Austin Environmental Heroes
Summer 2018 – Pilot Year Program Report

Executive Summary

The Austin Environmental Heroes (AEH) program was a six-week summer program that promoted service, professionalism, environmental conservation, and personal responsibility through caring for Austin's trees and waterways. This program combined the energies of TreeFolks and Austin Youth River Watch, each of which have decades of experience in their sectors, to deliver a robust, well-rounded environmental service learning experience to Austin's youth. Green-collar jobs training in tree watering and maintenance was coupled with environmental education in riparian restoration and water quality testing. This helped to foster an ecological awareness of the connections between urban forests and our water supply, while additionally alleviating the stress on municipal tree plantings over the hot summer months.

AEH students cared for a total of 242 trees at five urban park areas including Scofield Farms Neighborhood Park, Balcones District Park, Blackshear Elementary School, Dobie Middle School, and Norman Elementary School. Caring for these trees required using approximately 13,750 gallons of water from bulk stations. All locations had trees planted within the last 3 years that were no longer being watered by the Parks and Recreation Department (PARD). AEH students provided water for these trees even on days of extreme heat, when temperatures were at 100+ degrees. Additionally, students performed water quality evaluations in various locations around Austin.

The program was effective in reaching teens in underserved communities, while also being broadly demographically inclusive and impacting every part of the Austin metropolitan area. The program implementation model provided transportation, food, stipends, educational service learning, and educational adventure programming. This was attractive to a broad cross-section of youth and their parents, evidenced by the full registration.

Students learned specific quantitative facts regarding tree care. They learned that every two weeks saplings need about 30 gallons of water to remain hydrated. They also learned about overarching ideas, like how trees, waterways, built environment, and human impact are deeply interrelated. Students made comments indicating that they began to see and understand "the effect of micro actions on a macro scale." They learned these important lessons from green job professionals including: arborists, conservation managers, hydrologists, aquatic specialists, ichthyologists, and park rangers.

Discussion of Objectives and Outcomes

What follows below is a list of objectives in the initial proposal, and the corresponding outcomes of each objective.

1. Delivering a high-impact program in STEM, environmental education and youth development primarily targeted to underserved high school students of all backgrounds. The program aims to increase an understanding of environmental issues, confidence with STEM subjects, self-esteem, communication skills, and a sense of environmental and community stewardship.

This objective pertains mostly to the youth education outcomes of the program. It also addresses demographics, which is more thoroughly covered in objective #5. The six-week service-learning program taught students about urban tree species, urban forest health, water quality, watershed health, measurement & analysis of tree and water health indicators, urban forest restoration and riparian restoration. For specifics on daily program activities, see Appendix 1: Program Activity Schedule – Summary Details.

Students were required to go through an application and interview process in order to become a part of Austin Environmental Heroes. During the interview process, prospective students are asked a series of questions about their understanding of environmental issues and confidence with STEM subjects. This interview acted as the pre-assessment for the program. Open ended questions were used in the pre- and post- assessment, and these types of questions made it challenging to quantify the results. An additional challenge to quantifying the data is that the pre- and post- assessment questions did not match to give a clear picture of how knowledge of environmental issues and confidence with STEM subjects improved over the six-week program.

In order to have quantifiable data for the 2019 Austin Environmental Heroes program, both TreeFolks and Austin Youth River Watch will collaborate on a different pre- and post- assessment tool that will not rely on open-ended responses to show the educational impact of the program. The pre- and post-assessment will also have the same questions so we can more accurately measure a student's improvement after completing the program. The pre- and post- assessments will consist of a quiz related to urban forestry and riparian health, and include a survey with Likert scale questions to assess the students confidence with STEM subjects, self- esteem, communication skills, and sense of environmental and community stewardship.

