

Arroyo Colorado Watershed Protection Plan Implementation - Los Fresnos Best Management Practices (BMP) Implementation

Texas Water Resources Institute TR-529
July 2020



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Final Report

Fiscal Year 2020, Quarter 4

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Texas Water Resources Institute TR-529

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PREPARED IN COOPERATION WITH THE
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY AND
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Cover photo: Estero Llano Grande State Park in Weslaco, TX.

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Abbreviations List

AP	Advanced Placement	PM	Project Manager
BPM	Best Management Practice	PBL	Project-Based Learning
EE	Energy and the Environment	QPR	Quarterly Progress Report
FBD	Falcon Beautification Day	RMS	Resaca Middle School
LMMS	Liberty Memorial Middle School	STEAM	Science, Technology, Engineering, Art and Math
LCMS	Los Cuates Middle School	TCEQ	Texas Commission on Environmental Quality
LFHS	Los Fresnos High School	TWRI	Texas Water Resources Institute
LFCISD	Los Fresnos Consolidated Independent School District	TSSWCB	Texas State Soil and Water Conservation Board
LID	Low Impact Development		
OSSF	On-Site Sewage Facility		
PLTW	Project Lead the Way		

Introduction & Background

This project supported implementation of the Arroyo Colorado Watershed Protection Plan that was created by a partnership of experts and stakeholders. The project integrated and built upon the information gathered from other projects that implemented low impact development (LID), best management practice (BMP), educational programming and monitoring management measures listed within the plan as top strategies for improving water quality.

Nonpoint source pollution along the coast is of importance, locally. Within the Tidal Segment of the Arroyo Colorado Watershed, the project implemented management measures that will lead to long-term, sustainable impacts. Within its guidance document, *Guidance for Sustainable Stormwater Drainage on the Texas Coast*, the Center for Research in Water Resources, presents low-cost, high impact stormwater BMPs for this vulnerable area. Two coastal sites within the Arroyo Colorado Watershed were chosen for the implementation of selected LID improvements: the City of Los Fresnos Nature Park and the Los Fresnos Consolidated Independent School District's (LFCISD) Los Fresnos High School (LFHS) student parking lot. This project combined resources from communities, universities and other stakeholders to build a sustainable stormwater drainage program for other Texas coastal communities to follow.

The city of Los Fresnos developed a 20-acre nature park immediately south of the LFHS, with funding from the Texas Parks and Wildlife Department, on land purchased with Coastal Impact Assistance Program funds. LID elements in this project include pervious sections added to a parking lot, bioswales, a rainwater collection system from the roof of the restroom building, and educational components. The park includes trails, picnic tables, fishing, wildlife watching, nature-inspired playground equipment and other amenities that will encourage the public to visit. High school classes will utilize the park as an outdoor classroom for a variety of natural sciences and natural resource-based classwork.

The LFHS has a large, sloped parking lot that floods in some sections and drains into FM 1847. Stormwater from the high school flows across and under the parking lot where it is discharged into an existing vegetated wetland detention pond. The parking lot was refurbished to reduce erosion and sediment in the stormwater. Additional BMPs included planting native trees, plants and shrubs in the wetland to capture, detain and treat the stormwater. Los Fresnos science students performed Citizen Water Quality Monitoring in their own parking lot, with water testing kits and training from Texas Water Resources Institute (TWRI), the Arroyo Colorado Watershed Partnership and assistance from the Texas Stream Team. The sampling was conducted during the Project Based Learning (PBL) workshops. The Los Fresnos School District went on to incorporate this experiential learning into its Science, Technology, Engineering and Math curricula.

Coordination of outreach and education efforts by the Watershed Coordinator facilitated and supported partner communication and cooperation, public awareness and understanding, student monitoring training and communication with public officials. Materials included an annual newsletter, public information through the media and social media, website updates, Citizen Water Quality Monitoring training and public workshops. Existing education and outreach materials were used during the PBL workshops. New materials produced were project or location specific, such as information related to project BMPs.

Task 1: Project Administration

TWRI provided fiscal oversight of the staff and subcontractors to ensure all tasks and deliverables were completed in a timely manner and reported to the Texas Commission on Environmental Quality (TCEQ) in quarterly progress reports (QPRs). TWRI submitted QPRs to TCEQ on or before the due date throughout the contract period. The TWRI business team submitted reimbursement forms based on project expenditures in a timely manner throughout the entire contract period. TWRI provided the TCEQ Project Manager (PM) with quarterly budget updates throughout the project period with the QPRs and during quarterly conference calls, annually in requested annual budget updates, and as needed when making contract amendments.

TWRI and TCEQ participated in a “project kick-off” conference call on January 24, 2017. After the initial meeting, TWRI maintained communication with TCEQ through regular telephone and email correspondence throughout the entire project period.

TWRI provided the TCEQ PM with an annual report on the Los Fresnos BMP project in the Fall of 2017 and 2018.

TCEQ worked to utilize the 319 grant seed funding to apply for three grant application submittals: the Arroyo Education Continuation and On-Site Sewage Facility (OSSF) Project to the Texas State Soil and Water Conservation Board (TSSWCB) and the Bayview Irrigation District Phase I to the Bureau of Reclamation.

The Arroyo Education Continuation and OSSF Project grant application to the TSSWCB was not selected for funding. The grant proposal was edited and resubmitted to the TSSWCB the following year and it was selected for funding.

The Bayview Irrigation District Phase I Project grant application to the Bureau of Reclamation was selected for funding upon the initial submittal.

Task 2: Monitoring – Citizen Water Quality Monitoring

Faculty Training

TWRI worked with the Texas Stream Team to host a Core Water Quality training workshop on January 25, 2018. A total of 5 teachers attended the workshop:

- Andrea Ramos – Environmental Science Teacher, Los Fresnos United
- Ali Martinez – Chemistry, Los Fresnos United
- Amanda Ellison – Integrated Physics and Chemistry, Los Fresnos United
- Miriam Rivera – Advanced Placement (AP) Biology/AP Environmental, LFHS
- Alejandra Guzman – Science Strategist, Central Office

TWRI worked with the Texas Stream Team to host a second Core Water Quality training workshop on November 8, 2018. A total of 6 teachers attended the workshop:

- Andrea Ramos – Environmental Science Teacher, Los Fresnos United

- Ali Martinez – Chemistry, Los Fresnos United
- Amanda Ellison – Integrated Physics and Chemistry, Los Fresnos United
- Miriam Rivera – AP Biology/AP Environmental, LFHS
- Alejandra Guzman – Science Strategist, Central Office
- Christopher Devlin – Energy and the Environment (EE), Project Lead the Way (PLTW) Resaca Middle School (RMS)

Student Training using TST Curriculum

TWRI worked with the Texas Stream Team to host a Core Water Quality training workshop on January 25, 2018. A total of 12 students attended the workshop: 7 AP Biology and 5 AP Environmental Science students from LFHS.

Task 3: Education and Outreach

Workshops

TWRI worked with the LFCISD staff to plan and host a PBL workshop on March 20, 2019. On that morning, eight AP Biology students, led by Miriam Rivera at LFHS (11th and 12th graders), assisted in the training of 78 middle school students in 7th and 8th grade enrolled in the PLTW EE class. The students were split into four groups and rotated through four stations: 1) Flora identification in Falcon Pond with Mike Heep; 2) Topographic maps use and function with Jaime Flores; 3) Nonpoint and Point Sources of pollution with Alejandra Guzman and Victor Gutierrez; and 4) Water sample testing with Miriam Rivera assisted by AP Biology students.

Students worked with topographic maps of the area and identified the flora species hosted near Falcon Pond. Students took water samples across six different areas and tested the water for pH, temperature, dissolved oxygen and nitrate concentrations. Students received hands-on learning, field experience and information directly from community experts.

After the field trip, students had three weeks to research the key elements from the four stations on the field trip and create a portfolio, brochure or presentation including the different components of the Falcon Pond Beautification project.

The PBL workshop was such a success that the LFCISD asked TWRI to plan to host 4 more workshops: 1 Professional Development workshop for the LFCISD Science Teachers, 1 Falcon Pond Beautification Day Workshop (Task 5), 1 Arroyo Colorado Watershed Workshop for RMS Science classes (12 classes/300+ students) and a second PBL workshop.

TWRI worked with Dr. Jude Benavides and the LFCISD to host a Los Fresnos Professional Development Teacher Workshop on May 8, 2019. Dr. Benavides and TWRI gave four presentations: Geologic history of the Rio Grande Valley, Arroyo Colorado Watershed, Resacas of the Rio Grande Valley and Hurricane Strikes and Impacts on the Rio Grande Valley. The workshop lasted four hours and was attended by nine middle school science teachers from LFCISD.

TWRI coordinated with LFCISD to deliver presentations on the Arroyo Colorado Watershed, resacas and hurricane impacts on the Rio Grande Valley on January 21, 2020 to three RMS teachers and the entire

student body in the middle school. In order to give the presentations to the entire student body, the Los Fresnos RMS staff doubled up the science classes (two classes in one room per presentation) for six separate classes throughout the day

LFCISD students participated in the second Los Fresnos PBL program on March 3-4, 2020 at LFHS. The Los Fresnos PBL Program plan was developed by Alejandra Guzman, (District Science Strategist for Grades 6-12), Jimmy McDonough, (Executive Director for Academics), and Jaime Flores (TWRI Project Manager). Students from three middle schools were bused to the high school to participate in the PBL. The students and teachers who participated are listed below.

Tuesday Science, Technology, Engineering, Arts and Math (STEAM) Day from Resaca Middle School:

- 52 7th grade students
- Teachers: Christopher Devlin and Ezequiel Garcia
- 86 6th grade students
Teachers: Ezequiel Navarro and David Rodriguez

Wednesday Falcon Pond PBL:

- 7 Liberty Memorial Middle School (LMMS) students
- Teacher: Denjuami Barker
- 24 Los Cuates Middle School (LCMS) students
- Teachers: Wendy Wilson and Robert Cepeda

The students rotated through four different stations. The PBL agendas for the two days are listed below:

RMS STEAM Field Trip Agenda, March 3, 2020 all day

Adult Attendees: Alejandra Guzman, Jamie Flores, Michael Heep, Victor Gutierrez

Chris Devlin (all day), Ezequiel Garcia (all day), David Rodriguez (afternoon only), Ezequiel Navarro (afternoon only)

RMS Students: G06 STEAM, G07 Science STEAM, EE PLTW Students

Bus Schedule:

Morning – 1 Bus

9:00 a.m. Arrive at RMS to pick up 7th Grade STEAM Science students and EE PLTW Students (~50 students)

9:15 a.m. Arrive at LFHS

11:15 a.m. Pick up at LFHS

11:30 a.m. Arrive back at RMS

Afternoon – 2 Buses

1:00 p.m. Arrive at RMS to pick up 6th Grade STEAM students (~90 students)

1:15 p.m. Arrive at LFHS
3:15 p.m. Pick up at LFHS
3:30 p.m. Arrive back at RMS

Project Overview, Introductions and Logistics – Jaime Flores and Alejandra Guzman (10 minutes)

Station Rotations (1-4 at approximately 20 minutes each with 5-minute travel time between)

Afternoon 6th Grade:

STATION 1 – Michael Heep: Plant Classification (6.12CD) SA

STATION 2 – Jaime Flores: Rock Types & Density (6.10B, 6.6B) SM

STATION 3 – Victor Gutierrez: Biotic/Abiotic and Levels of Organization (6.12EF) SA

STATION 4 – Alejandra Guzman: Water Testing with Vernier Equipment and Chemical Changes (6.5C) ST

Morning 7th Grade:

STATION 1 – Michael Heep: Plant Adaptations and Behavior (7.11B, 7.13AB) SA

STATION 2 – Jaime Flores: WED and Watersheds (7.8BC) SEA

STATION 3 – Victor Gutierrez: Microhabitats and Biodiversity (7.10AB) SA

STATION 4 – Alejandra Guzman: Water Sampling Testing with Vernier Equipment (ST) Physical vs. Chemical Changes (7.6A)

Student question and answer session, group photo, load buses (10 minutes)

PLTW EE Field Trip Agenda, March 4, 2020 half day

Adult Attendees: Alejandra Guzman, Jamie Flores, Michael Heep, Victor Gutierrez

Roberto Cepeda (LCMS), Denjuami Barker (LMMS)

Students: PLTW EE

Bus Schedule:

Morning – 1 Bus

8:45 a.m. Arrive at LCMS to pick up EE PLTW Students (~30 students)

9:00 a.m. Arrive at LMMS to pick up EE PLTW Students (~7 students)

9:15 a.m. Arrive at LFHS

11:15 a.m. Pick up at LFHS

11:30 a.m. Arrive at LMMS

11:45 a.m. Arrive back at LCMS

Project overview, introductions and logistics – Jaime Flores and Alejandra Guzman (10 minutes)

Station Rotations (1-4 at approximately 20 minutes each with 5-minute travel time between, rotations will go numerically)

STATION 1 – Michael Heep: Falcon Pond Flora Identification

STATION 2 – Jaime Flores: Falcon Pond Beautification Area Transects and Measurements and Topographic Map Overview

STATION 3 – Victor Gutierrez: Point vs. Non-Point Pollution and Water Sample Locations

STATION 4 – Alejandra Guzman: Water Sample Testing with Vernier Equipment

Student question and answer session, group photo, load buses (10 minutes)

After the field trip, students had three weeks to research the key elements from the four stations on the field trip and create a portfolio, brochure or presentation including the different components of the Falcon Pond Beautification project. The students were also going to research the native trees and plants that were planted during the Falcon Pond Beautification day and develop the content and pictures for the plant identification signs. This last portion of the PBL did not happen due to the COVID pandemic. The TWRI PM worked to develop the content of the signs and have them manufactured and installed.

