

## Bike West Lafayette

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### **Introduction**

The goal of this collaborative project was to educate the West Lafayette community about biking and encourage more people within the city to view biking as a reliable mode of transportation. Along with the cohort of students in the NRES 497 capstone course at Purdue University, the project partners for this project were Amy Krzton-Presson (Wabash River Enhancement Corporation) and Halee Griffey (West Lafayette Climate Officer). The final deliverables that were created through the duration of the spring 2024 semester included an informational pop-up banner on the benefits of biking, a GIS map of bike infrastructure around Purdue University's campus, and a supplemental StoryMap to accompany both products. A few of the guidelines that were given by the project partners for the pop-up banner consisted of; ensuring it could educate a broad range of audiences, maintaining an 8th-grade reading level, and making it versatile enough to be used at other events outside of Wabash Riverfest (its intended use). Regarding the GIS map and StoryMap duo, the main goal with these deliverables was to improve/update already-created maps that the city of West Lafayette previously had. Through much collaboration from the university students and project partners, we were successfully able to incorporate the ideas of many and create the desired deliverables.

### **Literature Review**

#### Impacts of Biking

Biking offers a wide range of benefits that surpass those of driving, both for individuals and for the environment. Not only does biking contribute to personal health and fitness by providing a cardiovascular workout, but it also reduces stress levels and improves mental well-being. Unlike driving, biking doesn't contribute to air pollution or carbon emissions, making it an environmentally friendly mode of transportation. Additionally, biking can save money on fuel and maintenance costs, while also reducing traffic congestion and promoting community

engagement. Biking maintains a sustainable and health-conscious alternative to driving, offering numerous advantages for individuals and society alike.

## ENVIRONMENTAL IMPACTS

Riding bikes or cycling greatly reduces carbon emissions in comparison to traditional motor vehicles. Burning fossil fuels like gasoline causes greenhouse gasses to enter the atmosphere and contribute to climate change. When an individual chooses to ride their bike instead of driving, they reduce the amount of greenhouse gas emissions and air pollution around them (EPA, 2015). If 400,000 vehicles were removed from the road, 2 million metric tons of carbon dioxide would be saved from the atmosphere (EPA, 2015). Biking can also reduce sound pollution. Noise pollution's main source is road and rail traffic, causing disruptions in wildlife and the natural flora and fauna (National Academy of Engineering, 2010). Noise pollution is something that is typically disregarded, especially in the U.S., because of the wide acceptance of a busy everyday life. With bikes, the problem with noise pollution is virtually nonexistent. With increased biking, the amount of noise produced by motors, engines, and exhaust pipes decreases.

Another environmental benefit to biking would be the minimal infrastructure that is required for bicycle use (All Kids Bike). All that is required for bike riding is a clear path. Some cities have bike paths or lanes, but other bike riders simply ride on the street, sidewalk, or on natural terrain. Motor vehicles require paved roads for operation, which are much more of a disruption for the environment and wildlife than bike lanes.

Some may argue that electric vehicles or electric bikes would be a better way to reduce emissions, instead of going straight to a non-electric transportation option. This is simply untrue, considering that traditional bicycles are a zero-emission transportation option. If the manufacturing of the bike is accounted for (.05 pounds of carbon emitted per mile), it is still no comparison to the emissions that come from manufacturing an electric vehicle, electric bike, or some forms of public transportation (Foersterling, 2021). Another environmental concern when it comes to bicycle infrastructure is the construction of trails and their associated damage. Some common impacts of recreational bike trail use are vegetation loss, soil compaction, and land erosion (Marion and Wimpey, 2007). While these are issues to be concerned about, the environmental damage caused by automobiles and their infrastructure is about ten-fold that of the infrastructure-related environmental damage caused by biking and bike trails.

