Arkansas

Green Infrastructure Improves Water Quality and Changes Public Opinion in Stone Dam Creek Tributary

Waterbody Improved

The Arkansas Department of Agriculture's Natural Resources Division (NRD) first identified the Lake Conway-Point Remove Watershed (LCPRW) as a priority watershed in the state management plan in 2011. The Stone Dam Creek Tributary is in an urbanized area of the LCPRW and is significantly affected by stormwater flood events due to a lack of vegetation and over-channelization. These impacts result in eutrophication within the Stone Dam Creek Tributary. The City of Conway integrated nature-based stormwater treatment with green infrastructure techniques to improve water quality and flooding. Conway also used educational signage to inform the public of the importance of reducing nonpoint source pollution and improving water quality. Estimated load reductions from green infrastructure reduced nitrogen by 41% and phosphorus by 44% annually. Conway used this project to remediate a historic brownfield location into a local community park that reduced flooding, provided access to natural areas, and offered opportunities for recreation.

Water Quality Challenge

The Stone Dam Creek Tributary (SDCT) originates in the City of Conway in Faulkner County. Conway is the seventh-largest city in Arkansas and is part of the fast-growing central Arkansas metropolitan area. The SDCT is in the LCPRW and is currently a priority watershed in the NRD's 2018–2023 NPS management plan. A Fiscal Year 2017 Clean Water Act Section 319(h) subaward (17-500) between NRD and the Lake Conway-Point Remove Watershed Alliance supported the collection and analysis of water quality data that identified possible nonpoint source causes in the watershed. Land use and land cover data analyzed in the 17-500 project indicates that 83% of the SDCT is developed and is one of the most developed tributaries in the

LCPRW. Industrial pollutants and runoff from residential fertilizers and pesticides are causing SDCT to show signs of eutrophication. Some of the pollutants of greatest concern were found to be sediment, pathogens, and nutrients, which are exacerbated by increased stormwater flood events. The SDCT had the highest total phosphorus (in milligrams per liter [mg/L]) in sediment samples than any other tributary, finding that there was a 105% increase from the SDCT sample to the next highest tributary. The biggest impacts on SDCT were stormwater outfalls, low-water bridge crossings and bank erosion. Once problems were identified in the stream, three goals were established for this project: (1) using green infrastructure and low impact development to reduce nutrients and sedimentation, (2) implementing a nature-based landscape via wetland creation in an environmentally deficient area to reduce the flow of stormwater, and (3) creating a unique public education and recreation space for the community.

Figure 1. Aerial site view, before project began in 2021.

Project Highlights

Before this project began, Conway recognized that this was a historic brownfield site, which was acquired by the city in 2014 and remediated in June 2021 under the Arkansas Department of Environmental Quality Brownfield Program (Figures 1, 2 and 3). Several site remediation activities were performed, such as site assessment, soil removal (up to 4 feet in certain areas), the identification of chemicals of potential concern and disposal of excavated materials. The site was then backfilled with clean soils to stabilize and prepare it for future projects such as this one. Several activities led to the success of this Section 319 grant project (19-700). Green infrastructure and low impact development are practices that use soft engineering to create an ecologically based stormwater management approach that also works to reduce urban nonpoint

