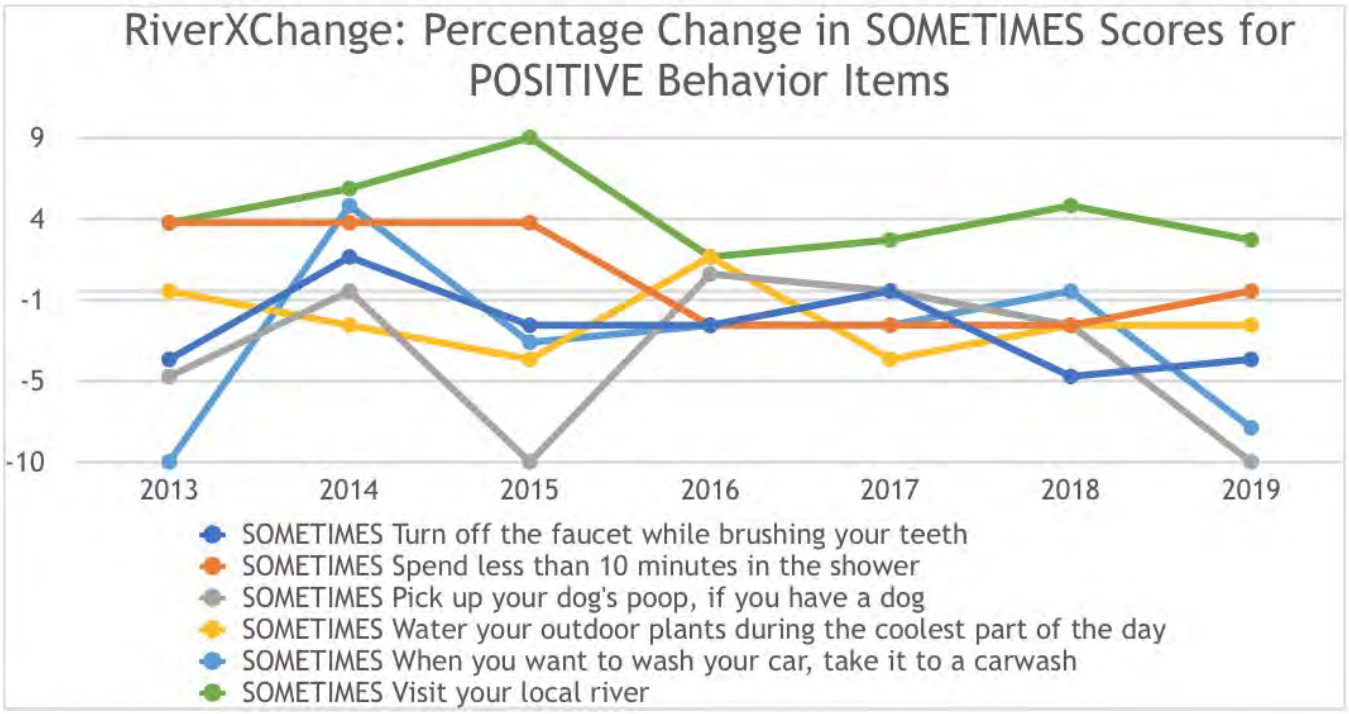
This graph illustrates an increase in positive behaviors after having received the RiverXchange presentations for the following behaviors: turning off the faucet when they brush their teeth, picking up their dog's poop, using a carwash service and spending less than 10 minutes in the shower. For many items we see an increase in positive behavior while also seeing a decrease in negative behaviors. For example, the question "How often do you pick up your dog's poop?", there is an increase in the response "Always or Very Often" while there is a decrease in the response "Never or Not Very Often." While these metrics are positive, we aim to have more significant positive findings in behavior metrics in future years.



This graph illustrates a decrease in negative behaviors after having received the RiverXchange presentations for all of the above listed behaviors except "Drop trash on the ground." It is likely that our students are unsure how to answer for the behaviors listed that may not feel applicable to them, for example, "How often do you wash chemicals or oil off your driveway into a gutter or storm drain?" For behaviors that are more specific to adults, it is more important to us that we capture students' understanding of the actions that are harmful to the watershed. As we revise our survey for next year, we will aim to make this behavior assessment more age appropriate for 5th grade students.

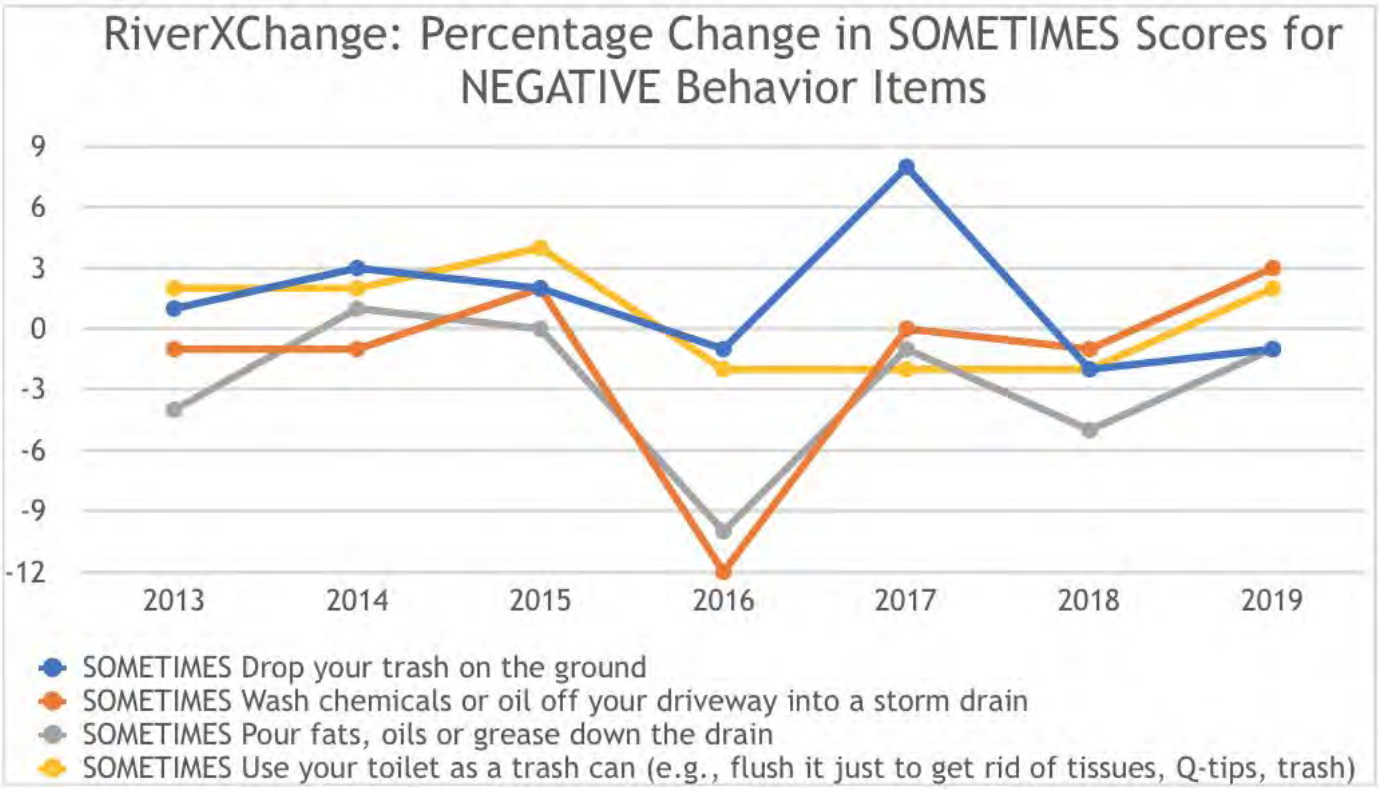
The following graphs show the percentage change between pre and post surveys on the behavior survey items since 2013. The graphs distinguish data for negative and positive behaviors. These graphs will be critical in our ongoing evaluation of the program.

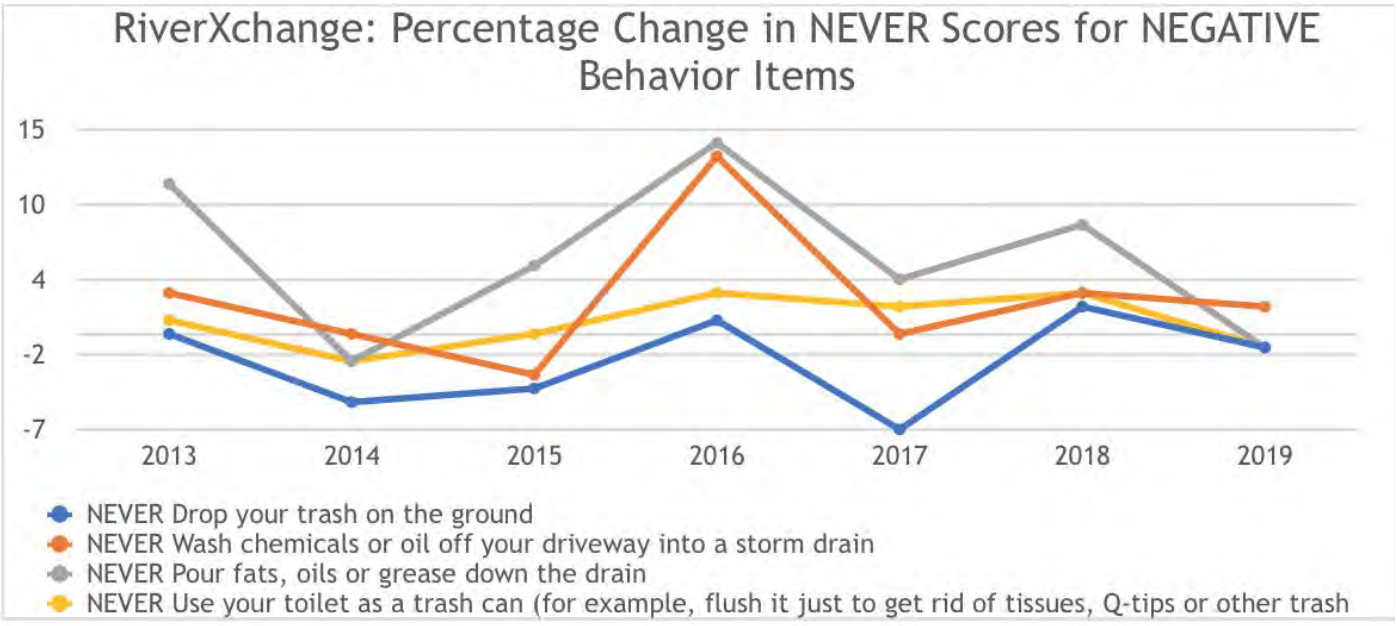




We see an overall trend of positive change in many of the listed behaviors since 2013. The most notable and consistent change showing in students learning the importance of picking up their dog's poop. Inconsistencies can be due to a variety of reasons, including changes in presenters and personnel operating the program, and students may gauge their behavior differently at the end of the year, with what they've learned throughout the program. Seeing how we compare year to year in our metrics, allows us to identify

where we need to improve the learning outcomes for students. In 2015, we had an additional presentation for our participating classes which emphasized all positive behaviors. These graphs also emphasize for us the importance of training our presenters at the start of the program and emphasizing our teaching objectives with them throughout the school year.

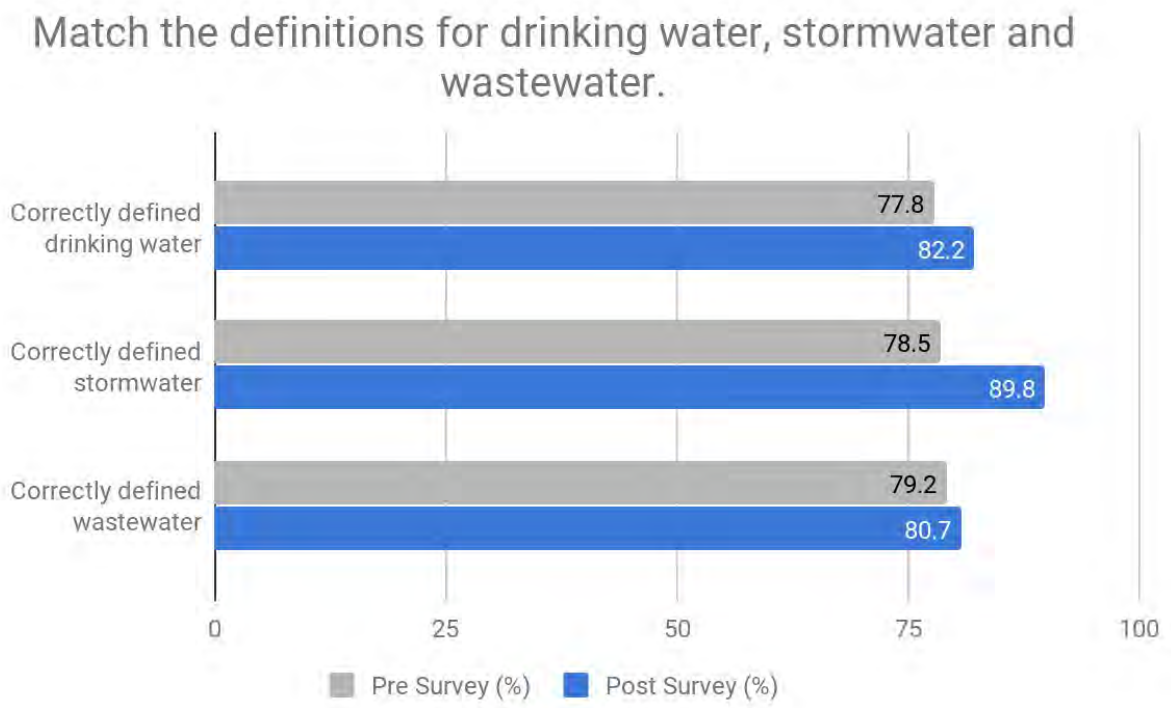




The change in negative behaviors is not consistent over the years, though we do see the majority of items showing a positive change year to year.

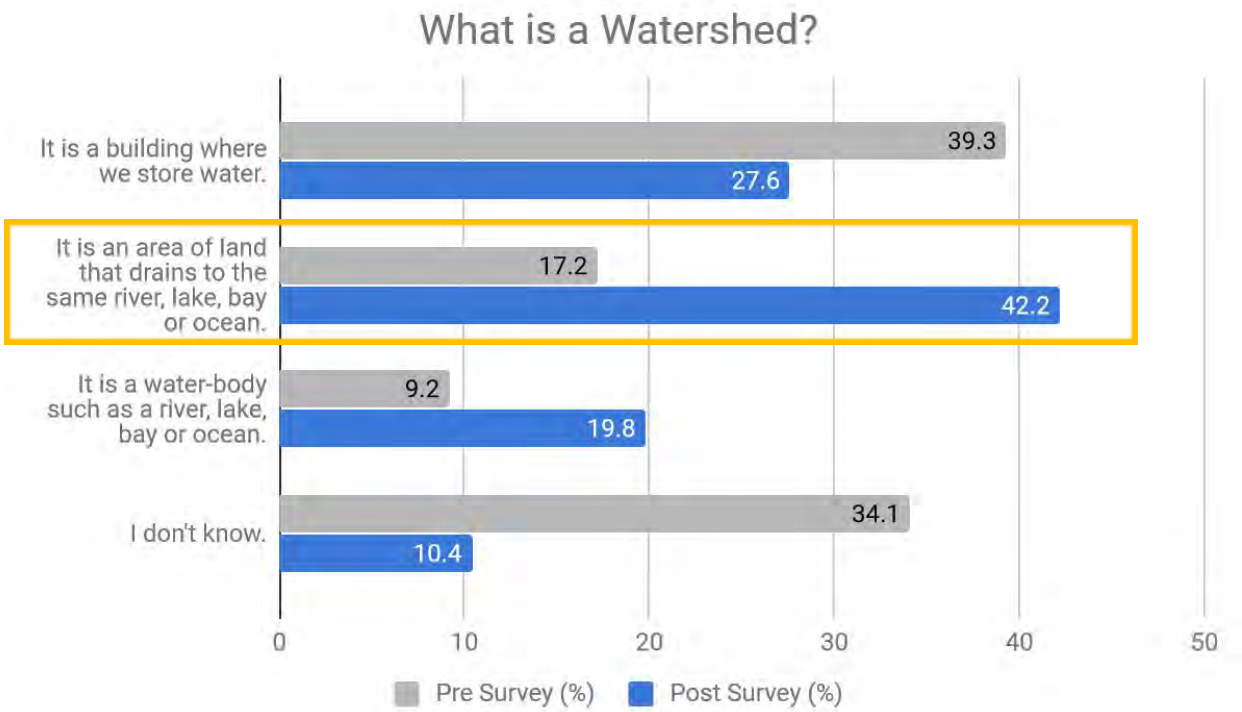
Correct answers, where applicable have been noted with a yellow outline. Stars have been used to indicate where we are seeing large differences with positive outcomes.

Item 2



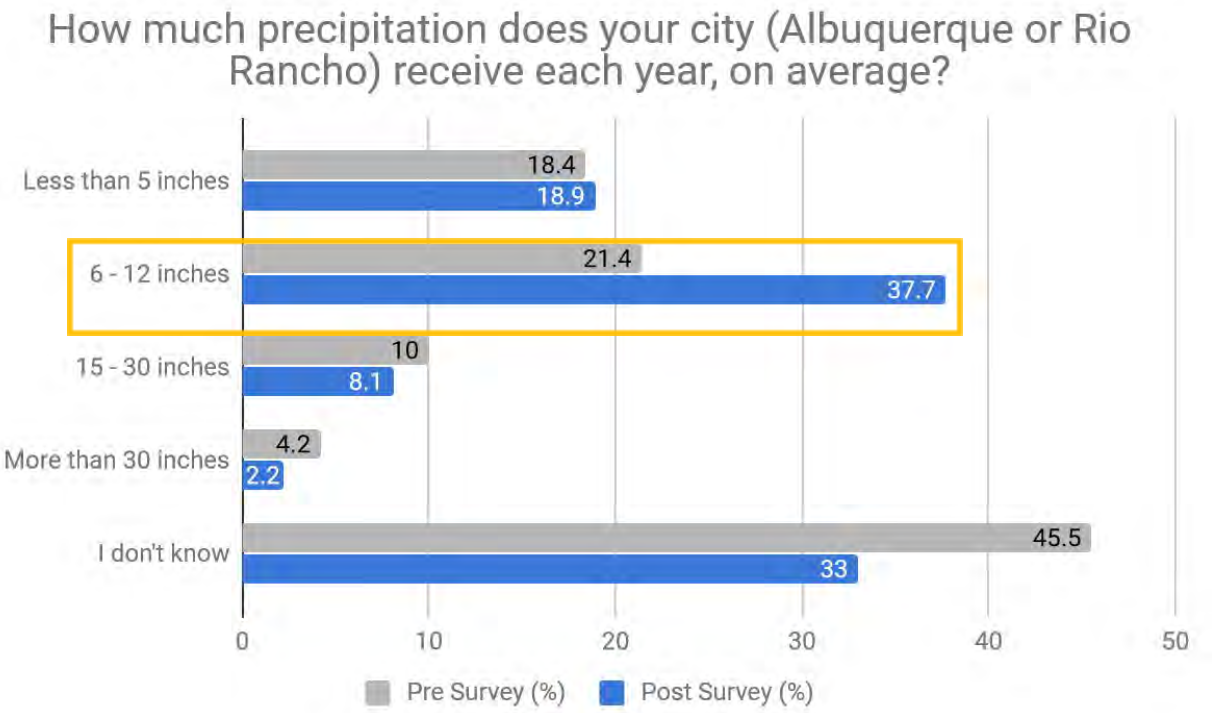
This graph does not demonstrate a significant change from pre to post. One possibility is that students are making educated guesses on the pre-survey and then are confident in their answer on the post-survey.

Item 3



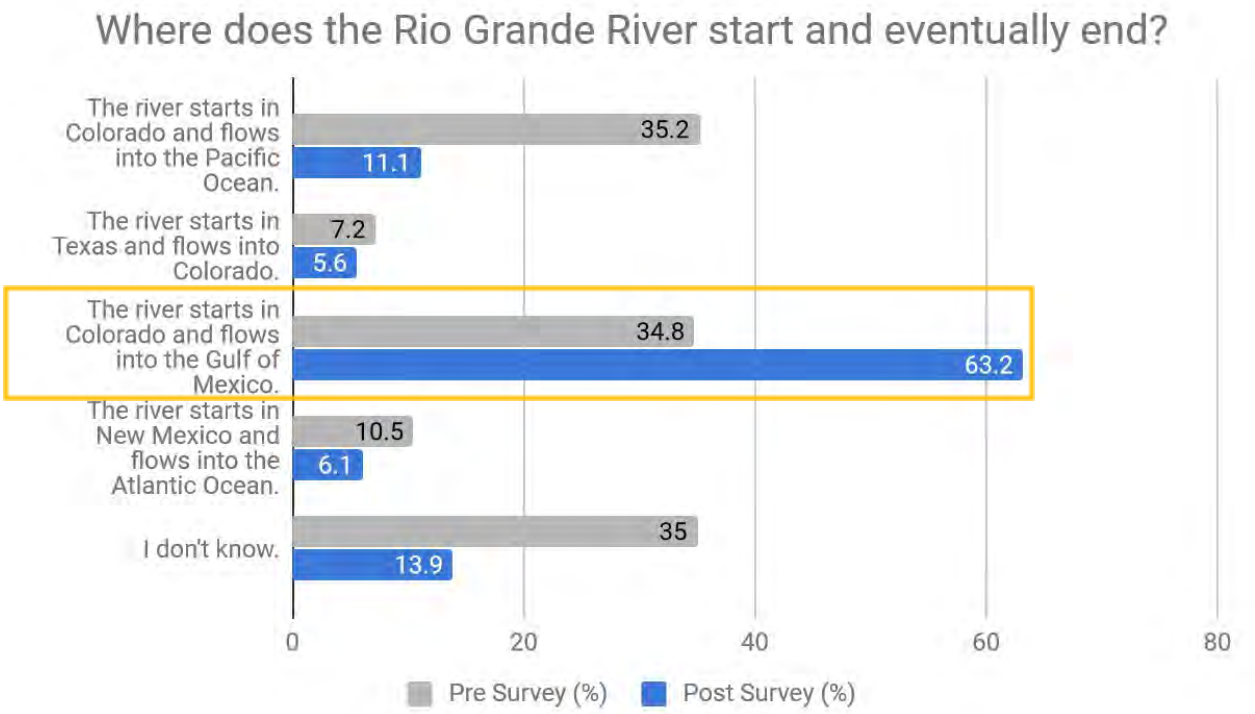
This graph demonstrates a 25% increase in correctly defining a watershed from the pre to post survey. Next year we intend to remove the option to answer “I don’t know” in all survey questions as we have determined that we could better assess student knowledge without it. Students may choose “I don’t know” in cases where they aren’t confident of the answer though could guess the correct answer with a challenge to consider the question more thoroughly.

Item 4



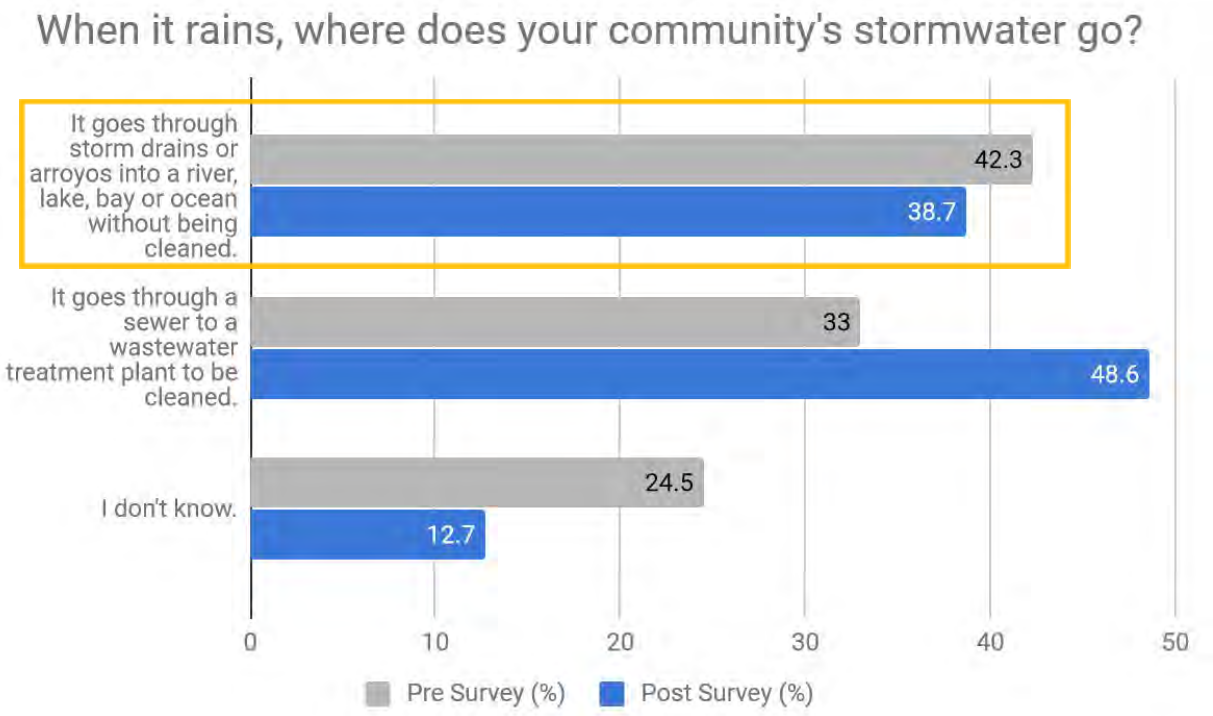
While we see a 16% increase in the correct answer here, we would like to see this metric improve next year. We adjusted the increments of the choices this year as well and added “less than 5 inches”. It’s likely that students who chose “less than 5 inches” thought the lesser precipitation reflected their home desert environment. We will plan to emphasize annual precipitation in the program next year. Also, we see again students opting for the “I don’t know” choice rather than perhaps choosing their best guess.

Item 5



Nearly 30% more students could answer this correctly at the end of the program.

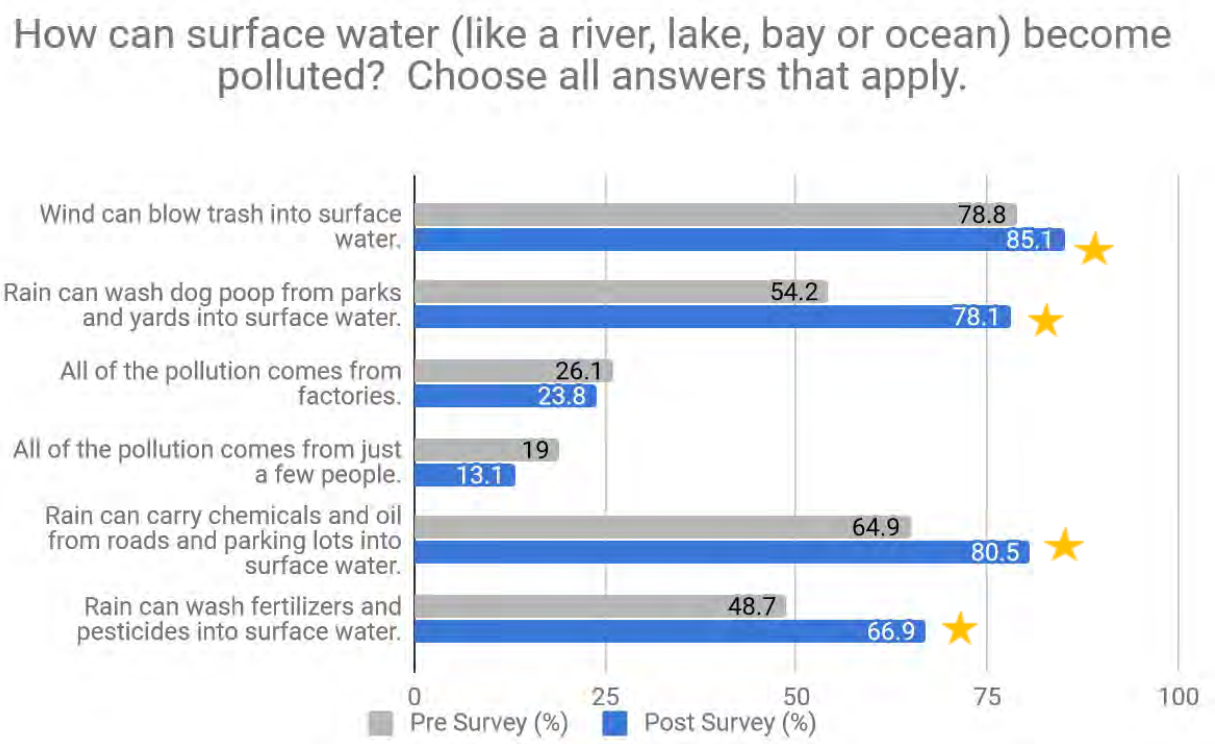
Item 6



This graph demonstrates a small decrease in correctly defining the stormwater pathway. We are not exactly sure where the misunderstanding is stemming from, but it may be rooted in misinformation about a sewer

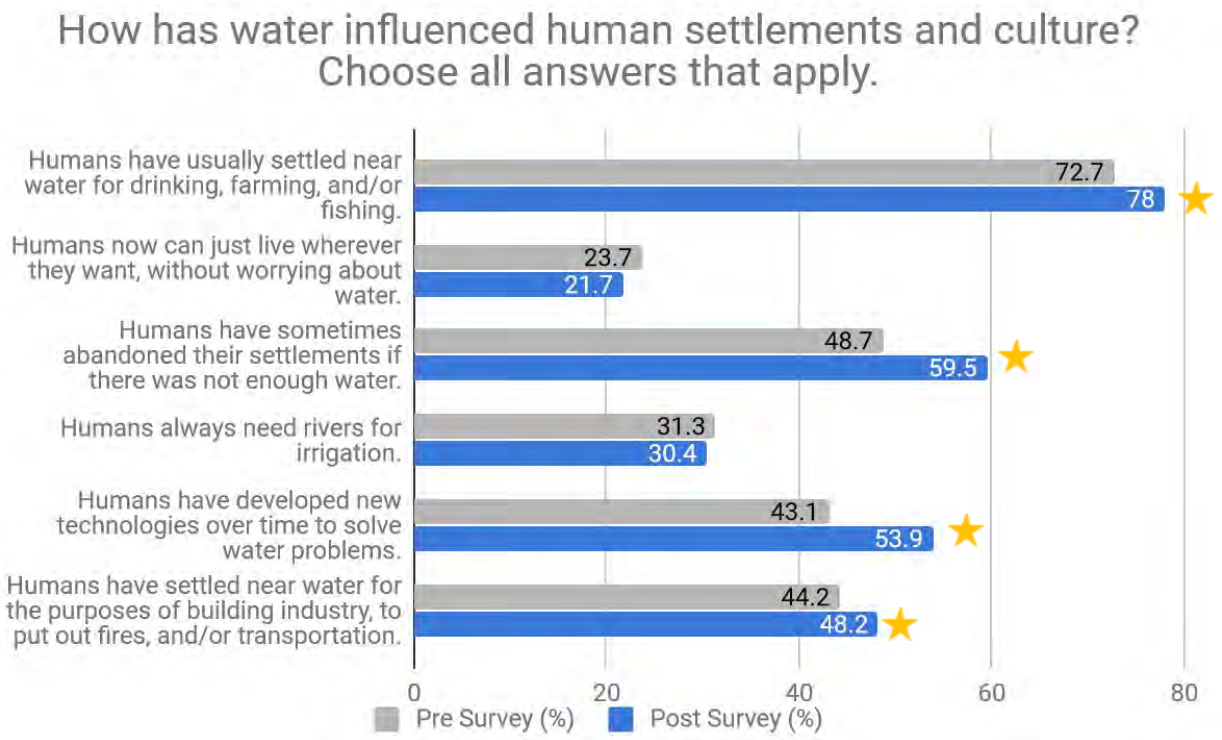
drain versus a stormwater drain. Next year we will ensure that teachers and presenters are clear about the difference between these drains and educate students on the distinctions. These results also support the need for a presenter workshop where we communicate with presenters the overall goal of RiverXchange in order to reinforce the collective goals and desired outcomes of our funders and in-kind sponsors.

