



# Mitigating Urban Heat Island Effect at Southern City Park

ENVI 460 | SPRING 2021

Conservation & Sustainability of Natural Resources

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Mayor Clint Lamb, *City of Sullivan*

## **ABOUT SC**

The Sustainable Cities (SC) Program is an experiential learning partnership focusing on sustainability and cities in Indiana. Disciplines across the institution are tasked with addressing sustainability issues in a specific community by integrating these into experiential projects for ISU students. These problems range from strategic planning recommendations to community needs assessment, and understanding the impacts of waste strategies to mapping trail systems, and many other issues.

This is a year-long partnership, in which students and faculty in courses collaborate with one specific community partner on these projects. Communities throughout Indiana have leaders who want to make real change. These leaders are passionate about moving their cities forward into the future, but are often limited by lack of resources, staff, and budget.

The SC Program utilizes the innovation and energy of students and faculty to provide ideas that will address these issues. This relationship reinforces and strengthens our Indiana communities.

Each ISU course and community partner will produce tangible and relevant outcomes for the community partner while providing ISU students with real world project completion. This report serves as this outcome.

## **SC PLANNING COMMITTEE**

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## ABOUT SULLIVAN, IN

Sullivan, IN is the county seat of Sullivan County and serves as a hub for the towns of Carlisle, Dugger, Farmersburg, Hymera, Merom, and Shelburn. Sullivan, IN was founded in 1853 and became the county seat. The total city limits is 1.88 square miles, but there are more residents living outside of this area that contribute to the community of Sullivan. Today, Sullivan has the largest estimated population as an incorporated town in Sullivan County.

Sullivan faces many similar social, environmental, and economic challenges to other rural Hoosier towns and others that are unique to the city itself. There are approximately 8,500 people available for the labor force in Sullivan County. Since 2009, the unemployment rate has steadily decreased in the county. There's approximately 2,500 people that live in Sullivan but work in other counties. Some of the major employers in Sullivan are Raybestos Powertrain LLC, Hoosier Energy Emergency, Peabody Energy Corp., Sullivan County Community Hospital, and Raybestos Products Co.

A common thought among Sullivan community members is that students that go to college graduate and don't return to Sullivan. The highest degree attainment of folks 25 and older in Sullivan County is a high school diploma. Trade programs and certifications are a community concern from folks.

Sullivan has a vast history and many points of interest in the community. The Sullivan County Public Library is one of 1,679 libraries designated as a Carnegie library. The Sullivan Civic Center was recently renovated to provide a central location for community members in Sullivan. The Heart of Sullivan is a civic organization that hosts many large events throughout the year. One of the largest events hosted in Sullivan is the Sullivan Annual Rotary Corn Festival.

This community is full of potential and is being led through a strategic plan intended to bolster its standing for Hoosiers. The ISU Sustainable Cities program intends to help reach that potential.

## COURSE PARTICIPANTS

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## EXECUTIVE SUMMARY

The City of Sullivan indicated the southern City Park as an area of interest for redevelopment as a neighborhood area and for sustainable features. There are existing structures and habitats that they are looking to bolster. Students in ENVI 460 identified multiple components of the city park that could be updated and upgraded to provide more sustainable infrastructure and community focus. They recommended permeable pavers in two locations in the park area, green roofing on some existing structures, and adding native habitats to the overall area.

## INTRODUCTION

The City of Sullivan's goal is to make the city a better place to live, work, and play. The city sees a lot of opportunity for integrating sustainable elements and infrastructure through their Quality of Life plan. One area the city is targeting is the Southern City Park. Students in ENVI460 were tasked with providing recommendations for a more sustainable area within the Southern City Park. Students gained knowledge about the city, community, and use of the park and formulated recommendations.

The Southern City Park is located on Main Street in Sullivan, IN. It includes an outdoor stage, playground equipment, sports fields and courts, enclosed shelter housing, and a community pool. The park covers nearly 50 full acres of green space with tree coverage in certain areas.



One issue that will impact the park and the surrounding neighborhood is the temperature and Urban Heat Island (UHI) effect. Daytime temperatures in urban areas can be 1-7 °F higher than surrounding areas.