Information Dissemination

TWRI worked to publish two Arroyo Colorado Watershed Partnership Annual Newsletters in the falls of 2018 and 2019. Both newsletters had an article on the Los Fresnos BMP project. TWRI also provided stakeholders with updates on the project through Arroyo Colorado website, monthly email updates, Steering Committee meeting project updates, QPRs and articles for the Rio Grande Valley AG Mag, Texas A&M AgriLife News, LFCISD website and Los Fresnos News.

Task 4: Los Fresnos Nature Park BMPs

Construction of the Los Fresnos Nature Park began in late October 2016. Initial work at the park consisted of clearing large areas of trees and brush in the locations for the parking lot, bathroom and trail. Clearing of the site continued until late November 2016.

Parking Lot with Pervious Section(s) and Bioswale(s)

Construction of the parking lot and bio-retention basin began December 5, 2016 but was periodically delayed by rain. The parking lot and bio-retention basin were completed by January 15, 2017.

Rainwater Collection System

The second phase of green infrastructure construction of the Los Fresnos Nature Park began September 20, 2018 and consisted of planting native trees and vegetation in the bio-retention basin, vegetative swale/rain garden and constructing a concrete pad to support a rainwater harvesting cistern.

The installation of the rainwater harvesting cistern was completed on November 8, 2018. The cistern was also connected to the rain garden/vegetative swale and native plants and shrubs were planted in the vegetative swale and bio-retention basin.

Educational/Interpretive Signage

The city of Los Fresnos installed educational/interpretive signage at the nature park on December 4, 2018. The signs consisted of one sign for the bio-retention basin/garden, one sign for the rain garden and two pet waste stations.

Task 5: LFCISD - LFHS BMPs

TWRI worked with LFCISD staff to plan and host the Falcon Beatification Day (FBD) workshop on November 16, 2019 at the LFHS campus. The workshop began at 8:30 am Saturday. A total of 40 students, two district employees, a school nurse, four campus administrators, five campus teachers/club sponsors and two parents/community members showed up for a total of 54 volunteers for the event. The students represented the LFHS (Biology Club members and AP Biology students), Los Fresnos United (Nature Club), RMS (STEAM 6th and 7th grade students), LCMS (Gardening Club) and LMMS (Junior National Honor Society Members).

The event began with TWRI PM Jaime Flores explaining to the students what they were going to do that morning—planting trees—and why. He distributed rubber boots, shovels and trash pickup sticks and gave a demonstration on how to dig a hole, remove the tree from the pot and plant it correctly. After that, the students broke up into groups of three to five and started planting and picking up trash.

The goal of FBD was to plant native flowers, shrubs and trees in Falcon Pond and pick up litter and trash in and around the pond. Falcon Pond is the bed of an abandoned resaca, an ancient distributary channel of the Rio Grande that has been modified to serve as a stormwater retention pond. During a rain event, all of the stormwater from the high school flows across and under the parking lot and eventually drains into Falcon Pond. The native flowers, shrubs and trees that were planted will serve several purposes: 1) filter out sediment, nutrients and pollutants from the stormwater coming from the high school and parking lot; 2) attract pollinators, such as bees, butterflies and hummingbirds; and 3) attract more birds to the pond.

The students planted 250 native flowers, shrubs and trees and collected one and a half 55-gallon trash bags full of trash in 2 hours. The flowers, shrubs and trees planted consisted of:

- Flowers: Scarlet Sage (60), Golden Wave Coreopsis (10), Mexican Capraria (10), Shrubby Aster (16), Heliotrope (20), Crucita (40), Golden Rod (40), Runyan Water Willow (10)
- Shrubs: Mexican Button Bush (10), Primrose Willow (5), Shrubby Aster (15)
- Trees: Montezuma Cypress (3), Anacua (5), Guamuchil (6)

Educational/Interpretive Signage

The TWRI PM contacted the LFCISD staff about how to proceed with the educational/interpretive signage since the kids were not returning to complete that portion of the PBL project hosted March 4-5, 2020. The LFCISD staff asked the TWRI PM to complete the signs. The TWRI PM worked to develop the content of the signs and have them manufactured. He contacted sign manufacturer iZone Imaging on June 1, 2020 with the content and pictures for the signs. It took another three months to edit the various proofs and finalize the content for the signs. The TWRI PM installed the sign posts on August 20, 2020. The signs were installed on the posts on September 23 & 25, 2020.

Discussion

The Arroyo Colorado Watershed Protection Plan Implementation-Los Fresnos Best Management Practices Implementation project was a success despite facing a few challenges. Weather was a factor in completing the Los Fresnos Nature Park BMPs, especially in the fall and early spring when the Rio Grande Valley receives most of its yearly rainfall. Construction of the BMPs had to be stopped several times because of rain. In the end, the nature park BMPs were completed and were exactly what the city wanted. The city converted an abandoned piece of property that was an eyesore in the middle of town into a thriving nature park that includes a bio-retention basin in the parking lot to capture and treat stormwater, bathrooms with a rainwater harvesting system connected to a rain garden/bio-swale and a 2-mile walking trail through a native riparian forest.

The LFHS portion of the project had its challenges as well. The school district did not refurbish the parking lot as it had agreed to do. Due to budget and time concerns, the district only resurfaced the parking lot during the summer when school was not in session. Because of this, TWRI was not able to install some of the BMPs originally planned, such as curb-cuts and refurbishing the stormwater outfalls. Instead, TWRI focused on improving the wetland detention pond by working on the bio-swale and planting native trees, plants and bushes.

TWRI also successfully modified the project-based learning workshop to fit the needs of the school district. The PBL workshops were originally planned for high school students; however after the first Texas Stream Team workshop, the teachers recommended changes. The teachers stated that they liked the workshops and trainings but thought that it would be more beneficial to the district to provide the workshops/trainings to the middle school students instead of the high school students. They explained that it is in the middle school, grades 6-8, that the students are introduced to and tested on earth science concepts and principals such as the water cycle, watersheds, rock types, weathering, erosion and deposition, eco-regions and hurricane impacts and flooding. They asked TWRI to deliver the workshops and trainings to the middle schools to supplement the science teachers' lesson plans. The TWRI PM agreed and worked with the science teachers to develop the PBL workshop/field trips. The workshops were a huge success and TWRI received a lot positive feedback from the science teachers and school district administration.

One key takeaway from this portion of the project is that it is extremely important to communicate and listen to your project partners throughout the project and be able to adapt in order to satisfy their needs and concerns.

Appendix



The Arroyo Colorado Watershed Partnership

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Los Fresnos Nature Park Best Management Practices Construction Narrative

Construction of the Los Fresnos Nature Park began in late October 2016. Initial work at the park consisted of clearing large areas of trees and brush in the locations for the parking lot, bathroom and trail. Clearing of the site continued until late November 2016. Construction of the parking lot and bio-retention basin began in December but was delayed on and off due to rain. The parking lot and bio-retention basin were completed by mid-January 2017.



Entrance to the Los Fresnos Nature Park, looking east off of FM 1847. Note the elevation difference between FM 1847 and the parking lot and the silt fencing around the construction areas.



Entrance looking SE.



Entering the parking lot looking to the S-SE. Note the curved design of the parking lot. Curves and irregular shapes are utilized throughout the parking lot and bio-retention basin.



Looking SE and toward the bio-retention basin. Note the slope of the parking lot into the bio-retention basin.



N end of the bio-retention basin looking S.



Bio-retention basin looking S.



Close up view of the slope in the bio-retention basin.



N end of basin looking W toward entrance and FM 1847.



South end of the basin looking west toward FM 1847.



South end of the basin looking northwest toward entrance and FM 1847.



South end of the basin looking north toward the high school. Again, note the curves utilized in the design of the parking lot and basin.



East side of the parking lot looking north-northeast toward high school. The bathroom for the park is already complete.



Rain gutters have already installed to capture and divert rainwater into the rain harvesting cistern and rain garden. The holes in the gutters for the downspouts have already been cut out.



Entrance to walking trail located in the southeast corner of the parking lot heading east and southeast.



The trail is designed to curve and wind it's way toward the resaca on the southern edge of the park.



Heading east. Palm trees in the northeast corner of the picture line the resaca bed.



After the next bend, the trail runs parallel to the resaca.



Last curve before running parallel with resaca.



All of the vegetation on the right is on the edge of the bank of the resaca.



Heading east along the bank of the resaca.



The Natural Levee of the resaca is visible on the left and the edge/bank of the resaca on the right.



Heading due east.



This is the end of the portion of the trail that was completed in the first phase of construction for the nature park. The parking lot, bio-retention basin, bathrooms and ¼ of the trail had been completed by 1/18/17.

Walking trail Construction-Phase II 3/1/18



Construction crew working to install silt fence before excavating/trenching down to grade in order to join Phase I & Phase II portions of the walking trail.



Heading east along the bank of the resaca.



Looking back toward the west and Phase I of the trail.



Looking back east. Maintainer is clearing vegetation for the trail.



The trail continues due east/southeast until making a U-turn at the end on the Nature Park property and heading back west toward the parking lot.



The trail begins to wind to the left in preparation of the U-turn.



The U-turn looking north.



Looking back toward the west after completing the U-turn.



Heading west



As the trail heads back west, the LFHS is to the north and adjacent to the property line.



Heading west/northwest.



The high school tennis courts are visible on the right side of the picture. The form for the concrete curb that will define the edge of the walking trail is also visible.



Heading west/southwest. Form for concrete is visible.



Heading west/northwest back toward north side of parking lot.



The end of the walking trail brings you back to the north side of the parking lot.

Phase II Trail construction-4/16/18



The concrete form is visible on the left side of the photo and the completed concrete curb is visible on the right.



Heading north/northeast, the forms and curb are visible. The grade of the walking trail has also been reached and is ready to receive the sub-grade material.



Heading east toward the end of the property and U-turn.



Heading east. Form and curb are visible.



Heading east/northeast. The curb on the left side has been completed and the forms have been removed. The forms are visible on the right side of the photo.



Heading north toward the U-turn. Concrete curb on both side of the trail is complete.



Completing the U-turn and heading back to the west.



The trail heading back etoward the parking lot.



Heading west/northwest. Subgrade is being added and compacted to form the base of the trail.



Heading west. The high school is to the north of the trail. Subgrade for the trail has already been compacted in this portion of the trail.



Heading back toward the parking lot.



Heading north/northwest. This the last curb before the trail reaches the northeast side of the parking lot.

Phase II Trail construction-5/22/18



This is where the trail was joined to the newer section of the trail. You can see the difference in color of the crushed granite. Heading east.



Heading east/northeast to end of park property nearing the U-turn.



Last section before U-turn.



This is a combination trail; both walking and bicycle trail. Walkers and runners use the entire trail. Bicyclists can only use the asphalt portion of the trail. The asphalt used is pervious pavement.



Looking back west from the east edge of the park property.



Heading west back to parking lot.



Heading west.



The trail has several curves as it makes it toward the parking lot and runs parallel with the high school.



The last 2 curves of the trail before reaching the parking lot.



The trail leading up to the parking lot. The contractor has placed dirt over the trail to use as a road for their equipment. The dirt will protect the trail from being damaged the vehicle traffic going over it.



One portion of the trail turns south to join the parking lot and rest continues out toward the street and sidewalk.



The trail can be accessed by someone riding a bicycle on the sidewalk.



Native trees north of the bathrooms. There are also native trees on the other side of the bathroom as well.



The Arroyo Colorado Watershed Partnership

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Los Fresnos Nature Park Best Management Practices Construction Narrative

Second Phase of Green Infrastructure construction of the Los Fresnos Nature Park in the Fall of 2018 consisted of planting native trees and vegetation in the bio-retention basin, installing a rainwater harvesting cistern and connecting the cistern to a rain garden/vegetative swale.



Native vegetation was recently planted in the Los Fresnos Nature Park bio-retention basin, looking from the south end of basin back toward the north.



Wild olive trees planted in north section of basin looking west toward FM 1847.



North end of the basin looking south, necklace pod-yellow sophora planted along the edge of basin.



Southwest corner as basin looking to the northeast.



Vegetative swale and rain garden being installed and connected to the rainwater harvesting cistern to be installed behind the public restrooms.



Swale with turk's cap being planted in between boulders.



View from south end of swale toward the north and bathroom.



Concrete pad behind bathrooms to be used as the base to support the rainwater harvesting cistern.



North end of pad looking south toward swale.



Northeast end of swale looking to the southwest from behind the bathroom. Pad for cistern shows proximity of cistern to the swale.



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Los Fresnos Nature Park Best Management Practices Construction Narrative

Follow up to Phase II of Low Impact development/Green Infrastructure construction of the Los Fresnos Nature Park in the Fall/Winter of 2018 consisted of completing the landscaping in the bio-retention basin and in the rain garden/vegetative swale, installing a rainwater harvesting collection system and connecting the collection system to the swale and rain garden.



The contractor completed the landscaping by adding mulch and gravel on and around the native vegetation that was recently planted in the Los Fresnos Nature Park bio-retention basin, looking from the southeast end of basin back toward the west.



Mulch added to cover wild olive trees and gravel added to retention basin, south end of basin looking north.



North end of the basin looking south, necklace pod-yellow sophora and turk's cap planted along the edge of basin.



Southwest corner as basin looking to the northeast.



Completed landscaping on the vegetative swale and rain garden that is connected to the rainwater-harvesting cistern installed behind the public restrooms.



Swale with turk's cap planted in between boulders.



View from south end of swale toward the north and bathroom.



Swale adjacent to privacy fence to protect rainwater harvesting system behind bathrooms.



North end of privacy fence protecting rainwater harvesting collection system, looking south toward swale.



Southeast end of privacy fence looking at the rainwater harvesting collection system behind the bathrooms looking to the northwest.



South view of the rainwater harvesting collection system connected to swale, south looking north.