Item 7



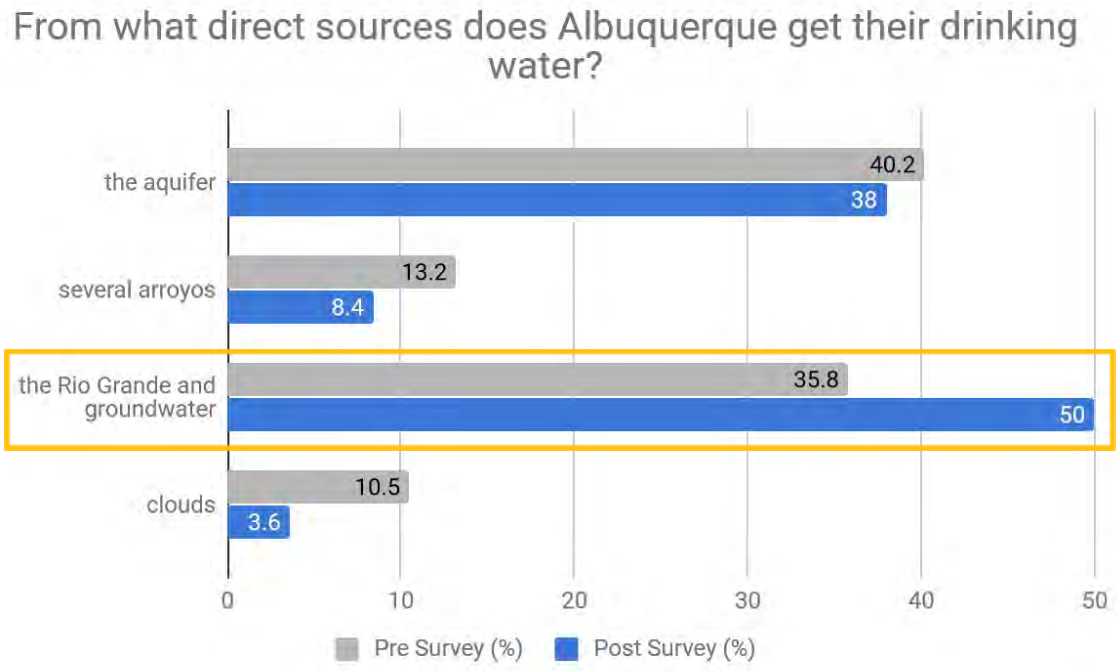
We see a significant increase (15-23%) in the understanding that stormwater can carry chemicals, fertilizers and dog poop into the river.

Item 8

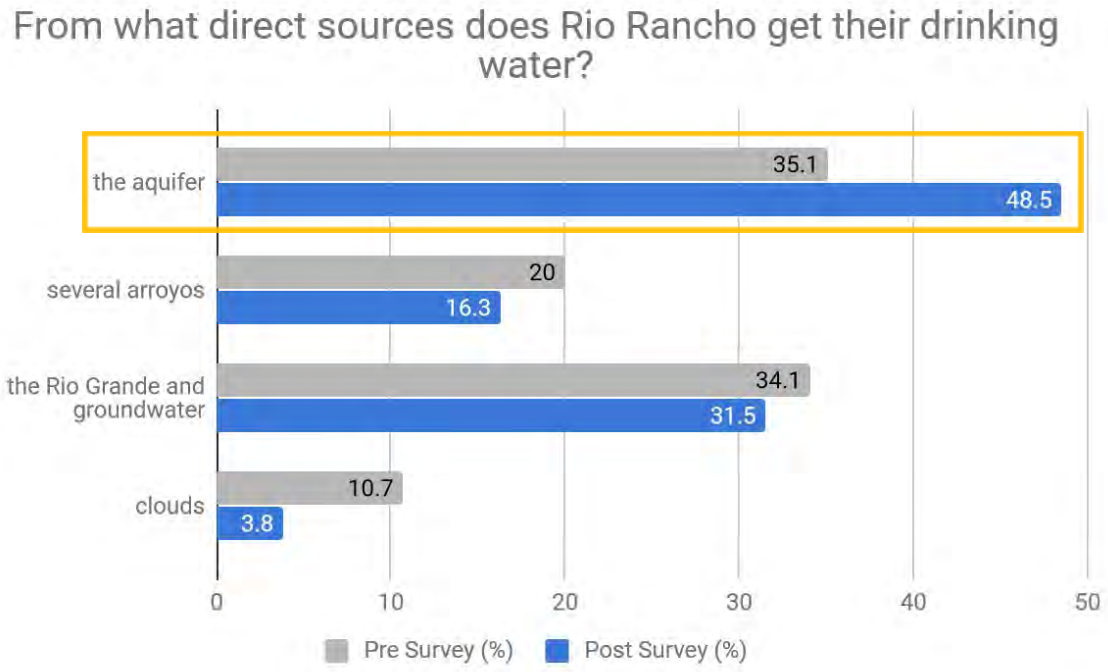


While students show a basic understanding of how water has influenced human settlements and culture at the time of the pre-survey, the post-survey shows an increase in overall understanding after students have been through the RiverXchange program.

Item 9

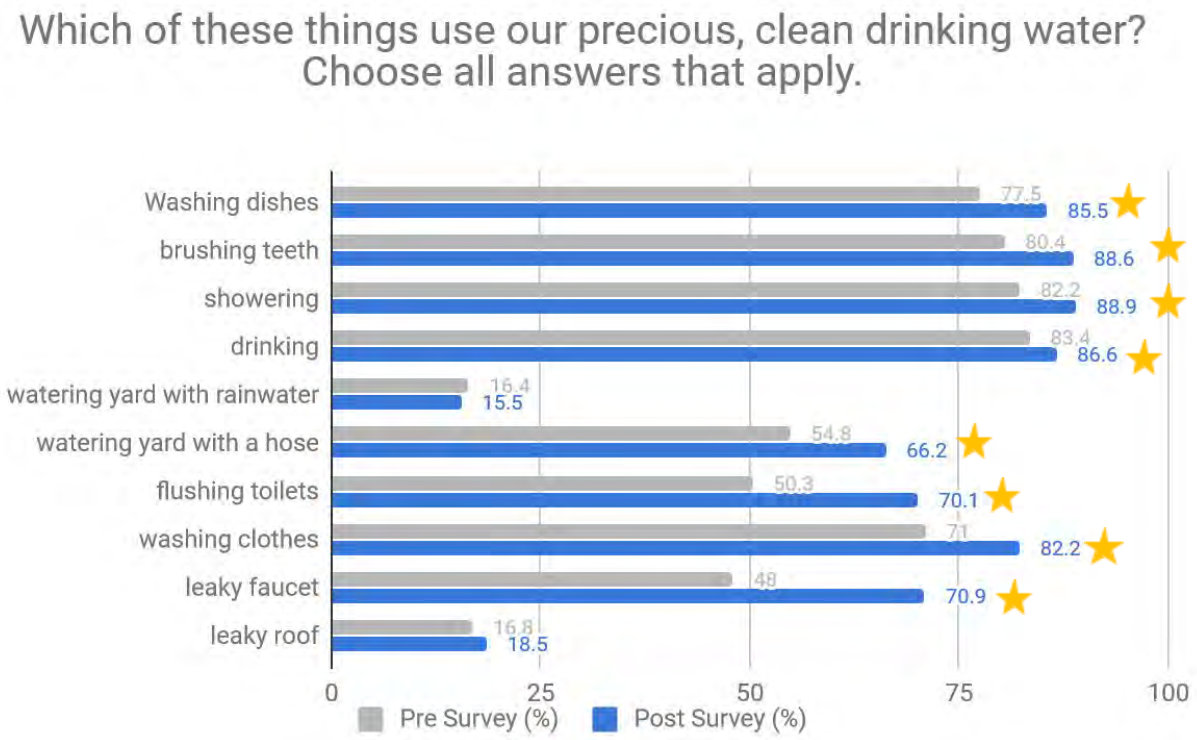


Item 10

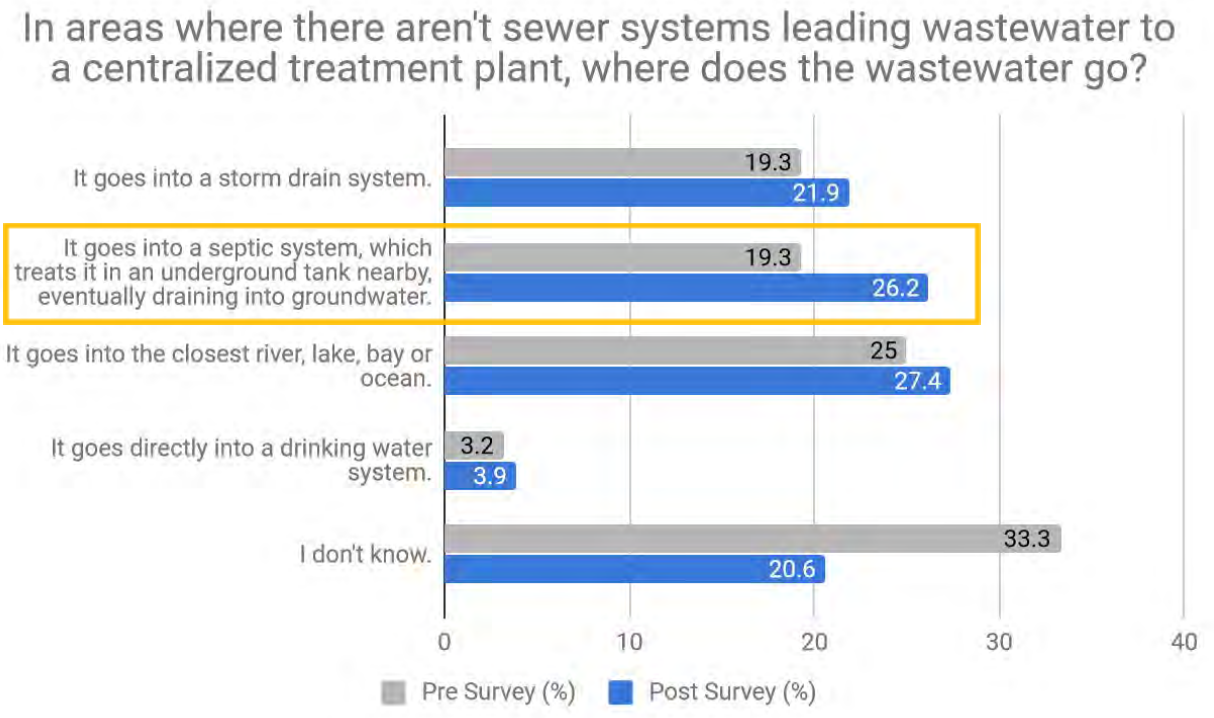


In previous years, all students, whether from APS or RRPS, could select the "river" or "groundwater/aquifer (wells)" as the correct answer to this question. To be more accurate this year, we offered students a similar question for both cities (Albuquerque and Rio Rancho). We also included an option reflecting that Albuquerque receives its drinking water from a combination of the river (surface water) and the aquifer. We also think it's important for students to understand where each city gets their drinking water. And we do see a significant increase in the correct answer for both questions. Next year, we will use the same terminology to signify the aquifer, instead of using "groundwater" and "aquifer."

Item 11



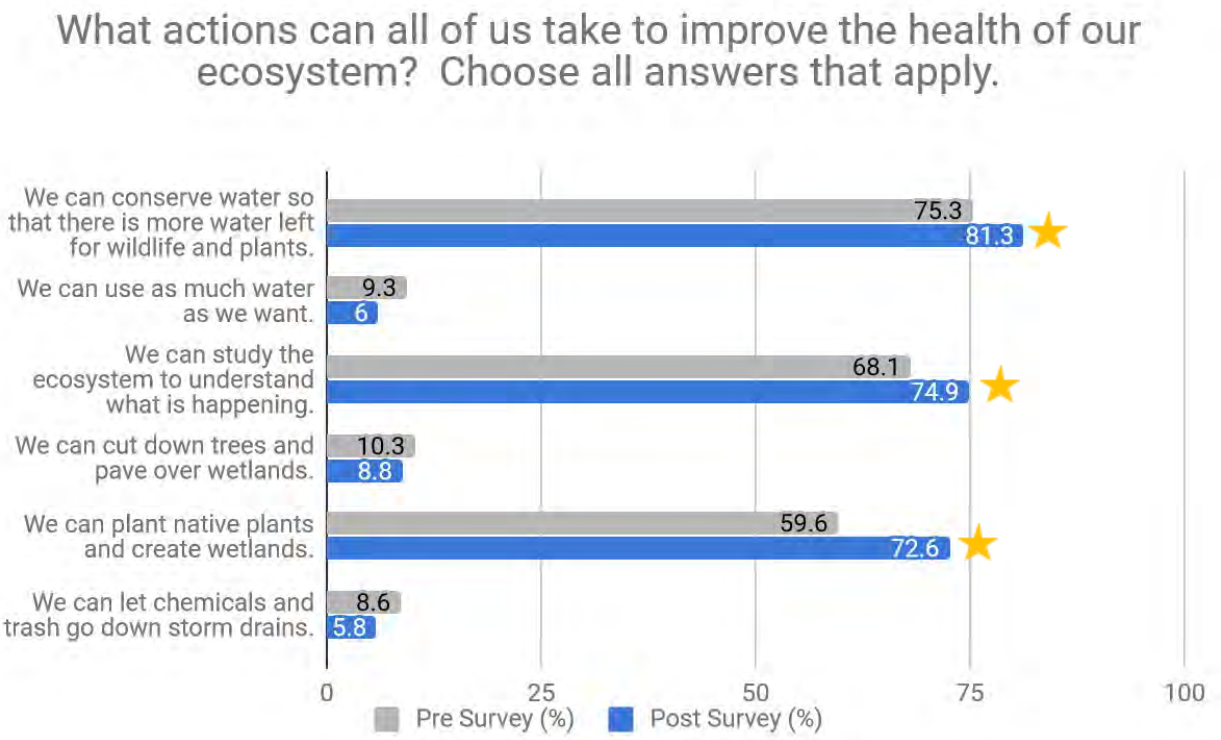
Item 12



It appears that this question is either confusing to read or the students aren't understanding the information from the program. It is likely that our APS students do not get exposed to septic systems as is covered in the

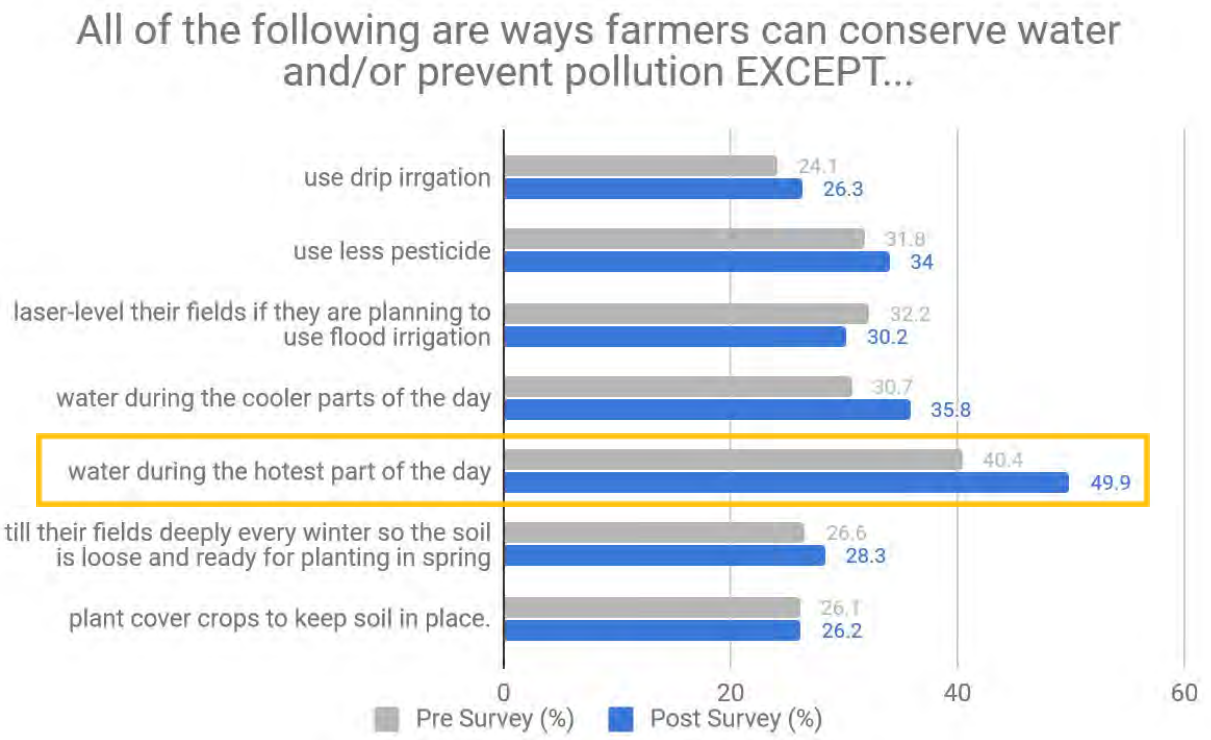
wastewater presentation for our RRPS students. While there is an increase in the correct answer in the post survey, the results also show a misunderstanding of wastewater through a similar percentage of students choosing several incorrect answers. We intend to address this more in the curriculum next year.

Item 13



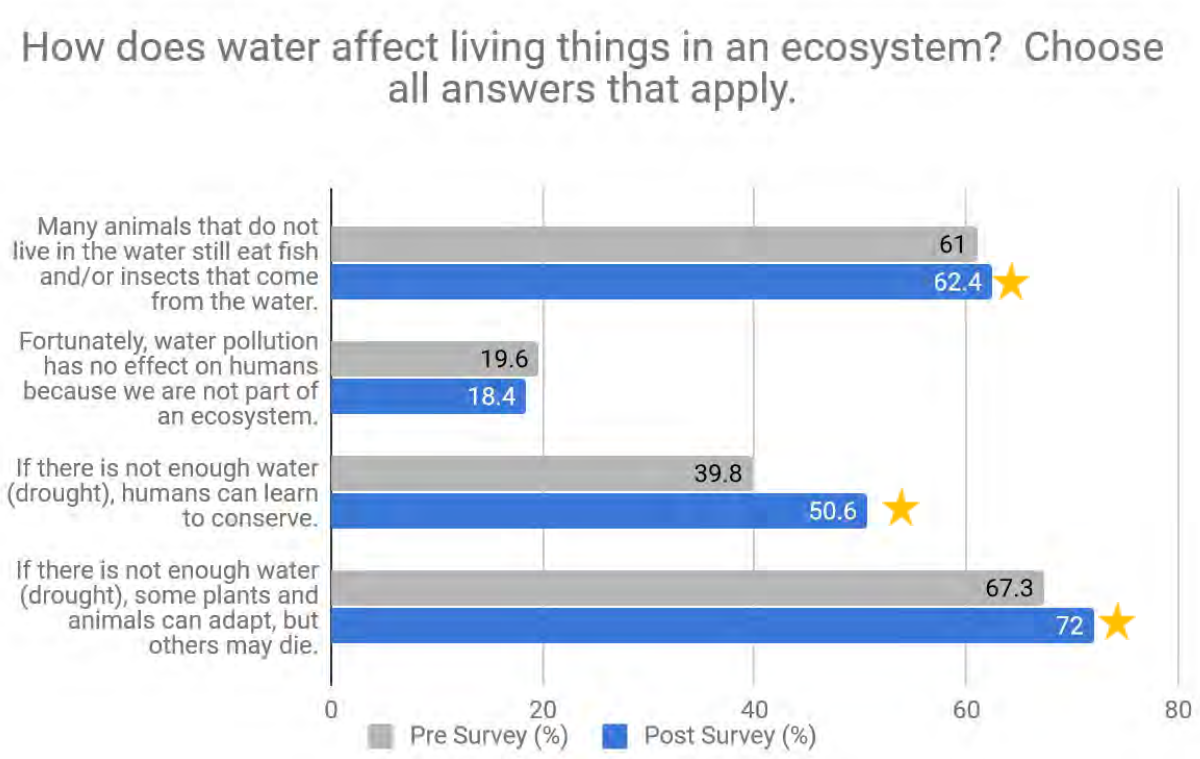
We see a 13% increase in the understanding that planting native plants can improve the health of our ecosystem. This may show learning of the significance of permeability in a landscape and how it can contribute to water conservation and support the health of the local environment.

Item 14



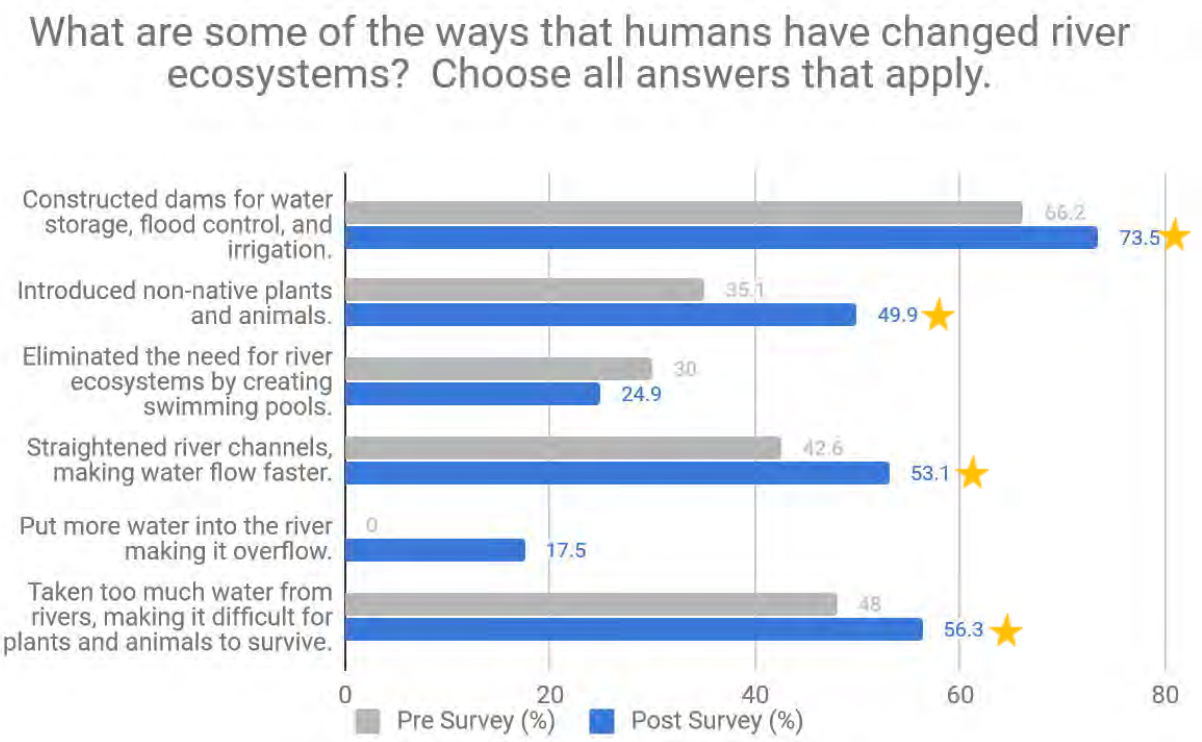
Our new presentation this year focused on acequia culture and history and water conservation did not address all of these items. With similar prompts, "All of the following EXCEPT…" we are noticing students may be choosing ALL the actions that apply rather than the one action that DOES NOT apply. Next year we will switch the question to picking all of the actions that apply to see if that yields better results.

Item 15



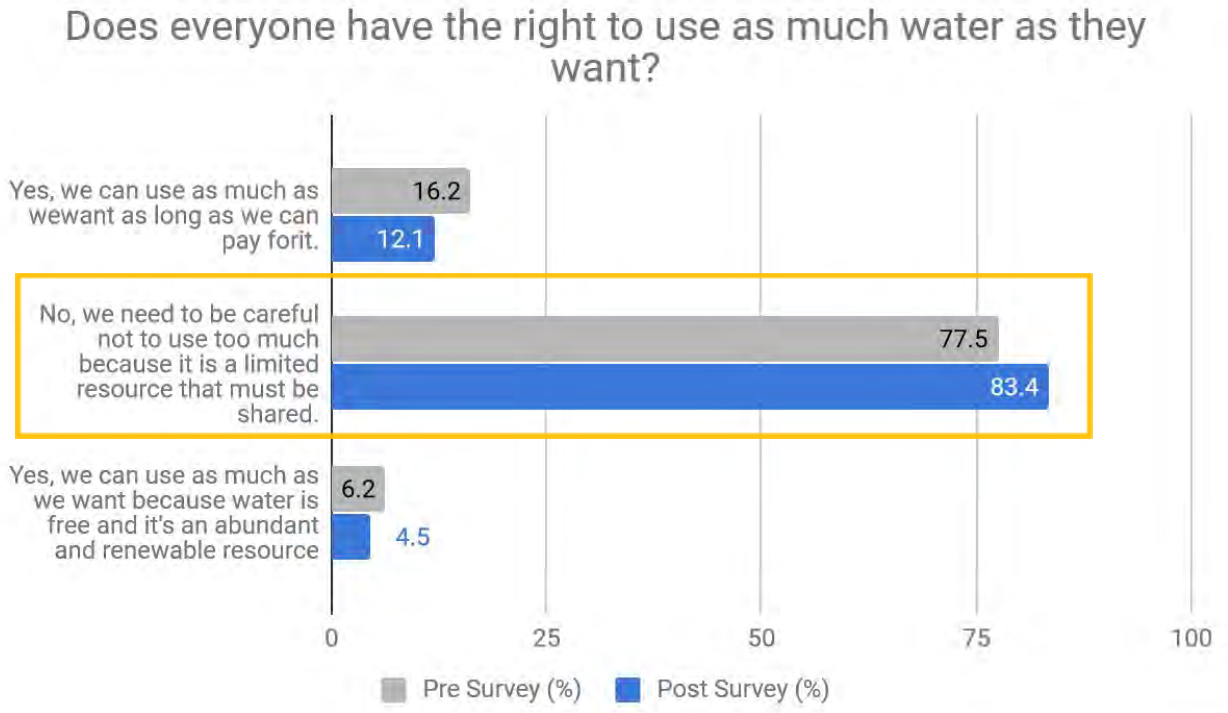
It appears that the answers to this prompt are intuitive for the majority of students from the beginning of the year. Though we do notice a greater increase in the understanding that humans can change their behavior and learn to conserve water.

Item 16



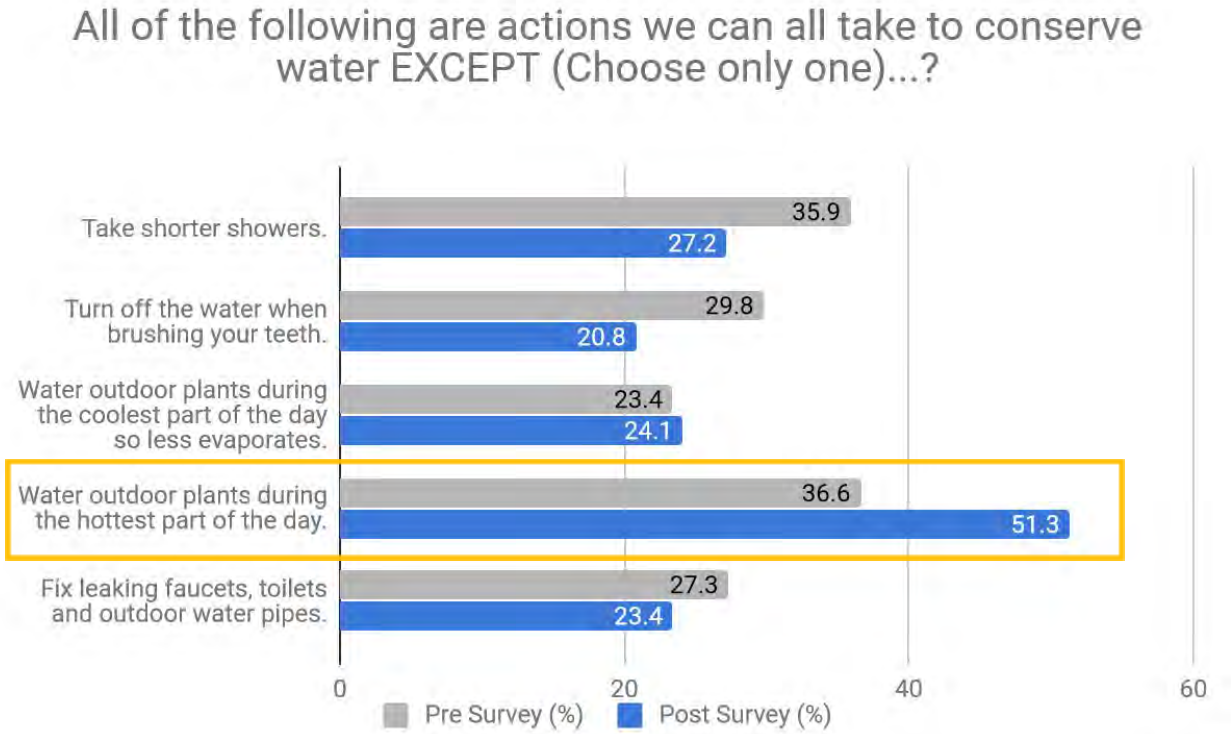
Through learning local water issues, including the history of the Middle Rio Grande, and planting native trees in the Bosque, students gained a significant understanding of the main ways humans have changed river ecosystems.