source pollution. One of these activities, permeable paving, was installed to allow water to pass through hardscapes and infiltrate the ground while removing sediment and trapping pollutants. Another activity, vegetated walls, uses vertical water harvesting to treat water and reduce stormwater runoff loads. Lastly, infiltration basins were installed to create shallow areas with permeable soils that temporarily detain and infiltrate stormwater. The wetland-based landscape activities included multiple rain gardens and bioswales, which are vegetated depressions that slow stormwater and trap pollutants through root infiltration (Figure 4). Educational signage was placed at each type of green infrastructure or low impact development to provide information on how they work and the importance of the project design (Figures 5 and 6). Conway also created several graphics, social media posts and educational videos to help promote the park and provide more details on stormwater, nonpoint source pollution and how the park is remediating these problems. Construction began in June 2021 and was completed in July 2022.
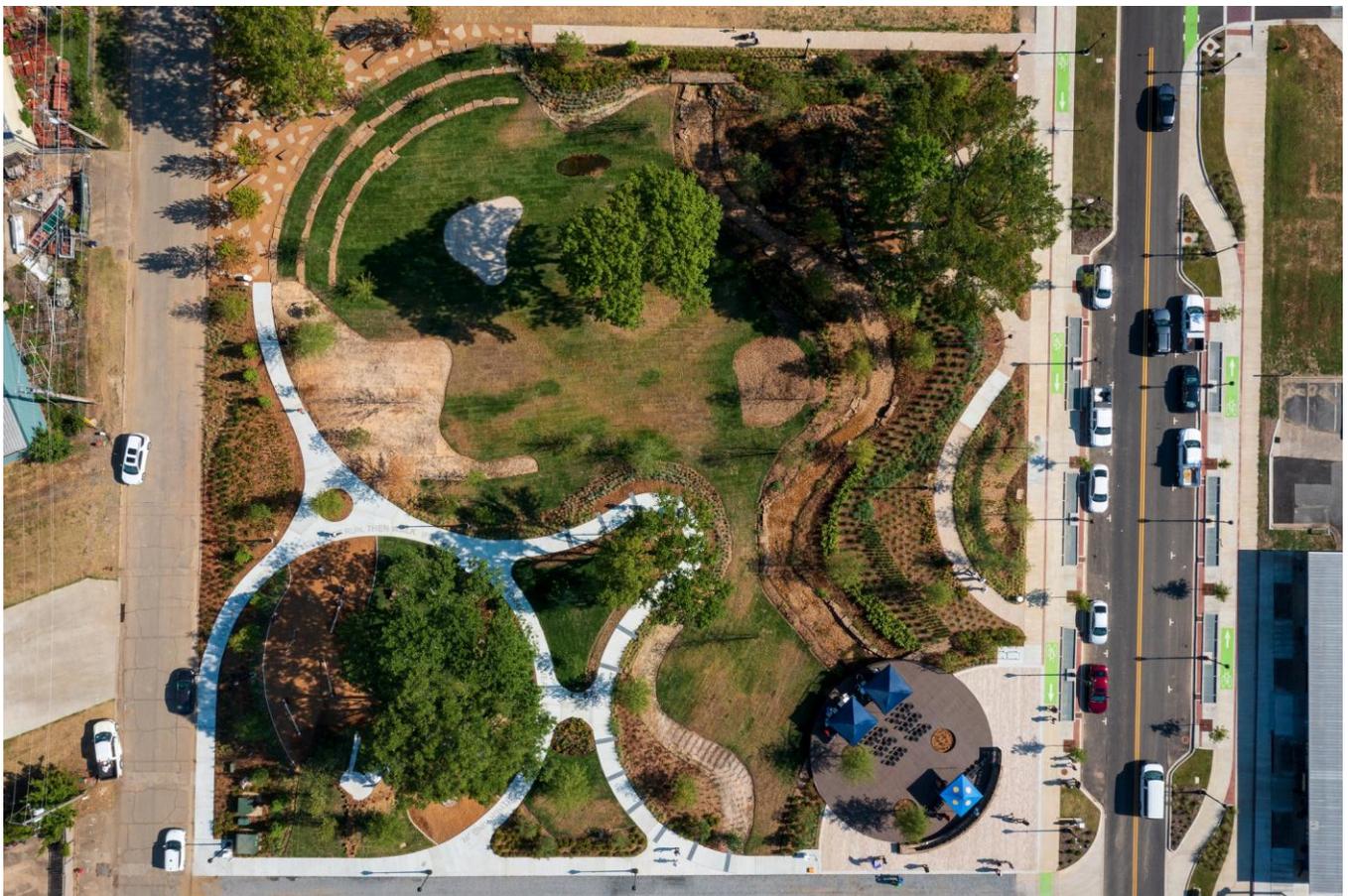

Figure 2. Aerial view of site, after project completion.