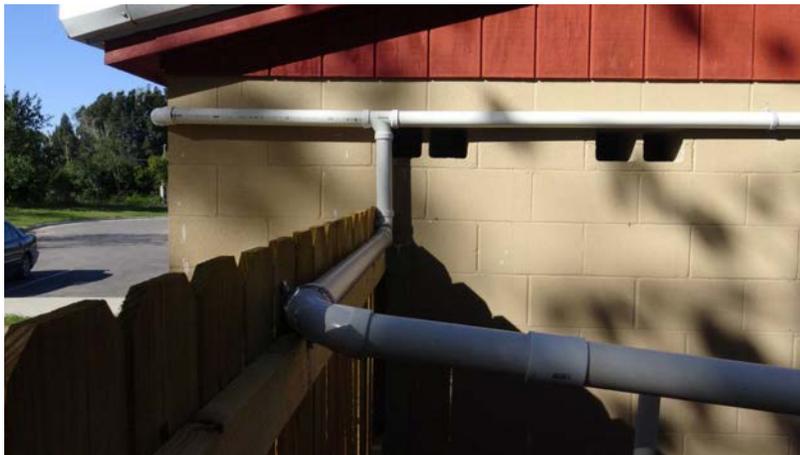
Plumbing of roof and rain gutters connecting to the rainwater harvesting collection system, north end of bathrooms looking south.



Plumbing of roof and rain gutters connecting to the rainwater harvesting collection system, northeast corner of bathroom looking southwest.



Plumbing of roof and rain gutters connecting to the rainwater harvesting collection system, southeast corner of bathroom looking northwest.



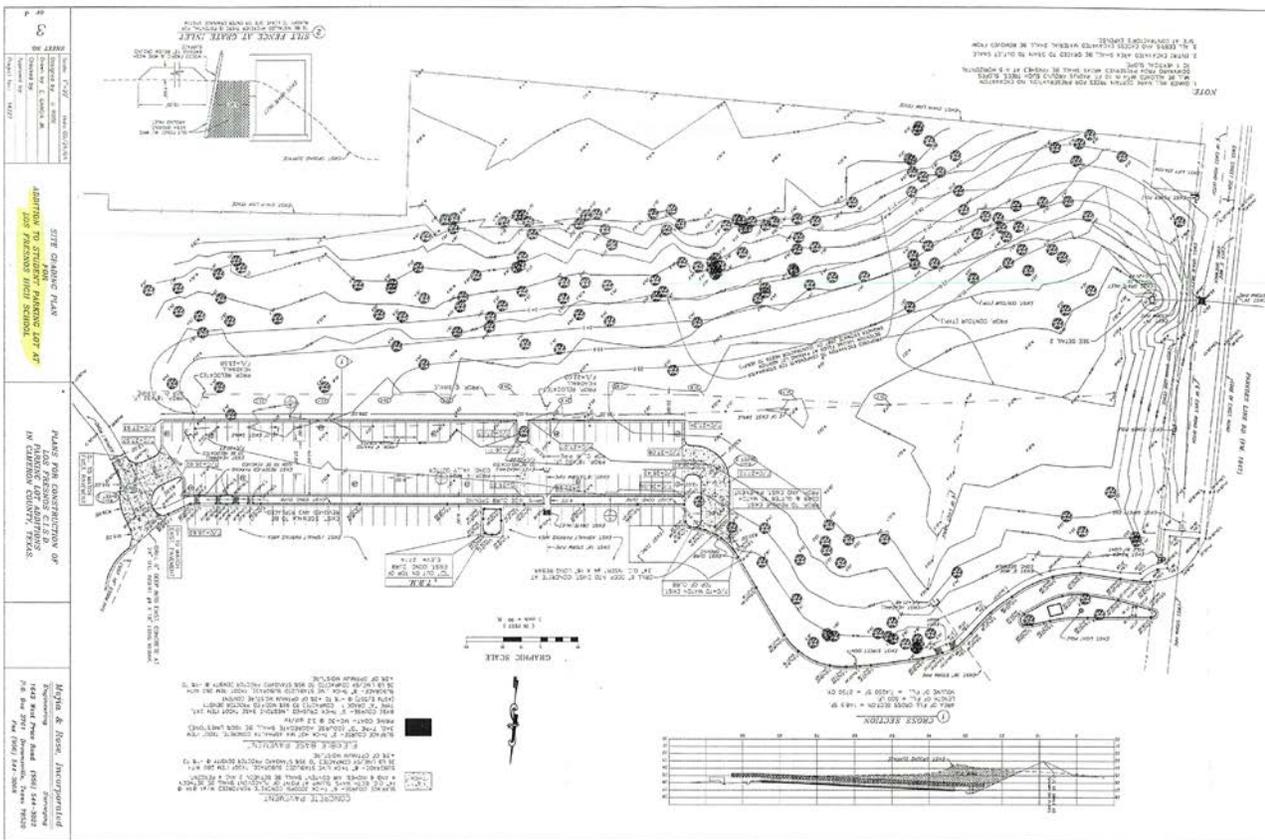
Plumbing of roof and rain gutters connecting to the rainwater harvesting collection system, southeast corner of bathroom looking due west.



Plumbing of roof and rain gutters connecting to the rainwater harvesting collection system, northeast corner of bathroom looking to the southeast.



North end of bio-retention basin, standing east of the basin looking back to the west.







The Arroyo Colorado Watershed Partnership

2401 East Highway 83
Weslaco, Texas 78596

956.969.5607 Office 956.969.5639 Fax www.arroyocolorado.org

Los Fresnos Stream Team Training II, 11/8/18

Phase II of the Los Fresnos Stream Team Training held at the Los Fresnos High School.



First time trainees from the Los Fresnos Middle schools getting ready for the training. List of instructors that attended workshop; Alejandra Guzman, Andrea Ramos, Miriam Rivera, Christopher Devlin, Denjuami Barker, Wendy Wilson.



Stacey Haddad from Texas Stream Team was the instructor.



Getting started with a power point presentation.



Going over the kit.



Collecting water sample in order to use the kit to test the water.



Instructions on filling out the Stream Team form.



Detailing what to look for when you reach the sampling location.



Collecting the water sample.



More instruction on water clarity, temperature and recording data.





Using the water sampling kit to test the collected water sample.



Testing for Dissolved Oxygen



Wrapping up test for Dissolved Oxygen.



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Los Fresnos Nature Park Best Management Practices Construction Narrative

Second Phase of Green Infrastructure construction of the Los Fresnos Nature Park in the Fall of 2018 consisted of planting native trees and vegetation in the Bio-retention basin, installing a rain water harvesting cistern and connecting the cistern to a rain garden/vegetative swale.



Native vegetation was recently planted in the Los Fresnos Nature Park Bio-retention Basin, looking from the south end of basin back toward the north.



Wild olive trees planted in North section of basin looking west toward FM 1847.



North end of the basin looking south, necklace pod-yellow sophora planted along the edge of basin.



SW corner as basin looking to the NE.



Vegetative swale and rain garden being installed and connected to the rainwater harvesting cistern to be installed behind the public restrooms.



Swale with turk's cap being planted in between boulders.



View from south end of swale toward the north and bathroom.



Concrete pad behind bathrooms to be used as the base to support the rainwater harvesting cistern.



North end of pad looking south toward swale.



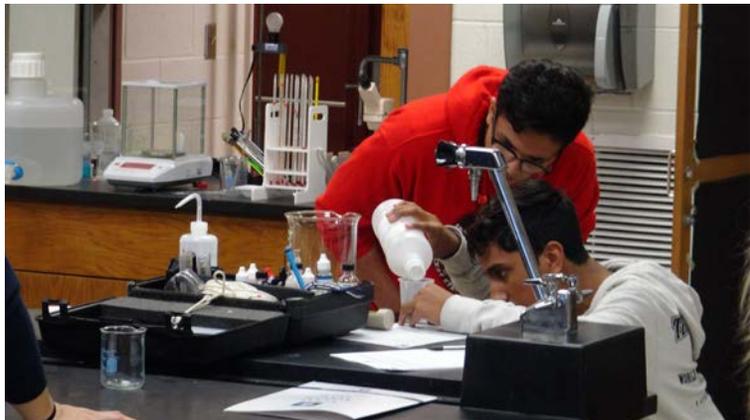
NE end of swale looking to the SW from behind the bathroom. Pad for cistern shows proximity of cistern to the swale.

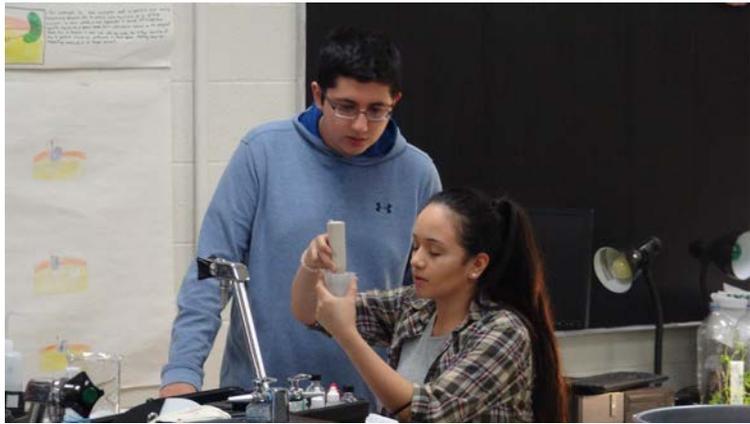
First Texas Stream Team Training





















Falcon Pond Beautification Day















Falcon Pond Tree signs









2nd Texas Stream Team Training







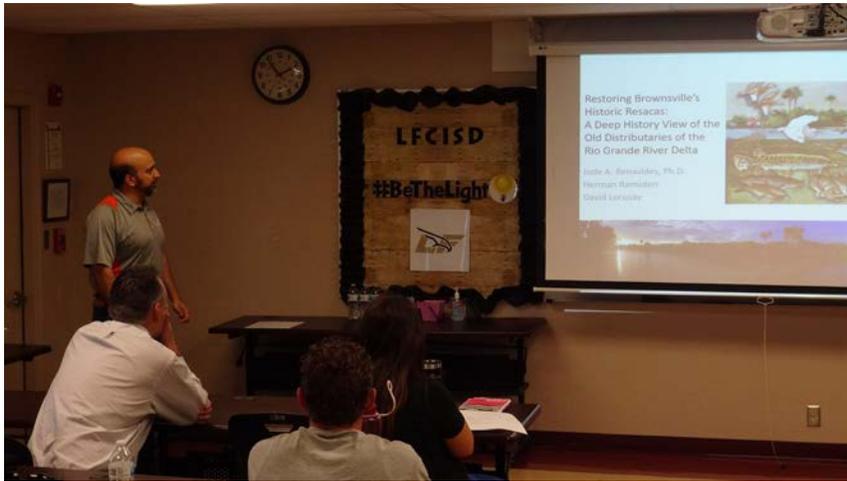








Teacher Workshop 5/8/19







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Los Fresnos ISD Falcon Pond Beautification Day

Los Fresnos ISD hosted the Falcon Beautification Day (FBD) on November 16, 2019 at the Los Fresnos High School campus. The FBD is Phase II of the project. Phase I was kicked off in March 2019.

Bright and early at 8:30 am Saturday morning, the volunteers started arriving. It was a beautiful morning with blue skies and a slight chill in the morning air. A total of 40 students, 2 district employees, 1 school nurse, 4 campus administrators, 5 campus teachers/club sponsors and 2 parents/community members showed up for a grand total of 54 volunteers for the event. The students were representing the Los Fresnos High School (Biology Club & AP Biology Students), Los Fresnos United (Nature Club), Resaca Middle School (STEAM 6th and 7th grade students), Los Cuates Middle School (Gardening Club), and Liberty Memorial Middle School (Junior National Honor Society Members).

The event began with Jaime Flores explaining to the students what they were going to do that morning, planting trees and the reasons why. He then began distributing rubber boots and shovels and trash pick up sticks. After the equipment had been distributed, Jaime gave a demonstration on how to dig a hole, remove the tree from the pot and then plant it correctly. After that, the students broke up into groups of 3-5 kids and started planting and picking up trash.

The goal of the Beautification Day was to plant native flowers, shrubs and trees in Falcon Pond and pick up litter and trash in and around the pond. Falcon Pond is actually the bed of an abandoned Resaca, an ancient distributary channel of the Rio Grande, that has been modified to serve as a stormwater retention pond. During a rain event, all of the stormwater from the High School flows across and under the parking lot and eventually drains into Falcon Pond. The native flowers, shrubs and trees that were planted will serve several purposes; 1) they will filter out sediment, nutrients and pollutants from the stormwater coming from the High School and parking lot, 2) they will bloom and provide nectar that will attract pollinators, such as bees, butterflies and hummingbirds and 3) attract more birds to the pond.

The students planted 250 native flowers, shrubs and trees and collected 1.5, 55 gallon trash bags full of trash in 2 hours. The flowers, shrubs and trees that were planted consisted of, Flowers-Scarlet Sage-60, Golden Wave Coreopsis-10, Mexican Capraria-10, Shrubby Aster-16 Heliotrope-20, Crucita-40, Golden Rod-40, Runyan Water Willow-10, Shrubs-Mexican Button Bush-10, Primrose Willow-5, Shrubby Aster-15, Trees-Montezuma Cypress-3, Anacua-5, Guamuchil-6.

Phase III of the project will consist of the students developing interpretive signage for the flowers, shrubs and trees that were planted in Falcon Pond as well as signage discussing NPS stormwater pollution and role of Falcon Pond removing those pollutants from the stormwater.

The Arroyo Colorado Partnership, Texas Water Resources Institute, and Los Fresnos ISD partnered together to implement this project. This project is being financed through grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality.