Item 17



While this answer is obvious to the majority of students, it shows a strong interest in and care for water conservation from future stewards of our watershed.

Item 18



The results in this graph are likely due to students misreading the question and picking ALL the actions we can take to conserve water instead of only choosing one action that DOES NOT conserve water. Next year we will switch the question to picking all of the actions that conserve water to see if that yields better results.

Appendix 1 includes the extension activities from the RiverXchange curriculum, Appendix 2 includes photos.

Appendix 1
Extension Questions and Activities

Understanding Our Watershed:

River Geography

- **Suggested Reading:**
  - **Books:**
    - *Follow the Water from Brook to Ocean* by Arthur Dorros
    - *Paddle-to-the-Sea* by Holling C. Holling
    - *One Well: The Story of Water on Earth (CitizenKid)* Strauss, Rochelle
  - **Articles:**
    - *Albuquerque Journal:* "As Bad as it Gets: Drought Returns to New Mexico."
    - *Albuquerque Journal:* "Drought Affecting 99% of New Mexico."

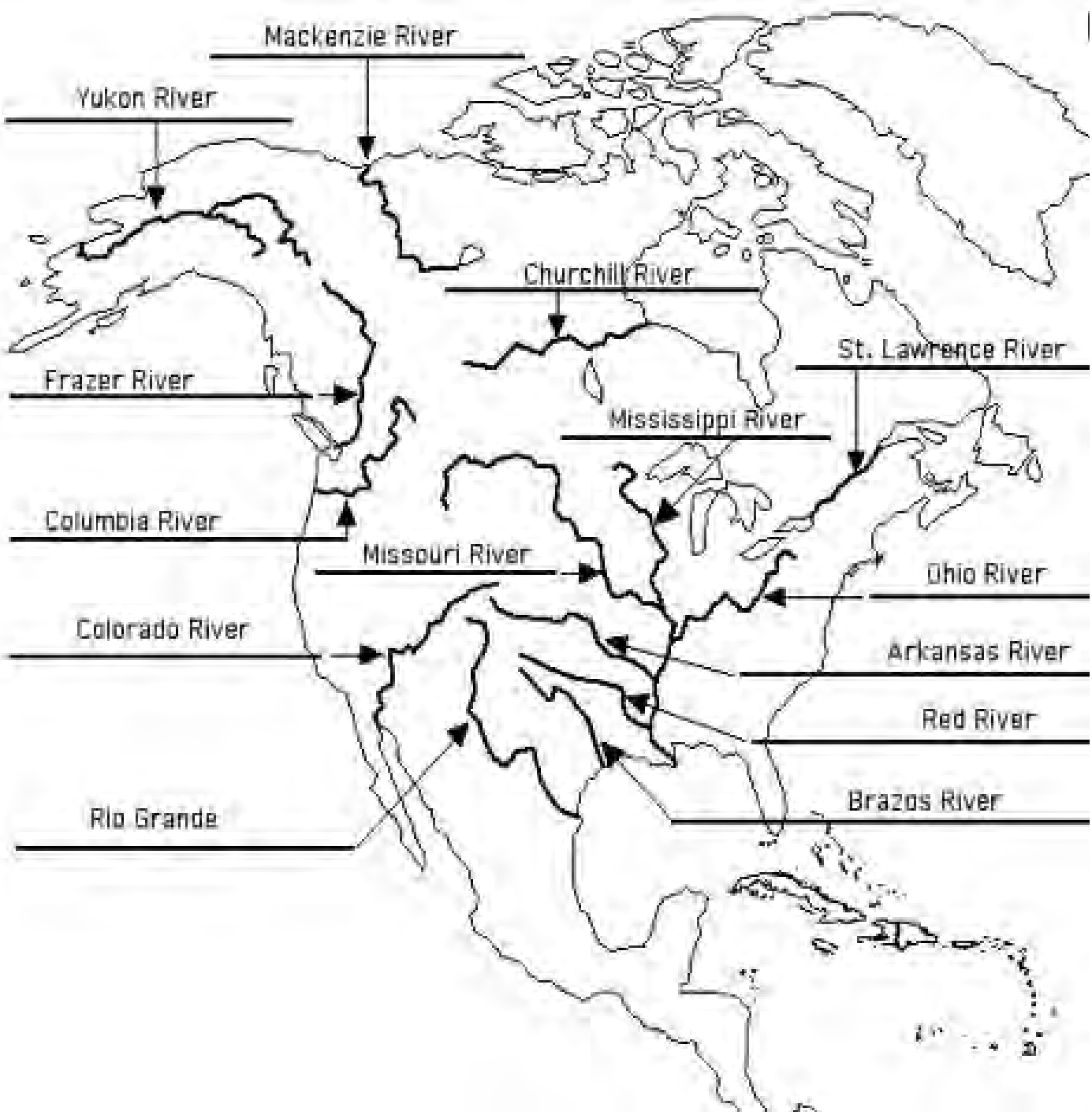
- **Watch:**
  - Watch Save Water - Save Our Rio!, a 17 minute video created by local summer camp students, sponsored by Albuquerque Water Utility Authority. Follow up with *When is the Drought Out?* http://www.abcwua.org/education/pdfs/Drought_GraphingOption.pdf

- **Write a letter to your partners or create a project, explaining:**
  - what a watershed is
  - the name of your river - this is also the name of your watershed!
  - the journey of your river from its headwaters to the ocean

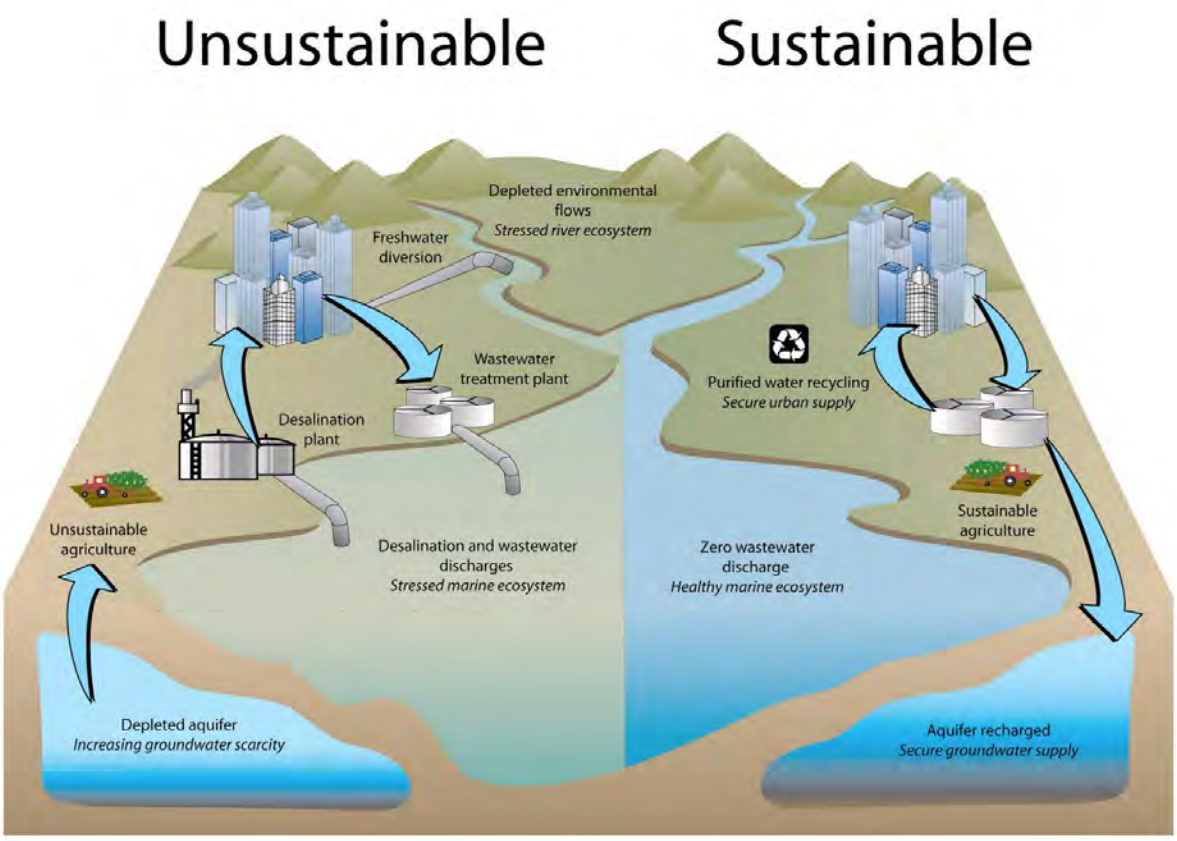
- ➢ what the river is like in your area - big/small, clear/muddy, fast/slow?
- ➢ how much precipitation your area receives each year, and what season gets the most precipitation

- ❖ **Want to explore further?** Refer to Project 1 in the RiverXchange Curriculum "Understanding a Watershed".
  - ➢ You can access the curriculum on your Kidblog homepage or by following this link: https://riverxchange.com/teachers2/curriculumpage/

North American River Map



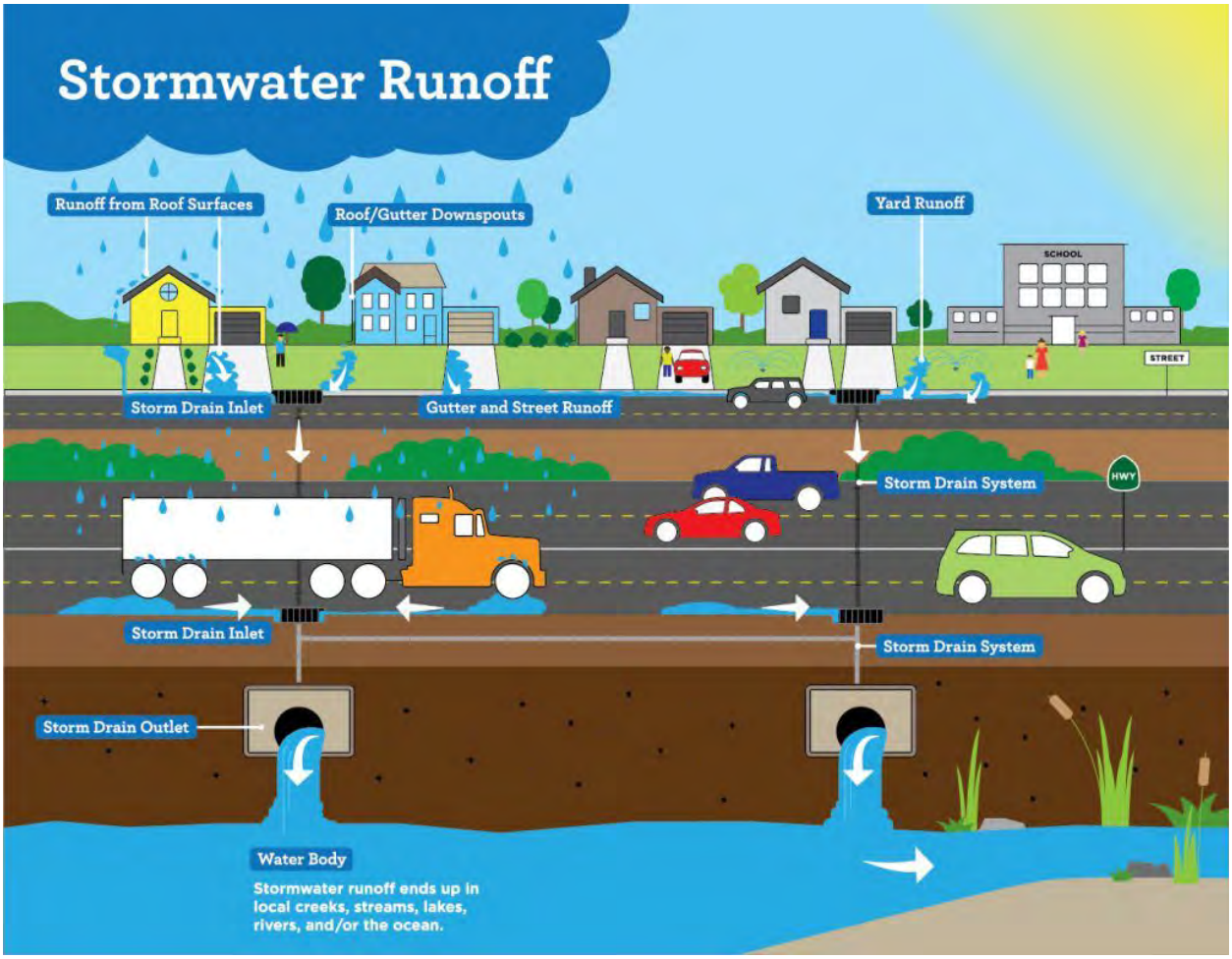
The urban water cycle



Clean Ocean Foundation 2009 - www.cleanocean.org

Understanding a Watershed:

Watershed Model / Infiltration and Runoff



Graphic credit: City of Columbia, MO

Enhance your student's blog posting and extend their learning beyond the Stormwater presentation with the following activities:

- **Suggested Reading:**
  - **Articles:**
    - *CNN* article. 2013. "Garbage Man of the River" http://www.cnn.com/2013/04/18/us/cnnheroes-pregracke-rivers-garbage
    - *Science News for Kids* article. 2012. "Suffocating Waters" https://www.sciencenewsforstudents.org/article/suffocating-waters
- **Watch:**
  - *The Human Solution to Water Pollution* video (to right of screen): http://sscafca.org/teacher-resources/
  - *The Majestic Plastic Bag* video (mockumentary): https://vimeo.com/14221747
    - For a 60 minute class activity, include this lesson to explore the Great Pacific Garbage Patch and what students can do to respond.

- Explore The Ocean Cleanup project and how an 18 year old started with a simple idea which is now making a difference in the effort to clean up the world's oceans.

❖ **Explore your watershed**

➢ Follow the link below to zoom in and explore your watershed and the watershed that family and friends live in, perhaps even your RiverXchange partners who live outside of New Mexico! Interactive Topographic Watershed Map of Earth

❖ **Lesson plan**

➢ *Don't Trash Our Rio Activity Guide* - A math based extension where students learn how much trash is pulled from Albuquerque's storm drain system yearly, and calculate how many trash bags or classrooms it would fill. (Follow links for additional handouts)

- **Reflection Questions**
  - Discuss how the gutters in our streets lead to **storm drains**, which often lead directly to the nearest body of water. Discuss the difference between **stormwater** and **wastewater** (from household drains and toilets).
  - What is stormwater and where does your community's stormwater go?
  - What did you learn about stormwater that was surprising to you?
  - How do things that happen in your yard or your neighbor's yard impact the watershed?
  - What have you noticed about stormwater in your own neighborhood?
  - What are some things you can do to clean up stormwater?
  - How can surface water become polluted?
  - What's happens when rain falls on a pervious surface compared to an impervious surface? Give examples of impervious surfaces.
  - How are groundwater and surface water connected?
  - What are ways you can minimize stormwater pollution?

❖ **Want to explore further?** Refer to Project 2 in the RiverXchange Curriculum "The Watershed".

➢ You can access the curriculum on your Kidblog homepage or by following the link below: https://riverxchange.files.wordpress.com/2018/09/riverxchange-curriculum-20181.pdf

Water in Our Society:

Drinking Water

Enhance your student's blog posting and extend their learning beyond the Drinking Water presentation with the following activities:

- **Suggested Reading:**
  - **Book:** *A Long Walk to Water*, by Linda Sue Park (2010: Clarion Books)
  - **Articles:**
    - **Albuquerque drinking water info**
      - from ABQ Water Utility Authority http://www.abcwua.org/education/pdfs/WaterUse_Text.pdf
      - About the San Juan Chama Project, ABQ Journal 2008: https://riverxchange.files.wordpress.com/2015/08/san-juan-chama-project.pdf
    - **Santa Fe drinking water info**
      - Buckman Diversion, ABQ Journal 2010: https://riverxchange.files.wordpress.com/2015/08/buckman-diversion.pdf
    - **Santa Fe drinking water info**
      - Buckman Diversion, ABQ Journal 2010: https://riverxchange.files.wordpress.com/2015/08/buckman-diversion.pdf

- **Lesson Plan: The Water Project**
  https://thewaterproject.org/resources/WaterLogs_5to8.pdf
  - Five simple activities and lessons to assist students in exploring how water scarcity may impact their lives and how they can contribute by conserving water.
  - Suggested activity: Students log their personal use and observation of other forms of water use over two days, then discuss their findings and explore what would happen if water scarcity were an issue. Another lesson also includes a TRUE/FALSE game to learn about water and how it impacts the human body and communities.

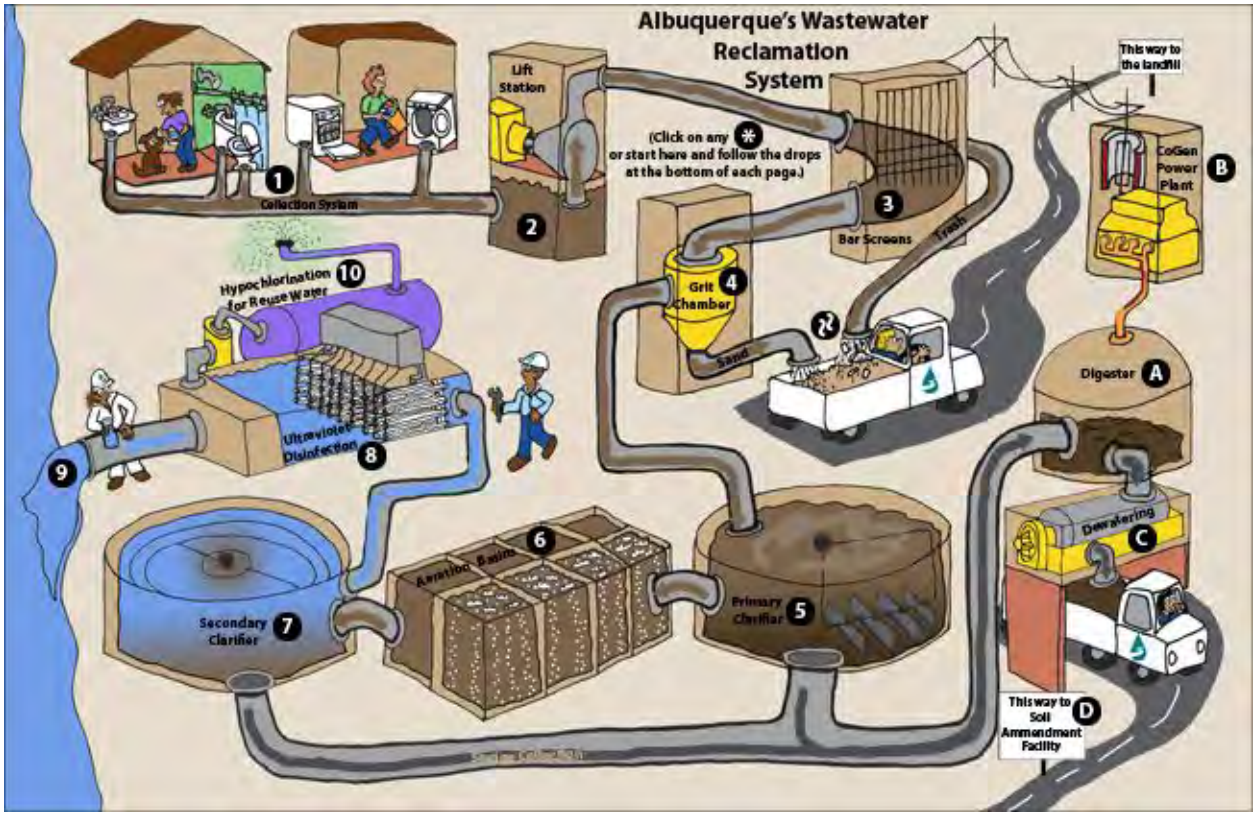
- **Lesson Plan: Cleaning Water**
  http://seplessons.ucsf.edu/node/1754
  - Create a filter in class to clean contaminated water and investigate your findings with the lesson linked below. This activity can be done over the course of a few days in class, or you can demonstrate how a filter works with your class in a shorter lesson.

- **Reflection Questions**
  - Where does your drinking water come from and what communities rely on it?
  - Drinking water is used for much more than bathing, flushing toilets and drinking. What are other ways you and your community use drinking water?
  - Did you learn anything surprising about how we use drinking water, if so what?
  - What percentage of the Earth is covered in water? Out of that amount, how much is accessible fresh water? How much is available as drinking water and why is it important to conserve it?
  - One third of the world's population does not have access to clean drinking water. How would your life be different if you had to walk miles to bring back water to your family?

- **Want to explore further?** Refer to Project 6 in the RiverXchange Curriculum "Drinking Water".
  - You can access the curriculum on your Kidblog homepage or by following this link: https://riverxchange.files.wordpress.com/2018/09/riverxchange-curriculum-20181.pdf

Water in Our Society:

Wastewater / Groundwater



Enhance your student's blog posting and extend their learning beyond the Wastewater presentation with the following activities:

- **Suggested Reading:**
  - *KOAT* news. 2015. "Aging Pipes Mean Higher Water Bills" http://www.koat.com/news/aging-pipes-could-mean-water-bill-hike/34284754
  - Combined sewer overflows article, by Anne Jefferson, a geology professor from Kent State. http://all-geo.org/highlyallochthonous/2013/03/combined-sewer-overflows-solving-a-19th-century-problem-in-the-21st-century/

- **Activities:**
  - Follow this link to the ABQ Water Utility Authority's website to navigate virtually through Albuquerque's wastewater system: http://www.abcwua.org/Education/SWRP_home.html
    - Want to add a project-based learning component to this exercise? Use these questions and activities to go along with your tour: http://www.abcwua.org/education/educators_WSDcur2_quest.html

- ➢ Show students the *Septic System* poster (the poster can be shown on a smartboard and explain the difference between a **sewer system** and a **septic system** – they both treat wastewater essentially the same way, but a septic tank is right by the house and uses a drainfield in rural areas.

- ➢ Create a Public Service Announcement with your class inspired about what you've learned. Take a video and post it on the blog to share with your partner class!

❖ **Watch:**

- ➢ Watch one of these videos in class to review the process of wastewater and what students can do to take care of wastewater: https://www.youtube.com/watch?v=Ldz29NqwK78 (An animation narrated by a young student)
- ➢ https://www.youtube.com/watch?v=tuYB8nMFxQA (A video of the water treatment process created by New Jersey American Water)
- ➢ Learn about recharging the aquifer in the City of Rio Rancho https://rrnm.gov/4024/Rio-Rancho-Pure

- **Reflection & Discussion:**
  - ○ What is wastewater and how does it impact your community?
  - ○ What is the difference between wastewater, stormwater and drinking water?
  - ○ How can you use what you've learned to make a difference at home and at school?
  - ○ What is the process of treating wastewater in your community? (For RRPS students, generally you are on a septic system). What is the difference between a sewer and septic system?
  - ○ What surprised you about the process of treating wastewater from the presentation?
  - ○ Why is it important to do what we can to keep certain things out of our wastewater, whether it goes to septic system or a wastewater treatment plant?

❖ **Want to explore further?** Refer to Project 8 in the RiverXchange Curriculum "Wastewater".

- ➢ You can access the curriculum on your Kidblog homepage or by following this link: https://riverxchange.files.wordpress.com/2018/09/riverxchange-curriculum-20181.pdf

Water in Our Society:

Commercial Uses of Our Waterways: Agriculture

Photo credit: Erich Schlegel

Enhance your student's blog posting and extend their learning beyond the Agriculture presentation with the following activities:

- **Suggested Reading:**
  - **Book:** *Out of the Dust* by Karen Hesse (1997: Scholastic Press)
    Written from the poetic perspective of 14 year old Billie Jo as she narrates her family's struggle in Oklahoma during the years of the Depression and the Dust Bowl.
  - **Articles:**
    - *ABQ Journal* article, 2013. "Deal Allows Farmers to Sell Irrigation Water" http://www.abqjournal.com/221194/news/deal-allows-farmers-to-sell-irrigation-water.htm
    - *National Geographic* article, 2014. "Parched: A New Dust Bowl Forms in the Heartland" http://news.nationalgeographic.com/news/2014/05/140516-dust-bowl-drought-oklahoma-panhandle-food/

- **Explore more about the Dust Bowl:** Check out the link below for an informative, interactive website developed by PBS. http://www.pbs.org/kenburns/dustbowl/educators/overview/

- **Lesson Plan: Soil is Not Trivial**
  - Using facts about the Dust Bowl, students write questions and play a trivia activity focused around the establishment of a national soil conservation program and the importance of soil. Students then explore and/or develop a plan to address a local soil conservation issue.
  - http://www.ncagr.gov/SWC/educational/documents/FLP_soil_is_not_trivial.pdf

- **Write a short story**
  - Write a short story from the perspective of someone who is living during, and affected by the Dust Bowl. Explore the PBS website link, or the suggested reading.

- **Lesson plan: Growing Plants**
  - Students will use the story of *The Empty Pot* to explore literature and science, practicing story mapping and learning about the needs of plants and the importance of soil and water. Like the characters in the story, students will plant and observe the growth of seeds. https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=484&author_state=0&grade=3&search_term_lp=growing%20plants

- **Reflection Questions**
  - What was the Dust Bowl and how did it impact people?
  - What do you think are the major agricultural lessons for us from the Dust Bowl?
  - How may we be able to prevent a dust bowl from occurring again?
  - What is important for farmers to consider when planning how to irrigate their farm and why?
  - How does agriculture relate to water and to our daily lives?
  - What did you discover in your planting activity about the different types of irrigation?

- **Want to explore further?** Refer to Project 5 in the RiverXchange Curriculum “Commercial Uses of Our Waterways”.
  - You can access the curriculum on your Kidblog homepage or by following this link: https://riverxchange.files.wordpress.com/2018/09/riverxchange-curriculum-20181.pdf

Water in Our Society:
Commercial Uses of Our Waterways: Acequias

Enhance your student's blog posting and extend their learning beyond the Agriculture presentation with the following activities:

- **Suggested Reading:**
  - **Articles:**
    - *ABQ Journal* article, 2013. "Deal Allows Farmers to Sell Irrigation Water" http://www.abqjournal.com/221194/news/deal-allows-farmers-to-sell-irrigation-water.htm
    - *National Geographic* article, 2014. "Parched: A New Dust Bowl Forms in the Heartland" http://news.nationalgeographic.com/news/2014/05/140516-dust-bowl-drought-oklahoma-panhandle-food/

- **Watch:**
  - *Nuestras Acequias* (20 minutes) and/or *South Valley Acequias* (4 minutes). Discuss the **acequia** system which was put in place by the Pueblo people and early Spanish settlers, how is it organized amongst the community and maintained? What is its cultural and ecological significance?

- Explore the acequia tradition further with *El Agua Es Vida* lessons.

❖ **Lesson Plan: Prior Appropriation**

➢ Using the *Prior Appropriation* activity guide, act out the two different methods of assigning water rights to all the water users. Discuss the difference between the Riparian Rights and Prior Appropriation doctrines. Research the history of water rights in your community and compare the differences in water rights issues with your partners' area. Prior Appropriation is used in the western states, which receive far less precipitation.

❖ **Discuss**

➢ How people have developed technological solutions to solve water problems. For example, many ancient settlements in the West were abandoned because of lack of water, but irrigation technology has made it easier to survive. Dams have made it easier to control the flow of rivers, reservoirs store water, and fish ladders are built so that dams don't prevent their migration. High-efficiency toilets and other appliances help conserve water.

- **Reflection Questions**
  - What did you learn about acequias that you didn't know before this presentation?
  - How are acequias important to life and culture in New Mexico?
  - What would happen to the land if people didn't maintain acequias?
  - What is important for farmers to consider when planning how to irrigate their farm and why?
  - How does agriculture relate to water and to our daily lives?

❖ **Want to explore further?** Refer to Project 5 in the RiverXchange Curriculum "Commercial Uses of Our Waterways".

➢ You can access the curriculum on your Kidblog homepage or by following this link: https://riverxchange.files.wordpress.com/2018/09/riverxchange-curriculum-20181.pdf

River Ecosystems:

Pole Planting Field Trip

Enhance your student's blog posting and extend their learning beyond the Field Trip with the following activities:

- **Suggested Reading:**
  - **For teacher:** Read or review the 1st part of Chapter 4 of the Bosque Education Guide: A River of Change and discuss with your class the history of the Rio Grande River, the changes made to it's flow and channel, and the impact on the Bosque ecosystem.
- **Make a food web**
  - Make a food web for our local ecosystem, identifying producers, consumers and decomposers, native species and invasive species, as well as local endangered species. Discuss how wildlife are "water users" too. Like humans, wildlife needs clean water to live, so as a community we must consider their needs when making choices about water. Use Bosque plant and animal cards to do *The Web* activity, discussing how all living things depend on each other.
- **Learn about the STRAW Project**
  - An ongoing watershed restoration project first inspired by 4th graders in 1992, based in Marin Co. California! Add it to your school's library and show the documentary in class.

http://www.pointblue.org/our-science-and-services/conservation-science/conservation-training/straw-program or read about the project in this article and discuss how youth can make an impact: http://www.marinij.com/article/NO/20150325/NEWS/150329872

- **Reflection & Discussion:**
  - What did you learn about the history of the Rio Grande River and the floodplain we planted in? How does this history impact the future of cottonwoods in the area?
  - Identify some common invasive species. Where did they come from and how are they impacting the Bosque?
  - What is the process of planting cottonwoods and willows and why do we do it in the wintertime?
  - After this field trip, how may you see and understand the Bosque differently?
  - What did you most enjoy while being down in the Bosque?
  - How can you apply what you learned or enjoyed on your field trip in your everyday life?

❖ **Want to explore further?** Refer to Project 9 in the RiverXchange Curriculum "Field Trip".