## ECONOMIC IMPACTS

While there are many benefits associated with biking, some that often get overlooked are the economic benefits of biking. Fewer people driving means the slower degradation of roads and therefore less frequent spending on their maintenance. The increase of bicycle-related infrastructure (trails, recreation facilities, etc.) within U.S. cities has proven to be positively impacting local economies across the country (Weigand, 2008). Weigand demonstrates that this increase in infrastructure promotes higher rates of spending near areas where the infrastructure is present. Real estate values have been shown to also increase as a result of increased biking activity. A study looking at housing prices in Indianapolis examined how homes near the Monon Trail (one of the most popular trails in the city) sold for an average of 11% more than the average home (Lindsey, 2004). Increased physical activity from cycling has also been found to be a large source of economic benefit for employers. Healthy, bicycle-riding employees tend to

miss fewer days of work which can result in significant cost savings for companies (Flusche, 2012). Biking can also be good for the overall economy by reducing congestion which can allow people to be more productive with their time instead of sitting in traffic (Ohlund et al., 2021).

In addition to the macroeconomic benefits, personal financial incentives heavily influence a person's decision to bike in place of driving. Whenever we consider this equation, we must consider the costs of using a car as our primary mode of transportation; The average new car sale price in the United States is 48,759 USD and the average used car sale price is 26,533 USD, a vast sum when compared to the costs of purchasing a bike new or used (Kelley Blue Book, 2024; Tucker, 2023). Our next obstacle when preferring a car for transportation is that of car insurance, a legally mandated product that on average, is nearly 795 USD a month in the United States (U.S. Bureau of Labor Statistics, 2024). While biking has few costs, driving a car has significant marginal costs, gas, and maintenance tend to increase drastically with usage. The U.S. average fuel costs are nearly 3.328 USD per gallon, and the average vehicle has an efficiency of 28 miles per gallon for the model year 2023 (U.S. Energy Information Administration, 2024; U.S. Department of Energy & U.S Environmental Protection Agency, 2024 ). On the opposing side, with the limited costs associated with bikes/bike maintenance, bike trail maintenance costs (and who pays for them) may foster concerns for some. In 2005, a survey of 100 trail providers was conducted and showed that 60% of these costs were covered by a government agency, while the other 40% were covered by non-profit/volunteer organizations (Rails to Trails Conservancy, 2005). When considering vehicle maintenance costs, among the most affordable vehicles to own, the 5-year cost of ownership ranges from 646 USD to an eye-watering 3143 USD depending on vehicle size and type (luxury, fuel type, form-factor) (Wakefield, 2023). The culmination of these factors heavily incentivizes the use of non-motorized forms of transportation, like biking!

## HUMAN HEALTH IMPACTS

While cycling as a form of commuting has countless benefits for the environment and is quite cost friendly, it is also an amazing way to stay physically fit and get extra exercise throughout the week. Many Americans are extremely busy and have limited time to get a proper workout each day, including strength and endurance training. It is recommended that the average adult does around 150 minutes of exercise each week, and only a 15 minute commute twice a day would reach this goal of 150 minutes, while you are just commuting to school or work (Centers for Disease Control and Prevention, 2022). This aligns perfectly with the 15.4 minute average commute time of West Lafayette, IN (Data USA, 2021).

Around 86% of Americans spend long, sedentary hours sitting at a desk every day, and factoring in sitting down in your car during your commute, the amount of time sitting per day can reach the 9-10 hour mark (Olsson, 2022). Any extended period of sitting, such as sitting behind a desk can have many negative consequences on the body. By sitting for 8-11 hours per day your body is at high risk of developing negative health problems such as hypertension, slower metabolism, and musculoskeletal disorders but getting daily exercise can help mitigate some of these risks (Medical News Today, 2023). One deterrent that might come to mind when deciding whether or not to bike to work is how sweaty one might get on their commute. Perspiration is a large factor that turns many people away from the idea of cycling to/from work (Engbers and Hendriksen, 2010). However, it's important to keep in mind that commuting by cycling can help limit some of the time sitting per day while also being a great form of exercise,

with many other positive impacts for your body. These include increased cardiovascular health, muscle building, improved balance, better overall mental health, and lower stress levels (Sreenivas, 2022). Relieving stress and maintaining positive mental health is extremely important especially when dealing with the stresses of working and everyday life. Exercising can increase the production of the brain's feel good neurotransmitters, which are known as endorphins (Mayo Clinic, 2022). Daily exercise can directly improve mental health by decreasing anxiety and depression while also improving sleep quality and overall mood (Sharma, 2006).