PLANT A TREE FOR YOUR COMMUNITY

Falcon Beautification Day

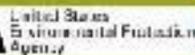
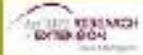
Plant a Tree for Your Community

HELP BEAUTIFY LOS FALCONES HIGH SCHOOL THROUGH A
CAMPUS CLEAN UP AND TREE PLANTING CEREMONY AT FALCON
POND ON SATURDAY NOVEMBER 16TH, 2013 AT 8 AM

TO SIGN UP AS A VOLUNTEER PLEASE VISIT
[HTTPS://PRAXIS.GILF.ORG/PROGRAMS/4075/1203](https://praxis.gilf.org/programs/4075/1203)
SCAN THE QR CODE OR CALL ALFONSO GIZAM AT 956-256-5096



Event Sponsors





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Los Fresnos Falcon Pond PBL Kick-off, 3/20/19

This project implements Low Impact Development (LID), Best Management Practices (BMPs) outlined in the Arroyo Colorado Watershed Protection Plan. It addresses management measures within the tidal segment of the Arroyo Colorado Watershed. Two coastal sites within the Arroyo Colorado Watershed were selected for the implementation of selected LID improvements: the City of Los Fresnos Nature Park and the Los Fresnos C.I.S.D. High School parking lot and adjacent stormwater retention pond referred to as Falcon Pond. This article will focus on the Los Fresnos High School Project Based Learning (PBL) Falcon Pond Water Beautification project.

During a rain event, all of the stormwater from the High School flows across and under the parking lot and eventually drains into Falcon Pond. Falcon Pond is actually the bed of an abandoned Resaca that has been modified to serve as a stormwater retention pond. The purpose of this project is to strengthen the Citizen Monitoring Program by training teachers and students on how to properly monitor and test water quality in Falcon Pond and to install LID improvements to Falcon Pond to remove sediment, contaminants and pollutants from the stormwater as it enters Falcon Pond.

Through Project Based Learning (PBL), students are working on the Falcon Pond Beautification Project for the first time. The PBL centers upon students taking water quality samples that directly feed into Falcon Pond. "Teachers have been planning this project since January to help supplement their curriculum and provide students with real-world science applications," said Alejandra Guzman, District Science Strategist for Grades 6-12. "They want to see if they can determine which pollutants are present and which ones are naturally removed from the storm water that comes off the drains and eventually feeds into Falcon Pond."

The Falcon Pond PBL is Phase III of the Citizen Monitoring Program. In Phase I, the Texas Stream Team trained 5 High School teachers, 7 AP Biology students and 5 AP Environmental Science students on how to use the basic Stream Team Kits on 1/25/18. In Phase II, the Texas Stream Team trained 3 High School Teachers for the second time (making them eligible to take a third training to become trainers) and 3 Middle School teachers for the first time on 11/26/18.

Now that the teachers had been trained, TWRI Project Manager, Jaime Flores, worked with Jimmy McDonough and Alejandra Guzman to formulate a plan on how proceed with the rest of the project. The team still needed to train more students on how to use the kits, introduce them to key TEKS and concepts such as, erosion, sedimentation, deposition, stormwater, watersheds, point and non-point sources of pollution and Best Management Practices to mitigate pollution. The Los Fresnos secondary science strategist determined that these concepts needed to be introduced and reinforced to Middle School students in 7th and 8th grades for them to get some hands on learning experience and hopefully help improve the student test scores. They then

consulted with their science teachers to begin developing the framework of the Falcon Pond PBL. "The beautification project is intended to help decrease the amount of pollutants entering the pond from the high school campus and parking lot," Guzman said. "It should help clean out our pond water system, so that we can help restore the wetland and to get more native plants, more vegetation and eventually more wildlife in the area. The ultimate project goal is to increase the biodiversity and enhance the pond ecosystem".

The Falcon Pond PBL kicked-off on 3/20/19 with a mixture of 7th and 8th grade Middle school students taking a field trip to Los Fresnos High School to learn about different types of water pollution. All of the students participating in the PBL are currently enrolled in the "Project Lead the Way (PLTW) Energy and the Environment class". Once the students arrived at the High School, they broke up into pre-designated groups. The students then rotated through four stations – 1) Flora identification in Falcon Pond with Mike Heep, 2) Topographic maps use and function with Jaime Flores, 3) Non Point Source and Point Sources of pollution with Alejandra Guzman and Victor Gutierrez and 4) Water sample testing with Miriam Rivera assisted by AP Biology students.

Students worked with topographic maps of the area and identified the flora species hosted near the pond. Students took water samples across six different areas and testing the water for pH, temperature, dissolved oxygen and nitrate concentrations. Students received hands-on learning, field experience and first-hand information directly from community experts.

After the field trip, students had 3 weeks to research the key elements from the four stations on the Field Trip and create a portfolio, brochure, or presentation including the different components of the Falcon Pond Beautification project. The final project will include the following: a graphical representation of the results from the water testing, a design for interpretive signage to be installed of the native plant species, a 3D or virtual map of the pond area where LID elements are to be installed, and information on potential careers related to the project.

The beautification portion of the wetlands will be next. The project team will review the students recommendations for the selection and placement of native trees and LID elements in the swale and wetland. The project team directed by Mike Heep will make the final determinations of native tree selection and create a landscaping map to be used for the actual beautification event. LFCISD will invite Students, Parents and members of the community that want to volunteer their time to help plant the native trees. Prior to the event, Mike and his staff will transport the trees to High School and place colored flags in the tree planting locations. Each flag color will correspond to a specific tree to ensure the trees are planted in the correct location.

"This is a pilot," Guzman said. "We would like to provide this learning experience to all seventh grade students in Los Fresnos. We decided that before we made that endeavor, that we would pilot it only with Energy and Environment PLTW students." After the project is over, the project team will meet to determine if the PBL was successful, discuss what changes need to be made to improve the PBL. Students will continue to collect water samples during storm events and plot the results to establish a baseline of what is in the water and try to spot any trends over time.



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Los Fresnos Falcon Pond PBL Attendance, 3/20/19

1 class of AP Biology students led by Miriam Rivera at Los Fresnos High School (11th & 12th graders) These students assisted in the training of the 7th & 8th grade students.

Zoe Marie Arriaga
Mya Jude Brown
Magnum Cody Callison
Elijah Barret Canning
Ashlyn Faith Cisneros
Sabrina Marie Garza
Jolie Marie Gonzales
Roberto Emmitt Zamora

2 classes of Energy & Environment Project Lead the Way students led by Wendy Wilson at Los Cuates Middle School (7th and 8th graders)

Wyatt Theo Aikman
Jocelynn Barrientos
Ivan Leonardo Cabrera Fernandez
Rafael Cordova Jr.
Shyan Marie Cruz
Adely Marie Delgado
Adrian Alejandro Escobedo
Kendell Anisha Flores
Luis Angel Garcia
Dylan Sebastian Gatica
Dakota Renae Hansen
Samantha Marie Ramos

Anthony Esai Castillo
Daniel Antonio Castro
Jason Manuel Macias
Richard Anthony Martinez
Dashell Anthony Martinez
Mia Isabela Ordaz-Solis
Anthony James Pena
Oziel Ramirez
Jorge Alberto Sanchez
Alex Silva
Leonardo Michael Teran
Noah Riley Vasquez

2 classes of Energy & Environment Project Lead the Way students led by Denjuami Barker from Liberty Memorial Middle School (7th and 8th graders)

Jaime Camacho Jr.

Alexandra Marie Galvez

Flavio Garcia

Joseph Ernest Garcia

Adrian Olvera

Jesus Estevan Jr.

Damian Rey Trevino

Alejandro Isiah Alvarez

Dalessandro Alexis Diaz

Briana Flores

Armando Garcia

Jesus Guevara Sanchez

3 classes of Energy & Environment Project Lead the Way students led by Christopher Devlin from Resaca Middle School (7th and 8th graders)

Valerie Dielly Briseno

Joshua Elijha Campos

Tiffany Cantu

Christopher Ryan Chase

Mario Alberto Cruz Jr.

Daniel De Leon

Janneth Adlemy Garcia

Arianna Alexa Hernandez

Juan Lozano III

Viviana Menchaca

Vicente Rocio Jr.

Samuel Abraham Rodriguez

Christopher Lee Saldana

Meagan Hazel Saldana

Gael Hasis Sifuentes

Ximena Torres

Derek Antuhan Alvarez Salas

Adrian Bravo

Orion Skyy Caraveo

Sabian Abdiel Cardenas

Jakob Dominic Cecarrini

Mark Aaron Coronado

Paola Stephania Gonzales

Charlyn Marie Molina

Adrian Tomas Montellano

Alixsandra Perez

Syanne Uresti

Luis Adrian Briseno
Calvin Broderick
Aaron Ryan Cavazos
Fatima Anaid Cazares
Valerie Mayella Chapa
Bruno Damian Cobos
Frida Cortez
Isabella Rae Gomez
Isiah Malachi Pierre
Cristian Gustavo Reyes
Victoria Alexis Robles
Briana Camila Rodriguez
Cassandra Anai Sanchez
Jesus Emmanuel Tavares
Aldo Antonio Velez



Falcon Lake PBL

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH 2020			4 Stream Team Field Trip Group 1 – 8:30 – 11:00 LCMS (24) Group 2 – 1:00 – 3:30 LMMS/RMS (40)	5 Water Testing *7.4A - Tools *7.8B – Weathering, Erosion, Deposition *7.8C - Watersheds	6 Water Testing *8.11D – Human Dependence	7
8	9 Graphing/Excel Water Results (Data Tables & Graphs Due) *7.2ABCDE	10 Graphing/Excel Water Results (Data Tables & Graphs Due) *7.2ABCDE	11 Plant Research Native Plant Website *7.10B - Biodiversity *7.10C - Succession Plant Research	12 Transects/Topo Maps 8.9C – Topographic Maps	13 Transects/Topo Maps	14
15	16 SPRING	17 BREAK	18 SPRING	19 BREAK	20 SPRING	21 BREAK
22	23 Plant Budgeting	24 Building 3D Model *7.18 – Making Models	25 Building 3D Model	26 Finish building Models	27 Present Models	

Falcon Lake PBL

2019

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH	18	19	20	21	22	23
	Memo & Intro Video		Stream Team Field Trip Group 1 – 8:30 – 11:00 LCMS (24) Group 2 – 1:00 – 3:30 LMMS/RMS	Water Testing *7.4A - Tools *7.8B – Weathering, Erosion, Deposition	Water Testing *8.11D – Human Dependence	
24	25	26	27	28	29	30
	Graphing/Excel Water Results (Data Tables & Graphs Due) *7.2ABCDE	Plant Research Native Plant Website *7.10B - Biodiversity	Plant Research (Plant Cards Due) *7.2B - Research	Transects/Topo Maps 8.9C – Topographic	Transects/Topo Maps	
APRIL	1	2	3	4	5	6
	Building 3D Model *7.3B – Making Models	Building 3D Model (Model Due)	Model Presentation Filming	Jobs/Career Research *7.3D Contributions	Brochure or Booklet 8.11B – Interactions	
7	8	9	10	11	12	13
	Brochure or Booklets Due					



Falcon Pond

PBL

Field Notes

March 18 – April 8, 2019

Field Trip Agenda

- I. **Project Overview, Introductions, & Logistics – (10 minutes)**
- II. **Station Rotations (20 minutes each with 5 minutes between, rotations will go numerically)**

STATION 1 – Michael Heep: Falcon Pond Flora Identification
STATION 2 – Jaime Flores: Falcon Pond Beautification Area Transects & Measurements & Topographic Map Overview
STATION 3 – Alejandra Guzman: Point vs. Non-Point Pollution & Water Sample Locations
STATION 4 –AP Biology Students: Water Sample Testing with Vernier Equipment
- III. **Student Question & Answer Session (5 minutes)**
- IV. **Aerial Shots (5 minutes near Falcon Pond)**
- V. **Load Up Buses**

PROJECT RELATED CAREERS

1.

2.

3.

4.

**Use this space for any additional notes, sketches,
or measurements from STATION 2.**

STATION 3 - Pollution Types

What is point source pollution?

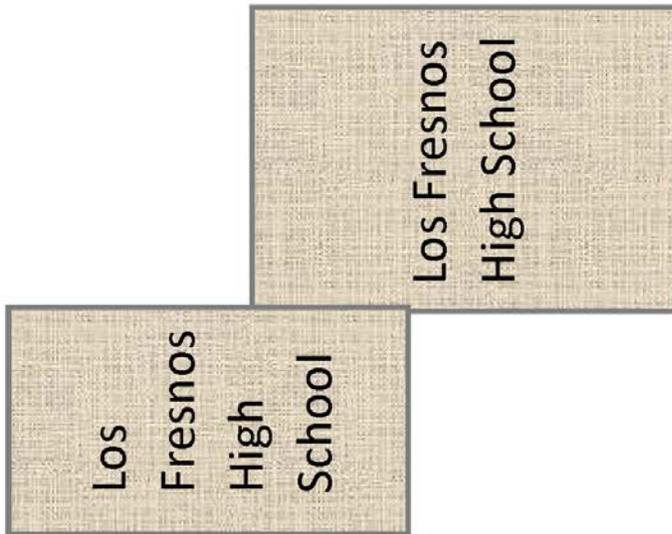
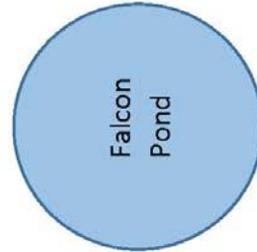
What is non-point source pollution?

Provide real world examples of each of the following.

<u>POINT SOURCE</u>	<u>NON-POINT SOURCE</u>

STATION 3 – Water Samples Map

Sketch out important areas near the school and identify where water samples were collected.