➢ You can access the curriculum on your Kidblog homepage or by following the link below: https://riverxchange.files.wordpress.com/2018/09/riverxchange-curriculum-20181.pdf

Appendix 2
Photos

Field trips

Students from Colinas del Norte at the Sandoval County Landfill. (Left) Receiving a presentation on the green waste composting operation with Robert Sanchez. (Below) At the top of the landfill, getting a tour of how the landfill works and question and answer with Chris Perea.

Below is a selection of images from our planting field trips at Alamo Farm and Candelaria Open Space Preserve.

Exhibit 6
BEMP 2018-2019

Bosque Ecosystem Monitoring Program (BEMP)
Report to the Storm Team of the
2018-2019 Stormwater Science Education Program

The main objective of the *Stormwater Science* outreach education program is to teach students how the health of the Rio Grande is directly related to the health of the surrounding watershed and what their responsibility and opportunities are to help keep the "Rio Grand." BEMP educators have developed a Stormwater Science program that includes a 90-minute classroom activity, a four-to-five-hour study trip to the Rio Grande, and optional curriculum extensions incorporating hands-on data analysis, graphing, and system modeling. **During the 2018-2019 school-year 2,017 students participated in Stormwater Science** activities in their classrooms, in the field, both, or in outreach events. The classroom program was delivered to **599 students** in **33 classrooms** at **13 different schools** in **Rio Rancho, Albuquerque, and Belen.** In addition to the Stormwater Science outreach, BEMP actively involves students in water quality monitoring through the *E. coli* monitoring contract with the Mid Rio Grande Stormwater Quality Team. **29 students from La Academia de Esperanza (LADE)** and **5 University of New Mexico (UNM) undergraduates** were directly involved in water quality monitoring of the Rio Grande in support of this contract. Students are taught the proper protocols for collecting field parameters and *E. coli* data, but, consistent with our quality assurance plan, are only allowed to collect field parameter data. Students then graph and analyze the data and are supported in presenting their findings at BEMP-supported conferences, professional conferences, and to policy makers. In 2018, the student-collected data (field parameters) and *E. coli* data were presented by a UNM undergraduate in August at the EPA Region 6 conference. BEMP also spent much of 2018-19 updating and enhancing its Stormwater Science education and outreach components.

The BEMP Stormwater Science program targets middle and high school students using two main formats: an indoor classroom lesson and an outdoor field experience or *Stormwater Study Trip*. This year, a new high school classroom lesson was designed and implemented to teach more complex and nuanced stormwater science concepts, including analyzing data to see how different water quality parameters are affected by storm events. High school curriculum extensions were also created for groups who either request multiple classroom visits or have enough class time for a longer, more intensive lesson.

1. Classroom curriculum*: Preparation and delivery of Stormwater Science activities in the classroom for middle and high school students* **(599 students)**

The principal objective for the middle school classroom curriculum is to demonstrate how some of our daily, individual actions impact the health of the Rio Grande. To reach that goal, students construct a model of the Rio Grande Watershed (pages 5 and 18). The watershed model has five different communities along the river: a cattle ranch, upstream and downstream eco-friendly towns, an urban city, and agricultural fields. Students add different 'runoff cards' to the river downstream of the communities where the runoff constituents originate. Some of the runoff is naturally occurring (e.g. turbidity) while some is human-caused (e.g. pesticides or oil). The model runs through two different scenarios: (1) *before-the-storm* and (2) *after-the-storm*. While working through different variations of the model, students record the number of runoff cards introduced into the river before and after a storm event (handout table; page 6). This helps them to conceptualize/quantify and further discuss the impacts of these changes to overall river health. Exploring these two scenarios demonstrates the harmful effects that stormwater contamination can have on aquatic organisms and downstream communities.

The high school classroom lesson builds upon these core concepts. After discussing the aforementioned watershed model, students learn about some key water quality parameters: temperature, conductivity, dissolved oxygen, turbidity, and dissolved organic matter. Students divide into groups assigned one parameter each. They must then predict how their parameter might be affected by a storm event along with providing justification for their prediction. Students are given graphed data of their parameter before and after actual storm events and must analyze the graphs to determine if the data supports their previous supposition. When classes have more time available, this activity is supplemented by two different curriculum extensions. The first curriculum extension uses the same key water quality parameters introduced in the regular classroom activity but the students analyze provided data and create their own graphs. We provide (1) a blank graphing sheet with the axis labeled and with the river flow data (used as a reference to talk about the time gap between the increase in cfs and parameter peaking; see page 13) and (2) a table with measurements for each parameter (see page 14). This activity helps students learn how to analyze and graph data and then interpret the results, using skills aligned with Next Generation Science Standards (NGSS). The second curriculum extension is a soil porosity and permeability experiment that deepens students' understanding of how different surfaces (natural vs. anthropogenic, permeable vs. impermeable) impact the overall water budget and water quality (page 15 and 16).

The Stormwater Science classroom program encourages students to be reflective about their daily behaviors and to think about ways they can help keep their watershed clean. Students are asked to brainstorm about how they can help improve watershed health before educators lead a discussion on watershed stewardship that aligns with MRGSQT educational messaging. In order to reach students that identify Spanish as their first language and better serve New Mexico's diverse communities, the handouts for these activities are now available to students in both English and Spanish (pages 7 and 8).

In 2018-19, the Stormwater Science curriculum was used in BEMP's pilot after-school program, BASS (BEMP After School Science). BASS engaged K-12 students from five Title 1 schools

through STEAM-based, hands-on learning, as well as self-directed, place-based exploration and data collection. As part of the curriculum, BEMP included two Stormwater Science sessions: a live macroinvertebrate lab (page 19), and leaf pack macroinvertebrate collection. BEMP used these opportunities to introduce stormwater science concepts to a new cohort of middle school students from communities underserved and underrepresented in the sciences.

Please note that classroom curriculum numbers no longer include tabling and other outreach events.

2. Stormwater Study Trip: *Delivery and coordination of place-based Stormwater Science experiences* **(113 students)**

The centerpiece of BEMP's stormwater outreach is the Stormwater Study Trip. This activity builds upon classroom activities and facilitates hands-on student experiences including performing water quality testing at the Rio Grande. The Stormwater Study Trip is a four to five-hour trip to the river during which students investigate how stormwater moves through the city and sweeps pollutants and debris into the river. Students also collect and interpret water quality data. The middle school version of the program begins with an explanation of the arroyo system in Albuquerque (map on page 9) followed by an arroyo pollution survey where students examine and categorize the amount of visible pollutants (e.g. plastics, paper, dog poop, animal scat, etc.) in Albuquerque's San Antonio arroyo which drains into the bosque. In the arroyo, students test water quality using a LaMotte water quality monitoring kit (pages 10, 11, and 18). When the students hike to the Rio Grande, they do additional water quality testing and collect leaf packs from two locations. Students then share their results with each other, compare Rio Grande and arroyo water quality data, and discuss what their results could mean in terms of the river's health. This section of the curriculum allows students to have a more hands-on learning experience involving different type of data collection and scientific tools. The high school Stormwater Study Trip uses the same format with an emphasis on the water quality indices (percent EPT and biotic index) through analyzing collected macroinvertebrates. The goal for high school students is to connect and understand the two collected data sets and develop a deeper sense of how the system functions on a broader scale.

During the 2018-2019 scholar year, BEMP added leaf packs placed along the Rio Grande and in a backwater pond as a method to collect macroinvertebrate data. Students collect four leaf packs, one week after they are placed in these two locations. Leaf packs are brought back to the classroom where hand-held lenses and dissecting scopes are used to identify macroinvertebrates. A handout is then used to calculate EPT (pages 9 and 12). This new methodology provides valuable biological information about water quality that can be compared to student-performed chemical water quality tests. Macroinvertebrate collection is also used as a tool to introduce concepts like using percent EPT as a water quality index. Student-generated datasets are compared, sparking a discussion about the short and long-term effects of a storm event.

As an alternative to the field-based Stormwater Study Trip, BEMP offers a curriculum extension that brings hands-on macroinvertebrate and water chemistry exercises to the classroom (page 17). A thorough revamp of the water chemistry lab offered in previous years, this extension uses BEMP's macroinvertebrate tank to bring live aquatic organisms to the classroom. After

magnifying lenses and dissecting scopes are used in conjunction with field guides to identify macroinvertebrates, students explore how these organisms can be used as bioindicators of water quality. Students then chemically determine the water quality of a local sample and hypothesize whether or not the organisms they observed came from the sampled system.

3. Elementary school outreach: *Continued delivery and coordination of Stormwater Science experiences for elementary school students* **(277 students)**

Although the BEMP Stormwater Science program primarily targets middle and high school students, BEMP also reaches hundreds of elementary school students through outreach events. BEMP participated in the 2018 Children's Water Festival at the Santa Ana Star Center (277 students and 23 teachers) where BEMP educators used macroinvertebrates to teach fourth grade students about their watershed, how humans impact the health of this system, how aquatic organisms are affected by pollution, and what everyone can do to improve the health of the Middle Rio Grande.

4. Monthly Monitoring: *Continued development and delivery of Stormwater Science outreach during Monthly Monitoring*

BEMP's Monthly Monitoring data collection is often able to include a discussion with students about the bosque's health and how it is intrinsically tied to Rio Grande hydrology and water quality. The impacts of storm events can be related to different type of pollutants students find and identify in the bosque and BEMP educators then engage students in a conversation about what they can do to help minimize these impacts. For example, students from Cien Aguas International School collect litter during and/or after data collection nearly every time they are at a BEMP site. Monthly Monitoring is often a space where educational concepts are introduced based upon what students encounter in the bosque or what they are currently studying in class. Because of this, Stormwater Science is only taught intermittently during Monthly Monitoring and has not yet been granularly tracked.

5. Summer programming: *Preparation and delivery of Stormwater Science presentations during summer programming* **(20 students)**

During June and July each year, BEMP partners with Horizons Albuquerque, a tuition-free academic enrichment program that intends to fill the summer learning gap that students from low-income families often encounter. This year, 20 middle school students learned about different methods scientists use to collect environmental data through hands-on, place-based experiences. Students collected water samples, analyzed water chemistry, and discovered how their results provide insight into the overall health of their local ecosystems.

6. Stormwater Science curriculum development: *Continued development of Stormwater Science curriculum*

Much of the 2018-19 school year was spent thoroughly updating the Stormwater Science curriculum, making it more hands-on, engaging, and appropriate for a wider range of students. While some Stormwater Science activities are already closely aligned with Next Generation

Science Standard principles, part of the 2019-20 school year will be spent applying specific standards to this program and making changes to the curriculum as needed. While this year's overall outreach numbers are lower than last year's, it is important to note that festivals and outreach events are no longer considered classroom outreach, but are reflected in the outreach total. The intensive Stormwater Science curriculum work completed this year is now ready to be rolled out to a broader audience in 2019-20 and beyond.

7. BEMP educational outreach events: *Funding covers partial costs for classrooms to participate in Otter Day and BEMP Student Congress* **(492 students)**

Hundreds of students took part in Stormwater Science-related activities at two BEMP events this year: two days of BEMP Student Congress (220 students and 31 adults), where BEMP students shared their research and experiences in the bosque, including watershed health observations; and BEMP's two Otter Days festivals(262 students and 45 adults), where first graders, hosted by high school students, are taught how they are individually responsible for keeping the Rio Grande and its watershed free of pollutants for the benefit of both wildlife and humans.

8. Additional BEMP educational outreach and events: *Funding covers partial costs for classrooms to participate in Luquillo-Sevilleta Virtual Symposium and Crawford Symposium* **(535 students)**

BEMP organizes and delivers two annual educational events where stormwater science concepts are presented in various forms: The Luquillo-Sevilleta Virtual Symposium (LSVS) and the BEMP Crawford Symposium. BEMP's Luquillo-Sevilleta Virtual Symposium (16 students and 13 adults) brings together students involved with the Luquillo Long Term Ecological Research Site in Puerto Rico and students from Albuquerque to share their watershed research with each other via Skype in Spanish. The BEMP Crawford Symposium (54 students and 250 adults) is an annual conference honoring BEMP's co-founder Dr. Clifford Crawford which celebrates community science along the Middle Rio Grande and showcases environmental research by both students and professionals (page 19).

As part of our outreach, BEMP also participates in events where we bring a variety of materials and activities directly related to BEMP's curriculum and data collection. Students and community members learn about different important aspects of the bosque ecosystem, including how it is impacted by storm events. These events now allow participants to observe and identify live freshwater macroinvertebrates, and learn how these organisms can be used as Rio Grande bioindicators. This year we participated in two major tabling events: Sandia High School Earth Day Festival (400 students and 30 adults) and Albuquerque Sign and Language Academy (ASLA) Fishing Day at Sandia Lakes (65 students and 45 adults).

APPENDICES

APPENDIX A: CLASSROOM HANDOUTS

English Classroom Handout – Middle School

BEMP
Bosque Ecosystem Monitoring Program
www.bemp.org 2018

Hydrologist: _____ Date: _____

Stormwater Science

What 2 sources can New Mexicans get their drinking water from?

1. _____
2. _____

Where does water go after we use it?

_____

A ***watershed*** is an area of land where all of the water that falls on it, or that is under it, drains to the lowest point.

Draw a line from the word to its definition

Turbidity	♦ A stream or arroyo that brings water to the main channel of the river
Nonpoint source pollution	♦ Types of nutrients found in fertilizers that can lead to excess algae growth
E.coli	♦ A single location where pollution is being leaked into the environment
Point source pollution	♦ A type of *bacteria* found in warm blooded animal's intestines that can make people sick
Nitrates and phosphates	♦ Tiny 'water bugs' whose species are an indication of water quality
Tributary	♦ *Any* type of pollution that comes from *many different* sources
Macro-invertebrates	♦ A measure of water clarity based on the amount of suspended solids

Page 1

Before: Amount + High / Medium / Low

After: Amount + ↑ / ↓ / = ✓ ✗

Is the river healthier before or after an storm event?

	Up-stream Ecofriendly Town		Cattle Ranch		Agricultural Field		Urban city		Down-stream Ecofriendly Town	
	Before	After	Before	After	Before	After	Before	After	Before	After
Oxygen										
Nutrients (Nitrates and phosphates)										
Turbidity										
Macroinvertebrates (healthy – unhealthy)										
Fish biodiversity (green – red – blue – yellow)										
Pesticides, Herbicides and Fungicides										
Trash										
Oil and gasoline										
Chemicals and medicine										
Escherichia coli										

Water quality AFTER an storm event:

Which community has the most polluted water AFTER an storm event? _____

How can YOU help to keep the watershed clean?

1. _____
2. _____
3. _____
4. _____

Page 2

English Classroom Handout – High School

BEMP

Name: _____ Date: _____

Stormwater Science

What is a **watershed**?

1. River composition during a storm event: A hypothetical watershed example

(Natural and anthropogenic inputs)

Which community has the most polluted water AFTER a storm event? _____ *Why?* _____

2. Data Analysis: A real example of a storm event in a city

Parameters analyzed:

- Temperature:
- Conductivity:
- Dissolved Oxygen (DO):
- Turbidity:
- Dissolved Organic Matter (DOM):

Example

Parameter: Conductivity

Prediction: *Water conductivity will drop right after an storm event due to the new input of rain water with no salts.*

Justification:

Your data

Parameter:

Group prediction:

Justification:

- Was your prediction supported based on your data analysis? Explain why or why not.

Page 1

Data Analysis: General discussion

1. In which order did the parameters react to the storm event?
2. In which season did this storm event occur?
3. Do you think these storm event peaks would be higher or lower in a different season? Why?
4. Would you expect the same parameter behavior in a non-urban area? Why?
5. Does the overall water quality after a storm event increase or decrease?

Take-home vocabulary

Match the following words with their descriptions: **Conductivity**; **Turbidity**; **Nonpoint source pollution**; ***Escherichia coli***; **Point source pollution**; **Dissolved Organic Matter**; **Temperature**; **Dissolved Oxygen** and **Tributary**.

- Drinking contaminated water with _____ may cause diarrhea.
- _____ is directly related to the concentrations of ions in the water which an oil spill can decrease.
- Acid water from acid rain is an example of _____.
- Rio Grande water often appears murky because of high _____.
- High water _____ can increase the solubility and thus the toxicity of certain compounds.
- _____ is the mixture of living and dead materials at various stages of decomposition.
- Chemical drainage into a stream from a nearby factory is an example of _____
- A lack of _____ in the river water can cause fish die-off's.
- The Chama river is a _____ of the Rio Grande.

3. How can YOU help improve the health of the river after an storm event?

1. _____
2. _____
3. _____
4. _____

Page 2

Spanish Classroom Handout – Middle School

Hidrólogo/a: _____ Fecha: _____

Ciencia detras una tormenta

Cuales son las dos fuentes de agua de donde los Nuevo Mexicanos sacan el agua para beber?

1. _____
2. _____

A donde va el agua despues de usarla?

_____

Una *cuenca hidrografica* es el territorio drenado por un unico rio, delimitado por montanas.

Conecta las palabras con su definicion

Turbidez	Corriente de agua que desemboca en un río mayor o directamente al mar.
Contaminacion difusa	Tipologia de nutrientes que se encuentran en los fertilizantes y que pueden causar crecimiento algal excesivo.
E.coli	Contaminacion de un solo origen.
Contaminacion focal	Tipologia de bacteria que se encuentra en el aparato digestivo de animales de sangre caliente. Cuando se ingiere, puede causar/traer enfermedad.
Nitratos y fosfatos	Pequenos insectos aquaticos que pueden ser usados como indicadores de la calidad del agua.
Tributario o afluente	Contaminacion de origen diverso.
Macro-invertebrados	Medida del grado de transparencia del agua que depende de la cantidad de particulas en suspension.

Page 1

En que momento el agua del rio es más saludable, antes o después de una tormenta?

Antes: Cantidad + Alta / Media / Baja

Después: Cantidad + ↑ / ↓ / = ✓ ✗

	Comunidad Ecológica rio arriba		Hacienda de ganado		Campo agrícola		Ciudad		Comunidad Ecológica rio abajo	
	Antes	Después	Antes	Después	Antes	Después	Antes	Después	Antes	Después
Oxígeno										
Nutrientes (Nitratos y fosfatos)										
Turbidez										
Macro invertebrados (saludables – no saludables)										
Biodiversidad peces (verde – rojo – azul – amarillo)										
Pesticidas, Herbicidas y Fungicidas										
Basura										
Aceite y gasolina										
Productos químicos y medicina										
Escherichia coli										

Calidad del agua después de una tormenta:

Cual de las comunidades sufre los mayores niveles de contaminación después de una tormenta? _____

Cómo TU puedes ayudar a mantener la cuenca limpia?

1. _____
2. _____
3. _____
4. _____

Page 2

Spanish Classroom Handout – High School

BEMP

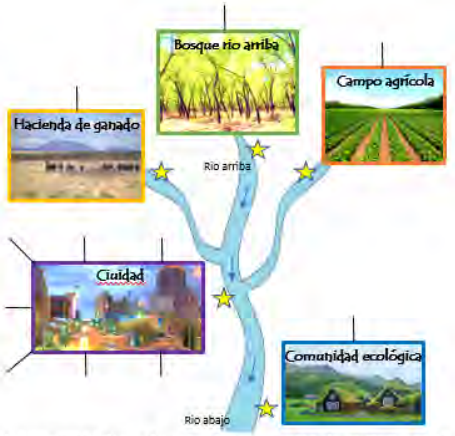
Nombre: _____ Fecha: _____

Ciencia detrás una tormenta

Qué es una **cuenca hidrográfica**?

1. Composición del rio durante una tormenta: Un ejemplo hipotético de una cuenca hidrográfica

(Elementos naturales y antropogénicos)



Cual de las comunidades sufre los mayores niveles de contaminación después de una tormenta? _____ *Por qué?* _____

2. Análisis de datos: Un ejemplo real de una tormenta en la ciudad

Parámetros analizados:

- Temperatura:
- Conductividad:
- Oxigeno Disuelto (OD):
- Turbidez:
- Materia Orgánica Disuelta (MOD):

Ejemplo:

Parámetro: Conductividad

Predicción: *La conductividad del agua disminuirá justo después de la tormenta debido a la incorporación de agua de lluvia (sin sales).*

Justificación:

Tus datos

Parámetro:

Predicción en grupo:

Justificación:

- Aceptas tu predicción según el análisis de datos? Explica por qué o por qué no.

Page 1

Análisis de datos: Discusión general

1. En qué orden respondieron los parámetros analizados durante la tormenta?
2. En qué estación del año ocurrió la tormenta?
3. Crees que el patrón de la grafica (puntos máximos y mínimos) seria el mismo en otra estación del año? Por qué?
4. Crees que los parámetros se comportarán de la misma manera en una área no urbanizada? Por qué?
5. Crees que la calidad del agua en general mejora o empeora después de una tormenta?

Vocabulario para llevarte a casa

Empareja las siguientes palabras con sus definiciones: **Conductividad**, **Turbidez**, **Contaminación focal**, ***Escherichia coli***, **Contaminación difusa**, **Materia Orgánica Disuelta**, **Temperatura**, **Oxigeno Disuelto** y **Tributario**.

- Beber agua contaminada con _____ puede causar diarrea.
- La _____ esta directamente relacionada con las concentraciones de iones en el agua. Un derrame de petróleo puede provocar el incremento de este parámetro.
- El agua acida procedente de la lluvia acida es un ejemplo de _____.
- El agua del Rio Grande es marrón porque la _____ es elevada .
- Un incremento en la _____ del agua del rio puede incrementar la solubilidad y por lo tanto la toxicidad de ciertos compuestos.
- _____ es la mezcla de materiales (vivos y muertos) en diversos estados de descomposición.
- Cuando una fabrica drena productos químicos al rio se le llama _____
- La ausencia de _____ en el agua puede causar la muerte masiva de peces en el rio.
- El rio Chama es un _____ del Rio Grande.

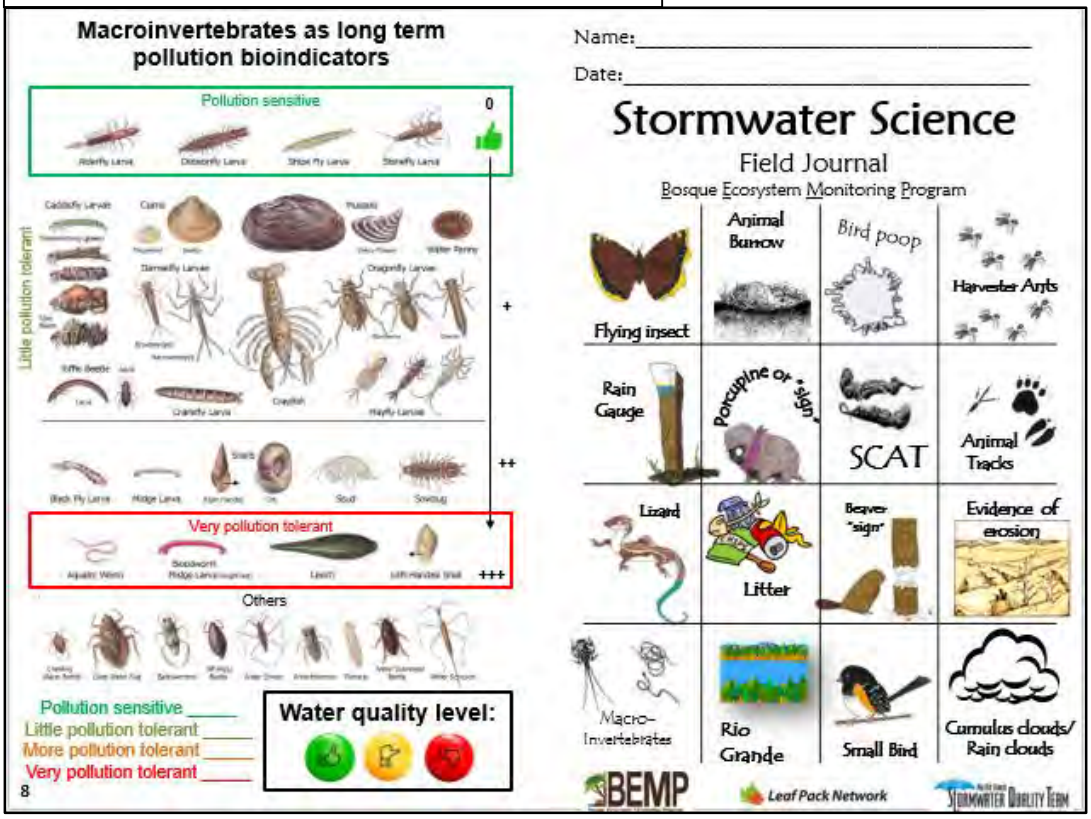
3. Cómo TU puedes ayudar a mantener la cuenca limpia?

1. _____
2. _____
3. _____
4. _____

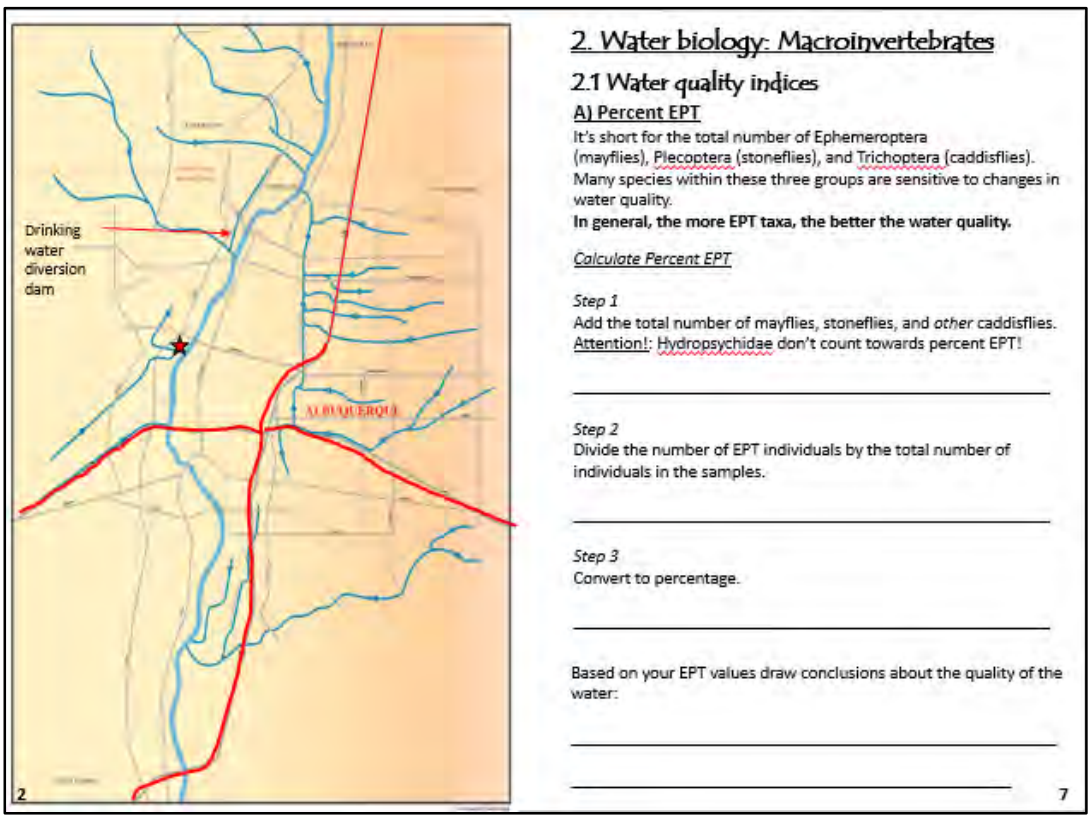
Page 2

APPENDIX B: STUDY TRIP HANDOUTS

Field Journal for study trips – Middle School



Page 1&8



Page 2&7

Field Journal for outdoor study trips (cont.) - MS

Weather Report

1. Time: _____ am or pm
2. Today's Weather:
3. Cloud Cover: _____ %
4. Wind: Speed: _____ Direction: km/h OR mph
5. Humidity: _____ %
6. Temp: It feels like: _____ °F It actually is.... _____ °F

Reflection/Conclusions

1. How do you think the weather can effect the water chemistry results of the river that we got today?

2. If the overall river health is fair or poor, who do you think is responsible? Do you think is a point source pollution or a non-point source pollution scenario?

6

Litter Survey

The San Antonio Arroyo collects runoff from all over the west side of Albuquerque, anything on the streets can end up in the arroyo. Tally the litter you find throughout the day here. Also, think who might be responsible for this. Is it a point source pollution or a non-point source pollution?

Litter type	Arroyo	Bosque
Plastic		
Paper		
Glass		
Metal		
Cigarette butts		
Dog poop		
Animal scat		
Evidence of chemicals		
Other trash		

Reminder:

- Point source pollution - comes from a specific place
- Non-point source pollution - comes from many places and people

3

Page 6&3

How long will it take?

Every piece of trash has a face… where and WHO did it come from? It takes just a moment for an item to be carelessly discarded where it can be washed into a river or blown in by wind, but it can take many, many years for it to completely decompose. Test your knowledge about decomposition times below by drawing a line from the item to its decomposition time.

Banana peel	1–2 million years
Cigarette butt	600 years
Fishing line	450 years
Styrofoam cup	20–1000 years
Milk carton	200–500 years
Plastic bottle	+1 million years
Aluminum can	1.5–10 years
Glass bottle	5 years
Plastic bag	3–4 weeks

Which of these things can be reused or recycled?