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## Goals and Objectives

1. To educate and encourage more people to commute by bike in West Lafayette by working with our project partners and completing our proposed deliverables
2. Creating resources for community members to learn more about biking

## Deliverable Descriptions

1. Educational pop-up banner
  - a. Develop an educational banner to be displayed at the Wabash Riverfest in July, promoting the benefits of biking
  - b. It should be readable for a broad range of audiences
  - c. Primarily target parents with children at the festival - maintain an 8th-grade reading level
2. Base Map
  - a. Includes these components of Purdue University:
    - i. Bike routes/trails around campus
    - ii. All bike rack locations within Purdue University
    - iii. Bike shop locations in West Lafayette
3. Interactive Story Map
  - a. Interactive GIS map of West Lafayette's existing bike infrastructure and amenities including trails, bike racks, and bike repair shops
  - b. The maps included:
    - i. West Lafayette Bike Lanes & Trails
    - ii. West Lafayette Bike Racks

- iii. West Lafayette Bike Repair Facilities
- c. Short educational excerpts on the environmental, personal health, and economic benefits of cycling to work rather than driving a car
- d. Also provided links for additional information. Those links included:
  - i. Riverfest information
  - ii. Purdue Cycling Club
  - iii. West Lafayette Bike Program
  - iv. Hodson's Bay Bike Shop

## Metadata & Technical Details

### Pop-Up Banner:

- Software: Canva
- Link to edit: [Pop-up Banner](#)
- Information originated from the literature review
- Icons provided by Canva and logos provided by project partners and Purdue NRES

### GIS Base Map

- Software: ArcGIS Pro
- Link to map: [Bike Base Map](#)
- Data from Google Maps and Purdue Physical Facilities
  - [Bike trails data link](#)
  - [Hodson's Bay Company location link](#)
  - Request Purdue Physical Facilities for bike rack data

### Interactive Story Map

- Software: Story map feature on ArcGIS Online
- Link to view: [Story Map](#)
  - Cannot have more than one collaborator
- Data originated from base map and information of environmental, economic, and health benefits originated from literature review
- Cover image: [Biking Image](#)
- Environmental icon: [Earth image](#)
- Health icon: [Bike image](#)
- Economic: [Chart image](#)
- Riverfest button link: <https://wabashriverfest.com/>
- Purdue Cycling Club button link: <https://purduecyclingclub.com/>
- West Lafayette Bike Program button link: <https://www.westlafayette.in.gov/our-city/getting-around/bike-program>
- Hodson's Bay Bike Shop button link: <http://www.hodsonsbay.com/>

## **Conclusion and Future Work**

Overall our group provided some great resources and information to help educate the citizens of West Lafayette about biking as a form of commuting and the various health, economic, and environmental benefits associated with it. From the River Fest banner which will be displayed at the famous Wabash Riverfest in July to our story map and trail/bike rack maps, hopefully, many people around the Greater Lafayette community will be able to learn a bit more about biking and maybe even consider picking it up. Our goal is to have anyone who wants to be able to find the story map, which could provide valuable information about where you can ride your bike and where to park it around campus and West Lafayette. The RiverFest banner is ready to go and will be displayed at RiverFest but the story map could be of concern as we saw during our presentation. It works better on certain browsers than others and is not as easily accessible as a normal website. A link to the story map on the existing Bike West Lafayette website would work but maybe even creating just a whole new webpage with the same information would be good for the future. Something that would take a bit more work but would be very beneficial in the long term would be creating a joint West Lafayette/Lafayette bike trail map showing the trails in both cities. Many people live in one city and commute to the other and overall they are two very connected cities, so a map with both could be a huge resource to everyone. In conclusion, I believe all of our deliverables turned out well, and are able to educate anyone looking for biking information!

## **Appendices**



# Benefits of Biking



Biking is a sustainable and health-conscious alternative to driving, offering many advantages for individuals and society as a whole.

## Environmental Benefits

Riding your bike instead of driving can significantly reduce the amount of greenhouse gases that are emitted into the atmosphere. Limiting these gases is the key to cleaner air and a healthier planet!



## Economic Benefits




Biking is quite inexpensive when compared to driving a car. Things like gas, oil maintenance, and insurance costs are all avoided when opting to bike.

## Health Benefits

Cycling is a great form of exercise! It can improve heart-health, build muscle, and increase overall happiness.