Although the data was challenging to quantify, students did give feedback during the post assessment. The post assessment questions and student feedback are listed below by category:

- *What is one thing you learned about the environment during the AEH program?*
- *What is one thing that you learned about trees or tree care?*
- *What is one thing that you learned about water quality testing?*

Trees

- Importance of correct watering techniques to support root and lateral growth
    - "I learned that we water the trees all around so the trees roots can grow outwards, making the tree strong."
    - "Trees roots grow horizontally in order to give trees more support."
    - "Roots need to be spread out instead of down."
    - "I should water young trees from inches away from the roots so their roots can spread out which is beneficial for the trees in so many ways."
    - "The roots grow outward so it needs lots of water around the perimeter."
    - "It's better to water around the drip line in order to promote root growth."
- Quantity of water required for saplings
    - "Baby trees need about 30 gal of water to keep hydrated."
- Tree identification
    - "You can identify a species by its traits. For example, by its leaves"
    - "A system to go about identifying them by branch, trunk, and leaf."

    - "I can identify oak and bald cypress trees."
- Random fun facts, perhaps of particular interest to teenagers
    - "There are female trees and male trees."
    - "I learned about tree intercourse."

Water Quality

- Water quality tests (pH, nitrates, dissolved oxygen, conductance, turbidity, and *E. coli*)
    - "The level of dissolved oxygen in a body of water is very important for the fish and wildlife relying on it."
    - "To test the clearness of the water we'd fill up a large tube with a pattern at the bottom and depending on how clearly we could see the pattern we could tell how clean that water was."
    - "I learned that dissolved oxygen increases throughout the day as the plants begin to photosynthesize."
    - "If the number for E. coli is higher than 496 it is harmful."
- Relationship between water quality and urban riparian ecosystems
    - "I learned more about the way sewage can run along creeks, and how that's a major problem for E. coli levels."
    - "Long as there is something wrong with one part of the water, the whole water body would get it since they are ALL connected."

Ecosystems

- "Interrelationships between different elements of urban environments, including human impact. "[I learned] how fragile and specific the conditions are for different species to survive in the ecosystems around Austin."
- "Our building can affect the temperature of the environment."
- "I learned that there are also native species of plants and animals that can be invasive."
- "Human impact can really be seen on the environment for example there are organisms eating microplastics which could harm them."
- "There are many types of species of plants and animals that help each other."
- "The effect of micro actions on a macro scale when we went to Barton Creek Habitat Preserve."

AEH students were greatly attracted to the program because of the resource supports provided, namely transportation, food, and the stipend; and this is consistent with our decades of experience providing educational programming to underserved communities. Inspiring more than half of a group of mostly underrepresented minority students towards STEM careers would be regarded as a success by most educators familiar with the challenges of working with underserved and underrepresented communities.

Again, 2019 methodology will be improved, in that it will provide matching pre- and post- assessment questions, and more quantifiable measurements than the open-ended questions of the 2018 assessment.

2. In this pilot year, 50 students completing the Austin Environmental Heroes summer program.

There was a high demand for this program and unfortunately limited spots available. 58 students were registered in the program within only three weeks of opening the registration process, and several

students afterwards were placed on a waitlist. 52 students were accepted into the program at start-time, and 49 students (94%) were in the program throughout its duration. The three students who were not able to complete the program had unavoidable summer work obligations.

The attendance rate for the program was 69%, many of the students that participated in the program had other obligations such as summer jobs, taking community college courses, or family obligations. TreeFolks and Austin Youth River Watch will consider working with students who do not have additional obligations during the six-week program to improve the overall attendance. We are considering an attendance requirement as part of the job acceptance process for the upcoming summer. It is a challenge to balance the needs of this community of youth from underserved communities with the needs of the program. This is a goal we will try our best to better meet in future programming.

3. Facilitating the completion of service-learning activities and projects that enhance environmental and STEM career awareness for students while assisting (1) local authorities in monitoring environmental conditions, and (2) local, public and private environmental agencies in actively improving environmental conditions.

AEH, like other environmental citizen science initiatives, provided data that local public and private agencies would not have otherwise had access to, due to personnel and resource limitations. AEH students' work on (a) tree health, and (b) water quality were reported, respectively to: (a) City of Austin Parks & Recreation Department Urban Forestry Program, and (b) the Lower Colorado River Authority and the City of Austin Watershed Protection Department.