_____

_____

_____

4

1. Water Chemistry

	Arroyo	River
Temperature	°F / °C	°F / °C
Turbidity	JTU	JTU
Nitrate	ppm	ppm
Phosphate	ppm	ppm
pH		
Dissolved oxygen	ppm %	ppm %
E. coli	Present / Absent	Present / Absent

Temperature
6-12 °C- good
13-15 °C- fair
>15 °C- poor

Turbidity
Sources: erosion, fire
1-99 JTU- good
4–100 JTU- fair
>100 JTU- poor

Nitrates
Sources: plants, soil, fertilizer
1-4 ppm- good
5- 20 ppm- fair
>20 ppm- poor

Phosphates
Sources: plants, fertilizer, plastic
1 ppm- good
2 ppm- fair
4ppm- poor

pH
1-strong acid- poor
6-weak acid- fair
7-neutral- good
8-weak base-fair
14-strong base-poor

Dissolved Oxygen
1 ppm or 60-100% -good
4 ppm or 40-60%- fair
8 ppm or 0-40%- poor

E. coli
Sources: animal waste
E.coli will always be present in small amounts. Large amounts are harmful to humans and animals

Overall river health: (circle one)

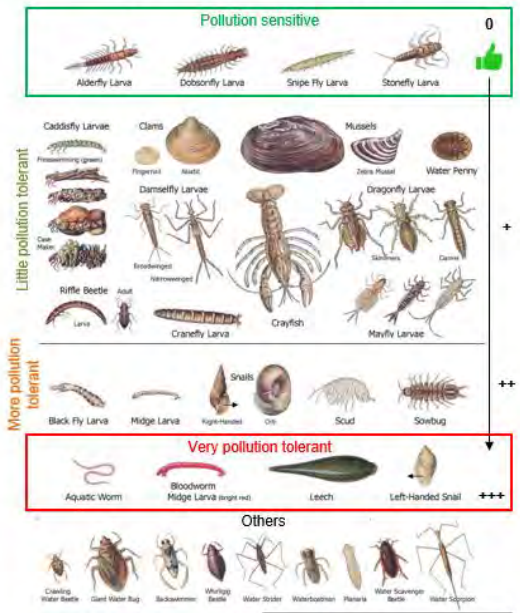
Good Fair Poor

5

Page 4&5

Field Journal for study trips – High School

Macroinvertebrates as long term pollution bioindicators



Pollution sensitive _____
Little pollution tolerant _____
More pollution tolerant _____
Very pollution tolerant _____

Water quality level:

8

Name:_____

Date:_____

Stormwater Science

Field Journal

Bosque Ecosystem Monitoring Program

BEMP Leaf Pack Network Stormwater Quality Team

Page 1&8

1. Water Chemistry

	Arroyo	River
Temperature	°F / °C	°F / °C
Turbidity	JTU	JTU
Nitrate	ppm	ppm
Phosphate	ppm	ppm
pH		
Dissolved oxygen	ppm %	ppm %
E. coli	Present / Absent	Present / Absent

Temperature
8-12 °C- good
13-15 °C- fair
>15 °C- poor

Turbidity
Sources: erosion, fire
1-39 JTU- good
4--100 JTU- fair
>100 JTU- poor

Nitrates
Sources: plants, soil, fertilizer
1-4 ppm- good
5- 20 ppm- fair
>20 ppm- poor

Phosphates
Sources: plants, fertilizer, plastic
1 ppm- good
2 ppm- fair
4ppm- poor

pH
1-strong acid- poor
6-weak acid- fair
7-neutral- good
8-weak base-fair
14-strong base-poor

Dissolved Oxygen
1 ppm or 60-100% -good
4 ppm or 40-60%- fair
8 ppm or 0-40%- poor

E. coli
Sources: animal waste
E.coli will always be present in small amounts. Large amounts are harmful to humans and animals

River health: (circle one)

Good Fair Poor

2

Biotic Index	Water Quality	Degree of Organic Pollution
<3.75	Excellent	Organic pollution unlikely
3.75-5.0	Good	Some organic pollution
5.1-6.5	Fair	Substantial pollution likely
6.6-10.0	Poor	Severe pollution likely

Overall Conclusions

1. Why is important to compare the water chemistry of the river to the macroinvertebrate data?
2. Does these two measurements show the same overall results?
3. Are the water chemistry results for the arroyo different form the river? Why?
4. Are the macroinvertebrate indices different between the pond and the river? Why?

7

Page 2&7

B) Biotic Index

Biotic Index is a comparison of the abundance of taxa and their tolerance to environmental stress. This widely used index can indicate organic and nutrient pollution. Organisms are assigned tolerance values which range from 0 to 10, depending on the organism's sensitivity to changes in water quality and habitat (tolerance values increase as water quality decreases).

In contrast to the percent EPT index, the lower the biotic index, the better the water quality.

Calculate Biotic Index

Step 1
To calculate the Total Tolerance Value (D), multiply each taxa (B) by the Pollution Tolerance Value (C) and record in column D.

Step 2
Add all Total Tolerance Value values (D): _____

Step 3
Add all Average # from all packs (B): _____
This is the *total number of individuals*.

Step 4
Divide all Total Tolerance Value (step 2) by total number of Individuals (step 3).

_____

Step 5
Look up the Biotic Index Value in the table to know the degree of organic pollution:

_____

6

Weather Report

1. Time: _____ am or pm
2. Today's Weather:
3. Cloud Cover: _____ %
4. Wind: Speed: _____ Direction: km/h OR mph
5. Humidity: _____ %
6. Temp: It feels like: _____°F It actually is.... _____°F

Reflection/Conclusions

1. How do you think the weather can effect the water chemistry results of the river that we got today?

2. If the overall river health is fair or poor, who do you think is responsible? Do you think is a point source pollution or a non-point source pollution scenario?

3

Page 6&3

2. Water biology: Macroinvertebrates (Pond or River)

Taxa	A Total # in your pack	B Average # from all packs	C Pollution Tolerance Value	D Total Tolerance Value
EPHEMEROPTERA (Mayflies)			0.6	
PLECOPTERA (Stoneflies)			1	
TRICHOPTERA (Caddisflies)				
Hydropsychidae (Common Netspinners)			3	
Other Caddisflies			2.9	
ANISOPTERA (Dragonflies)			6	
ZYGOPTERA (Damselflies)			7	
MEGALOPTERA				
Corydalidae (Hellgrammites)			0	
Sialidae (Alderflies)			4	
COLEOPTERA (Beetles)			4.6	
DIPTERA (True Flies)				
Athericidae (Watersnipe flies)			2	
Chironomidae (Midges)			6	
Simuliidae (Black flies)			6	
Tipulidae (Crane flies)			3	
Other Diptera			6	
AMPHIPODA (Scud)			6	
ISOPODA (Aquatic sowbugs)			8	
DECAPODA (Crayfish)			6	
OLIGOCHAETA (Aquatic Worms)			8	
HIRUDINEA (Leeches)			8	
TURBELLARIA (Planarians)			8	
GASTROPODA (Snails)			7	
SPHAERIIDAE (Fingernail Clams)			8	

4

2.1 Water quality indices

A) Percent EPT

It's short for the total number of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). Many species within these three groups are sensitive to changes in water quality.

In general, the more EPT taxa, the better the water quality.

Calculate Percent EPT

Step 1
Add the total number of mayflies, stoneflies, and *other* caddisflies.
Attention!: Hydropsychidae don't count towards percent EPT!

_____

Step 2
Divide the number of EPT individuals by the total number of individuals in the samples.

_____

Step 3
Convert to percentage.

_____

Based on your EPT values draw conclusions about the quality of the water:

_____

_____

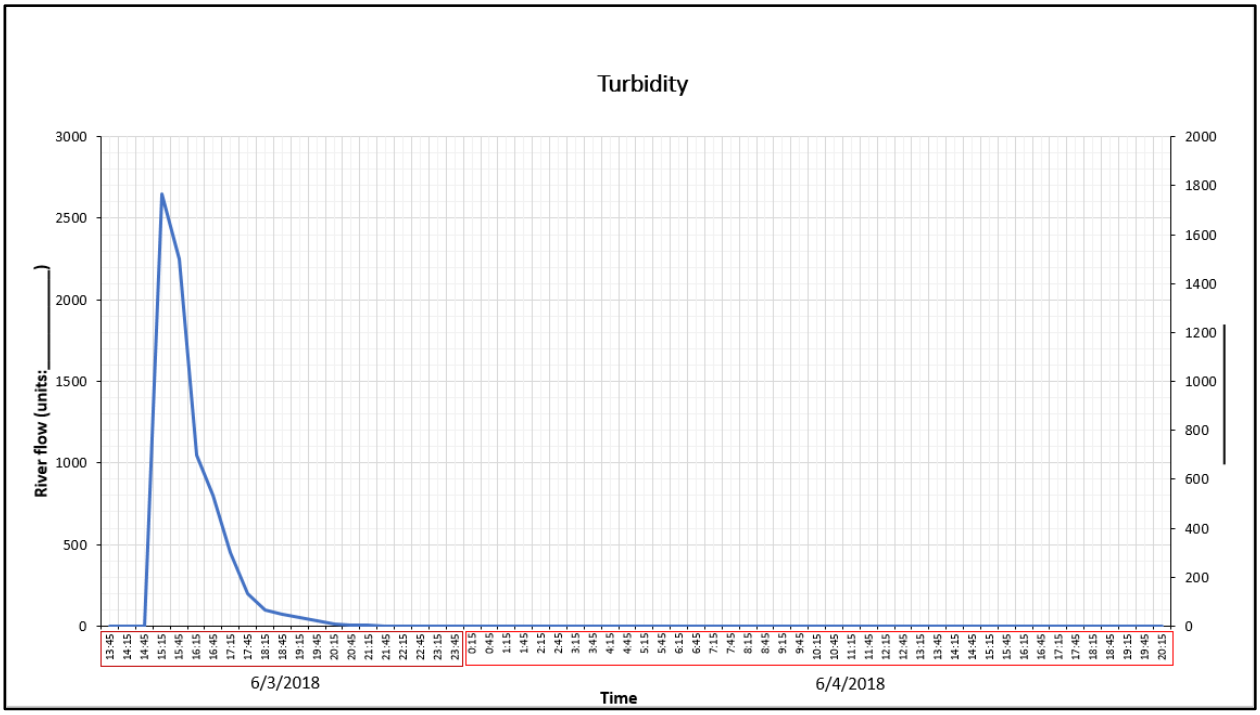
5

Page 4&5

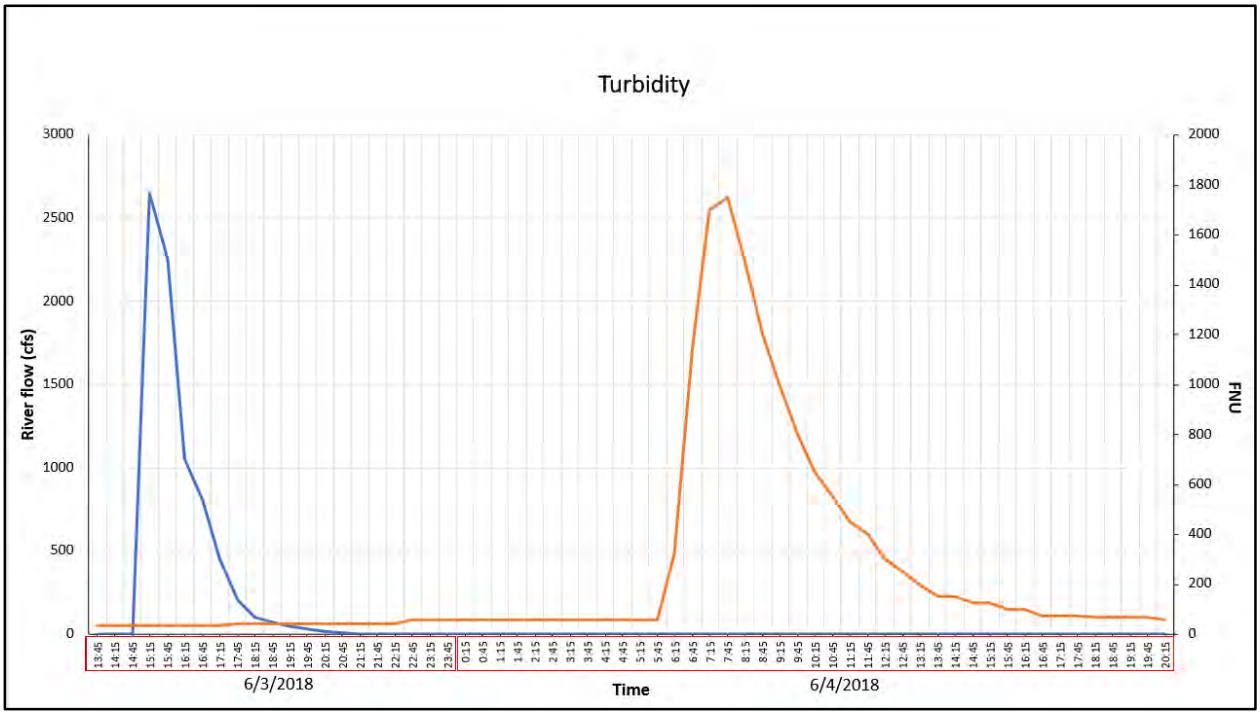
APPENDIX C: CURRICULUM EXTENSIONS

Curriculum extension 1 – HS graphing

Handout

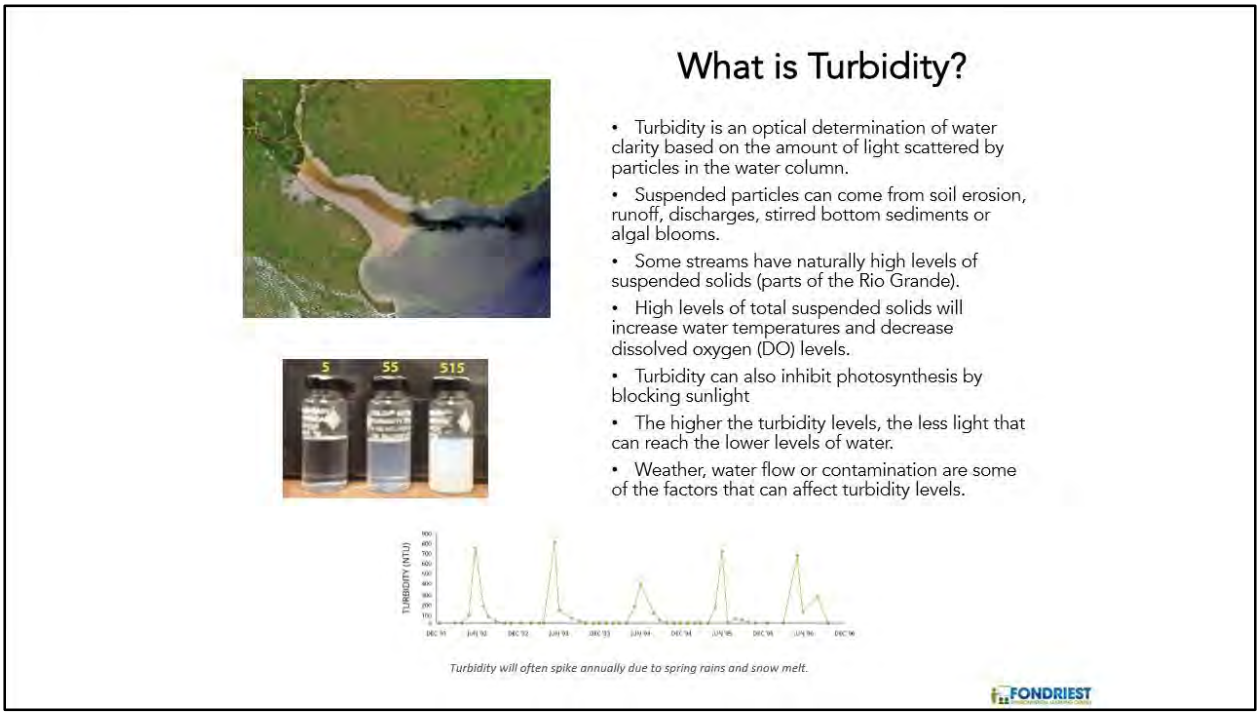


Result expected



Curriculum Extension 1 – HS graphing (cont.)

Handout Information



Table

Date	Time	Precipitation (mm)	River flow (cfs)	Turbidity (FNU)
6/3/18	13:45	0	0	35
6/3/18	14:15	1.6	1	35
6/3/18	14:45	0.1	1	35
6/3/18	15:15	0	2650	35
6/3/18	15:45	0	2250	35
6/3/18	16:15	0	1050	35
6/3/18	16:45	0	800	35
6/3/18	17:15	0	450	35
6/3/18	17:45	0	200	45
6/3/18	18:15	0	100	45
6/3/18	18:45	0	70	45
6/3/18	19:15	0	50	45
6/3/18	19:45	0	30	45
6/3/18	20:15	0	15	45
6/3/18	20:45	0	7	45
6/3/18	21:15	0	3	45
6/3/18	21:45	0	1	45
6/3/18	22:15	0	1	45
6/3/18	22:45	0	1	60
6/3/18	23:15	0	1	60
6/3/18	23:45	0	1	60
6/4/18	0:15	0	1	60
6/4/18	0:45	0	1	60
6/4/18	1:15	0	1	60
6/4/18	1:45	0	1	60
6/4/18	2:15	0	1	60
6/4/18	2:45	0	1	60
6/4/18	3:15	0	1	60
6/4/18	3:45	0	1	60
6/4/18	4:15	0	1	60
6/4/18	4:45	0	1	60
6/4/18	5:15	0	1	60
6/4/18	5:45	0	1	60
6/4/18	6:15	0	1	325
6/4/18	6:45	0	1	1150
6/4/18	7:15	0	1	1700
6/4/18	7:45	0	1	1750

Curriculum Extension 2 – HS Soil Porosity and Permeability Experiment

Cary Institute of Ecosystem Studies

BEMP

Name _____ Date _____

Stormwater Science: Soil Porosity and Permeability Experiment

Background: Layers of rock, sand or gravel that are good ground water reservoirs are called aquifers, from the Latin words for "water" and "to bring". This water reservoirs are key to transfer nutrients from the soil to growing plants. The properties that make a good aquifer are those that increase the storage of water (porosity) and increase the flow of water (permeability) within that layer. ***Porosity*** is the proportion of empty space in a substrate. ***Permeability*** is a measure of the ease with which liquids and gases can pass through a substrate. Some soil types let water flow in quickly (infiltrate), others may let the water completely through at a fast paste and some others may keep the water from getting in at all. None of these soil types is better than the other. Today you will complete an investigation to determine which soil substrate holds the most water.

Hypothesis:

_____

_____

Materials:

- Funnel
- Substrates: (1) sand, (2) soil, (3) gravel and (4) clay
- Plastic wrap
- Water
- Plastic cups - optional
- Beakers
- Graduated cylinder
- Coffee filter
- Stopwatch
- Dropper

Procedure:

1. Make observations about the substrates you will test. Write down your observations
2. Get a funnel, and place the coffee filter inside the funnel.
3. Measure 200 mL of the first substrate you will test into the funnel.
4. Place the funnel over a beaker. One person should hold the funnel and block the tip with a finger.
5. Measure out 100 mL of water with the graduated cylinder and record the amount in the table (A).
6. Pour the water SLOWLY into the funnel, making sure not to let the water overflow the funnel. Allow the water to soak in all the way. Use the dropper to remove any excess water on top of the gravel. Be sure to put any water removed from the cup back into the graduated cylinder.
7. Record how many ml of water are now in the graduated cylinder, then discard.
8. Complete the table to determine how many ml of water you poured into the cup.
9. SLOWLY remove your finger from the tip of the funnel.
10. Time for 1 minute as the water drips from the funnel into the beaker.
11. Record the final volume of water in the beaker in the table.
12. Empty the sediment in the funnel into the appropriate container.
13. Repeat the above steps for all substrates.
14. Complete the trial again with only the coffee filter. This is your control.
15. Finally, cover the last substrate you tested (clay) with plastic wrap. Do not pull it tight, but lay it on top of the soil sample inside of the funnel. Pour the same amount of water onto the sample, and wait five minutes to see what will happen.
16. Write down all of your results and compare with your classmates.

Substrate	A. Water beginning (ml)	B. Water end (ml)	C. Water used (A-B) **Porosity**	D. Water cylinder	E. Water dripped **Permeability**
Sand					
Soil					
Gravel					
Clay					
Control					

Results:

_____
_____
_____
_____

Discussion:

1. What happens to the porosity when the particle size gets smaller?

2. Through which material did the water move the fastest? The slowest? Why?

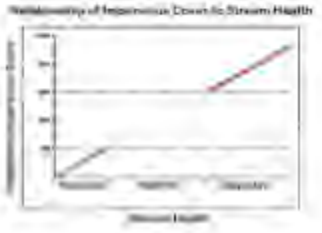
3. Why is the permeability of the substrates different?

4. What happen to the permeability of the plastic wrap?

5. What type of surface does plastic wrap mimic in real life?

6. Which substrate would cause the least flooding for a community? Why?

7. What does this graph tell you about the relationship between permeability and stream health? How does this graph relate to the activity you just completed?



Curriculum Extension 3 – MS & HS

BEMP
Bonque Ecosystem Monitoring Program

Hydrologist: _____ Date: _____

Stormwater Science

What 2 sources can New Mexicans get their drinking water from?

1. _____

2. _____

Where does water go after we use it?

_____

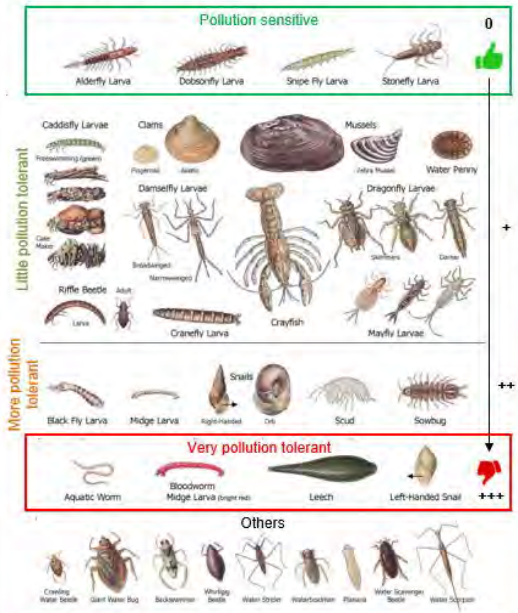
A ***watershed*** is an area of land where all of the water that falls on it, or that is under it, drains to the lowest point.

Draw a line from the word to its definition

Turbidity	♦ A stream or arroyo that brings water to the main channel of the river
Nonpoint source pollution	♦ Types of nutrients found in fertilizers that can lead to excess algae growth
E.coli	♦ A single location where pollution is being leaked into the environment
Point source pollution	♦ A type of *bacteria* found in warm blooded animal's intestines that can make people sick
Nitrates and phosphates	♦ Tiny 'water bugs' whose species are an indication of water quality
Tributary	♦ *Any* type of pollution that comes from *many different* sources
Macro-invertebrates	♦ A measure of water clarity based on the amount of suspended solids

Page 1

1. *Water Biology:* Macroinvertebrates as long term pollution bioindicators



Pollution sensitive _____
Little pollution tolerant _____
More pollution tolerant _____
Very pollution tolerant _____

Water quality level:

2. *Water Chemistry:* Dissolved materials as short term pollution indicators

Water origin:	_____
Turbidity	JTU
Nitrate	ppm
Phosphate	ppm
pH	
Dissolved oxygen	ppm %
E. coli	Present / Absent

Water quality level:

Turbidity
Sources: erosion, fire
1-39 JTU- good
4--100 JTU- fair
>100 JTU- poor

pH
1-strong acid- poor
6-weak acid- fair
7-neutral- good
8-weak base-fair
14-strong base-poor

Nitrates
Sources: plants, soil, fertilizer
1-4 ppm- good
5- 20 ppm- fair
0 ppm- poor

Dissolved Oxygen
1 ppm or 60-100% -good
4 ppm or 40-60%- fair
8 ppm or 0-40%- poor

Phosphates
Sources: plants, fertilizer, plastic
1 ppm- good
2 ppm- fair
4ppm- poor

E. coli
Sources: animal waste
E.coli will always be present in small amounts. Large amounts are harmful to humans and animals

How can YOU help to keep the watershed clean?

1. _____
2. _____
3. _____
4. _____

Page 2

APPENDIX D: PHOTOS

Watershed model at Jefferson Middle School

Study Trip Water Quality analysis at the arroyo system

Study Trip with el Camino Real Academy – Water Quality analysis at the river

Study Trip macroinvertebrate lab observation

Otter Day 2019

BEMP Student Congress 2019

Luquillo-Sevilleta Virtual Symposium (LSVS)

Tabling event at Sandia High School

BASS students at Harrison Middle School observing macroinvertebrates

APPENDIX E: 2018-2019 STORMWATER SCIENCE EDUCATION OUTREACH NUMBERS

Date	School/Event name	City	Students	Adults	Grade	Activity	Presentations	School Level
11/27/18	Harrison MS	Albuquerque	2	1	6, 7, 8	BASS	1	MS
3/5/19	Harrison MS	Albuquerque	5	1	6, 7	BASS	1	MS
4/12/19	Ace Leadership HS	Albuquerque	12	1	11, 12	Classroom	1	HS
1/31/19	Albuquerque Institute for Mathematics and Science	Albuquerque	50	2	7	Classroom	2	MS
1/29/19	El Camino Real Academy	Albuquerque	24	2	6	Classroom	1	MS
12/5/18	Jefferson MS	Albuquerque	116	2	6,7,8	Classroom	6	MS
12/4/18	La Academia De Esperanza	Albuquerque	50	1	9, 10, 11	Classroom	5	HS
2/13/19	School of Dreams Academy	Los Lunas	15	1	11,12	Classroom	1	HS
3/8/19	School of Dreams Academy	Los Lunas	12	1	11,12	Classroom	1	HS
11/8/18	Taft MS	Albuquerque	14	1	6,7,8	Classroom	1	MS
9/25/18	The International School	Albuquerque	40	2	4	Classroom	2	MS
2/12/19	The International School	Albuquerque	14	1	9, 10	Classroom	2	HS
3/25/19	Volcano Vista HS	Albuquerque	168	2	11, 12	Classroom	5	HS
11/28/18	Wilson MS	Albuquerque	36	1	6,7,8	Classroom	2	MS
8/22/18	2018 EPA Region 6 Conference	Albuquerque	1	70	NA	Conference	1	NA
2/15/19	BEMP Crawford symposium	Albuquerque	54	250	all	Event	1	all
4/15/19	BEMP Otter Day	Albuquerque	130	21	K, 1	Event	1	ES
4/25/19	BEMP Otter Day	Albuquerque	142	24	1	Event	1	ES
4/24/19	BEMP Student Congress	Albuquerque	140	20	6, 7, 8	Event	1	MS
4/26/19	BEMP Student Congress	Albuquerque	80	11	6, 7, 8	Event	1	MS
4/25/19	Luquillo-Sevilleta Virutal Symposium	Albuquerque/Puerto Rico	16	13	6, 11	Event	1	MS/HS
10/22/18	Rio Rancho schools/Children's Water Festival	Rio Rancho	130	4	4	Event	6	ES
10/23/18	Rio Rancho schools/Children's Water Festival	Rio Rancho	147	19	4	Event	6	ES
9/14/18	Amy Bielh HS	Albuquerque	21	2	9	Other*	1	HS
7/1/19	Horizons Albuquerque	Albuquerque	20	5	6	Other*	1	MS
2/14/19	El Camino Real Academy	Albuquerque	20	5	6	Study trip	1	MS
11/2/18	Holy Ghost Catholic Church	Albuquerque	20	2	7	Study Trip	1	MS
4/23/19	Holy Ghost Catholic Church	Albuquerque	24	3	6	Study trip	1	MS
11/13/18	Taft MS	Albuquerque	15	1	6, 7	Study trip	1	MS
2/26/19	The International School	Albuquerque	14	1	9,10	Study Trip	1	HS
3/29/19	Volcano Vista HS	Albuquerque	20	2	10	Study trip	1	HS
4/10/19	Albuquerque Sign Language Academy	Albuquerque	65	45	4, 5, 6, 7, 8	Tabling	1	ES/MS
4/17/19	Sandia HS	Albuquerque	400	30	9, 10, 11, 12	Tabling	1	HS
TOTAL			2017	547				

*Other activities included condensed study trips (~2 hours) and classroom lessons (~30 min)

and Bernalillo Counties. This will include age-appropriate, substantive education about point and non-point source pollution that impacts the Rio Grande locally and at large. To closely align this work with BEMP's mission, students will also have the opportunity to work with real water quality data collected along the Rio Grande in Albuquerque to better understand the impacts of storm events on their local watershed. These students will have additional opportunities to learn about stormwater science concepts when participating in BEMP's Monthly Monitoring data collection. Elementary school students will primarily receive Stormwater Science education through community events, festivals, and BEMP Monthly Monitoring.

To best accommodate a variety of school models and incorporate feedback from participating classroom teachers, BEMP will offer two Stormwater Science curriculum components during the 2019-2020 school year: a classroom lesson and a Rio Grande Study Trip. Both experiences include the explicit message that students can and should act to protect the health of the Rio Grande and its watershed.

1. Classroom curriculum*: Preparation and delivery of Stormwater Science activities in the classroom for middle and high school students*

During the classroom lesson, middle school students build a watershed model with runoff cards representing pollutants relating to MS4 permit requirements and educational priorities as detailed in the matrix provided by the Storm Team. The high school classroom lesson builds upon these core concepts and includes new data analysis and data visualization components that align with NGSS principles.

2. Stormwater Study Trip: *Delivery and coordination of place-based Stormwater Science experiences*

The Study Trip is a place-based educational experience which, for middle school students, includes walking through an arroyo, surveying for litter, and testing water quality at the Rio Grande. At the high school level, the Study Trip uses a similar format with an emphasis on water quality indices and other related ecological concepts. In order to build a more holistic understanding of the Rio Grande watershed and provide students the opportunity to work with real data, student-collected water quality data gathered during these Study Trips will be shared internally with other participants. BEMP will continue to build this dataset, share student-collected data with other science organizations (ex. GLOBE – Global Learning and Observations to Benefit the Environment), and make this data available for student research projects.

Whether students only receive classroom activities or also participate in a Study Trip, Stormwater Science outreach will address all four areas of Science, Technology, Engineering and Math (STEM) education through exploring the ecological and chemical effects of water pollution, scientific technology used to test and record water chemistry data, and the engineering and design of storm drains and arroyos. During the 2018-19 school year, BEMP created lesson extensions that can be used as either homework assignments or as classwork. For the 2019-2020 school year, BEMP will to continue to align Stormwater Science activities with Next Generation Science Standards.

To implement this program, BEMP education staff will contact middle and high school teachers in Albuquerque public, charter and private schools with a focus on Title I schools. First priority will be given to public schools and then to charter, private, and home schools in Sandoval and Bernalillo Counties.

3. Elementary school outreach: *Continued delivery and coordination of Stormwater Science experiences for elementary school students*

While the Stormwater Science curriculum is primarily focused upon middle and high school students, BEMP educators will continue to attend to a variety of outreach events such as the Children's Water Festival and BEMP's Otter Days where younger students will learn about stormwater science concepts and actionable ways to help keep the Rio Grande healthy.

4. Monthly Monitoring: *Continued development and delivery of Stormwater Science presentations during Monthly Monitoring*

In addition to the core Stormwater Science curriculum, BEMP will, when possible, continue to educate all of its K-12 student and community partners about stormwater science concepts during Monthly Monitoring data collection. Students will also learn how to care for and conserve the Rio Grande and its watershed in ways that amplify key Storm Team messaging and takeaways.