 @WabashRiver

 @WabashRiver

 @WabashRiverEC

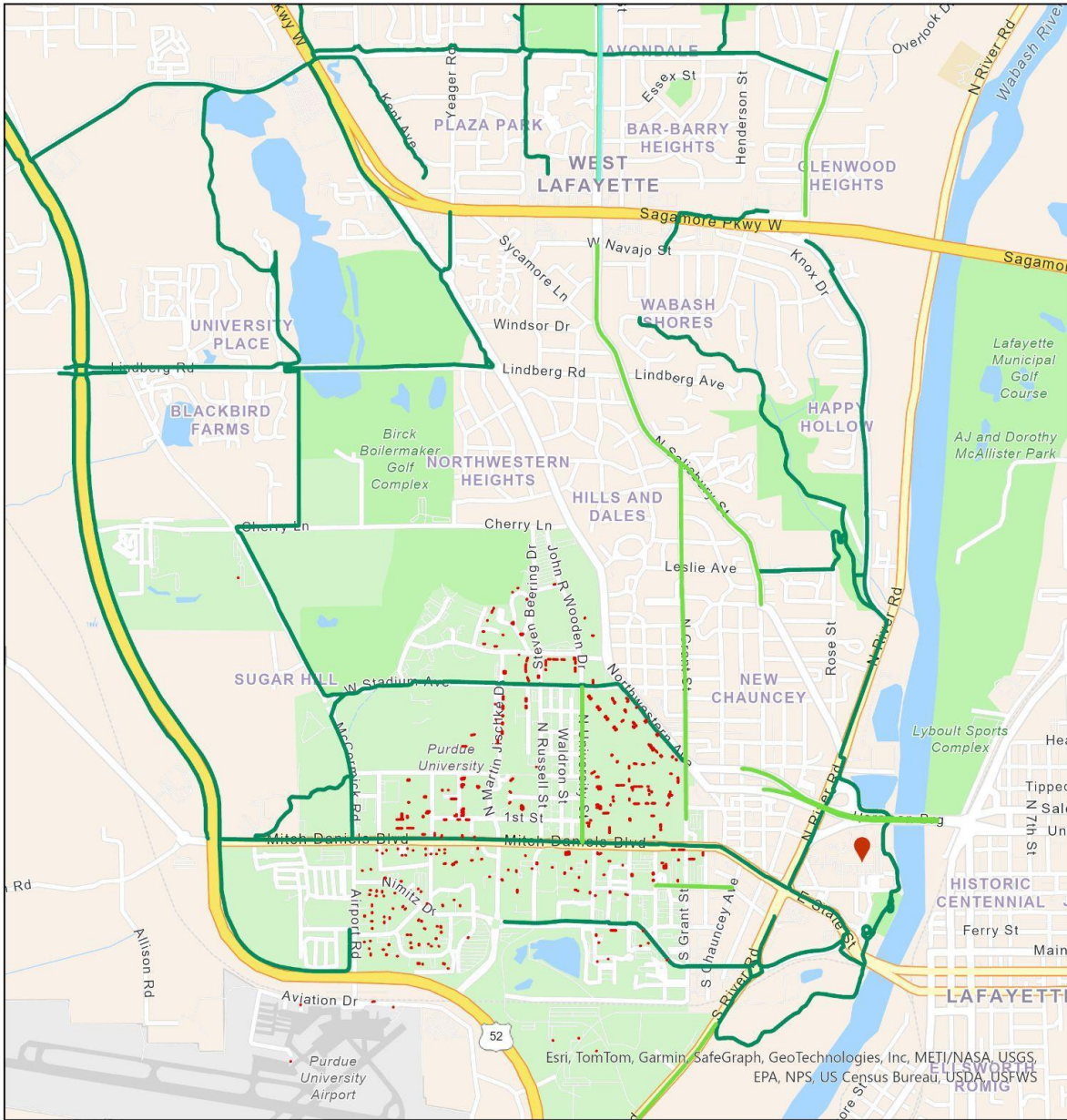
**WABASH RIVER**  
ENHANCEMENT CORPORATION

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# West Lafayette Bike Trail Map



## Legend

- BikeRacks
- Bike Repair Facilities
- Trails
- Paved Trail
- Bike Trail
- Overlap



*Base Bike Map*

**Story Map**  
*Story Map Link*