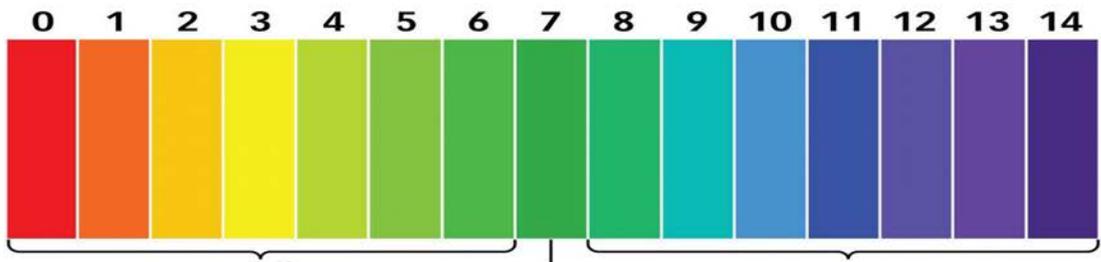
Note: Images not drawn to scale.

STATION 4 – Testing Water Samples

<u>Water Sample</u>	<u>Temperature (unit _____)</u>	<u>pH</u>	<u>Notes or Other Test</u>
1			
2			
3			
4			
5			

What does pH test for?

Explain the pH scale below.



What do you think acid rain is? Why?

AGENDA

Project Overview, Introductions, & Logistics – Jaime Flores & Alejandra Guzman (10 minutes)

Station Rotations (1-4 approximately 20 minutes each with 5 minute travel time between, rotations will go numerically)

STATION 1 – Michael Heep: Falcon Pond Flora Identification

STATION 2 – Jaime Flores: Falcon Pond Beautification Area Transects & Measurements & Topographic Map Overview

STATION 3 – Victor Gutierrez: Point vs. Non-Point Pollution & Water Sample Locations

STATION 4 – Alejandra Guzman: Water Sample Testing with Vernier Equipment

CAREERS

1.

2.

3.

4.

Falcon Pond

PBL

Field Notes

March 4, 2020

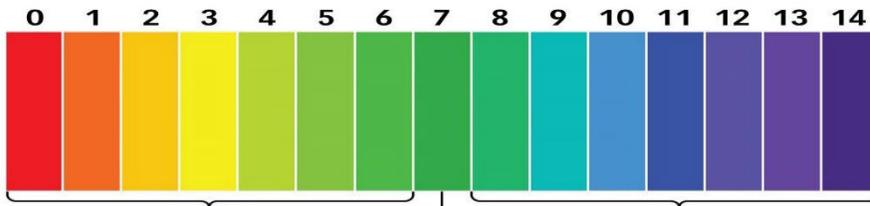


STATION 4 - Testing Water Samples

<u>Water Sample</u>	<u>Temp. (unit)</u>	<u>pH</u>	<u>Notes or Other Test</u>
1			
2			
3			
4			
5			

What does pH test for?

Explain the pH scale below.



What do you think acid rain is? Why?

STATION 3 - Pollution Types

What is point source pollution?

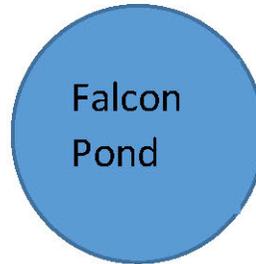
What is non-point source pollution?

Provide real world examples of each of the following.

<u>POINT SOURCE</u>	<u>NON-POINT SOURCE</u>

STATION 3 - Water Samples Map

Sketch out important areas near the school and identify where water samples were collected.



Note: Images not drawn to scale.

Additional Notes:



🏠 Location: Los Fresnos High School Falcon Pond
📅 Date: Wednesday 3.20.19
🕒 Time: 9:00 a.m. or 1:00 p.m.

Field Trip Agenda

Attendees: Jamie Flores, Michael Heep, Wendy Wilson, Denjuami Barker, Chris Devlin, Miriam Rivera, Alejandra Guzman & Energy & Environment PLTW Students, and AP Biology Students

I. Project Overview, Introductions, & Logistics – Jaime Flores & Alejandra Guzman (10 minutes at HS entrance)

II. Station Rotations (1-4 approximately 20 minutes each with 5 minute travel time between, rotations will go numerically)

STATION 1 – Michael Heep: Falcon Pond Flora Identification

STATION 2 – Jaime Flores: Falcon Pond Beautification Area Transects & Measurements & Topographic Map Overview

STATION 3 – Alejandra Guzman: Point vs. Non-Point Pollution & Water Sample Locations

STATION 4 – AP Biology Students: Water Sample Testing with Vernier Equipment

III. Student Question & Answer Session (5 minutes)

IV. Aerial Shots (5 minutes near Falcon Pond)

Using Drone with Ronnie Zamora

V. Load Up Buses





🏠 Location: Los Fresnos High School Falcon Pond
📅 Date: Wednesday March 4, 2020
🕒 Time: 9:00 a.m.

PLTW EE Field Trip Agenda

Adult Attendees: Alejandra Guzman, Jamie Flores, Michael Heep, Victor Gutierrez
Roberto Cepeda (LCMS), Denjuami Barker (LMMS)

Students: PLTW Energy & Environment

Bus Schedule:

AM – 1 Bus

8:45 a.m. Arrive at LCMS to pick up EE PLTW Students (~30 students)

9:00 a.m. Arrive at LMMS to pick up EE PLTW Students (~7 students)

9:15 a.m. Arrive at LFHS

11:15 a.m. Pick up at LFHS

11:30 a.m. Arrive at LMMS

11:45 a.m. Arrive back at LCMS

I. Project Overview, Introductions, & Logistics – Jaime Flores & Alejandra Guzman (10 minutes)

II. Station Rotations (1-4 approximately 20 minutes each with 5 minute travel time between, rotations will go numerically)

STATION 1 – Michael Heep: Falcon Pond Flora Identification

STATION 2 – Jaime Flores: Falcon Pond Beautification Area Transects & Measurements & Topographic Map Overview

STATION 3 – Victor Gutierrez: Point vs. Non-Point Pollution & Water Sample Locations

STATION 4 – Alejandra Guzman: Water Sample Testing with Vernier Equipment

III. Student Question & Answer Session, Group Photo, Load Buses (10 minutes)



The Arroyo Colorado Watershed Partnership Newsletter



Fall 2018

TWRI, AgriLife Extension and others host training, field days in 2018 for LRGV producers

Master Rancher Program

On Jan. 22, the Texas Water Resources Institute (TWRI) presented to 15 attendees of the Master Rancher Program at the Texas A&M AgriLife Extension Service Center in Cameron County. Speakers for the program were experts in irrigation, financial and technical assistance from across the Lower Rio Grande Valley. There were presentations on irrigation management practices and water delivery for pastures and rangeland. TWRI presented a program on ag issues affecting the Arroyo Colorado watershed, including demonstrating land use, land loss to urban development, nonpoint source pollution and cost-share incentive programs that can help improve conservation practices in the county.

Rio Grande Valley Forage Field Day

About 40 attendees participated in the Rio Grande Valley (RGV) Forage Field Day on Oct. 10 at Encino Ranch, hosted by Mitzi and Mark Swanberg in Raymondville. TWRI and its partners, including Willacy County Soil and Water Conservation District, U.S. Department of Agriculture Natural Resources Service (USDA NRCS), USDA Agricultural Research Service, Prairie View A&M University, Texas State Soil and Water Conservation Board (TSSWCB) and AgriLife Extension county agents, organized the educational program to inform producers on best management practices for healthy pastures and rangelands. Since pastures and rangelands have different issues than row crops in terms of irrigation, pests and fertility, this field day focused on major points dealing with these issues. Presentations were given on weed management and fertility, specifically on how to properly manage forages by soil testing, how to know the amount of fertilizer needed, how to control weeds and how to keep and maintain healthy pastures. Producers learned how to correctly apply chemicals on brush in their pastures and

the type and amount of chemicals recommended. USDA NRCS, TSSWCB, Texas Department of Agriculture and the Farm Service Agency gave presentations about their cost-share incentive programs and how they could help producers implement conservation practices. Producers had been concerned with hay and equipment theft on their pastures and ranches. To provide some information on these topics, Joe Aguilar, special agent from the Texas and Southwestern Cattle Raisers Association, spoke about hay fraud and what to look for when selling large amounts of hay at a time.

Small acreage and disadvantaged producer meetings

This past year, TWRI collaborated with AgriLife Extension economist Dr. Samuel Zapata and AgriLife Extension county agents to produce educational programs targeting small acreage farmers, beginning farmers and historically disadvantaged producers in a series of workshops. *(cont. on back page)*



TWRI and partners held a workshop on maximizing water use for vegetables.

The preparation of this newsletter was financed with grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality.



Arroyo Colorado

Coastal BMP project is implementing LID improvements in Los Fresnos

Two coastal sites within the Arroyo Colorado watershed have been chosen to implement selected low impact development (LID) improvements: the City of Los Fresnos Nature Park and the Los Fresnos Independent School District High School student parking lot and stormwater detention pond.

This project is part of the management measures recommended in the Arroyo Colorado Watershed Protection Plan (WPP) and addresses management measures within the tidal segment of the Arroyo Colorado watershed.

These sites are adjacent and unique in that both sites are part of an *resaca*, the *Resaca Escondida*. The northern portion of the *resaca* makes up the southern part of the high school campus and also receives stormwater runoff from the school and parking lot. The nature park's location is on the natural levee of the *resaca*, with the bed of the *resaca* surrounding it to the north, west and south.

Los Fresnos is developing the 20-acre nature park immediately south of the high school, with funding in part from the Texas Parks and Wildlife Department, on land purchased with Coastal Impact Assistance Program funds. Clean Water Act 319 funds were used to install LID elements, including a bio-retention basin in the parking lot, bioswales, pervious walking trails and a rainwater collection system on the roof of the restroom building, as well as educational components. High school classes will use the park as an outdoor classroom for a variety of natural sciences and natural resource-based classwork.



The City of Los Fresnos installed LID elements at the nature park, including a bio-retention basin in the parking lot. Other LID elements include bioswales, pervious walking trails and a rainwater collection system.



feet 2000
meters 700

- Project boundary**
 - Parking lot**
 - Restroom**
 - Trails & approaches**
 - Playground**
 - Fishing pier / boat launch**
 - Bird/photo blind and overlook**
 - Amphitheater**
- Invasive, non-native, and weedy species will be removed and native vegetation reestablished throughout the park.
- Benches, picnic tables, butterfly gardens, drip station, exercise stations, signage and other amenities will be located along the trails.

Development of the City of Los Fresnos Nature Park located on the natural levee of the *Resaca Escondida*.



Los Fresnos High School science students will perform citizen water quality monitoring on the stormwater from the school and at the end of the BMP treatment train to compare results.



Aerial photograph of *Resaca Escondida* in Los Fresnos, circa 1960.

Know it. Respect it. Enjoy it.



The Los Fresnos High School has a large, sloped parking lot that drains into the bed of the resaca. This portion of the resaca also serves as a detention basin to capture stormwater runoff from the school and parking lot. For this project, the school district will install a series of stormwater best management practices (BMPs) designed to divert, slow down and treat the stormwater as part of a treatment train. The BMPs will channel the stormwater to vegetated wetlands to minimize sediment and other pollutants in the stormwater flow.

TWRI, in conjunction with the Texas Stream Team, hosted a Stream Team Training workshop to train Los Fresnos High School teachers and students to use water sampling kits. After all trainings are completed, Los Fresnos science students will perform citizen water quality monitoring on the stormwater from the school and at the end of the BMP treatment train to compare results. Sampling will be conducted during rain events during school hours. The high school will incorporate this experiential learning into its Science, Technology, Engineering, and Math (STEM) curricula.

The Arroyo Colorado Watershed Coordinator, Jaime Flores, conducted education and outreach efforts for the project, facilitated and supported partner communication and cooperation and raised public awareness and understanding of the resaca, stormwater runoff and the Arroyo Colorado WPP. He also coordinated student monitoring training and communicated with public officials so that they could gain a better understanding of the importance of the projects and long-term project sustainability.



San Benito Wetlands helps reduce nitrogen loadings in arroyo

The Arroyo Colorado has high nutrient levels due to nonpoint source runoff from urban and agricultural land and from 24 permitted, wastewater treatment facilities that discharge approximately 60 million gallons per day in the Arroyo Colorado. The Arroyo Colorado Watershed Protection Plan (WPP) identifies wetlands and wastewater reuse as management measures to reduce nutrient loadings.

In 2012, the Texas Water Resource Institute (TWRI) partnered with the cities of Harlingen and San Benito to pipe treated effluent from the city of San Benito Wastewater Treatment Facility (WWTF) into abandoned ponds that were part of the old lagoon, pre-mechanical WWTF. This created a coastal wetland habitat and further decreased the nitrogen content of the water prior to releasing into the Arroyo Colorado.



San Benito Wetlands.

In 2017, the city of San Benito began Phase 3 of the project. The city used Coastal Management Zone Act funds to add infrastructure to its WWTF to pump effluent to three additional ponds and to connect the ponds for water circulation. The water in these ponds will not be discharged to the Arroyo Colorado but will evaporate back into the atmosphere, effectively reducing all sediment, nutrients and bacteria that might have been carried off in the effluent.

The city removed invasive plant species and replaced them with native wetland vegetation and trees. The city also provided public access to the site and refurbished two existing sampling piers to include a wildlife viewing platform to facilitate environmental education and ecotourism. Educational and interpretive signage was installed to provide information about the project, native wildlife and coastal resources and stewardship.

TWRI and the city of San Benito conducted education and outreach to residents and public officials, ensuring the project's long-term success. TWRI conducted three workshops to educate the public and community leaders on the importance of wetlands and provide information about the project.



Refurbished piers in the San Benito Wetlands.



Arroyo Colorado

This project is one of many point and nonpoint source best management practices (BMPs) that have been implemented through the WPP. The BMPs have led to reduced nitrogen loadings in the Arroyo Colorado. Monitoring of the Arroyo Colorado has shown a significant decline in ammonia levels and no significant increase in nitrite and nitrate levels. Ammonia in wastewater is being converted to nitrite and nitrate more effectively, and nonpoint loadings of nitrite and nitrates are likely decreasing because there is no associated increase of nitrites and nitrates. This shows that total nitrogen loadings are decreasing.