Best Management Practice	Number Installed	Units	Comments
Raingarden/ bioretention basin	5001.66	SQUARE FEET	
Infiltration Basin	21983.09	SQUARE FEET	
Porous Pavement	5385.76	SQUARE FEET	

Results

This project was successful in demonstrating how green infrastructure could be used in an urban setting to reduce nonpoint source pollution and mitigate stormwater. The estimated active load reductions were calculated using PLET for the SDCT, which found reductions in nitrogen (by 41%), phosphorus (by 44%), and sediment (by 48%). With the constructed infrastructure and native vegetation, the project provided increased water storage and infiltration, erosion control, nutrient cycling, recreation and ecosystem services. Conway has seen a decrease in flooding in this area due to the successful implementation of stormwater management practices. Education and outreach components were also very successful in promoting green infrastructure, as demonstrated by the results of a survey completed by citizens who have visited the park. An estimated 73% of those surveyed wanted to see more green infrastructure implemented in Conway. Another 63% said they were now more likely to plant native plants after visiting and learning the importance of native vegetation. Finally, this project was a success as it remediated a brownfield site into a unique public education and recreation area.
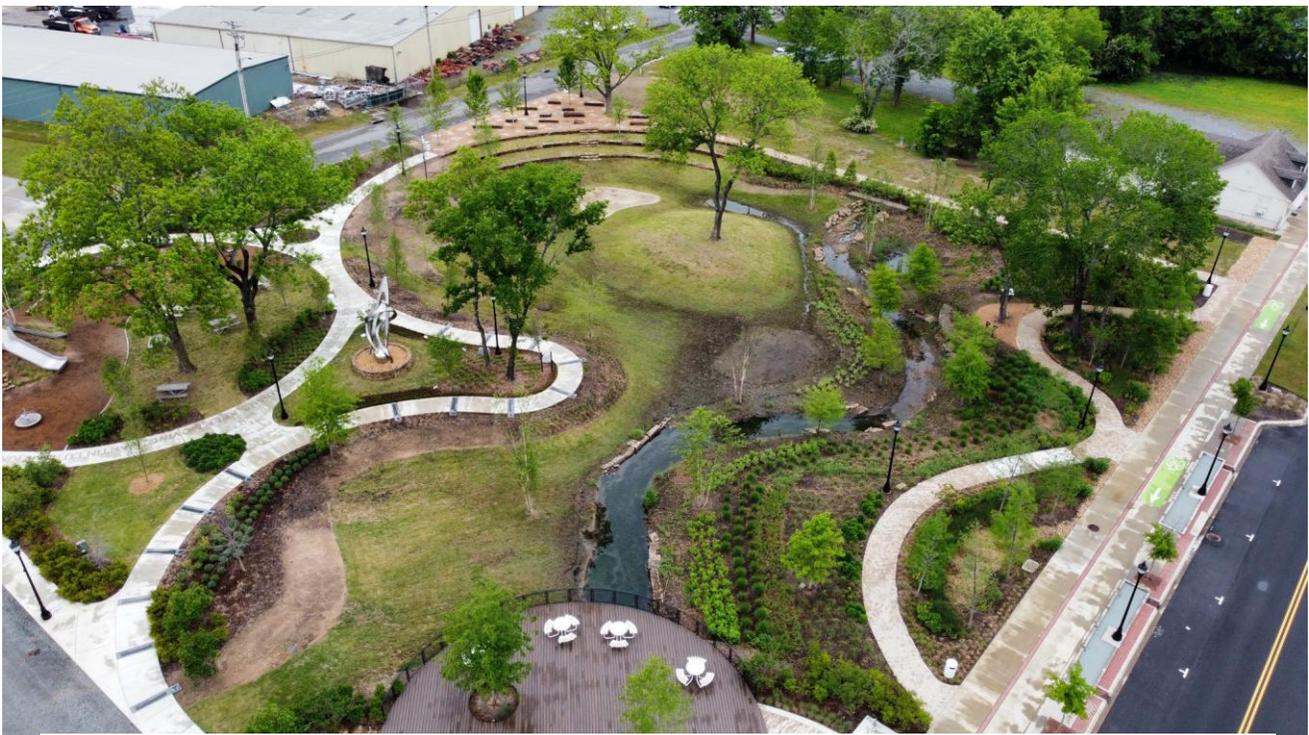

Figure 3. Aerial view of site in 2023, after project completion and plant growth has occurred.