Schools in Bernalillo and Sandoval Counties that participated in BEMP monthly monitoring during 2018-2019 school year and are anticipated to participate in 2019-2020:

Location	**Name**
Bernalillo	Bernalillo Middle School Santo Domingo Elementary School
Rio Rancho	Rio Rancho Cyber Academy
Albuquerque	Albuquerque Institute of Math and Science Bandelier Elementary School Bosque School Cien Aguas International School Harrison Middle School Highland High School Jefferson Middle School La Academia De Esperanza La Cueva High School Rio Grande Elementary School Rio Rancho Cyber Academy South Valley Academy The International School at Mesa del Sol Wilson Middle School Volcano Vista High School

5. Summer programming*: Preparation and delivery of Stormwater Science presentations during summer programming*

During summer months, BEMP partners with Horizons Albuquerque, a tuition-free academic enrichment program that intends to fill the summer learning gap that students from low-income families often encounter. BEMP plans on offering a program for high school students where they will learn to collect and analyze water quality-related datasets as part of their summer enrichment experience.

6. Stormwater Science curriculum development: *Continued development of Stormwater Science curriculum*

BEMP educators will continue to develop new hands'-on, engaging and age-appropriate curriculum activities for a wider range of students. Educators will continue to develop data-intensive stormwater science activities to better align with Next Generation Science Standards.

7. BEMP educational outreach events: *Funding covers partial costs for classrooms to participate in Otter Day and BEMP Student Congress*

Two of the main Stormwater Science-related field activities that BEMP organizes every year are BEMP Student Congress and Otter Day. The main goal of BEMP Student Congress is to gather middle school students from different areas in Albuquerque and help them share their research and experiences in the

bosque, including watershed health observations. BEMP's Otter Day is an event where first graders, hosted by high school students, are taught how they are individually responsible for keeping the Rio Grande and its watershed free of pollutants for the benefit of both wildlife and humans. We plan to continue offering this type of events for the next school year.

8. Additional BEMP educational outreach and events: *Funding covers partial costs for classrooms to participate in Luquillo-Sevilleta Virtual Symposium and Crawford Symposium*

BEMP also participates in other outreach events throughout the school year where stormwater science concepts are taught to a broad audience. BEMP organizes two of these events every year - the Luquillo-Sevilleta Virtual Symposium (LSVS) and the Crawford Symposium. The LSVS is an online event where students from Albuquerque and Puerto Rico share their watershed research in Spanish via Skype. BEMP's Crawford Symposium is a community science event honoring Dr. Clifford Crawford (BEMP's co-founder) where students and professionals present their Middle Rio Grande environmental research. In both of these events, BEMP teaches students why it is their responsibility to help maintain a clean river and watershed and what steps they can take to help. In the next school year, BEMP educators will continue to participate in Stormwater Science-related research projects that will be presented to the scientific community and the public at large..

All deliverables will be non-proprietary and consist of: education materials, online posting of lesson plans and associated documents, and a report summarizing the program's accomplishments, findings, documented learner outcomes, and participant numbers.

Exhibit 7
Rio Rancho Children's Water Festival 2018-2019

Children's Water Festival

Rio Rancho, 2018

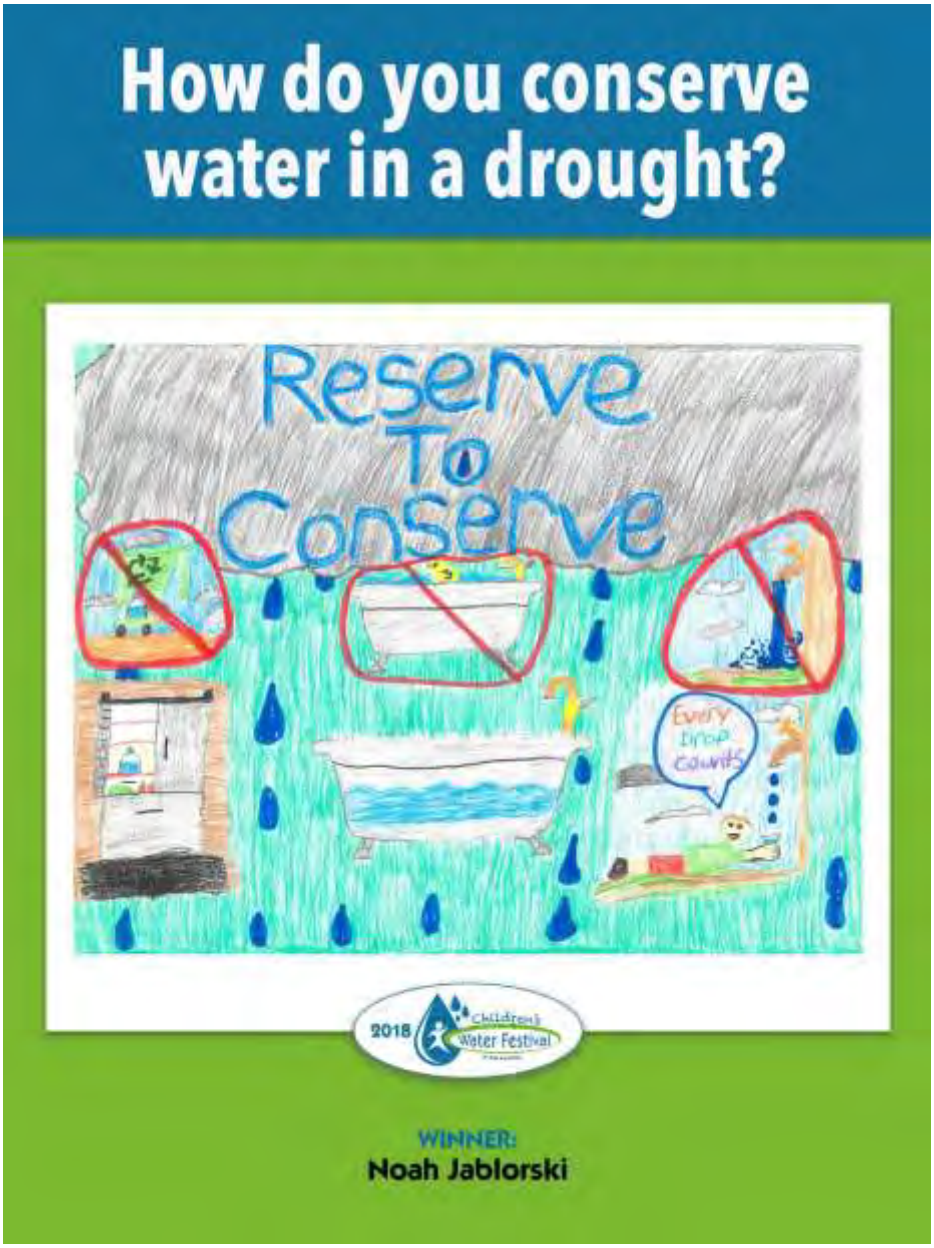


Table of Contents

Executive Summary

The 2018 Children's Water Festival (Festival) was held Monday, October 22nd and Tuesday, October 23rd at the Santa Ana Star Center in Rio Rancho. An estimated 1,500 fourth-grade students attended from 64 classrooms and one small group of home-schoolers; Bernalillo Elementary School, St. Thomas Aquinas, and all of the elementary schools in Rio Rancho Public Schools. The students attend three 30 minute presentations in a half-day format. Up to seventeen classes from three to four schools were on-site at one time. Schools attended a morning or afternoon program.

The seventeen presentations represented twenty-two professional organizations that ranged from federal, state, regional governments, and private industry. The organizations all have water interests and focused on subjects such as the water cycle, water quantity and conservation, water distribution, and water quality and pollution.

Students were evaluated on basic water knowledge before and after the Festival. On average, for all testing returned, **the students showed an increase in knowledge of 9 percentage points on the post testing**.

A teacher from Sandia Vista Elementary wrote, "I thought this was the best year out of the years I've attended with my class. All of our water activities were hands-on and informative."

The Festival costs an estimated $23,000. The City of Rio Rancho contributed $10,000 to the Festival and additional funding was raised through the New Mexico Water Conservation Alliance 501(c)(3). Festival sponsors include: Jacobs, Waste Management, NM Gas Company, Southern Sandoval County Arroyo Flood Control Authority, RMCI Inc., All Type, Alpha Southwest, and CWA Strategic Communications.

Introduction

The Children's Water Festival (Festival) has occurred in Rio Rancho since 2007. The 2010 Festival was the first event hosted by the City of Rio Rancho's Water Conservation Office. This report is for the 2018 Festival; the ninth event hosted by the Water Conservation Office. As in years past, the Festival was held at the Santa Ana Star Center. There were an estimated 1,500 students attending from 64 classrooms and one small group of home-schoolers; Bernalillo Elementary School, St. Thomas Aquinas, and all of the elementary schools in Rio Rancho Public Schools. The event was held on October 22nd and Tuesday, October 23rd.

Purpose and Intent

The principal focus of the Festival is to educate fourth-grade school children about water and its relationship to humans, animals and other natural resources in a fun and interactive atmosphere. The Festival's vision is to:

- Introduce students and teachers to new ideas, options, and solutions so they will conserve and protect water for the future,
- Lay the foundation for further learning, and
- Reach as many students and teachers as possible.

Public participation is essential to successful water conservation, and educating the public promotes better water conservation planning and implementation. Early education influences the future acceptance of water conservation concepts. This early education experience also has shown that training efforts affected behavioral changes and improved water use practices. Water conservation goals are only as effective as water users' willingness to adopt and implement appropriate water conservation measures. Through special training activities, water users are taught proper water use practices and techniques. Efficient use of water supplies decreases waste and prevents degradation of water quality leading to healthier ecosystems for fish and wildlife, including locally listed endangered species, such as, the Rio Grande Silvery Minnow (*Hybognathus amarus)* and the Southwestern Willow Flycatcher (*Empidonax traillii extimus*).

The Festival was designed specifically to introduce and explain new and unfamiliar water management tools to present and future water users and managers. Research concerning water conservation education indicates the targeted group of the Festival, fourth-grade students, is ideal for achieving long-term goals. Through sharing water conservation and water quality tools at home and with extended family, the estimated 1,600 participants (students, teachers, and chaperones) represent a potential audience of 10,000 to 15,000 people for the Festival program.

A series of activities that cover a wide range of core curriculum areas were presented at the Festival. These activities included language arts, mathematics, science, social studies, visual arts, and health/wellness; all of which are tied to water conservation, water quality, and water quantity in the arid Southwest desert.

The updated Water Resources Management Plan (Plan), adopted by the City of Rio Rancho Governing Body in 2014, details water efficiencies and water conservation measures to be taken by the City to better manage the existing water supplies. Policy E.4 of the Plan sets forth this initiative: "Continue consulting with and improving the partnership with Rio Rancho Public Schools to implement a robust water resources educational curriculum."

Additionally, the City of Rio Rancho Strategic Plan was formally adopted by the City of Rio Rancho Governing Body on March 25, 2009 and updated August 2017. One important element of the Infrastructure Strategies section of the Strategic Plan pertains to water sustainability and conservation to support growth and development of the City.

"My class enjoyed all 3 events. They learned the most from the watershed activity, where the students stood on blue tape that represented the water that flows into the river. They still talk about it." said one Sandia Vista Elementary teacher.

Funds

Festival Cost

The Festival costs are listed in the table below. Please note that the cost for the Santa Ana Star Center is only for the personnel time. Any monies raised from sponsors that exceed the Festival costs will be used for the 2019 Festival. The cost per student for the Festival was $14.96, and includes the Festival T-shirt and transportation.

Cost Description	Amount
Santa Ana Star Center	$2,271.96
Pipe and Drape rental	$2,801.92
Catering for volunteers & presenters	$4,401.72
Buses	$3,560.70
T-shirts with art/logos (1,629 shirts)	$7,866.10
Shadow box (for T-shirt winner)	$23.18
Banner for Display Stand	$96.00
Posters	$216.00
Copy paper (pre & post-tests)	$44.00
White paper for T-shirt artwork	$37.29
Thank you cards	$130.42
Fiscal Sponsor	$1,000.00
Thank you gifts for steering committee	$168.00
Stamps for VIP invitations/thank you cards	$62.32
Total	**$22,679.61**

Sponsorships

Through its fiscal partner, the New Mexico Water Conservation Alliance, a 501(c)3 non-profit organization, the City of Rio Rancho was able to secure several sponsors to fund the Festival. Additionally, the City sponsored $10,000 for the Festival.

A heartfelt thank you goes to these valuable partners for the Festival!

Steering Committee

The Festival was directed by a diverse steering committee. The core group contained members from:

- City of Rio Rancho's Water Conservation Office
- City of Rio Rancho's Keep Rio Rancho Beautiful Office
- Jacobs
- Sandoval County Master Gardeners
- Sandoval County Master Composters
- New Mexico Environment Department – Surface Water Quality Bureau
- Citizen volunteers

Design of Festival

Students attended the Festival for a half day program that included three presentations. This ensures participation by all Rio Rancho fourth graders. There is a transition period in the middle of the day where the morning classes are leaving and the afternoon classes are arriving.

Teachers and students experienced the Festival in three parts: pre-Festival activities, the Festival itself, and post-Festival activities.

Pre-Festival Activities

- Each school provides a lead fourth grade teacher who confirms their commitment to participate, provides the number and names of the teacher/classes and the number of anticipated students for each.
- Elementary schools are provided the information on how to participate in the student T-shirt artwork project; student art work is submitted to the Water Conservation Office and a winner is selected.
- The pre-Festival tests are provided to the schools and the teachers administered the test to the students. The post-Festival tests, printed on colored paper, were dropped off at the same time.
- Teachers received resource kit materials that included the T-shirts and miscellaneous items donated by our sponsors (e.g., pens, rulers.).

Rio Rancho Children's Water Festival Event

Students at the "Rio Grande Bosque Water Cycle" activity.

- The Water Festival ran from 9:40 a.m. through 1:30 p.m.
- Students attending the Festival in the morning boarded buses at 9:15 a.m. at their school. Students attending the afternoon program boarded the buses at 11:30 a.m.
- Each class was met by a guide/timekeeper who escorted them to each of their three assigned presentations.
- Teachers turned in completed pre-Festival student tests and photo releases.
- Presentations lasted 30 minutes and topics included: water quality, water conservation, water cycle, wastewater, ecosystems, and built water infrastructure.
- All students received a Festival T-shirt. Noah Jablorski, Puesta del Sol Elementary, was the winner of the T-shirt student artwork contest. His design was displayed on the front of the T-shirt and Festival sponsor logos were on the back.

Noah Jablorski – T-shirt artwork winner from Ms. Armendariz's Puesta del Sol Elementary class

Post-Festival Activities

- Post-Festival tests were completed by students.
- Tests and teacher evaluation forms were picked up by steering committee members.
- Teachers will receive a copy of this report with specific information on how their students did on the tests.

All aspects of the Festival planning and implementation were created with the *Big Water Questions* in mind. Each activity was categorized into one of three water themes, and each class attended one 30-minute activity in each of those themes. In addition, each presentation addressed at least one of the *Big Water Questions*, as well as the Festival's mission and objectives. The long-term outcome goal is that all elementary school students will be able to provide reasonable answers to these questions by the time they reach middle school.

Big Water Questions

- Why is water so important to life?
- How do all living things depend on each other?
- What is the water cycle?
- What is a watershed?
- Where does my drinking water come from?
- What makes water dirty?
- How much water does my family use?
- Who are the other water users in our society?
- How can *I* protect our water?
- Where does my wastewater go?

Schools Attending the Festival

The following table outlines which schools attended.

Elementary School	**Number of Teachers**	**Number of Students**
Bernalillo Elementary	6	133
Cielo Azul Elementary	5	113
Colinas del Norte Elementary	5	124
Enchanted Hills Elementary	6	158
Ernest Stapleton Elementary	6	144
Maggie Cordova Elementary	6	150
Martin Luther King Elementary	6	147
Puesta del Sol Elementary	6	135
Rio Rancho Elementary	4	103
Sandia Vista Elementary	6	132
St. Thomas Aquinas Elementary	2	40
Vista Grande Elementary	5	132
Home School Group	1	5
Totals	**64**	**1,516**

Festival Presentations

One teacher wrote, “Each of the activities were “hands-on”. They were informative and fun!”

“Let’s Settle This Outside” activity. Students learn about wastewater treatment while becoming a wastewater operator.

Each year the Festival relies on numerous professionals who volunteer their expertise and presentation time. These professionals represent federal, state and regional government entities, local engineering firms, and the school district. They choose presentations that represent their missions or specialties. There were seventeen presentations running simultaneously on both Day 1 and on Day 2. A description of all the presentations, the presenters and their contact information has been provided in Appendix A.

Volunteer Hours

The Festival could not be held without the assistance of a number of volunteers, presenters, and steering committee members. New last year, was a requirement that the volunteers use the City's on-line application process to have a background check conducted. It was hopeful that this year process would be smoother and it was not. The City's human resources staff added an additional requirement where the volunteer applicants had to fill out a form with their social security number and driver's license number. At least one volunteer was worried that her social security number may fall in the wrong hands and she would not complete the process. Several other volunteers expressed concern about this new step.

The table below lists an estimate of the in-kind volunteer hours.

Presenters	382.5 hours
Volunteers	166.5 hours
Steering Committee Meetings	37 hours
Total Hours	**586 hours**

Lessons Learned

Steering Committee Comments from the Festival

There were only a few comments from the steering committee including:

- Bus issues with Rio Rancho Elementary– there was still a problem with one school not being picked up on time even though we verified with the bus coordinator to make sure all schools were on the bus schedule. We did not get a good response from the bus coordinator when asked why the bus did not arrive; we were told both "rain delay" and "the bus was there but the classes did not get on it when they were supposed to". On the teacher evaluation forms, though, the teachers said that bus 481 was not there on time. They missed the entire first rotation.
- Chaperones from Bernalillo Elementary did not have badges showing that they were supposed to chaperone the classes.
- One female parent and boyfriend show up the first day and wanted to be let in. They were not background checked and were denied entry. The teacher said that the parent was not supposed to be there. The parent and boyfriend walked the outside of the Star Center trying each door to get in.
- A comment from the Festival Director to the Star Center security team was overheard by one of the Bernalillo Elementary teachers. When talking about the chaperone badges, the Director told security that "Bernalillo is different" and the teacher took offense.
- A male parent of a Bernalillo student wanted to be let in to visit with the class. He did not know the name of the teacher his child was with so he was denied entry.
- A comment from last year was that it needed to be more hands on – maybe let presenters know that "lecture time" should be no more than 10 minutes and use the last 15 minutes for hands-on. Still need to get better with this. Several of the presenters lectured most of the time.
- Many teachers want more activities, but that is impossible – can't get enough volunteers and presenters to do more than two days.
- From last year, we did put TURN OVER on front of test page so kids answer all of the questions and had more students do both pages.
- One class from M. Cordova (Alderson) had a lot of the students circled in between the numbers on the post-test causing the post-test scores to be significantly lower than the pre-test scores (12% decrease).
- DeCristoforo's class from ML King all received scores of 100% on the post-tests. This gave a 24% increase in the score.
- We barely managed with less volunteers due to the inconvenience of the background check.
- The Festival began at 9:40 this year and some of the classes could not make it in time. Suggestion is to go back to 9:45 for next year. Need to have the students on the bus by 1:30 next year, just like this year.
- Food for the vegetarian presenters and volunteers was very poor. Even though the caterer told us what would be served, the Star Center staff did not have anything the first day and

it was cold the next day. Next year, need to have vegetarian as one of the options especially since the meals were enchiladas one day and lasagna the other.

- There needs to be ice packs, or something quick, when a child either pinches a finger or trips. We had a student trip and bump his knee and we had to scramble to find ice and something to put the ice in.
- Question #3 from the test has "False" then "True" as the selection for the students. It was mentioned that this might be misleading for the students so it will be rewritten for next year to have "True" then "False" as the answers.
- One of the teacher comments from 2017 was that it would be nice to have each school's t-shirts be a different color. We checked on this when we ordered the shirts for this year. Colored shirts would be an additional $1 per shirt. This would put the cost of shirts from $4.95 per shirt to $5.95 per shirt. The t-shirts are the second most expensive cost of the Festival besides the venue and food for presenters and volunteers.

Comments from Teacher Evaluation Forms

Buses

- Comment from St. Thomas Aquinas: "Our office registrar received a call stating that we had not confirmed via RRPS Trip Tracker. We never had to do this in the past. We also do not have access to this system. It was Liz Aldaz who called from RRPS transportation."
- Comments from Rio Rancho Elementary:
  - "Our buses were late picking us up at Rio Rancho Elem so we missed the first rotation."
  - "Bus 481 from Rio Rancho was late causing us to miss 1 activity."
- Comment from Vista Grande: "Well, the only thing was we only got 2 buses for 5 classes and we had to do 3 to a seat."
- No problems. The bus driver was great!
- Buses were fine. We were a bit crammed in.
- "Left fast and arrived fast" Commented a teacher from M. Cordova.

2017 Festival layout.

Santa Ana Star Center

- Wonderful place.
- Facility was clean/spacious.
- Great; was good. All set up, good temp., no noise.
- Thought layout was good and having a volunteer guide kept us right on time.
- While acoustics are poor, the lessons reach the students just fine. I love the venue for this.
- Not decorated fun or with kid-friendly posters.
- It would be nice if chairs were available for the teachers & parents volunteers.
- The "rooms" were too small for tables and my 25 students.
- Well organized & a lot of room for the students @ each station.

Activities

- Each of the activities were "hands-on". They were informative and fun!
- Yes, the activities were fabulous! I believe making the activities shorter in time (± 15 mins.) would allow students to see more.
- Some were hands on but still not very engaging for students.
- Students enjoyed the content. A content guide to be used ahead of time (to introduce vocab/concepts would be great).
- Improved by…Small tables for 27 children to huddle around, my group did a lot of listening in all 3 stations.
- At our first station, it was impossible for 24 kids to gather around a small table & be able to see. I understand there is a specific vocabulary to be uses with the water content & activities but not all students know what they mean. Many of the presenters seemed very annoyed that my class didn't instantly understand a term. The only rotation my class was engaged in was the Jeopardy station. More than half of my class was disengaged during the other two. They were unsure of what to do & shy they were doing the activity, & learned nothing from them. The students might be more engaged & learn <u>something</u> if they were able to choose what station they visited.
- Many were hands on but many of the rotations finished early (up to 15 minutes) and struggled to keep kids engaged.
- Thank you for more hands on activities this year. It is hard for 4th graders to sit and listen to lectures.
- I thought this was the best year out of the years I've attended with my class. All of our water activities: "Leaky Faucet", "water cycle in Action", and "flood Plain" were <u>hands-on</u> and <u>informative</u>.

- The presentation from the Museum of Natural History was the most memorable for my students. Although they did have to figure out a connection from ancient New Mexico to water resources.
- I like that you posted the information students should know before leaving in every booth. My students and I noticed.
- My students enjoyed all 3 events. They learned the most form the watershed activity, where the students stood on blue tape that represented the water that flows into the river. They still talk about it.
- I like how everything is separated. It helps the students focus on the presenter. I also like how the person escorting the group has sign with my name on it. It made it easy to find.
- My students really enjoyed the activities. One activity was having trash and the water & poo squish toys & the kids acted as a river. Great hands-on.

Overall

- Make it interesting and kid friendly. Presenters seemed as if they did not want to be there. Presentations were boring and dull. It was nice to take home goodies, kids love that.
- For a larger class of 26+, more models may help for all to see.
- Great! A lot of volunteers that were well prepared & very knowledgeable.
- More hands on, at least 1 group out of the 3.
- Make sure EVERYONE receives the same info about the process of the festival. We got different info than our guide got.
- Shorten time slots to allow us to see more rotations.
- Provide chairs for the adults to sit in. This has always been done before. Two out of three presentations did not have them available. (Festival staff note: the chairs were there but not placed out where the teachers could access them; need to do better on this next year.)
- I think the key is to have little bit of explanation and mostly hands-on activities. The presenters should be patient and kind to the students.
- Possibly have the first rotation set up differently since buses can't get there as early as expected.
- My students loved it. Things they learned included, ½ of New Mexico was ocean, we have ocean fossils, illegal dump sites, waste and toxins pollute river and aquifer and that there many layers to a landfill.
- It was my first time and we had a great time.
- This is such important information. We should have curriculum for at least 2 weeks prior and the time we are at the event should be longer.
- Test question #2 and #3 are poorly written.
- I just feel like it needs to be more kid friendly, like a fun rally, or water rally before we go in?

- The organization can make sure each teacher gets a mix of different topics through the stations. For example, my class went to two rotations that explained the water cycle (very similar discussions). The organization can also make sure each teacher gets their fair share of hands-on activities. (Festival staff note: we use a activity matrix and do try to make sure that teachers don't go the same activity year after year and have a mix of activities each year.)

Festival Event

The two days of the Festival ran very smooth with two exceptions:

- There was an issue with the buses for Rio Rancho Elementary and the students missed the first rotation. The Festival Director spoke to the Rio Rancho teachers to let them know that activities could be brought to them.
- The comment from the Festival Director to the Star Center security team that was overheard by one of the Bernalillo Elementary teachers. When talking about the chaperone badges, the Director told security that "Bernalillo is different" and the teacher took offense. The Festival Director apologized to one of the Bernalillo teachers who contacted her after the event and tried to explain the context of the comment.

Appendix A

Working Timeline

The following was used to ensure that steps of the Festival preparation were completed in a timely manner.

- July 15 – PO for RR Sponsorship
- July 15 – PO for Buses
- August 1 – update VIP list and mail invitations
- August 14 – RR schools starts
- August 24 – Email teachers about CWF date and artwork delivery
- August 30 – Drop off artwork paperwork, poster, photo release forms
- September 1 – email volunteers
- September 7 – email reminder to teachers including schedule
- September 7 – Start scheduling/meeting with teacher/schools
- September 11 – Pick up artwork, photo release forms
- September 17 – Meeting to select the winner
- September 17 – Artwork to Wayne at Rio Rancho T Shirts
- September 28 – meet with SASC about food, etc.
- October 15 – Pick up T Shirts
- October 15 – email layout to SASC
- October 16 – Meeting to pack bags
- October 16 – Drop off bags this week
- October 22nd and 23rd – Water Festival
- November 1 – Pick up post tests
- December 31 – Festival report completed

Appendix B

Teacher/Class Rotation Schedule

Booth	MON Oct 22 morning		9:40 – 10:10	10:15 – 10:45	10:50 – 11:20
#	**Presentation**	**Category**			
1	Incredible Journey – NMED	Water Cycle	Lambson Cielo Azul	McCann Cielo Azul	Langdon/Romero Puesta del Sol
2	No Dumping – KRRB	Recycling/Water Quality	McCann Cielo Azul	Smith Puesta del Sol	Torres Colinas del Norte
3	Vacant				
4	Let's Settle this Outside – Jacobs	Wastewater	Armendariz Puesta del Sol	Lambson Cielo Azul	Wiberg Colinas del Norte
5	Basic Surface Water Treatment – Carollo	Water Quality	Langdon/Romero Puesta del Sol	Armendariz Puesta del Sol	Herrera Puesta del Sol
6	Water Jeopardy – Bohannan Huston	General Water	Vargas Colinas del Norte	Ulibarri Puesta del Sol	Smith Puesta del Sol
7	Watersheds & Aquifers – UNM	Source Water	Romero Cielo Azul	Torres Colinas del Norte	Armendariz Puesta del Sol
8	Rolling River – Ciudad SWCD	Watersheds	Ulibarri Puesta del Sol	Wiberg Colinas del Norte	McCann Cielo Azul
9	RG Bosque Water Cycle - RGNC	Water Cycle	Torres Colinas del Norte	Romero Cielo Azul	Vargas Colinas del Norte
10	Weather or Not - NOAA	Weather	Infantino Cielo Azul	Farfan Colinas del Norte	Lambson Cielo Azul
11	Watersheds & Stormwater – SNL	Watersheds	Messenger Cielo Azul	Vargas Colinas del Norte	Romero Cielo Azul
12	Leaky Faucet – RRPS	Conservation	Smith Puesta del Sol	Parker/Straley Puesta del Sol	Randall Colinas del Norte
13	NM Past and Present – NM Cultural Services	Historical Perspective	Farfan Colinas del Norte	Randall Colinas del Norte	Messenger Cielo Azul
14	Water Cycle – Ask Academy	Water Cycle	Randall Colinas del Norte	Messenger Cielo Azul	Ulibarri Puesta del Sol
15	BEMPing it Up – BEMP	Ecosystems	Herrera Puesta del Sol	Langdon/Romero Puesta del Sol	Farfan Colinas del Norte
16	Keep the Rio Grande – Stormwater Team	Watersheds	Parker/Straley Puesta del Sol	Herrera Puesta del Sol	Infantino Cielo Azul
17	Virtual Water – OSE	General Water	Wiberg Colinas del Norte	Infantino Cielo Azul	Parker/Straley Puesta del Sol
	16 Presenters		**16 Classes**		

Booth	MON Oct 22 afternoon		11:50 – 12:20	12:25 – 12:55	1:00 – 1:30
#	**Presentation**	**Category**			
1	Incredible Journey – NMED	Water Cycle	DeCristoforo ML King	Pearson ML King	Marsh Enchanted Hills
2	No Dumping – KRRB	Recycling/Water Quality	Mandich Enchanted Hills	Lawton St.Thomas	Wallace ML King
3	Vacant				
4	Let's Settle this Outside – Jacobs	Wastewater	Wallace ML King	Zukowski Enchanted Hills	Salaz ML King
5	Basic Surface Water Treatment – Carollo	Water Quality	Filkins ML King	Salaz ML King	Wiebelhaus Enchanted Hills
6	Water Jeopardy – Bohannan Huston	General Water	Sierz Enchanted Hills	Hunt Enchanted Hills	Dannenberg Enchanted Hills
7	Watersheds & Aquifers – UNM	Source Water	Marsh Enchanted Hills	Wallace ML King	Hunt Enchanted Hills
8	Rolling River – Ciudad SWCD	Watersheds	Zukowski Enchanted Hills		Sierz Enchanted Hills
9	RG Bosque Water Cycle - RGNC	Water Cycle	Dannenberg Enchanted Hills	Sierz Enchanted Hills	Lawton St.Thomas
10	Weather or Not - NOAA	Weather	Summerbell ML King	Dannenberg Enchanted Hills	Pearson ML King
11	Watersheds & Stormwater – SNL	Watersheds	Griego St. Thomas	Wiebelhaus Enchanted Hills	
12	Leaky Faucet – RRPS	Conservation	Salaz ML King	Mandich Enchanted Hills	Filkins ML King
13	NM Past and Present – NM Cultural Services	Historical Perspective	Lawton St.Thomas	Marsh Enchanted Hills	DeCristoforo ML King
14	Water Cycle – Ask Academy	Water Cycle		Griego St. Thomas	Zukowski Enchanted Hills
15	BEMPing it Up – BEMP	Ecosystems	Hunt Enchanted Hills	Filkins ML King	Summerbell ML King
16	Keep the Rio Grande – Stormwater Team	Watersheds	Pearson ML King	DeCristoforo ML King	Mandich Enchanted Hills
17	Virtual Water – OSE	General Water	Wiebelhaus Enchanted Hills	Summerbell ML King	Griego St. Thomas
	16 Presenters		**15 Classes**		