In the initial proposal for the program, TreeFolks and Austin Youth River Watch projected they would be able to water eight parks totaling 617 trees, and this projection was made without fully understanding the challenges that this program would face in regards to transportation, lack of functioning fill sites, and the restriction of a 1,000 gallon watering trailer. After additional meetings with PARD and understanding their specifications for watering, the program was tailored to be more efficient given all the logistical factors. AEH students were able to water five of the eight parks, reaching 242 of the 617 trees.

Throughout the AEH summer program, students watered trees, monitored tree health conditions, conducted water quality tests, and performed park and creek clean-ups. Tree watering and tree health conditions were reported to City of Austin Parks & Recreation Department's Urban Forestry Program. Water quality measures were reported to the Lower Colorado River Authority and the City of Austin Watershed Protection Department. See Appendix 1: Program Activity Schedule – Summary Details, Appendix 2: Tree Watering Log, and Appendix 3: Water Quality for details.

This outcome did not meet our proposed goal of trees and parks. The 2018 pilot year provided information about realistic goals for the summer 2019 program.

4. Augmenting municipal tree watering to improve survival of newly planted public trees in Austin's parks and schoolyards.

AEH students cared for a total of 242 trees at 5 urban park areas, using approximately 13,750 gallons of water from bulk stations:

- Scofield Farms Neighborhood Park: 58 Trees. Each tree watered a total of two times in four visits (third visit canceled due to rain)
- Balcones District Park: 81 Trees. Each tree watered a total of two times in four visits (third visit canceled due to rain)
- Blackshear Elementary School: 26 Trees. Each tree watered a total of three times in three visits
- Dobie Middle School: 58 Trees. Half of trees watered 2 times; other half of trees watered 1 time in 3 visits. Other visits canceled due to rain.
- Norman Elementary School: 19 Trees. Each tree watered once in one visit. This was an emergency situation where the joint-use park no longer had a functioning irrigation system and needed support.

All 5 areas had trees that were planted within the last 3 years, and all areas were not being watered by PARD. AEH students provided water for these trees even on days of extreme heat, when temperatures were at 100+ degrees. We cannot gauge the long term survival immediately after the program, however, we posit that these 242 trees will have increased survival rates compared to trees under similar circumstances that did not receive watering in the same time period.

One of the metrics used to measure this outcome was the cost savings to PARD, in the grant proposal TreeFolks requested $50,000 dollars, with the overall program costing $132,758.80. The estimated cost of a contractor to do the same work would be approximately $20,000. The cost estimate provided by Heritage Tree Care can be found in the AEH backup folder. The cost of a contractor is significantly lower than the cost to execute the AEH program. PARD supported this program by allowing TreeFolks to use their Austin Water Utility account and paid for water use during the 2018 pilot year. TreeFolks now has their own account with Austin Water Utility and will be paying for water in 2019, relieving PARD of that cost to the program. PARD also provided staff time by providing site maps, as well as meetings to discuss the logistics of watering the parks, TreeFolks is proposing to water the same sites for the 2019 season to reduce PARD staff time since we have all the supporting documents for the 2018 parks.

TreeFolks and Austin Youth River Watch realize this metric is not a good assessment of the worth of the program. Although a contractor may be cheaper and more efficient, it would not include the community engagement and education pieces that Austin Environmental Heroes works to accomplish. TreeFolks and Austin Youth River Watch want to provide support to municipal trees, but the purpose of this program is to engage students and empower them to become environmental stewards beyond the Austin Environmental Heroes Program. TreeFolks and Austin Youth River watch will adjust the 2019 proposal to find a more fitting metric to measure the success of the program.

During the 2018 pilot year PARD reached out to TreeFolks staff to water Scofield Farms Neighborhood Park, unfortunately this was after the AEH program had concluded in August and TreeFolks was unable to provide support to water the park. Communications with PARD is provided in the AEH backup folder.

5. Facilitating the development and training of the next generation of culturally and racially diverse environmental stewards and STEM professionals.

The 49 students who completed the AEH program came from a wide variety of socioeconomic and cultural backgrounds. It was significantly inclusive of ethnic minority students, which made up 84% of the program student population. The number of ethnic minorities enrolled in our program represents a higher proportion than that served by the Austin Independent School District, which is 73%, based on Austin ISD student demographic reports. The ethnicity and gender proportions for AEH are as follows.