Team works on inventory of Cameron County Septic Systems

Private residential on-site sewage facilities (OSSFs), commonly referred to as septic systems, have varying designs based on physical conditions of the local soils. Typical designs consist of one or more septic tanks and a drainage or distribution field (anaerobic system) or aerobic systems that have an aerated holding tank and often an aboveground sprinkler system for distributing the liquid. In the Arroyo Colorado watershed, 95 percent of the OSSFs installed are septic tanks with a drainfield. In the simplest terms, household waste flows into the septic tank or aerated tank, where solids settle out. The liquid portion of the waste flows to the distribution system, which may consist of buried perforated pipes or an aboveground sprinkler system.

Several pathways of the liquid waste in OSSFs afford opportunities for bacteria to enter groundwater and surface waters if the systems are not properly operating. Properly designed and operated, however, OSSFs would be expected to contribute virtually no fecal bacteria to surface waters. For example, it has been reported that less than 0.01 percent of fecal coliforms originating in household wastes move further than 6.5 feet down gradient of the drainfield of a septic system (Weikel et al., 1996).

During the development of the Arroyo Colorado Watershed Protection Plan and the Texas Coastal Zone OSSF Inventory, Texas A&M AgriLife Extension Service and Texas Water Resources Institute (TWRI) conducted a preliminary effort to estimate OSSFs. TWRI and AgriLife Extension acquired sewer service maps from cities and other sewer providers and digitized polygons of the sewer service areas. Cameron County 911 addresses were obtained, and addresses outside the service areas were assumed to use an OSSF. Preliminary estimate maps were created for both the Arroyo Colorado watershed and the

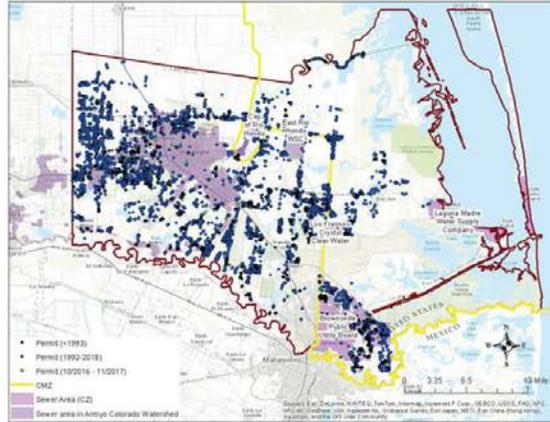


Figure 1. Cameron County OSSF permits geolocated through August 2018.

coastal zone. TWRI, AgriLife Extension and the University of Texas Rio Grande Valley (UTRGV) then partnered with the Cameron County Health Department to develop a more detailed inventory and database of OSSFs.

For the second phase of the OSSF Inventory, the project team of TWRI, AgriLife Extension and UTRGV are working with Cameron County to develop an inventory of all OSSFs within the county. The project team entered into a collaborative agreement with Cameron County to review the county's OSSF permit data in order to identify and estimate the total number of OSSFs in the watershed. The team obtained permit spreadsheets and records and was able to automatically match some permits to the Cameron County Appraisal District Parcel geographic information system (GIS) layer. The project team was also able to match permits that contained addresses to the Cameron County 911 GIS layer. So far, approximately 10,000 OSSF permit files have been automatically matched to the Parcel and 911 GIS layers. Figure 1 is a map showing parcel centroids and 911 addresses of the matched permits. There are many additional permits that will need to be manually matched to the GIS parcel layer. This next phase of the project is about to begin and will accomplish this goal over the next three years.



Nueces River Authority Steering Committee and Stakeholder Update #4

(4th Quarter of FY 2018-2019) June-August 2018

September 11th, 2018



Streamflow rates for five sites visited July 18 following a minor flood event on the Arroyo Colorado.

Site	<i>E. coli</i>	Ammonia	TKN	Total Phos	Nitrate	Nitrite	Chlorophyll a
13079	97 MPN	<0.1 mg/L	3.0 mg/L	0.6 mg/L	3.8 mg/L	<0.2 mg/L	19.2 µg/L
16445	230 MPN	<0.1 mg/L	3.0 mg/L	0.6 mg/L	4.0 mg/L	<0.2 mg/L	27.2 µg/L
13080	80 MPN	<0.1 mg/L	3.2 mg/L	0.6 mg/L	3.8 mg/L	<0.2 mg/L	25.2 µg/L
22003	20 MPN	0.2 mg/L	2.1 mg/L	0.2 mg/L	1.2 mg/L	<0.2 mg/L	98.5 µg/L
22004	250 MPN	<0.1 mg/L	3.1 mg/L	0.2 mg/L	0.8 mg/L	<0.2 mg/L	39.8 µg/L

(Disclaimer – Data has not been validated or input and uploaded into the SWQMIS Database.)

Routine Clean Rivers Program Monitoring

Field staff from the Nueces River Authority (NRA) conducted routine quarterly water quality sampling at all river/reservoir stations and coastal stations in the second quarter. A couple of stations were dry including San Miguel Creek and the Frio River in Tilden. No dissolved oxygen monitoring occurred this quarter due to a lack of streamflow in the middle Nueces and Atascosa rivers.

Monitoring Changes for FY 2019

Following the Coordinated Monitoring Meeting last March, NRA field staff revised the list of sampling stations. In an attempt to streamline the monitoring to avoid duplication of efforts, a number of sites in the same Assessment Unit (AU) were dropped. On the chopping block for 2019 were two quarterly sites in the above tidal portion of the Arroyo Colorado down in the Rio Grande Valley: Stations 16445 and 13080. NRA also dropped quarterly Station 20701 (Nueces River at the Airport Road boat ramp) and Station 13093 on Petronila Creek. Station 13093 will be monitored through the ongoing Petronila Tributary Study. Two new quarterly sites will be added to the sampling site list for 2019: Los Olmos Creek (Station 13034), located on U.S.

Highway 77 near Riviera and Choke Canyon Reservoir (Station 13019) near the dam. NRA will add metals in water at four routine quarterly monitoring sites: Choke Canyon Reservoir (Station 17389), Atascosa River at Farm-to-Market 99 (Station 12980), Conn Brown Harbor (Station 18848) and Port Bay at Farm-to-Market 188 (Station 13405).

Flood and Drought Report

It seems that South Texas is always in a drought or in a flood, or both at the same time. In mid-June, tropical moisture inundated the coast with a four-day-long gully washer but left the mid- and upper-Nueces River Basin high and dry. After the rain totals were tallied, it became clear that the only water flowing into Lake Corpus Christi came from the sky as opposed to the rivers. Lake Corpus Christi did rise about 10 feet between June 15 and June 22, and all water was from direct rainfall on or near the lake.

Basin 22 – Nueces-Rio Grande Coastal Basin

The Nueces-Rio Grande Coastal Basin covers approximately 10,400 square miles in South Texas and includes streams such as Petronila Creek (Segments 2203 and 2204), which is a tributary to Baffin Bay and the Arroyo Colorado (Segments 2201 and 2202) in the Rio Grande Valley.

Valley Monitoring

For FY 2018, NRA monitored five sites in the Rio Grande Basin. Three sites (16445, 13079 and 13080) are located on the above tidal portion of the Arroyo Colorado (Segment 2202) and two are tributaries of the Laguna Madre (Segment 2491). As mentioned earlier, NRA will be dropping sites 16445 and 13079 for FY 2019 due to the redundancy in the same AU. All five sites were visited on July 18 following a minor flood event on the Arroyo Colorado. Streamflow rates were back in the normal range by the site visit. (Disclaimer – Data has not been validated or input and uploaded into the SWQMIS Database.)

Nueces-Rio Grande Coastal Basin
Monitoring Stations



Nueces-Rio Grande Coastal Basin monitoring stations.



Texas A&M AgriLife Extension Service
 Arroyo Colorado Watershed Partnership
 2401 E. Hwy 83
 Weslaco, Texas 78596



Change Service Requested

(cont. from front page)

TWRI hosted six workshops covering areas from livestock management, fruit production and pest management, to how to achieve optimal yields and be ready for local and state markets. Each workshop had a focus on business planning, so landowners were informed about where and how they could apply for cost share assistance and where they could apply for USDA loans. Events were well attended, averaging 50 attendees.

Advances in irrigation for vegetable production

On May 12, TWRI and partners facilitated an irrigation program focused on maximizing water use for vegetable production. There were presentations on the latest state-of-the-art irrigation technology including soil moisture sensors, drip irrigation, drip tape, irrigation land leveling and irrigation pipelines for faster water delivery. There was good discussion between local and neighboring producers about their irrigation practices. For implementation of most best management practices, financial and technical assistance is funded through USDA NRCS and TSSWCB.

Water conservation for youth

Throughout the year, TWRI participated in youth development programs explaining the importance of water conservation and nonpoint source pollution. Using

a watershed model, TWRI educational presentations demonstrated how water is delivered, used, disposed of and, eventually, how it enters into the Arroyo Colorado to be distributed into the Lower Laguna Madre. Sometimes accompanying the watershed model was a live model stream trailer, which demonstrates how a stream flows and the impacts on the riverbank such as soil erosion, sediment and nutrient runoff. Presentations about water conservation have been made to more than 3,000 kids this year in the tri-county area of Hidalgo, Cameron and Willacy counties.

Improving Cotton and Row Crop Yields with Efficient Irrigation

On Oct. 16, TWRI and partners facilitated a program on cotton and other row crop irrigation at the Texas A&M University-Kingsville Citrus Center in Weslaco. Producers were refreshed on the practice of using surge valves and poly-pipe to efficiently irrigate main row crops produced in the RGV, including cotton, corn and grain sorghum. Dr. Lucas Gregory, senior research scientist at TWRI, opened the program. Dr. Jason Krutz, Mississippi Water Resources Research Institute director, discussed similar practices in the Mississippi Delta for row crops and incorporating surge valves for their efficiency. Mac Young, AgriLife Extension program specialist, spoke about improving crop yields and economics through irrigation management. There were over 30 attendees from across the RGV at this event.



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The Arroyo Colorado Watershed Partnership Newsletter



Fall 2019

TWRI, AgriLife Extension and others host training, field days in 2019 for LRGV producers

By Victor Gutierrez

Rio Grande Valley Brush and Forage Management Field Day

About 60 attendees participated in the Rio Grande Valley (RGV) Brush and Forage Management Field Day Oct. 15 at the San Luis Ranch hosted by the Flores family in San Manuel. Texas Water Resources Institute (TWRI) and its partners, including U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS), USDA Farm Service Agency, Prairie View A&M University, Texas State Soil and Water Conservation Board (TSSWCB) and Texas A&M AgriLife Extension Service county agents, organized the educational program to inform producers on best management practices for brush management and forage inventory. Since pastures and rangelands have different issues than row crops in terms of irrigation, pests, fertility, etc., this field day focused on major points dealing with managing rangelands. Presentations and a ranch tour were given on brush and forage management. Presentations by Jose “Pepe” Martinez and Henry Gonzalez from USDA NRCS specifically focused on how to properly manage forages during the ranch tour.

A presentation on identifying native and introduced forage species and soil needs by Vivian Garcia (USDA NRCS) was of particular interest during the morning tour. Megan Clayton, AgriLife Extension range specialist, presented on how to properly apply chemicals on brush in pastures, the correct stages plant species need to be for the optimal uptake of the chemicals added and the type of chemicals to use along with the rates recommended to control brush. USDA NRCS and TSSWCB representatives provided information about their cost-share incentive programs and how the programs can help producers implement conservation practices.

Small acreage and disadvantaged producer meetings

This past year, TWRI collaborated with Dr. Samuel Zapata, AgriLife Extension economist; Dr. Juan Anciso, AgriLife Extension vegetable specialist; Dr. Juan Enciso, Texas A&M AgriLife Research irrigation specialist; and county extension agents Vidal Saenz, Hidalgo County; Ashley Gregory, Hidalgo County; Jennifer Herrera, Cameron County; and Ronnie Zamora, Willacy County to produce educational programs targeting small acreage farmers, beginning farmers and historically disadvantaged producers in a series of workshops.

The project team hosted six workshops covering a number of topics ranging from livestock management, fruit production and preparation of products for sale at local and state farmer’s markets along with a value-added workshop demonstrating other avenues for crop commodities. (see *Trainings, field days on page 6*)



Attendees at the Rio Grande Valley Brush and Forage Management Field Day at the San Luis Ranch.

The preparation of this newsletter was financed with grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality.



Arroyo Colorado

22nd Annual Rio Grande Valley Beef Improvement Association's Bull Gain Test and Heifer Development Program

By Jaime Flores

The 2019 Bull Gain Test and Heifer Development Program was held on Oct. 9 at Rio Beef Feedyard in San Manuel. Bulls and heifers were delivered to the feedyard early that morning to begin the program. The cattle were tagged, weighed, vaccinated and dewormed. The program's purpose is to provide uniform, economical, nutritional and health management to allow optimal growth and fair comparisons of genetic differences between animals in similar age groups. The test enables Texas A&M AgriLife Extension Service county agents to provide a uniform method of collecting performance data and providing it to consignors and other interested parties. The data collected is also used by the county agents to conduct educational activities based on the results of the program.

These bulls are put on 110-day gain test and are measured for Average Daily Gain (30%), Rib-eye Area/cwt (20%), Weight per day of Age (20%), Percent IMF "Marbling" (20%) and Scrotal Circumference (10%). Bulls are ranked by breed and by age. Heifers are ranked by their

reproductive tract scores, pelvic area and frame size to provide information to breeders of yearling purebred and commercial bulls and heifers for use in selection and marketing to beef cattle producers throughout Texas. Bulls that have an overall test ratio of 100 or better, have passed a fertility test and are negative for trichomoniasis are given a clean bill of health and are eligible to go to auction. This year there were four age groups, Senior Bulls – Spring 2018, Intermediate Bulls – Summer 2018, Junior Bulls – Fall 2018 and Calf Bulls – Spring 2019.