Booth	TUE Oct 23 morning		9:40 – 10:10	10:15 – 10:45	10:50 – 11:20
#	**Presentation**	**Category**			
1	Incredible Journey – NMED	Water Cycle	Sidor M Cordova	Hurlock M Cordova	Malan Bernalillo
2	No Dumping – KRRB	Recycling/Water Quality			
3	DW Model – Santa Fe	Water Quality	Sosa Bernalillo	Gabaldon M Cordova	Martinez Bernalillo
4	Let's Settle this Outside – Jacobs	Wastewater	Galvez-Romero Bernalillo	Alderson M Cordova	Paiz Rio Rancho
5	Basic Surface Water Treatment – Carollo	Water Quality	Hurlock M Cordova	Chavez Bernalillo	Steiner M Cordova
6	Water Jeopardy – Bohannan Huston	General Water	Malan Bernalillo	Sidor M Cordova	Bailey/Mashour Rio Rancho
7	Watersheds & Aquifers – UNM	Source Water	Lujan Bernalillo	Steiner M Cordova	Chavez Bernalillo
8	Rolling River – Ciudad SWCD	Watersheds	Paiz Rio Rancho	Galvez-Romero Bernalillo	Boldt Rio Rancho
9	RG Bosque Water Cycle - RGNC	Water Cycle	Aldaz Rio Rancho	Boldt Rio Rancho	Galvez-Romero Bernalillo
10	Weather or Not - NOAA	Weather	Martinez Bernalillo	Lujan Bernalillo	Sidor M Cordova
11	Watersheds & Stormwater – SNL	Watersheds	Alderson M Cordova	Sosa Bernalillo	Hurlock M Cordova
12	Leaky Faucet – RRPS	Conservation	Chavez Bernalillo	Zirpel M Cordova	Gabaldon M Cordova
13	NM Past and Present – NM Cultural Services	Historical Perspective	Boldt Rio Rancho	Malan Bernalillo	Sosa Bernalillo
14	Water Cycle – Ask Academy	Water Cycle	Bailey/Mashour Rio Rancho	Paiz Rio Rancho	Alderson M Cordova
15	BEMPing it Up – BEMP	Ecosystems	Gabaldon M Cordova	Aldaz Rio Rancho	Zirpel M Cordova
16	Keep the Rio Grande – Stormwater Team	Watersheds	Zirpel M Cordova	Bailey/Mashour Rio Rancho	Aldaz Rio Rancho
17	Virtual Water – OSE	General Water	Steiner M Cordova	Martinez Bernalillo	Lujan Bernalillo
	16 Presenters		**16 Classes**		

Booth	TUE Oct 23 afternoon		11:50 – 12:20	12:25 – 12:55	1:00 – 1:30
#	**Presentation**	**Category**			
1	Incredible Journey – NMED	Water Cycle	Pichette Sandia Vista	Wadsworth Sandia Vista	Reichbach E Stapleton
2	No dumping – KRRB	Recycling/Water Quality	Pasternaki/Hernandez Vista Grande	Bird Vista Grande	Fox - Sandia Vista Salido - Home School
3	DW Model – Santa Fe	Water Quality	Rojas/Sanchez E Stapleton	Gonzales Vista Grande	Lautt E Stapleton
4	Let's Settle this Outside – Jacobs	Wastewater	Zungia E Stapleton	Lowe E Stapleton	Walker Vista Grande
5	Basic Surface Water Treatment – Carollo	Water Quality	Wadsworth Sandia Vista	Pichette Sandia Vista	Marcotte E Stapleton
6	Water Jeopardy – Bohannan Huston	General Water	Grant Vista Grande	Pasternaki/Hernandez Vista Grande	Valdez Sandia Vista
7	Watersheds & Aquifers – UNM	Source Water	Valdez Sandia Vista	Rojas/Sanchez E Stapleton	Glauvitz/Cook Sandia Vista
8	Rolling River – Ciudad SWCD	Watersheds	Rambaldi Sandia Vista	Walker Vista Grande	Wadsworth Sandia Vista
9	RG Bosque Water Cycle - RGNC	Water Cycle	Lowe E Stapleton	Glauvitz/Cook Sandia Vista	Rambaldi Sandia Vista
10	Weather or Not - NOAA	Weather	Lautt E Stapleton	Reichbach E Stapleton	Gonzales Vista Grande
11	Watersheds & Stormwater – SNL	Watersheds	Reichbach E Stapleton	Grant Vista Grande	Pichette Sandia Vista
12	Leaky Faucet – RRPS	Conservation	Glauvitz/Cook Sandia Vista	Valdez Sandia Vista	Rojas/Sanchez E Stapleton
13	NM Past and Present – NM Cultural Services	Historical Perspective	Walker Vista Grande	Lautt E Stapleton	Grant Vista Grande
14	Water Cycle – Ask Academy	Water Cycle	Marcotte E Stapleton	Fox - Sandia Vista Salido - Home School	Zungia E Stapleton
15	BEMPing it Up – BEMP	Ecosystems	Gonzales Vista Grande	Marcotte E Stapleton	Pasternaki/Hernandez Vista Grande
16	Keep the Rio Grande – Stormwater Team	Watersheds	Fox - Sandia Vista Salido - Home School	Zungia E Stapleton	Bird Vista Grande
17	Virtual Water – OSE	General Water	Bird Vista Grande	Rambaldi Sandia Vista	Lowe E Stapleton
	17 Presenters		**17 Classes**		

Appendix C

Festival Presentations

This appendix lists all of the Festival presentations and contacts. For each section, there is the name of the presentation, a brief description of the activity, the correlation of the presentation with the Next Generation Science Standards (NGSS), the contact information of the presenter and if available, where the teacher can locate a similar presentation if they would like to teach it in the classroom.

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Basic Surface Water Treatment
Students learn about processes used to clean water in a contemporary water treatment facility through an interactive process. This activity teaches children about the importance of water quality for drinking water.

Next Generation Science Standards, Grades 3-5:
Practice 2, Practice 3

Carollo Engineers
Rob Buss rbuss@carollo.com

****

BEMPin' It Up
Students learn about the plants, mammals, arthropods, and water table along the Bosque and how it is all supported by water in the Rio Grande.

Next Generation Science Standards, Grades 3-5:
Practice 6, Practice 7

Bosque Ecosystem Monitoring Program, UNM Dept. Biology & Bosque School
Kelly Steinberg (505) 898-6388 x 151 kelly.steiner@bosqueschool.org

Similar activity found on web: Habitats of the World, Discovery Education
http://www.discoveryeducation.com/teachers/free-lesson-plans/habitats-of-the-world.cfm

****

Drinking Water Model
The 3D EnviroScape® Drinking Water/Wastewater model traces the path of the water we use in our communities. Real water is drawn from the aquifer and enters the water treatment plant processes -- clean water is delivered for residential and commercial uses -- wastewater is sent for treatment -- treated water returned to the river.

Next Generation Science Standards, Grades 3-5:
Practice 1, Practice 2

City of Santa Fe – Water Conservation Office
Christine Chavez cychavez@ci.santa-fe.nm.us

****

Incredible Journey
During this activity, students become water molecules and move through the water cycle. They learn about the movement and distribution of water – as well as pollution – on the earth.

Next Generation Science Standards, Grades 3-5:

Practice 6, Practice 7

NM Environment Department, Surface Water Quality Bureau
Heidi Henderson heidi.henderson@state.nm.us

A similar activity found on web: Incredible Journey, Project WET
http://files.dnr.state.mn.us/education_safety/education/project_wet/sample_activity.pdf

****

Keep the Rio Grande

Keep the Rio Grande Activity is an interactive game where the students become an arroyo supplying stormwater to the Rio Grande. The stormwater picks up a variety of items as the flow increases creating a flood or raindrops, trash, pet waste, bacteria, plastics as the students pass the items down to the river. The students learn about stormwater quality and the impact we have on water in our neighborhoods and town. After the rain has stopped, students discuss the water and debris on the ground around them and at the end of the line the river. Then they are tasked with sorting all of the items to bins labeled: trash, compost, recycle and rain.

Next Generation Science Standards, Grades 3-5:
Practice 1, Practice 2

Middle Rio Grande Stormwater Quality Team
Xavier Pettes (505) 891-5045 xpettes@rrnm.gov

****

Leaky Faucet

Students create a water leak and scientifically measure the leak using graduated cylinders over three tests. The students then compute the average milliliters of water leaked over one minute to the amount of gallons of water leaked and wasted over one year.

Next Generation Science Standards, Grades 3-5:
Practice 4, Practice 5

Rio Rancho Public Schools
Lou Cusimano (505) 975-0326
lou.cusimano@rrps.net

A similar activity found on web: Leaky Faucet, Utah Education Network
http://www.uen.org/Lessonplan/preview.cgi?LPid=27247

****

Let's Settle This Outside

Students become wastewater operators and learn how the wastewater treatment plant cleans dirty water. They then create wastewater using everyday materials and clean the wastewater by sorting it into three stations: water, sludge, and trash.

Next Generation Science Standards, Grades 3-5:
Practice 1,

Jacobs
Billy Jaquez (505) 891-5024 billy.jaquez@jacobs.com
Rita Armijo (505) 891-5024

A similar activity found on web: Wastewater: We Treat it Right, City of Boise
http://bee.cityofboise.org/media/216580/43385_Wastewater.pdf

****

New Mexico Past and Present
Students learn where water comes from (the water cycle), where water is today in New Mexico, and what they can do to protect and conserve water. The students then become detectives to discover where water occurred in the past in New Mexico.

Next Generation Science Standards, Grades 3-5:
Practice 3, Practice 6

New Mexico Museum of Natural History and Science
Mike Sanchez (505) 841-2583 michael.sanchez1@state.nm.us

****

No Dumping

The 3D EnviroScape® Landfill Model was utilized to teach students the importance of landfills. The students demonstrated how both landfills and illegal dumpsites affect the environment. Students participated by adding mock hazardous items that can be found in both landfills and illegal dumpsites. This allowed the students to see how hazardous items affected the environment and how landfills can protect the environment from these hazards.

Next Generation Science Standards, Grades 3-5:
Practice 2

City of Rio Rancho, Keep Rio Rancho Beautiful
Zac Keintz (505) 896-8729 zkeintz@rrnm.gov

****

Rio Grande Bosque Water Cycle

In the semi-arid climate of New Mexico, our scarce precipitation limits the quantity of water available for use by plants, animals and humans. Students become water molecules traveling through a water cycle. The presentation emphases, with evidence and cause and effect, why we need to consider all water users when making water-use decisions.

Next Generation Science Standards, Grades 3-5:
Practice 6, Practice 7

Rio Grande Nature Center
Tanja George (505) 344-7240 Tanja.George@state.nm.us

A similar activity found on web: Incredible Journey, Project WET
http://files.dnr.state.mn.us/education_safety/education/project_wet/sample_activity.pdf

****

Rolling River

How does a river work? Students interact with a model watershed and watch the cause and effects of precipitation as it flows down-gradient from urban and rural environments. Students learn about "pervious" and “impervious” surfaces and their relationship with the water cycle, including pollutant transport and increased erosion. Students learn that their personal actions can protect their watershed.

Next Generation Science Standards, Grades 3-5:
Practice 2, Practice 7

Ciudad Soil and Water Conservation District
Steve Glass
ciudadswcd1944@gmail.com

A similar activity found on web: Protecting Our Water Resources, Midwest Research Institute (See Level 2)
http://www.stormwater.ucf.edu/toolkit/vol3/Contents/pdfs/Student%20Activities/student_activities.pdf

****

Virtual Water

The activity teaches students the importance of water and introduces /explains the terms "direct" and "indirect" water use and challenge students to think of how all water use is connected.
Students create a "water web" that illustrates their dependence on water and their interdependence among other water users. Students learn how water users depend upon the goods and services provided by other water users.

Next Generation Science Standards, Grades 3-5:
Practice 1, Practice 2

New Mexico Office of the State Engineer,
Water Conservation Bureau
Julie Valdez
julie.valdez@state.nm.us

****

Water Cycle

The students made bracelets with different colored beads that represented phases of the water cycle. Additionally, the students participated in an interactive matching game, where the students had to match the steps of the water cycle to the correct pictures, as well as guess how much clean water is readily available to us.

Next Generation Science Standards, Grades 3-5:
Practice 1, Practice 2

The ASK Academy
Barbara McCann (505) 366-3437
bmccann@theaskacademy.org

****

Water Jeopardy

Students learn basic concepts and differences about groundwater vs. surface water supply for potable drinking water. The concepts are reinforced by participation in a Jeopardy game where students compete to determine the correct water "question" for a series of given "answers" (like the TV show).

Next Generation Science Standards, Grades 3-5:
Practice 1

Bohannon Huston, Inc.
Nathan Roberts (505) 823-1000
nroberts@bhinc.com

A similar activity found on web: The Water Cycle Jeopardy, Super Teacher Tools (online Flash game for up to 5 teams)
http://www.superteachertools.com/jeopardy/usergames/Jan201205/game1327973751.php

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Watersheds and Aquifers

Students learn about watersheds by examining and manipulating both types of models. They learn that a watershed is the land area that drains to a water body such as a river or lake. The

students also learn how drinking water comes from aquifers and how pollution can influence water quality.

Next Generation Science Standards, Grades 3-5:
Practice 1, Practice 2

University of New Mexico, Civil Engineering
Blade Allen blallen3196@unm.edu

A similar activity found on web: Protecting Our Water Resources, Midwest Research Institute (See Level 2)
http://www.stormwater.ucf.edu/toolkit/vol3/Contents/pdfs/Student%20Activities/student_activities.pdf

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Watersheds and Stormwater
Students learn about watersheds by examining and manipulating watershed models. They learn that a watershed is the land area that drains to a water body such as a river or lake. They see for themselves how watersheds can influence water quality.
Next Generation Science Standards, Grades 3-5:
Practice 1, Practice 2

http://www.stormwater.ucf.edu/toolkit/vol3/Contents/pdfs/Student%20Activities/student_activities.pdf

Sandia National Laboratories
John Kay (505) 344-7240
jtkay@sandia.gov

A similar activity found on web: Protecting Our Water Resources, Midwest Research Institute (See Level 2)

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Weather or Not
Students analyze meteorological and hydrological data to determine if a flash flood might occur, issue warnings, and monitor the flood event.

Next Generation Science Standards, Grades 3-5:
Practice 1, Practice 2, Practice 3,

National Oceanic & Atmospheric Administration, National Weather Service
Kerry Jones (505) 243-0702 kerry.jones@noaa.gov

A similar activity found on web: Create Your Own Water Cycle, The Water Project
http://thewaterproject.org/resources/lesson-plans/create-a-mini-water-cycle.php

Appendix D

Information to Teachers

The following information was included in the teacher packets with the student's pre- and post-tests.

2018 Children's Water Festival

Monday, October 22nd
Tuesday October 23rd

Santa Ana Star Center

3001 Civic Center Circle NE
Rio Rancho, NM 87144

Theme: "***How do You Conserve Water in a Drought?***"

The Children's Water Festival has been arranged so **ALL** fourth-grade students in Rio Rancho and Bernalillo Elementary can attend the event. This is a ***FREE*** event for the students and teachers using monies donated from local businesses who care about water-related education.

The water festival is organized with three activities in the morning and three activities in the afternoon. Each school will attend on one day at either the morning or afternoon session. Each class will attend three activities during their session.

Morning Session	Afternoon Session
9:40-10:10	11:50-12:20
10:15-10:45	12:25-12:55
10:50-11:20	1:00-1:30

Chaperones

It is recommend at least one adult be present for every ten students. Chaperones are responsible for their own transportation to the Star Center. They have not been included in the bus count. Please ask all chaperones and any volunteers from the school to wear their school badges. **We ask that only the approved chaperones attend from your school. Please no "extra" parents/grandparents that show up to watch; they will be turned away!** If you do have any of these "extras", have them contact me prior to the event and I can assign them to be volunteers at the event.

Transportation

Buses are provided and paid by the Children's Water Festival. There will be no place or time for students to eat lunch at the Star Center, so plan on your students' lunch period to be at your school either before or after the water festival.

RRPS TEACHERS ARE RESPONSIBLE FOR FILLING OUT THE TRIP TRACKER.

- **Morning Sessions - Schedule for 9:15 pick up and 11:25 pick up**
- **Afternoon Sessions – Schedule for 11:25 pick up and 1:30 pick up**
- **Bernalillo and St. Thomas will be scheduled by City Staff**

These are the schools that will be attending with dates and arrival times.

Elementary School	Lead Teacher	Email	Number Classes	Day	Time
Puesta del Sol	Sarah Parker	sarah.parker@rrps.net	6	10/22	9:40
Colinas Del Norte	Ashley Randall	ashley.randall@rrps.net	5	10/22	9:40
Cielo Azul	Karin McCann	karin.mccann@rrps.net	5	10/22	9:40
St. Thomas	Pat Lawton	pat.lawton@stasnm.net	2	10/22	11:50
M.L. King	Allison Salaz	allison.salaz@rrps.net	7	10/22	11:50
Enchanted Hills	Christina Mandich	christina.mandich@rrps.net	7	10/22	11:50
M. Cordova	Cheyenne Zirpel	Cheyenne.zirpel@rrps.net	6	10/23	9:40
Rio Rancho	Joy Christopherson	joy.christopherson@rrps.net	4	10/23	9:40
Bernalillo	Samantha Lujan	slujan@bps.k12.nm.us	6	10/23	9:40
Vista Grande	Bethany Grant	bethany.grant@rrps.net	5	10/23	11:50
E. Stapleton	Carey Rojas	carey.rojas@rrps.net	6	10/23	11:50
Sandia Vista	Merry Wadsworth Veronica Valdez (Mont.)	merry.wadsworth@rrps.net veronica.valdez@rrps.net	6	10/23	11:50
Total (as of 9/12/18)			65		

Water Conservation staff would love to meet with all your 4th grade teachers to go over the festival and the logistics. The meeting should take about 15 minutes or so.

Please contact Marian Wrage, Rio Rancho Environmental Programs Manager and Festival Director, if there are any questions and to schedule the meeting with your 4th grade team. Marian's telephone number is (505) 896-8737, her cell is (505) 681-7325, and her email is mwrage@rrnm.gov.

The Rio Rancho Children's Water Festival funding has been provided by:

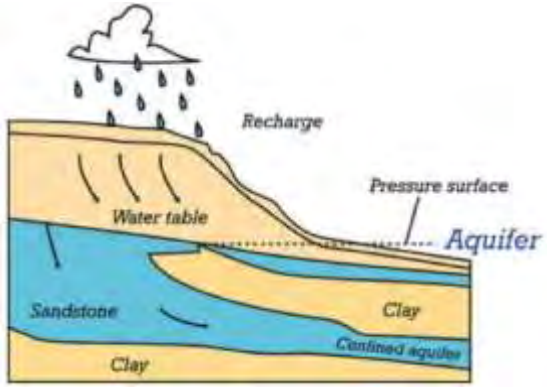
SPONSORS

Pre and Post Test

The Festival steering committee rewrote the student test in 2017; diagrams and pictures were added to help the students visualize the concepts. Note that references to "Rio Rancho" on the tests was changed to "Bernalillo" for the students attending from Bernalillo Elementary.

1. Many substances and objects can make river water dirty. Which of the following items can make the Rio Grande dirty?
   a) Trash
   b) Dog poop
   c) Leaky cars
   d) All the above

2. An **aquifer** is a layer of water-saturated porous rock. It lies below the water table. Most people who live in New Mexico get drinking water from a well drilled into an aquifer. If you live in Rio Rancho, is the water coming from your faucet from an aquifer?
   a) True
   b) False



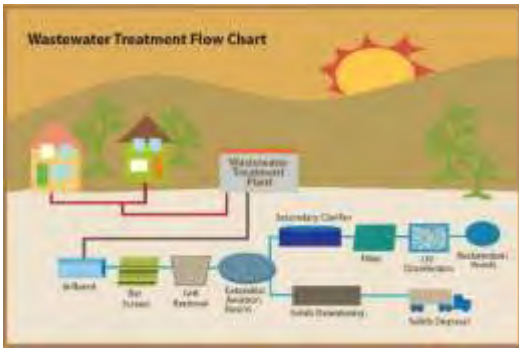
3. A **watershed** is an area of land that drains all the streams and rainfall to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel. Is the following statement true or false: We all live in a watershed?
   a) False
   b) True

4. Everyone in Rio Rancho/Bernalillo uses, on average, about 65 gallons of water per person per day. If you have four people in your home, what is your family's daily average water use?
   a) 260 gallons of water per day
   b) 200 gallons of water per day
   c) 2,600 gallons of water per day

5. Water users in our state include plants, animals, and people. Why is water so important to life?
   a) People need it to survive
   b) Plants need it to survive
   c) The river needs it to support nature
   d) All the above

6. The **water cycle** happens as the earth is warmed by the sun and water circulates between the earth's oceans, atmosphere, and land. Which of the following are terms associated with the water cycle?
   a) Pumping, Treatment, Delivery
   b) Evaporation, Condensation, Precipitation
   c) River, stream, aquifer

7. How can we protect our water?
   a) Litter
   b) Tell your parents when you see a leak
   c) Pour chemicals on the ground



8. **Wastewater** (or sewer water) is the used water from toilets, showers, and clothes washers and it is too dirty to go straight into the river or into the ground. Septic tanks and wastewater treatment plants clean the water before it goes to the river or into the ground.
   a) True
   b) False

Appendix E

Statistical Outcomes from Students' Tests by School, Teacher, and Question

The following table shows the percentage of students that got the question correct on both the pre and post-test. The improvement is shown by the increase/decrease in percentage points. Not every teacher from every school provided pre and post-tests. ***There was a 9 percentage point increase from pre- to post-tests for all the participating students.***

Table 1 shows the increase/decrease by question for the entire testing group.
Table 2 shows the test increase/decrease average by school and teacher.
Table 3 shows pre- and post-test by each teacher (school) for each question.

Table 1 **Test Question**	**Increase from Pre to Post-Test**
1 Makes river dirty	19%
2 DW come from	8%
3 Watershed	29%
4 How much Water	7%
5 H2O important to life	7%
6 Water Cycle	7%
7 Protect water	3%
8 Wastewater	2%

Table 2 **School**	**Average %**	**Average % by School**
Bernalillo		
Galvez-Romero (BES)	5%	
		5%
Cielo Azul		
Romero	21%	
Infantino/Lynch	8%	
Lambson	8%	
McCann	26%	
Messenger	16%	
		16%

Colinas del Norte		
Randall	13%	
Farfan	15%	
Vargas	14%	
Torres	11%	
Wiberg	1%	
		11%
Enchanted Hills		
Zukowski	-2%	
Dannenberg	-4%	
Sierz	7%	
Mandich	15%	
Marsh	5%	
Wiebelhaus	17%	
		6%
Ernest Stapleton		
Lowe	16%	
Lautt	11%	
Reichbach	14%	
Rojas/Sanchez	13%	
Marcotte	8%	
Zuniga	5%	
		11%
Maggie Cordova		
Alderson	-12%	
Gabaldon	4%	
Hurlock	7%	
Sidor	1%	
Steiner	15%	
Zirpel	15%	
		5%
Martin Luther King		
DeChristoforo	24%	
Pearson	16%	
Salaz	3%	
		14%
Puesta del Sol		
Langdon/Romero	13%	
Ulibarri	26%	
Straley/Parker	-2%	
Smith	15%	
		13%

Rio Rancho		
Aldaz	17%	
Boldt	3%	
Bailey/Mashour	8%	
Paiz	2%	
		8%
Sandia Vista		
Pichette	9%	
Fox	13%	
Glauvitz/Cook	17%	
Rambaldi	14%	
Valdez	4%	
Wadsworth	12%	
		11%
St. Thomas Aquinas		
Lawton	3%	
Griego	10%	
		6%
Vista Grande		
Grant	15%	
Paternaki/Hernandez	6%	
Gonzales	13%	
Bird	2%	
Walker	25%	
		12%
Increase/Decrease		9%

Table 3

Teacher (School) Question#	**AS PERCENTAGE**		
Galvez-Romero (BES)	Pre %	Post %	Improvement
1 Makes river dirty	38%	46%	8%
2 DW come from	31%	69%	38%
3 Watershed	62%	85%	23%
4 How much Water	69%	62%	-7%
5 H2O important to life	54%	54%	0%
6 Water Cycle	38%	46%	8%
7 Protect water	54%	46%	-8%
8 Wastewater	85%	62%	-23%
Average %	54%	59%	
	Average increase =		5%

Romero (CA)	Pre %	Post %	Improvement
1 Makes river dirty	42%	91%	49%
2 DW come from	68%	100%	32%
3 Watershed	11%	55%	44%
4 How much Water	58%	64%	6%
5 H2O important to life	53%	73%	20%
6 Water Cycle	32%	45%	13%
7 Protect water	74%	91%	17%
8 Wastewater	74%	64%	-10%
Average %	52%	73%	
	Average increase =		21%

Infantino/Lynch (CA)	Pre %	Post %	Improvement
1 Makes river dirty	84%	88%	4%
2 DW come from	60%	76%	16%
3 Watershed	48%	68%	20%
4 How much Water	56%	80%	24%
5 H2O important to life	80%	84%	4%
6 Water Cycle	64%	80%	16%
7 Protect water	88%	88%	0%
8 Wastewater	80%	60%	-20%
Average %	70%	78%	
	Average increase =		8%

Lambson (CA)	Pre %	Post %	Improvement
1 Makes river dirty	80%	96%	16%
2 DW come from	80%	92%	12%
3 Watershed	20%	25%	5%
4 How much Water	64%	75%	11%
5 H2O important to life	88%	88%	0%
6 Water Cycle	88%	79%	-9%
7 Protect water	100%	92%	-8%
8 Wastewater	60%	95%	35%
Average %	73%	80%	
	Average increase =		8%

McCann (CA)	Pre %	Post %	Improvement
1 Makes river dirty	35%	69%	34%
2 DW come from	47%	88%	41%
3 Watershed	41%	75%	34%
4 How much Water	53%	63%	10%
5 H2O important to life	35%	63%	28%
6 Water Cycle	35%	69%	34%
7 Protect water	59%	88%	29%
8 Wastewater	71%	69%	-2%
Average %	47%	73%	
	Average increase =		26%

Messenger (CA)	Pre %	Post %	Improvement
1 Makes river dirty	33%	61%	28%
2 DW come from	83%	83%	0%
3 Watershed	22%	72%	50%
4 How much Water	50%	67%	17%
5 H2O important to life	44%	78%	34%
6 Water Cycle	44%	61%	17%
7 Protect water	89%	89%	0%
8 Wastewater	83%	61%	-22%
Average %	56%	72%	
	Average increase =		16%

Randall (CDN)	Pre %	Post %	Improvement
1 Makes river dirty	74%	82%	8%
2 DW come from	70%	73%	3%
3 Watershed	30%	64%	34%
4 How much Water	83%	100%	17%
5 H2O important to life	74%	82%	8%
6 Water Cycle	30%	59%	29%
7 Protect water	87%	91%	4%
8 Wastewater	70%	68%	-2%
Average %	65%	77%	
	Average increase =		13%

Farfan (CDN)	Pre %	Post %	Improvement
1 Makes river dirty	38%	96%	58%
2 DW come from	75%	71%	-4%
3 Watershed	50%	50%	0%
4 How much Water	54%	63%	9%
5 H2O important to life	63%	83%	20%
6 Water Cycle	33%	50%	17%
7 Protect water	58%	88%	30%
8 Wastewater	79%	67%	-12%
Average %	56%	71%	
	Average increase =		15%

Vargas (CDN)	Pre %	Post %	Improvement
1 Makes river dirty	67%	95%	28%
2 DW come from	62%	89%	27%
3 Watershed	48%	53%	5%
4 How much Water	76%	100%	24%
5 H2O important to life	90%	100%	10%
6 Water Cycle	52%	74%	22%
7 Protect water	100%	100%	0%
8 Wastewater	86%	79%	-7%
Average %	73%	86%	
	Average increase =		14%

Torres (CDN)	Pre %	Post %	Improvement
1 Makes river dirty	27%	73%	46%
2 DW come from	82%	82%	0%
3 Watershed	64%	82%	18%
4 How much Water	64%	68%	4%
5 H2O important to life	36%	64%	28%
6 Water Cycle	32%	27%	-5%
7 Protect water	86%	86%	0%
8 Wastewater	82%	82%	0%
Average %	59%	71%	
	Average increase =		11%

Wiberg (CDN)	Pre %	Post %	Improvement
1 Makes river dirty	45%	50%	5%
2 DW come from	86%	78%	-8%
3 Watershed	59%	72%	13%
4 How much Water	59%	67%	8%
5 H2O important to life	73%	56%	-17%
6 Water Cycle	55%	56%	1%
7 Protect water	77%	78%	1%
8 Wastewater	68%	70%	2%
Average %	65%	66%	
	Average increase =		1%

Zukowski (EH)	Pre %	Post %	Improvement
1 Makes river dirty	89%	78%	-11%
2 DW come from	89%	94%	5%
3 Watershed	39%	72%	33%
4 How much Water	56%	50%	-6%
5 H2O important to life	78%	67%	-11%
6 Water Cycle	89%	67%	-22%
7 Protect water	89%	83%	-6%
8 Wastewater	72%	72%	0%
Average %	75%	73%	
	Average increase =		-2%

Dannenberg (EH)	Pre %	Post %	Improvement
1 Makes river dirty	83%	86%	3%
2 DW come from	91%	86%	-5%
3 Watershed	57%	52%	-5%
4 How much Water	65%	67%	2%
5 H2O important to life	91%	95%	4%
6 Water Cycle	74%	52%	-22%
7 Protect water	96%	95%	-1%
8 Wastewater	96%	86%	-10%
Average %	82%	77%	
	Average increase =		-4%

Sierz (EH)	Pre %	Post %	Improvement
1 Makes river dirty	85%	88%	3%
2 DW come from	81%	88%	7%
3 Watershed	31%	84%	53%
4 How much Water	92%	88%	-4%
5 H2O important to life	92%	96%	4%
6 Water Cycle	85%	96%	11%
7 Protect water	100%	92%	-8%
8 Wastewater	96%	84%	-12%
Average %	83%	90%	
	Average increase =		7%