Ethnicity Demographics

- African American = 11 (22%)
- Anglo = 8 (16%)
- Asian American = 2 (4%)
- Hispanic = 28 (57%)

Gender Demographics

- Female = 30 (61%)
- Male = 19 (39%)

The geographic diversity of our students is demonstrated by their enrollment in 13 schools and residence in 17 zip codes.

Schools:

- Akins High School
- Anderson High School
- Austin High School
- Crockett Early College High School
- Eastside Memorial Early College High School
- Idea Allan College Preparatory
- Lanier Early College High School
- LBJ Early College High School
- Manor High School
- Manor New Technology High School
- McCallum High School
- Reagan Early College High School
- St. Michael's Catholic Academy

Zip Codes:
78621, 78653, 78702, 78721, 78724, 78731, 78741, 78744, 78745, 78747, 78748, 78749, 78752, 78753, 78754, 78758, 78759

Taking into account the schools AEH students attended, zip codes where they resided, and locations where programming tasks were performed, we can report that this program impacted all parts of the metropolitan Austin area, including East, West, South, North, and Central Austin.

Much of the delivery of the AEH program was designed on the Austin Youth River Watch model, which includes methods to ensure program accessibility because it serves primarily at-risk and low-income youth. The main element ensuring accessibility was the transportation provided by the program. On regular program days, students were picked up in the morning at central neighborhood locations including Akins High School, Eastside Memorial High School, LBJ High School, Lanier High School, and McCallum High School. They were provided transportation between program sites and taken home after program completion.

The post-program assessment showed that over half of the students (62%) that participated in the AEH program were inspired to continue their education or pursue a career in the scientific field. This is a highly positive outcome since the demographics of the pilot AEH student cohort, with 84% coming from

ethnic minority backgrounds, is only barely reflected in the STEM fields. Percentage calculations for this questions can be found in the AEH Backup folder. The arduous challenges of diversifying the STEM pipeline to reflect our population in an inequitable society have long been discussed in educational, sociological, and scientific literature. Without enough current STEM role models in place that reflect the underserved and underrepresented communities AEH and programs like AEH serve, larger resource investments must be taken to create the same positive differences found in communities with greater financial and cultural capital.

Again, 2019 methodology will be improved, in that it will provide matching pre- and post- assessment questions, and more quantifiable measurements than the open-ended questions of the 2018 assessment.

In the post-program assessment we also assessed the importance of program accessibility with the following questions. **Was it helpful to have transportation provided by River Watch?**

Students were asked to give a range from 1 to 5, with ***1*** being "Did not make a difference," and ***5*** being "Very Helpful."
-95% answered 4 or 5, (87% answering 5 specifically); the remaining 5% of students answered 3.

- **Would you have participated if there was no transportation provided?**

-64% of students answered ***No***, they would not have participated if transportation were not provided
36% answered ***Yes*** and felt they would have still participated.

Accessibility, particularly for students from lower income backgrounds, was likely enhanced by the $350 stipend for the 6-week program, though it did not seem to be as significant a factor for participation overall as transportation.

- In the post-program assessment we also assessed the importance of financial support. **Did the stipend make an impact on your decision to participate?**

46% of students answered ***No***, while 54% answered ***Yes***.

In such a diverse student environment, it helps to have supportive program staff managing the program. In the post-program assessment we inquired if they felt we achieved this goal.

- **Did you feel supported by your coordinator/program staff?**

Students were asked to give a range from 1 to 5, with ***1*** being "Did not feel supported," and ***5*** being "Felt Very Supported."
98% answered ***4*** or 5, 85% answering 5 specifically; remaining 2% of students answered 3, feeling neutral about the level of staff support.

Program Promotion:

AEH was promoted to the general public and to high school students in a number of different ways. A press conference was held at City Hall with Councilmembers Alter and Pool on April 16th that publicly announced the program. The program was designed for all high school students, with students from

underserved, underrepresented, and at-risk communities strongly encouraged to apply. Students who are at-risk, from low-income households, and who are ethnic minorities compose over 80% of the AYRW student population, and thus the program was promoted during the last few weeks of the spring semester afterschool program to AYRW students via verbal announcements and flyers.