The Rio Grande Valley Beef Improvement Association was created in 1998 to assist cattlemen in improving the quality of their livestock. The bull gain test is an official gain test conducted by Texas A&M AgriLife Extension Service, under the direction of Dr. Joe Paschal, AgriLife Extension beef specialist and AgriLife Extension county agents in Cameron, Hidalgo, Willacy and Starr counties. Successful bull gain tests and heifer development programs have been conducted every year since 1998. A total of 1,608 bulls and 1,110 heifers have been entered in the program since its inception.



Beef Improvement Association's Bull Gain Test and Heifer Development Program conducted by Texas A&M AgriLife Extension Service to assist cattlemen in improving the quality of their livestock by collecting performance data.



Team works on updating the inventory of septic systems in Cameron County

By Gabriele Bonaiti

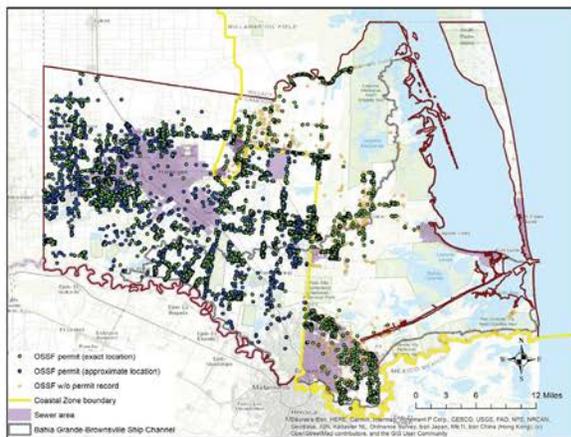
Private residential on-site sewage facilities (OSSFs), commonly referred to as “septic systems” (or Onsite Wastewater Treatment System, OWTS), are estimated in Cameron County to have grown by more than 400 systems in 2018, reaching a total of almost 36,700 systems. OSSFs have various designs based on physical characteristics of the local soils and the level of seasonal groundwater and are generally categorized as “conventional” or “aerobic.” Conventional systems typically consist of one or more septic tanks and a drainage or distribution field and are the most common type in Cameron County. Aerobic systems have an aerated holding tank and typically an above-ground sprinkler for distributing the treated effluent. When properly designed and operated, both types of OSSFs are expected to contribute virtually no fecal bacteria to adjacent water bodies.

During the development of the Arroyo Colorado Watershed Protection Plan, it was decided that a detailed inventory of OSSFs (number, location, type, age, etc.) could be beneficial, and funds were obtained from the Texas Commission on Environmental Quality to start developing an OSSF GIS database. In the first phase of the project, Texas A&M AgriLife Extension Service (AgriLife Extension), Texas Water Resources Institute (TWRI) and University of Texas Rio Grande Valley (UTRGV) created preliminary maps for the Arroyo Colorado watershed and the coastal zone. In

Phase II, AgriLife Extension, TWRI and UTRGV worked with the Cameron County Health Department to develop a complete inventory of OSSFs for the entire county. This phase will last three years.

The adopted method refers to previous experiences in Texas, i.e., the Coastal On-site Sewage Inventory database and the Lampasas River Watershed OSSF Inventory, by AgriLife Extension, and the Houston-Galveston Area Council OSSF Inventory. Identified steps include: a) maps of sewer service areas are obtained from cities and other sewer providers, and used to identify (and exclude) properties reached by collective lines; b) 911 physical addresses and aerial photography are used to identify buildings that likely have an OSSF and that fall outside sewer areas; c) parcels legal description and OSSF permits are used to estimate age and type of OSSFs and to validate OSSF location.

Currently, the main focus is locating OSSF permits in collaboration with Cameron County Health Department. The department agreed to update its database, start collecting XY coordinates of new permits and share data on a regular basis (use of XY coordinates was identified as the most effective method in locating new permits). AgriLife Extension, TWRI and UTRGV provide support to the health department, such as students, software and hardware, data analysis and online tools (e.g., interactive web maps). The county has an electronic database, which includes permits for installed OSSFs since 1988. The project team is working to determine the total count of permits and the number located on a map (some precisely on top of a building and some on an approximate location). Historic OSSFs permits are located using any available information, including appraisal legal description, while new ones are shared monthly by the health department and immediately located on a map based on XY coordinates and physical address. To date, a total of 12,109 OSSFs have been located on a map, as shown in Figure 1. Out of these, 47% have been located precisely on top of the building, while 53% are still on an approximate location (OSSFs with a permit obtained in the years 1988-2017).



Cameron County OSSFs geolocated as of August 2019.



Arroyo Colorado

Los Fresnos ISD hosts Falcon Pond Beautification Day

By Jaime Flores

Los Fresnos Independent School District hosted the Falcon Pond Beautification Day (FPBD) on Nov. 16 at the Los Fresnos High School campus. The FPBD is Phase II of the beautification project. Phase I was kicked off in March 2019.

The goal of the FPBD was to plant native flowers, shrubs and trees in Falcon Pond and pick up litter and trash in and around the pond.

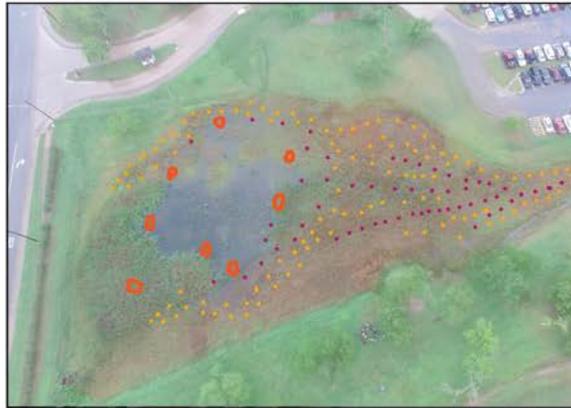
The volunteers started arriving early Saturday morning. A total of 54 volunteers, including 40 students, two district employees, a school nurse, four campus administrators, five campus teachers/club sponsors and two parents/community members, showed up for the event. The students represented the Los Fresnos High School (Biology Club and AP Biology students), Los Fresnos United (Nature Club), Resaca Middle School (STEAM 6th and 7th grade students), Los Cuates Middle School (Gardening Club) and Liberty Memorial Middle School (Junior National Honor Society members).

Jaime Flores, Arroyo Colorado watershed coordinator, first explained to the students that they were going to plant trees and the reasons why. Rubber boots, shovels and trash pick up sticks were distributed and Flores demonstrated how to dig a hole, remove the tree from the pot and plant it correctly. Then the students broke into groups of 3-5 and started picking up trash and planting.

Falcon Pond is the bed of an abandoned resaca, an ancient distributary channel of the Rio Grande, modified to serve as



Los Fresnos High School students planting flowers, shrubs and trees at Falcon Pond Beautification Day.



Aerial photo marking where volunteers planted flowers, shrubs and trees during the Falcon Pond Beautification Day.

a stormwater retention pond. During rain events, all of the stormwater from the high school flows across and under the school's parking lot and eventually drains into Falcon Pond. The native flowers, shrubs and trees that were planted will serve several purposes: 1) they will filter out sediment, nutrients and pollutants from the stormwater coming from the high school and parking lot, 2) they will bloom and provide nectar that will attract pollinators, such as bees, butterflies and hummingbirds, and 3) they will attract more birds to the pond.

In two hours, the students planted 250 native flowers, shrubs and trees and collected trash to fill one and half 55-gallon trash bags. The flowers, shrubs and trees planted were: Scarlet Sage, Golden Wave Coreopsis, Mexican Capraria, Shrubby Aster, Heliotrope, Crucita, Golden Rod, Runyan Water Willow, Mexican Button Bush, Primrose Willow, Shrubby Aster, Montezuma Cypress, Anacua and Guamuchil.

Phase III of the project will consist of the students developing interpretive signage for the flowers, shrubs and trees that were planted in Falcon Pond, as well as signage discussing nonpoint source stormwater pollution and the role of Falcon Pond in removing pollutants from the stormwater.

The Arroyo Colorado Partnership, Texas Water Resources Institute and Los Fresnos ISD partnered together to implement this project. It is being financed through grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality.





Irrigation Management Modernization Challenges and Opportunities demo, tour

By Victor Gutierrez

On July 16, Texas Water Resources Institute (TWRI), Texas Water Development Board and Rio Farms facilitated an Irrigation Modernization Challenges and Opportunities program that included a cotton irrigation demonstration trial that was conducted from April–August 2019 in Monte Alto. Rio Farms partnered with TWRI to conduct an irrigation demonstration project on a 16-acre tract of land using cotton as the target crop. The 16-acre block was split into three sections: a control block; a treatment block, which used an irrigation technology called Pipe Planner that uses larger hole sizes to push water faster down the furrows; and a skip row irrigation block. Soil moisture sensors were used to better understand water movement into the soil profile within each block. Three sensor arrays consisting of three sensors each (at 6, 12 and 24 inches deep) were placed in the center of each block at approximately a third of the way down the rows and a third of the way from the end of the row. Data was collected weekly and helped in determining when irrigation was needed. Automatic water metering technology was also used to report water use. A tour of the field highlighted challenges faced, lessons learned and future plans.

Irrigation district field tours

In preparation for the July 16 field day, on July 15, a group of farmers/producers and irrigation district members took a bus tour from Casa de Palmas in McAllen to two different pump houses. The first stop was in Hidalgo at the historic Hidalgo Pump House. The second stop was at the equally historic pump house located in Los Indios to demonstrate how water is pumped from the Rio Grande and then “pushed” into irrigation district reservoirs. Producers were refreshed on the practice of using poly-pipe to efficiently irrigate main row crops produced in the Rio Grande Valley (RGV), including cotton, corn and grain sorghum. Dr. Lucas Gregory, senior research scientist at TWRI, opened the program to irrigation specialists across the state. Irrigation district representatives spoke about improving irrigation district modernization and salinity management. There were more than 30 attendees from across the RGV at this event.



Tom McLemore, general manager, Harlingen Irrigation District, discusses the components and utility of the automated canal gate demonstration channel at the Rio Grande Center for Ag Water Efficiency.



Water level sensor and automated gates in the demonstration channel at the Rio Grande Center for Ag Water Efficiency.



Arroyo Colorado

Training, field days *(cont. from front page)*

Each workshop also included a section that focused on business planning. Landowners were informed about where and how they could apply for cost-share assistance programs and where they could apply for USDA loans.

Every workshop was well attended, averaging 50 people per workshop. This year, based on feedback from participants who attended last year's workshops, producers who were not able to physically attend a workshop could live stream the workshops through Facebook Live and/or see the workshops through the RGV small acreage website: <http://bit.ly/RGVSmallAcreage>.

Irrigation programs

TWRI and partners facilitated back-to-back identical irrigation programs focused on maximizing the efficiency of irrigation water use through technology and irrigation management. These programs were Sept. 25 at the AgriLife Extension annex service center in Cameron County and Sept. 26 at the Echo Hotel Conference Center in Edinburg.

There were presentations on the latest state-of-the-art irrigation technology including soil moisture sensors, drip irrigation and drip tape from local industry representatives Danny Sosebee, Netafim USA and Jeffery Kleypas, Toro Irrigation. Irrigation land-leveling and irrigation pipelines for faster water delivery, both irrigation best management practices, along with chemigation and fertigation process for application were presented by Dr. Juan Enciso, AgriLife Research irrigation specialist.

Salinity issues in irrigation water have become more of an issue over the last several years in the RGV, and producers had requested more information on salinity. In response to this request, Dr. Girisha Ganjegunte, Texas A&M AgriLife Research professor, El Paso, presented on salinity manage-

ment in irrigation water and discussed the option to plant alternative crops. Dr. Dana Porter, AgriLife Extension agricultural engineering specialist, Lubbock, presented on irrigation scheduling tools and approaches to specific to soil and crop needs. Dr. Luis Ribera, AgriLife Extension agricultural economist, spoke on economics and value of irrigation water specific to the RGV, a topic of particular interest to the producers.

Dr. Leyon Greene of the Texas Water Development Board spoke on TexMesonet, a weather tool application to help inform producers on weather conditions and the use and installment of weather stations.

With a little over 70 attendees combined, there was good discussion between irrigation specialists and local producers about their irrigation practices and updates on which best management practices are in the new 2018 Farm Bill. Financial and technical assistance for these BMPs will be funded through USDA NRCS and TSSWCB.

Water conservation for youth

Throughout the year, TWRI participated in youth development programs explaining the importance of water conservation and nonpoint source pollution. Using a watershed model, TWRI educational presentations demonstrated how water is delivered, used and disposed of and, how eventually, it enters into the Arroyo Colorado to be distributed into the Lower Laguna Madre. Sometimes accompanying the watershed model was a live model stream trailer, which demonstrates how a stream flows and the impacts on the riverbank such as soil erosion and sediment and nutrient runoff. Presentations about water conservation have been made to more than 3,000 children this year in the tri-county area of Hidalgo, Cameron and Willacy counties.



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Guamuchil

Pithecellobium dulce

Pithecellobium dulce is a tropical tree that is not native to the Rio Grande Valley. In its native [Mexico](#), the tree is known as huamuche, guamuche / huamúchil/ guamúchil. The Guamuchil tree reaches a height of about 10 to 15 m (33 to 49 ft). Its trunk and branches are spiny. Each leaf is made up of 2 pairs of oblong leaflets. The flowers are greenish-white, fragrant and resemble puffballs. Seedpods are beanlike, turning pink when ripe and open to expose the fleshy edible pulp that surrounds each flat, shiny, black seed.