Mandich (EH)	Pre %	Post %	Improvement
1 Makes river dirty	61%	78%	17%
2 DW come from	65%	78%	13%
3 Watershed	22%	61%	39%
4 How much Water	61%	65%	4%
5 H2O important to life	78%	87%	9%
6 Water Cycle	61%	83%	22%
7 Protect water	91%	96%	5%
8 Wastewater	74%	87%	13%
Average %	64%	79%	
	Average increase =		15%

Marsh (EH)	Pre %	Post %	Improvement
1 Makes river dirty	50%	67%	17%
2 DW come from	78%	90%	12%
3 Watershed	17%	19%	2%
4 How much Water	61%	57%	-4%
5 H2O important to life	44%	62%	18%
6 Water Cycle	56%	52%	-4%
7 Protect water	56%	67%	11%
8 Wastewater	67%	57%	-10%
Average %	54%	59%	
	Average increase =		5%

Wiebelhaus (EH)	Pre %	Post %	Improvement
1 Makes river dirty	82%	95%	13%
2 DW come from	59%	91%	32%
3 Watershed	18%	91%	73%
4 How much Water	82%	100%	18%
5 H2O important to life	82%	82%	0%
6 Water Cycle	77%	82%	5%
7 Protect water	95%	100%	5%
8 Wastewater	91%	77%	-14%
Average %	73%	90%	
	Average increase =		17%

Lowe (ES)	Pre %	Post %	Improvement
1 Makes river dirty	55%	68%	13%
2 DW come from	80%	84%	4%
3 Watershed	40%	53%	13%
4 How much Water	60%	79%	19%
5 H2O important to life	60%	79%	19%
6 Water Cycle	60%	84%	24%
7 Protect water	90%	89%	-1%
8 Wastewater	55%	89%	34%
Average %	63%	78%	
	Average increase =		16%

Lautt (ES)	Pre %	Post %	Improvement
1 Makes river dirty	59%	89%	30%
2 DW come from	82%	94%	12%
3 Watershed	47%	61%	14%
4 How much Water	76%	67%	-9%
5 H2O important to life	41%	39%	-2%
6 Water Cycle	53%	50%	-3%
7 Protect water	59%	83%	24%
8 Wastewater	47%	67%	20%
Average %	58%	69%	
	Average increase =		11%

Reichbach (ES)	Pre %	Post %	Improvement
1 Makes river dirty	65%	91%	26%
2 DW come from	78%	86%	8%
3 Watershed	30%	82%	52%
4 How much Water	74%	73%	-1%
5 H2O important to life	61%	82%	21%
6 Water Cycle	96%	95%	-1%
7 Protect water	96%	95%	-1%
8 Wastewater	78%	86%	8%
Average %	72%	86%	
	Average increase =		14%

Rojas / Sanchez (ES)	Pre %	Post %	Improvement
1 Makes river dirty	26%	80%	54%
2 DW come from	68%	85%	17%
3 Watershed	53%	70%	17%
4 How much Water	79%	60%	-19%
5 H2O important to life	58%	65%	7%
6 Water Cycle	68%	60%	-8%
7 Protect water	74%	100%	26%
8 Wastewater	68%	75%	7%
Average %	62%	74%	
	Average increase =		13%

Marcotte (ES)	Pre %	Post %	Improvement
1 Makes river dirty	48%	68%	20%
2 DW come from	65%	60%	-5%
3 Watershed	48%	52%	4%
4 How much Water	74%	64%	-10%
5 H2O important to life	61%	72%	11%
6 Water Cycle	48%	84%	36%
7 Protect water	91%	96%	5%
8 Wastewater	61%	64%	3%
Average %	62%	70%	
	Average increase =		8%

Zuniga (ES)	Pre %	Post %	Improvement
1 Makes river dirty	57%	63%	6%
2 DW come from	74%	84%	10%
3 Watershed	30%	68%	38%
4 How much Water	78%	74%	-4%
5 H2O important to life	70%	68%	-2%
6 Water Cycle	61%	74%	13%
7 Protect water	96%	89%	-7%
8 Wastewater	87%	74%	-13%
Average %	69%	74%	
	Average increase =		5%

Alderson (MC)	Pre %	Post %	Improvement
1 Makes river dirty	45%	88%	43%
2 DW come from	85%	25%	-60%
3 Watershed	30%	50%	20%
4 How much Water	50%	13%	-37%
5 H2O important to life	75%	94%	19%
6 Water Cycle	65%	44%	-21%
7 Protect water	95%	56%	-39%
8 Wastewater	65%	44%	-21%
Average %	64%	52%	
	Average increase =		-12%

Gabaldon (MC)	Pre %	Post %	Improvement
1 Makes river dirty	72%	75%	3%
2 DW come from	64%	63%	-1%
3 Watershed	36%	42%	6%
4 How much Water	80%	42%	-38%
5 H2O important to life	52%	71%	19%
6 Water Cycle	20%	17%	-3%
7 Protect water	80%	92%	12%
8 Wastewater	60%	92%	32%
Average %	58%	62%	
	Average increase =		4%

Hurlock (MC)	Pre %	Post %	Improvement
1 Makes river dirty	57%	67%	10%
2 DW come from	67%	71%	4%
3 Watershed	29%	52%	23%
4 How much Water	57%	67%	10%
5 H2O important to life	57%	67%	10%
6 Water Cycle	57%	38%	-19%
7 Protect water	67%	86%	19%
8 Wastewater	57%	57%	0%
Average %	56%	63%	
	Average increase =		7%

Sidor (MC)	Pre %	Post %	Improvement
1 Makes river dirty	52%	65%	13%
2 DW come from	65%	75%	10%
3 Watershed	48%	70%	22%
4 How much Water	74%	55%	-19%
5 H2O important to life	61%	70%	9%
6 Water Cycle	52%	45%	-7%
7 Protect water	100%	80%	-20%
8 Wastewater	74%	75%	1%
Average %	66%	67%	
	Average increase =		1%

Steiner (MC)	Pre %	Post %	Improvement
1 Makes river dirty	58%	56%	-2%
2 DW come from	74%	94%	20%
3 Watershed	42%	72%	30%
4 How much Water	53%	89%	36%
5 H2O important to life	63%	67%	4%
6 Water Cycle	53%	72%	19%
7 Protect water	100%	100%	0%
8 Wastewater	58%	72%	14%
Average %	63%	78%	
	Average increase =		15%

Zirpel (MC)	Pre %	Post %	Improvement
1 Makes river dirty	32%	48%	16%
2 DW come from	63%	71%	8%
3 Watershed	42%	71%	29%
4 How much Water	53%	81%	28%
5 H2O important to life	47%	62%	15%
6 Water Cycle	47%	62%	15%
7 Protect water	79%	81%	2%
8 Wastewater	58%	67%	9%
Average %	53%		
	Average increase =		15%

DeCristoforo (MLK)	Pre %	Post %	Improvement
1 Makes river dirty	100%	100%	0%
2 DW come from	75%	100%	25%
3 Watershed	31%	100%	69%
4 How much Water	31%	100%	69%
5 H2O important to life	94%	100%	6%
6 Water Cycle	100%	100%	0%
7 Protect water	94%	100%	6%
8 Wastewater	81%	100%	19%
Average %	76%	100%	
	Average increase =		24%

Pearson (MLK)	Pre %	Post %	Improvement
1 Makes river dirty	44%	80%	36%
2 DW come from	76%	72%	-4%
3 Watershed	12%	56%	44%
4 How much Water	72%	80%	8%
5 H2O important to life	72%	84%	12%
6 Water Cycle	76%	96%	20%
7 Protect water	96%	96%	0%
8 Wastewater	76%	84%	8%
Average %	66%	81%	
	Average increase =		16%

Salaz (MLK)	Pre %	Post %	Improvement
1 Makes river dirty	83%	88%	5%
2 DW come from	91%	92%	1%
3 Watershed	35%	28%	-7%
4 How much Water	91%	84%	-7%
5 H2O important to life	74%	92%	18%
6 Water Cycle	57%	80%	23%
7 Protect water	91%	88%	-3%
8 Wastewater	78%	72%	-6%
Average %	75%	78%	
	Average increase =		3%

Langdon/Romero (PDS)	Pre %	Post %	Improvement
1 Makes river dirty	35%	76%	41%
2 DW come from	57%	80%	23%
3 Watershed	43%	68%	25%
4 How much Water	48%	48%	0%
5 H2O important to life	74%	68%	-6%
6 Water Cycle	74%	80%	6%
7 Protect water	91%	96%	5%
8 Wastewater	70%	80%	10%
Average %	62%	75%	
	Average increase =		13%

Ulibarri (PDS)	Pre %	Post %	Improvement
1 Makes river dirty	32%	73%	41%
2 DW come from	77%	82%	5%
3 Watershed	23%	64%	41%
4 How much Water	68%	82%	14%
5 H2O important to life	32%	82%	50%
6 Water Cycle	59%	82%	23%
7 Protect water	77%	100%	23%
8 Wastewater	64%	77%	13%
Average %	54%	80%	
	Average increase =		26%

Straley/Parker (PDS)	Pre %	Post %	Improvement
1 Makes river dirty	89%	88%	-1%
2 DW come from	89%	71%	-18%
3 Watershed	16%	35%	19%
4 How much Water	74%	82%	8%
5 H2O important to life	89%	76%	-13%
6 Water Cycle	63%	59%	-4%
7 Protect water	100%	94%	-6%
8 Wastewater	95%	94%	-1%
Average %	77%	75%	
	Average increase =		-2%

Smith (PDS)	Pre %	Post %	Improvement
1 Makes river dirty	60%	84%	24%
2 DW come from	55%	84%	29%
3 Watershed	40%	53%	13%
4 How much Water	45%	42%	-3%
5 H2O important to life	70%	84%	14%
6 Water Cycle	45%	47%	2%
7 Protect water	80%	89%	9%
8 Wastewater	55%	84%	29%
Average %	56%	71%	
	Average increase =		15%

Aldaz (RR)	Pre %	Post %	Improvement
1 Makes river dirty	40%	88%	48%
2 DW come from	64%	80%	16%
3 Watershed	32%	80%	48%
4 How much Water	56%	52%	-4%
5 H2O important to life	60%	80%	20%
6 Water Cycle	52%	32%	-20%
7 Protect water	92%	100%	8%
8 Wastewater	40%	60%	20%
Average %	55%	72%	
	Average increase =		17%

Boldt (RR)	Pre %	Post %	Improvement
1 Makes river dirty	65%	78%	13%
2 DW come from	55%	67%	12%
3 Watershed	20%	61%	41%
4 How much Water	45%	33%	-12%
5 H2O important to life	75%	72%	-3%
6 Water Cycle	45%	50%	5%
7 Protect water	85%	78%	-7%
8 Wastewater	90%	61%	-29%
Average %	60%	63%	
	Average increase =		3%

Bailey/Mashour (RR)	Pre %	Post %	Improvement
1 Makes river dirty	56%	59%	3%
2 DW come from	84%	82%	-2%
3 Watershed	24%	68%	44%
4 How much Water	38%	59%	21%
5 H2O important to life	68%	59%	-9%
6 Water Cycle	40%	59%	19%
7 Protect water	76%	86%	10%
8 Wastewater	84%	64%	-20%
Average %	59%	67%	
	Average increase =		8%

Paiz (RR)	Pre %	Post %	Improvement
1 Makes river dirty	53%	61%	8%
2 DW come from	74%	83%	9%
3 Watershed	16%	26%	10%
4 How much Water	63%	57%	-6%
5 H2O important to life	79%	78%	-1%
6 Water Cycle	68%	57%	-11%
7 Protect water	84%	91%	7%
8 Wastewater	89%	91%	2%
Average %	66%	68%	
	Average increase =		2%

Pichette (SV)	Pre %	Post %	Improvement
1 Makes river dirty	61%	81%	20%
2 DW come from	52%	71%	19%
3 Watershed	57%	57%	0%
4 How much Water	91%	81%	-10%
5 H2O important to life	43%	71%	28%
6 Water Cycle	61%	57%	-4%
7 Protect water	83%	95%	12%
8 Wastewater	78%	81%	3%
Average %	66%	74%	
	Average increase =		9%

Fox (SV)	Pre %	Post %	Improvement
1 Makes river dirty	75%	100%	25%
2 DW come from	90%	84%	-6%
3 Watershed	50%	95%	45%
4 How much Water	65%	95%	30%
5 H2O important to life	95%	95%	0%
6 Water Cycle	95%	95%	0%
7 Protect water	95%	100%	5%
8 Wastewater	85%	89%	4%
Average %	81%	94%	
	Average increase =		13%

Glauvitz/Cook (SV)	Pre %	Post %	Improvement
1 Makes river dirty	68%	89%	21%
2 DW come from	95%	95%	0%
3 Watershed	37%	89%	52%
4 How much Water	47%	95%	48%
5 H2O important to life	84%	89%	5%
6 Water Cycle	68%	79%	11%
7 Protect water	95%	95%	0%
8 Wastewater	84%	84%	0%
Average %	72%	89%	
	Average increase =		17%

Rambaldi (SV)	Pre %	Post %	Improvement
1 Makes river dirty	61%	75%	14%
2 DW come from	78%	75%	-3%
3 Watershed	39%	60%	21%
4 How much Water	48%	55%	7%
5 H2O important to life	70%	75%	5%
6 Water Cycle	39%	60%	21%
7 Protect water	61%	80%	19%
8 Wastewater	70%	100%	30%
Average %	58%	73%	
	Average increase =		14%

Valdez (SV)	Pre %	Post %	Improvement
1 Makes river dirty	90%	100%	10%
2 DW come from	76%	90%	14%
3 Watershed	57%	67%	10%
4 How much Water	81%	76%	-5%
5 H2O important to life	100%	95%	-5%
6 Water Cycle	90%	90%	0%
7 Protect water	100%	100%	0%
8 Wastewater	62%	67%	5%
Average %	82%		
	Average increase =		4%

Wadsworth (SV)	Pre %	Post %	Improvement
1 Makes river dirty	61%	87%	26%
2 DW come from	52%	78%	26%
3 Watershed	43%	65%	22%
4 How much Water	70%	83%	13%
5 H2O important to life	96%	91%	-5%
6 Water Cycle	70%	87%	17%
7 Protect water	87%	96%	9%
8 Wastewater	83%	74%	-9%
Average %	70%	83%	
	Average increase =		12%

Lawton (ST)	Pre %	Post %	Improvement
1 Makes river dirty	75%	100%	25%
2 DW come from	85%	95%	10%
3 Watershed	25%	40%	15%
4 How much Water	65%	70%	5%
5 H2O important to life	90%	85%	-5%
6 Water Cycle	80%	85%	5%
7 Protect water	100%	85%	-15%
8 Wastewater	90%	70%	-20%
Average %	76%	79%	
	Average increase =		3%

Griego (ST)	Pre %	Post %	Improvement
1 Makes river dirty	58%	89%	31%
2 DW come from	63%	78%	15%
3 Watershed	32%	83%	51%
4 How much Water	84%	94%	10%
5 H2O important to life	79%	72%	-7%
6 Water Cycle	95%	100%	5%
7 Protect water	100%	94%	-6%
8 Wastewater	74%	56%	-18%
Average %	73%	83%	
	Average increase =		10%

Grant (VG)	Pre %	Post %	Improvement
1 Makes river dirty	35%	56%	21%
2 DW come from	77%	56%	-21%
3 Watershed	19%	64%	45%
4 How much Water	58%	72%	14%
5 H2O important to life	58%	52%	-6%
6 Water Cycle	19%	56%	37%
7 Protect water	69%	80%	11%
8 Wastewater	46%	68%	22%
Average %	48%	63%	
	Average increase =		15%

Paternaki/Hernandez (VG)	Pre %	Post %	Improvement
1 Makes river dirty	52%	87%	35%
2 DW come from	62%	70%	8%
3 Watershed	33%	61%	28%
4 How much Water	43%	61%	18%
5 H2O important to life	71%	70%	-1%
6 Water Cycle	71%	39%	-32%
7 Protect water	95%	83%	-12%
8 Wastewater	71%	78%	7%
Average %	62%	69%	
	Average increase =		6%

Gonzales (VG)	Pre %	Post %	Improvement
1 Makes river dirty	68%	89%	21%
2 DW come from	73%	78%	5%
3 Watershed	27%	89%	62%
4 How much Water	86%	96%	10%
5 H2O important to life	91%	81%	-10%
6 Water Cycle	55%	56%	1%
7 Protect water	91%	81%	-10%
8 Wastewater	64%	89%	25%
Average %	69%	82%	
	Average increase =		13%

Bird (VG)	Pre %	Post %	Improvement
1 Makes river dirty	60%	44%	-16%
2 DW come from	64%	78%	14%
3 Watershed	24%	56%	32%
4 How much Water	72%	78%	6%
5 H2O important to life	72%	50%	-22%
6 Water Cycle	44%	50%	6%
7 Protect water	80%	72%	-8%
8 Wastewater	60%	67%	7%
Average %	60%	62%	
	Average increase =		2%

Walker (VG)	Pre %	Post %	Improvement
1 Makes river dirty	59%	59%	0%
2 DW come from	74%	81%	7%
3 Watershed	11%	85%	74%
4 How much Water	63%	85%	22%
5 H2O important to life	56%	70%	14%
6 Water Cycle	41%	81%	40%
7 Protect water	78%	96%	18%
8 Wastewater	63%	85%	22%
Average %	56%	80%	
	Average increase =		25%

Exhibit 8
Diverted Waste and Material Reuse

City of Albuquerque

FY19 Total HHW (lbs) Diverted from Landfill

Calandar Year	Month	Recycled Waste														Sent for Destruction						
		Reuse Center	RC0014 Waste Oil	RC5056 Motor Fluids	RC0016 Lead Acid Batteries	RC6006 Mercury	ACT15687 Household Paint, xylene, tolulene 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	RC0012 Acids	RC0013 Bases	RC0015 Flamables Toxics Incenerated	RC6002 Toxic-Solid (Poisons)	RC7182 Oxidizers	Misc*	TOTAL
2018	Jul	3,390	13,934	13,468	0	0	0	3,412	1,795	0	305	514	0	291	0	339	181	875	869	0	0	39,373
	Aug	3,906	15,751	13,259	0	26	790	2,446	1,774	193	0	135	0	1,197	0	525	194	1,004	854	0	0	42,054
	Sep	2,814	10,688	17,241	3,276	0	0	2,440	425	0	468	335	0	306	0	665	190	481	399	0	0	39,728
	Oct	2,706	7,689	10,341	3,366	0	0	1,629	767	0	0	192	0	594	0	204	255	1,711	364	0	0	29,818
	Nov	1,956	14,016	14,900	1,200	0	0	1,651	840	176	244	216	0	313	465	355	110	449	140	0	301	37,332
	Dec	1,506	4,149	6,393	0	0	0	848	422	0	0	232	0	0	138	391	0	353	291	0	0	14,723
MID YEAR		16,278	66,227	75,602	7,842	26	790	12,426	6,023	369	1,017	1,624	0	2,701	603	2,479	930	4,873	2,917	0	301	203,028
2019	Jan	786	7,360	9,600	0	30	1,111	1,703	0	0	0	216	0	700	133	268	337	1,142	189	446	0	24,021
	Feb	1,866	11,740	15,460	0	0	904	1,404	451	0	0	341	0	372	88	458	0	488	411	139	755	34,877
	Mar	444	6,959	10,279	0	0	0	1,577	780	231	0	669	0	793	131	186	0	909	162	0	0	23,120
	Apr	1,782	12,623	11,288	1,187	0	1,800	1,761	889	30	0	605	0	472	160	445	499	681	448	0		34,670
	May	3,120	12,664	12,294	1,442	0	2,363	2,666	886	222	304	242	0	532	148	732	182	952	614	0	301	39,664
	Jun	8,340	16,410	12,384	0	0	1,074	1,633	861	151	0	241	0	554	169	479	195	1,243	655	0		44,389
TOTAL (lbs)		32,616	133,983	146,907	10,471	56	8,042	23,170	9,890	1,003	1,321	3,938	0	6,124	1,432	5,047	2,143	10,288	5,396	585	1,357	403,769

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

TOTAL	403,769
TOTAL Recycled Waste	332,075
% Recycled	82.2%

PO Amount:	$1,000,500.00
Paid Amount:	$841,434.25
Amount left on PO:	$159,065.75

PO# DSW0016901

* 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 (NGwash@ACTEnviro.com). These weights are all in pounds and will be totaled and converted to tons as you enter the information. Use the tons recycled number on the Diversion report on the Recycled HHW line.

City of Albuquerque

MATERIAL REUSE CENTER				
Month	Partcipants	Containers	Pounds	Savings
Jul-18	102	565	3,390	$3,390
Aug-18	111	651	3,906	$3,906
Sep-18	74	469	2,814	$2,814
Oct-18	76	451	2,706	$2,706
Nov-18	61	326	1,956	$1,956
Dec-18	24	251	1,506	$1,506
Mid-year Subtotal	**448**	**2,713**	**16,278**	**$16,278**
Jan-19	24	131	786	$786
Feb-19	59	311	1,866	$1,866
Mar-19	10	74	444	$444
Apr-19	104	297	1,782	$1,782
May-19	235	520	3,120	$3,120
Jun-19	110	1390	8,340	$8,340
Total FY18	**990**	**5,436**	**32,616**	**$32,616**

Pounds = number of containers x 6 lbs/container

*count out the participation forms that are mailed to us by ACT and enter that number under participants and then all up all items taken from the program. Enter that number under the containers section. The pounds and savings will auto-populate based on a formula of each item being on average 6 lbs. If ACT requests more forms, talk to Mila Romero at the Edith Yards.

Bernalillo County

Household Hazardous Waste Collection Participation

July 2018- June 2019

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)	HW/ER Included in Monthly cost	Total Cummulative Cost
Jul-18	108	1352	1	1155	188	9	Sandoval- 9	13.9%	$88,830.25	$950.25	$0.00	$88,830.25
Aug-18	79	1256	0	1070	175	11	Sandoval-11	13.9%	$82,541.50	$901.50	$0.00	$82,541.50
Sep-18	37	977	0	794	179	4	Cibola-1 Sandoval-2 Santa Fe-1	18.3%	$64,386.25	$881.25	$0.00	$64,386.25
Oct-18	41	1020	4	836	183	1	Sandoval - 1	17.9%	$67,248.25	$947.75	$0.00	$67,248.25
Nov-18	60	858	6	730	126	2	Sandoval-2	14.7%	$56,926.50	$1,156.50	$0.00	$56,926.50
Dec-18	41	531	4	463	67	1	Sandoval-11	12.6%	$35,311.75	$796.75	$0.00	$35,311.75
Jul-Dec 2018	**366**	5994	**15**	**5,048**	**918**	**28**		15.3%	**$ 395,244.50**	**$5,634.00**	$0.00	$395,244.50
Jan-19	45	768	2	655	113	0		14.7%	$50,977.00	$1,057	$0.00	$50,977.00
Feb-19	27	749	0	630	115	4	Sandoval-2 SantaFe-1 Taos-1	15.4%	$49,599.00	$914	$0.00	$49,599.00
Mar-19	53	1180	2	989	185	6	Sandoval-5 Valencia-1	15.7%	$77,614.50	$915	$0.00	$77,614.50
Apr-19	50	1088	0	903	180	5	Sandoval- 5	16.5%	$71,719.25	$999	$0.00	$71,719.25
May-19	109	1452	0	1250	195	7	Sandoval - 5 Soccorro-1 valencia-1	13.4%	$96,012.75	$1,633	$0.00	$96,012.75
Jun-19	94	1522	0	1,324	189	9	Sandoval- 9	12.4%	$100,267.25	$1,337	$0.00	$100,267.25
Jan-Jun 2019	**378**	**6,759**	**4**	**5,751**	**977**	**31**		14.5%	**$446,189.75**	**$6,855**	**0.00**	**$446,189.75**
FY19 Total	**744**	**12,753**	**19**	**10,799**	**1,895**	**59**		**14.9%**	**$841,434.25**	**$12,489**	**0.00**	**$841,434.25**
				Participant Total (other than orphaned)			**12,753**			**$12,489**		

Monthly Average	**1062.75**

Participant Fee	$ 65.00

FY19 Budget	**$ 540,000.00**
Remaining Balance	**$ (301,434.25)**

	Participants	Percentage	Cost
BERNCO Participation to date	1,895	14.9%	$123,175
Unknown or Not Enough Info to Geocode (costs absorbed by COA)	744	5.83%	$48,360

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 Lught 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 resients that did not have enough information to the COA total but also list them separate so we can track them.

Exhibit 9
Nature Conservancy 2018-2019

New Mexico
212 East Marcy, Suite 200
Santa Fe, New Mexico 87501

Tel (505) 988-3867 nature.org/new mexico
Fax (505) 988-4095

The Nature Conservancy in New Mexico
Urban Conservation Educational Programs
Final Report to the City of Albuquerque: June 2019

In 2019, The Nature Conservancy engaged communities throughout the Albuquerque area, including several under-resourced neighborhoods, with education/awareness programs focused on stormwater pollution that highlight nature-based solutions. Our education programs reached both adults and youth with hands-on, outdoor learning activities about stormwater impacts on the Rio Grande, how Albuquerque residents can reduce stormwater pollution, and the role of infiltration and the use of trees and other vegetation to clean our air and water. We reached approximately 625 youth and 1,225 adults directly with our water messages and additional community members through earned media from articles featured in the Albuquerque Journal and other tv and radio news outlets.

Youth Education Programs:
Throughout the year we engaged kids and young adults ranging from elementary aged children to age 24. Activities included installing rain barrels, building rain gardens, making native seed bombs, tree planting and participating in other conservation educational events. In partnership with a local elementary school we installed 750 gallons of rainwater storage at Eugene Fields Elementary to support their existing garden space and expand the gardening space to accommodate greater student participation. Additionally, we worked with a girl scout troop to install a rain garden to accompany rain barrels at a local community center. Finally, we engaged a high school class over several lectures, site visits and build day activities to install a large rain garden on campus where flooding in a central plaza was a problem turned into a resource.

For the second year in a row, we participated in the environmental day at Sandia Lakes where 138 special-needs students and their families (30 adults) built seed bombs, learned about how stormwater impacts our waterways and enjoyed catching fish. Students were primarily from Albuquerque Sign Language Academy, and special-education students from various schools throughout Albuquerque Public Schools (APS) system. Participants, both youth and adults, participated in similar hands-on activities and watershed based educational curriculum. Topics included stormwater management, water quality, watershed connections, the importance of forests and mountains as water towers, drinking water sources, impacts of drought, and ecological consequences of river management.

The Nature Conservancy
Protecting nature. Preserving life.™

New Mexico
212 East Marcy, Suite 200
Santa Fe, New Mexico 87501

Tel (505) 988-3867 nature.org/new mexico
Fax (505) 988-4095

We have also engaged eight Rocky Mountain Youth Corp members, ages 17-25, in activities to learn about trees and how stormwater could serve as an asset to building a more robust tree canopy in Albuquerque. Crew members assisted with taking an inventory of and assessing the health of trees in city parks and street trees to help us understand where the gaps in tree canopy are, which trees do the best in our urban setting and identifying locations where stormwater could benefit street trees. Additionally, we participated in UNM Geography Day, guest lectured at UNM transportation engineering class, the Cibola Youth Advisory Council, the City of Albuquerque's Bosque crew, a fall Garden Party at Coronado Elementary school, and Build your Refuge Day at Valle de Oro National Wildlife Refuge. These activities help us reach new audiences and engage students of all ages in stormwater management learning events.

Adult Education Programs:
Over the course of the engagement with the City of Albuquerque, we installed more than 4,000 gallons of rainwater storage at various locations including schools, community centers, community gardens and other public spaces. We also provided talks and presentations to community groups such as the Civitan Group, Kiwanis Club, South San Pedro Neighborhood Association, International District Healthy Communities Coalition, and the Los Jardines Community Garden. Additionally, we tabled at larger event such as South Valley Pride day, Environmental Justice Day and sponsored the City Nature Challenge, including hosting an event and reaching our members with partner events.

To reach a more professional audience we also presented at the UNM Paving Conference, the Land and Water Summit, and the EPA region 6 stormwater conference. Collectively participating in these community-based and professional events allowed us to reach more than 1,225 people with the message of water conservation and stormwater management approaches that will benefit the Rio Grande and help people understand what role they play in helping to keep the river clean.

Tijeras Creek is an important tributary of the Rio Grande and with its recent TMDL limits, it is an area of active restoration. The Conservancy has continued to participate in this Watershed Collaborative, which is addressing all parts of the watershed from high in the Sandias to the river. Projects such as the Cedro Restoration Project at the Cedro Creek headwaters and the Rocky Mountain Youth Corp project, funded by the Rio Grande Water Fund, which is restoring 3-4 miles of Cedro Creek, will improve conditions to reduce erosion, improve water infiltration and potentially reduce the flow of contaminants into the City's

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jurisdiction.

Finally, we have engaged with two local experts to develop a plant list of trees and shrubs that are suitable for five elevational transects crossing the city. These selected species account for drought tolerance, water requirements, temperature limits, invasiveness, wildlife habitat and other attributes that make them good selections for our arid City.

Marketing and Communications:
During the time of the Conservancy's contract with the city, we disseminated press releases and media advisories about urban conservation outreach activities. We also produced a "benefits of trees and rainwater harvesting" postcards, an urban program annual report and a conservation handout that highlights our work with the City of Albuquerque. These collateral pieces are utilized at tabling events and distributed to residents during educational activities and identify the City of Albuquerque as a funder of this work.

During the time of our contract with the City, the program received 22 mentions reaching 16.8 million online and another 231,000 via video broadcast. The coverage is valued at $32,000.

We also featured the urban conservation activities via Facebook, our Great Places E-newsletter (reaching 3,000 individuals), and via Nature.Org/Newmexico as highlighted below.

Facebook: July 2018 – June 2019

- 35 posts
- 9,288 people reached
- 9,741 impressions
- 654 people engaged

Great Places E-Newlsetter: July 2018 – June 2019

- 5 GPN stories
- 61 clickthroughs
- Average reach: 2,600 recipients

Nature.org July 2019 – June 2019

- Two web pages
    - Page 1
        - https://www.nature.org/en-us/about-us/where-we-work/united-states/new-mexico/stories-in-new-mexico/creative-conservation-in-albuquerque/
        - Views: 948
    - Page 2
        - https://www.nature.org/en-us/about-us/where-we-work/united-states/new-mexico/stories-in-new-mexico/new-mexico-nature-in-the-city/
        - Views: 245