Outside of the AYRW program, flyers and information about the program were shared with the Austin ISD Science Curriculum department to distribute, and also with a few Austin ISD teachers directly. Breakthrough Central Texas, a nonprofit that builds a path through college for students from low-income communities, serves a population similar to AYRW. They requested our presence for a panel presentation on summer opportunities, and program information was shared with their students. Posts were made through AYRW and TreeFolks digital channels (website, email newsletters, Facebook, Twitter, and Instagram), and flyers and information were distributed at tabling opportunities, such as at Austin High School's Earth Day Fair.

<u>Austin Environmental Heroes Pilot Year Conclusions and Findings</u>

The pilot year of the Austin Environmental Heroes (AEH) program was intended to provide findings to form the basis for a long-term, effective program for watering trees in Austin parks while also educating youth. Below is information about challenges the AEH program faced during the 2018 pilot year. Findings for improving program efficacy:

A. *Measuring impact on tree health*. While long-term health of trees watered through the AEH program cannot be measured with only a one-year timeframe, it is posited that these 242 trees will experience increased survival rates compared to trees under similar circumstances that received less watering in the same time period. A stable, consistent program over multiple years will provide meaningful data on tree growth and survival rates
B. *Balancing water refill stations with student timetable*. The City of Austin provides only two available spigots for refilling large watering trucks with reclaimed water, both on the east side of Austin. TreeFolks crowdfunded a 1,000 gallon pump-operated water trailer to support the AEH program. We found that there was insufficient time in a morning to refill the water trailer, particularly when watering trees in parks located far north. We recommend both the use of a larger truck, and potentially refilling the truck with hydrant water when servicing larger trucks.

C. *Alleviating transportation difficulties*. A critical logistical hurdle was determining watering refill stations and appropriate time periods for refill while juggling transporting water and students. Targeted trees, refill stations and student's schools and residences were all located in different areas, making the transportation coordination extremely challenging.
    1. TreeFolks and Austin Youth River Watch will consider localizing to parks that are near the pick-up locations to help reduce the amount of time spent driving to and from parks.
    2. TreeFolks is working to increase our watering capacity to support the AEH program as well as serve the community need for tree watering.

Successful program implementation strategies included providing transportation, food, and stipends, while also providing a diverse, supportive staff structure. One of our students said she joined the program because she was going off to college in the fall and "I want to know I left Austin a better place

than when I came in." Considering what she and the other students learned and accomplished, indeed they did.

AYRW keeps a database of student info and makes efforts to regularly track students. The vast majority of the AEH students who were not seniors and have not graduated high school are also currently enrolled in AYRW's after school program, which allows for relatively easy tracking. For students that graduate, AYRW records students' plans for college and career, and performs check-in with alums as much as they can through events, social media, and direct communication. Over the last three years of increased alumni tracking, we have seen 60-67% of graduates entering STEM, STEM-related, and environmental fields of study and work.

Budget vs. Actuals

Budget Items	**Grant**	**Grant Actuals**	***Match***	**Total with Match**
Prog Coordination – TreeFolks	$8,980.00	$11,705.46	*$22,139.14*	$33,844.60
Prog Coordination – AYRW	$17,120.00	$17,120.00	*$20,585.69*	$37,705.69
Water ($2.82 per 1,000 gallons)			*$38.78*	$38.78
Student Stipends	$17,500.00	$13,007.59		$13,007.59
Truck/Trailer	$3,000.00	$3,000.00	*$39,000.00*	$42,000
Transportation (gas, parking)	$1,400.00	$2,223.12		$2,223.12
Equipment	$500.00	$2,191.47		$2,191.47
Food	$1,500.00	$754.89		$754.89
Insurance			*$992.66*	$992.66
Totals	$50,000.00	$50,002.53	*$82,756.27*	*$132,758.80*

All grant actuals are included in the backup folder provided.
Program coordination and overhead matching funds from AYRW and TreeFolks are based on time spend by support staff to help administer the program
All other hard cost matching funds are provided in the backup folder