The materials used throughout an area impact the temperature massively. Solid or paved surfaces prevent water from seeping into the ground and cooling the area (Santamouris). Dark and non-reflective, or low-albedo, materials can also raise temperatures by absorbing heat rather than reflecting. Elevated temperatures caused by UHI's increase the use of cooling systems. Energy bills and blackouts and shortages increase for surrounding neighborhood communities.

**The goal for any improvements to the city park should help reduce the UHI effect and engage the community in why these are important efforts.**

# PERMEABLE PAVERS

Most of the city park is pavement around the shelter structures, around the playground, and for the parking lots. Solid pavement does not allow water filtration to the surface, which prevents natural cooling effects. Depending on the type of pavement used, it can absorb more heat than necessary instead of reflecting. A more permeable pavement is recommended for certain areas in the city park area.

There are three types of **permeable pavement**. Permeable pavers, permeable poured concrete, and permeable poured asphalt.

Permeable pavers are typically a grid system that allow water to infiltrate the pavement and drain into the ground or sub-base rock underneath. They are just as strong and durable as traditional paving methods. Some examples include plastic grid pavers with flexible joints, rigid or rolled plastic pavers, and interlocking concrete grids.



Permeable poured concrete and asphalt are made of a coarse aggregate that is coated in mortar and cement paste. This creates a structure that allows water to filter through to the ground surface. There are some issues

with permeable poured material such as clogging materials that can filter through.

Permeable pavement helps prevent ice forming on the pavement by allowing the water to seep through into the ground. This can be beneficial for Indiana winters. Permeable pavement helps reduce UHI in parking lots of walking trails because of the movement of water and precipitation into the ground.

## RECOMMENDATIONS



Permeable pavers are the ideal solution, but permeable poured concrete is a good alternative if more cost-effective. **Permeable pavers or permeable poured concrete should be used in the highlighted orange areas at the city park.** These are parking lot areas that take up a lot of space.

# GREEN ROOFING

Existing structures at the city park are a standing shelter, community pool, community center, and restroom. These have typical roofing structures that can contribute to UHI effect. Implementing green roofing on existing structures could help reduce the UHI effect.

Green roofs help reduce UHI effect by using soil and plants instead of typical roof materials. This helps rainfall permeate and evapotranspiration. Green roofs increase the attractiveness of an area and assist in removing toxins from the air. Additionally, they help reduce storm water and rainfall runoff.

## RECOMMENDATIONS

Green roofs can be added to existing structures. All of the structures that green roofs can be added to are highlighted in green. **Ideally, the structures that can handle the weight of these roofing additions would be used. The standing shelter and the community pool would be most ideal.**



## NATIVE PLANTING & SIGNAGE

There are multiple habitat sites at the city park area. Habitats in public areas are an opportunity for bolstering pollinator habitats and engaging the community in efforts. They can also help reduce the UHI effect if planting appropriately. These could be bolstered by planting native habitats and adding educational signage about pollinator and native habitats.

Attracting birds is as simple as planting bird friendly vegetation, and it is necessary to attract tourism from birdwatchers. **Birdscaping** is planting habitats that include food, shelter, and native habitats. City park habitats should focus on food, water, shelter, and brood raising places.

Planting the right combination of trees, shrubs, and grasses can help create year-round bird watching experiences in the city park. It can also help create pollinator habitats.

Another important part is planting native plants as they help improve soil health and conditions. This can help the movement of water in the ground and reduce UHI effect.

All of these should be paid attention to the habitat sites in the city park.

### RECOMMENDATIONS

The sites that are marked with a green “x” are prime locations to think intentionally about the plant habitat construction. These sites should include signage about the efforts used to encourage birding, pollinators, and soil health.



## **CONCLUSION**

The City of Sullivan has multiple opportunities for the city park and improving the sustainable qualities to reduce UHI effect. The park is near the entire community and surrounds multiple homes, so it is an ideal location to reduce UHI effect to improve community health and quality. The ENVI 460 students provided multiple recommendations for improving the city park and sustainable options.

### **RECOMMENDATIONS:**

1. Place permeable pavers in surrounding parking lot areas.
2. Construct green roofs on existing structures.
3. Create intentional native planting habitats around the entire park.

## APPENDIX A.

The image 13.1 below displays an example of the type of signage proposed to add in Southern City Park, explaining the plant's scientific name and common name.



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