Partners and Funding

| Partner Type	Agency	Funding	Notes
Federal	U.S. ENVIRONMENTAL PROTECTION AGENCY	$599,995	319(h) Nonpoint Source Pollution grant
Federal	U.S. ENVIRONMENTAL PROTECTION AGENCY	$200,000	Superfund grant to remediate brownfield site
City	CITY OF CONWAY	$880,553	In-kind support by the City of Conway, Lake Conway-Point Remove Watershed Alliance, and the University of Arkansas Community Design Center and Office for Sustainability.
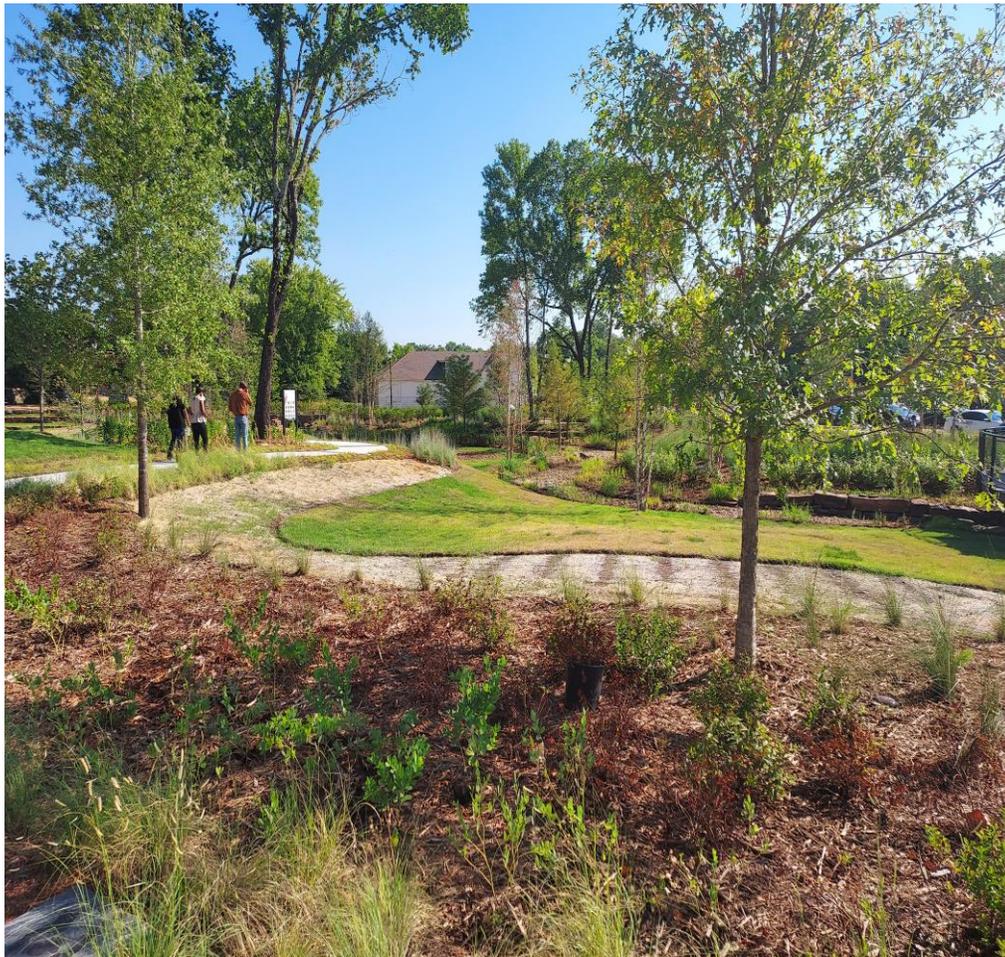
Figure 4. Green infrastructure practices were included in the design.

Figure 5. Educational signage describing the watershed where the project occurred.