Guamichil fruits are a favorite food of woodpeckers, chachalacas, parrots, opossums, rodents and humans. Seeds are dispersed after being eaten. Caterpillars of the Red Bordered Pixie and Large Orange Sulphur butterflies feed on the leaves. The tree is drought resistant, fast growing, but cold sensitive and is frequently planted as an ornamental and butterfly host plant in the Rio Grande Valley. Young trees can be killed after a brief freeze, but mature specimens usually recover quickly.

Plants for Los Fresnos High School Falcon Pond

Trees

Montezuma Cypress-3

Anacua-5

Guamuchi-6

Shrubs

Mexican Button Bush-10

Primrose Willow-5

Shrubby Aster #1-15

Flowers

Scarlet Sage-60

Golden Wave Coreopsis #1-10

Mexican Capraria #1-10

Shrubby Aster #1-16

Heliotrope #1-20

Crucita #1-40

Golden Rod #1-40

Runyan Water Willow #1-10

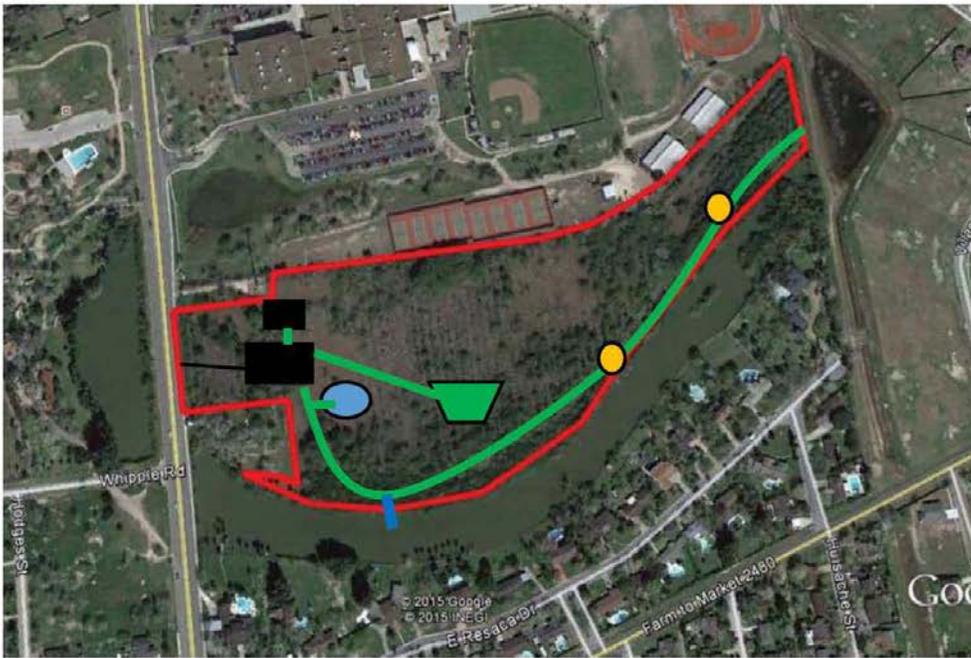
Coastal BMP project; City of Los Fresnos Nature Park & Los Fresnos Consolidated Independent School District (CISD) / High School

This project implements the Arroyo Colorado WPP. It addresses management measures within the tidal segment of the Arroyo Colorado watershed. Two coastal sites within the Arroyo Colorado watershed have been chosen for the implementation of selected low impact development (LID) improvements: the City of Los Fresnos Nature Park and the Los Fresnos Independent School District High School student parking lot and stormwater detention pond.

Both of these sites are adjacent to each other and are unique in that both sites are part of a Resaca. The Resaca is named Resaca Escondida. The northern portion of the Resaca makes up the southern part of the High School campus and also receives stormwater runoff from the school and parking lot. The location of the Nature Park is on the natural levee of the Resaca, with the bed of the Resaca surrounding it to the North, West and South.



Los Fresnos is developing a 20-acre nature park immediately south of the Los Fresnos High School, with funding in part from the Texas Parks and Wildlife Department, on land purchased with Coastal Impact Assistance Program funds. With this Contract, 319 funds were used to install LID elements including a bio-retention basin in the parking lot, bioswales, pervious walking trail and a rainwater collection system from the roof of the restroom building, and educational components. High school classes will utilize the park as an outdoor classroom for a variety of natural sciences and natural resource based classwork.



Project boundary

Parking lot

Restroom

Trails & approaches

Playground

Fishing pier / boat launch

Bird/photo blind and overlook

Amphitheater

Invasive, non-native, and weedy species will be removed and native vegetation reestablished throughout the park.

Benches, picnic tables, butterfly gardens, drip station, exercise stations, signage and other amenities will be located along the trails.

The Los Fresnos High School has a large, sloped parking lot that drains into the bed of the Resaca. This portion of the Resaca also serves as a detention basin to capture stormwater runoff from the school and parking lot. For this project, the LFCISD will install a series of stormwater BMPs designed to divert, slow down and treat the stormwater as part of a treatment train. The BMPs will channel the stormwater to a vegetated wetlands to minimize sediment and other pollutants in the stormwater flow.

TWRI in conjunction with the Texas Stream Team hosted a Stream Team Training workshop on January 25, 2018 to train Los Fresnos High School Teachers and students to use water sampling kits. After the training was completed, Los Fresnos science students will perform Citizen Water Quality Monitoring on the stormwater from the school and at the end of the BMP treatment train to compare results. Sampling will be conducted during rain events during school hours. The high school will incorporate this experiential learning into their Science, Technology, Engineering, and Math (STEM) curricula.

The Arroyo Colorado Watershed Coordinator worked to conduct education and outreach efforts for the project, facilitate and support partner communication and cooperation and raise public awareness and understanding. He also worked to coordinate student monitoring training and communicated with public officials so that they could gain a better understanding of the importance of the projects and long-term project sustainability.



Memo

To: Los Fresnos CISD Students

From: Jaime Flores, P.G.

Arroyo Colorado Watershed Coordinator

CC: Energy & Environment Teachers

This project is being paid for through grant funds provided through the Clean Water Act of 1972. The Environmental Protection Agency (EPA) has allocated funds to the Texas Commission on Environmental Quality (TCEQ), which has in turn funded a grant proposal submitted by the Texas Water Resources Institute, a Texas A&M Agri-Life Extension office. This grant provides funding to work on a collaborative project with the City of Los Fresnos and Los Fresnos Consolidated Independent School District. This money is intended to be used in our local coastal zone in order to tackle problems related to non-point source pollution. The purpose of this project is to strengthen the Citizen Monitoring Program by training teachers and students on how to properly monitor and test water quality in your community. We need your help to determine how we can best use natural processes and landscaping to slow down the storm water, decrease or divert erosion, and treat and/or remove pollutants from the water before they become a part of the Resaca bed found near Falcon Pond, which is located near the South parking lot of Los Fresnos High School. We hope your ideas can help our office determine how we can best use our grant money to refurbish Falcon Pond by using natural vegetation and landscaping. We also hope that you can help us inform the public by creating and installing interpretive signage for native plants in the area and possibly presenting your findings to the local community.



2401 East Highway 83 Weslaco, TX 78596
T: 956.969.5607 W: twri.tamu.edu

Los Fresnos Nature Park Sign Text & Logos-14x12

“This cooperative project has been funded in part by the United States Environmental Protection Agency through the Texas Commission on Environmental Quality.”

🏠 Location: Los Fresnos High School Falcon Pond
📅 Date: Tuesday March 3, 2020
🕒 Time: 9:00 a.m. or 1:00 p.m.

RMS STEAM Field Trip Agenda

Adult Attendees: Alejandra Guzman, Jamie Flores, Michael Heep, Victor Gutierrez
Chris Devlin (All Day), Ezequiel Garcia (All Day), David Rodriguez (PM Only), Ezequiel Navarro (PM Only)

RMS Students: G06 STEAM, G07 Science STEAM, Energy & Environment PLTW Students

Bus Schedule:

AM – 1 Bus

9:00 a.m. Arrive at RMS to pick up 7th Grade STEAM Science students and EE PLTW Students (~50 students)

9:15 a.m. Arrive at LFHS

11:15 a.m. Pick up at LFHS

11:30 a.m. Arrive back at RMS

PM – 2 Buses

1:00 p.m. Arrive at RMS to pick up 6th Grade STEAM students (~90 students)

1:15 p.m. Arrive at LFHS

3:15 p.m. Pick up at LFHS

3:30 p.m. Arrive back at RMS

I. Project Overview, Introductions, & Logistics – Jaime Flores & Alejandra Guzman (10 minutes)

II. Station Rotations (1-4 approximately 20 minutes each with 5 minute travel time between)

PM 6th Grade:

STATION 1 – Michael Heep: Plant Classification (6.12CD) SA

STATION 2 – Jaime Flores: Rock Types & Density (6.10B, 6.6B) SM

STATION 3 – Victor Gutierrez: Biotic/Abiotic and Levels of Organization (6.12EF) SA

STATION 4 – Alejandra Guzman: Water Testing with Vernier Equipment & Chemical Changes (6.5C) ST

AM 7th Grade:

STATION 1 – Michael Heep: Plant Adaptations & Behavior (7.11B, 7.13AB) SA

STATION 2 – Jaime Flores: WED and Watersheds (7.8BC) SEA

STATION 3 – Victor Gutierrez: Microhabitats & Biodiversity (7.10AB) SA

STATION 4 – Alejandra Guzman: Water Sampling Testing with Vernier Equipment (ST) Physical vs. Chemical Changes (7.6A)

III. Student Question & Answer Session, Group Photo, Load Buses (10 minutes)

Runyon's Water-willow

***Justicia pacifica* (Oerst.) Hemsl.**

Acanthaceae (Acanthus Family)

The Runyon's Water Willow a very rare species that grows in the wet riparian zones, swamps and pond edges of Deep South Texas. Its northern range extends only to the extreme southern part of the Rio Grande Valley in Cameron county. It does best in full sun but will grow in partial shade. It grows southward through much of Mexico. Paul Runyan discovered and documented this specimen when he was documenting the development and establishment of the Rio Grande Valley in the 1930's.

AGENDA

STATION 1 – Michael Heep: Plant Classification (6.12CD) SA

STATION 2 – Jaime Flores: Rock Types & Density (6.10B, 6.6B) SM

STATION 3 – Victor Gutierrez: Biotic/Abiotic and Levels of Organization (6.12EF) SA

STATION 4 – Alejandra Guzman: Water Testing with Vernier Equipment & Chemical Changes (6.5C) ST

CAREERS

1.

2.

3.

4.

STEAM DAY



**G06 Field Notes
March 5, 2020**

STATION 1 – Plant Classification

Domain:	
Kingdom:	
Characteristics:	

<u>Common Name</u>	<u>Quick Sketch of Plant or Leaf</u>	<u>Native or Not?</u>

STATION 2 -Rock Types

	Characteristics & Process of Formation	Examples & Drawings
S		
I		
M		

How do you calculate density?

What is the formula?

Rock Sample	Mass	Volume	Density
1			
2			
3			

STATION 3 – A/Biotic Factors

Biotic Factors	Abiotic Factors

Biological Levels or Organization

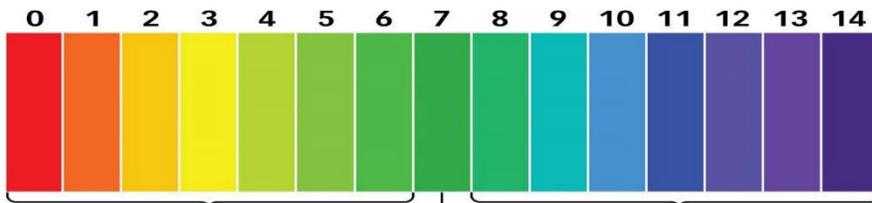
	Level	Define	Example
Smallest Level			
Largest Level			

STATION 4 - Testing Water

<u>Water Sample</u>	<u>Temp. (unit)</u>	<u>pH</u>	<u>Notes or Other Test</u>
1			
2			
3			
4			
5			

What does pH test for?

Explain the pH scale below.



What do you think acid rain is? Why?

Explain the evidence of a chemical change. What did you observe today that was a chemical change?

AGENDA

STATION 1 – Michael Heep: Plant Adaptations & Behavior (7.11B,7.13AB) SA

STATION 2 – Jaime Flores: WED and Watersheds (7.8BC) SEA

STATION 3 – Victor Gutierrez: Microhabitats & Biodiversity (7.10AB) SA

STATION 4 – Alejandra Guzman: Water Sampling Testing with Vernier Equipment (ST) Physical vs. Chemical Changes (7.6A)

CAREERS

1.

2.

3.

4.

STEAM DAY



G07 Field Notes
March 5, 2020

STATION 2 -Watersheds

	Define	Examples
W		
E		
D		

*What is a watershed?

*Explain how human activities can affect the watershed.
Provide at least three examples.

STATION 3 - Microhabitats

What is a microhabitat?

Name two examples of microhabitats observed today.

Draw and label one microhabitat from today.

Define biodiversity.

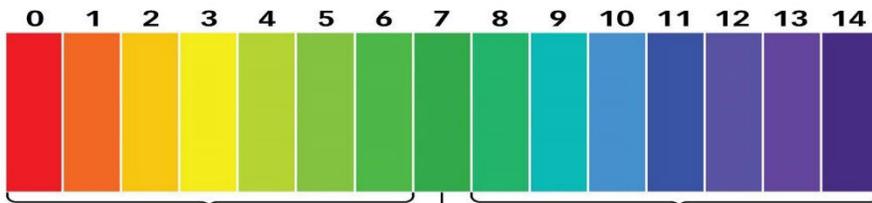
Explain how high and low biodiversity affects an ecosystem.

STATION 4 - Testing Water

<u>Water Sample</u>	<u>Temp. (unit)</u>	<u>pH</u>	<u>Notes or Other Test</u>
1			
2			
3			
4			
5			

What does pH test for?

Explain the pH scale below.



What do you think acid rain is? Why?

Explain the difference between a physical and chemical change.

What type of changes did you observe today?