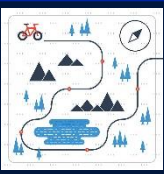




'CYCLING TRAILS ACROSS THE US' CONSOLIDATED MAPPING PROJECT

Kevin G. Clark
Rachel Dieman

WebGIS Course #GEOG677 – Spring 2024



'CYCLING TRAILS ACROSS THE US' CONSOLIDATED MAPPING PROJECT

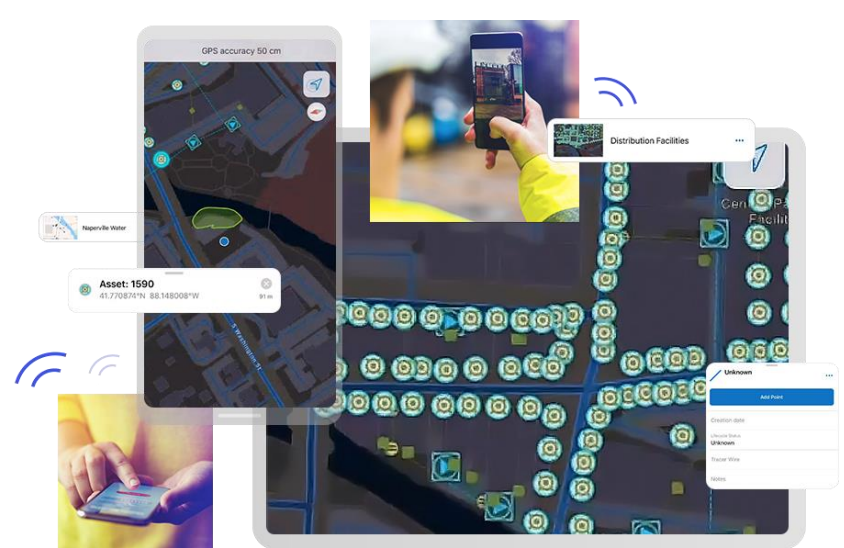
Kevin G. Clark

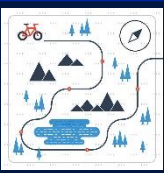
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- Project Overview.
 - Problem Statement.
 - Introduction.
 - Focus Area.
 - Business Plan.
 - ArcGIS System Pattern.
 - ArcGIS Architecture.
 - Deployment Pattern.
 - Capability Delivery.
 - Portal System Architecture.
 - Portal Benefits.
 - Data Methodology.
 - Application Front End (Mockup).
 - References.
 - Appendix.





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■ Problem Statement.

- Cycling has become more popular in the United States for exercising, commuting and general recreation.
- But there is no single resource for users to research cycling trails.
- This proposal is to create a web portal that allows users to view, submit and rate cycling trails across the United States. **Planning Route Tool.**

■ Introduction.

- The number of people who rode bikes in the United States in 2022 was 54.7 million, which represents a 7% increase from the year before. Industry experts are estimating a yearly increase in demand of bicycles of 5.3% between 2020 until 2027.
- The increase in demand is driven by numerous factors, including the rise of environmental awareness, an increasing emphasis on fitness and health, and the increasing popularity of bicycles as an alternative form of transportation.



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■ Focus Area.

- The study area for this proposal will focus on the contiguous United States (CONUS) which includes the 48 US states on the continent of North America including the District of Columbia. The total area and population for the county is as followed:
 1. 3.1 million square miles
 2. 333 million people in the United States
- As of the 2022 Census data, the population was 333.2M with the following geographic breakdown:

Region	Population	% of Population
Northeast	56,983,517	17%
Midwest	68,909,283	20.6%
West	78,896,805	23.6%
South	130,125,290	38.9%
Totals	333,287,557	100%





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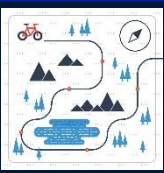
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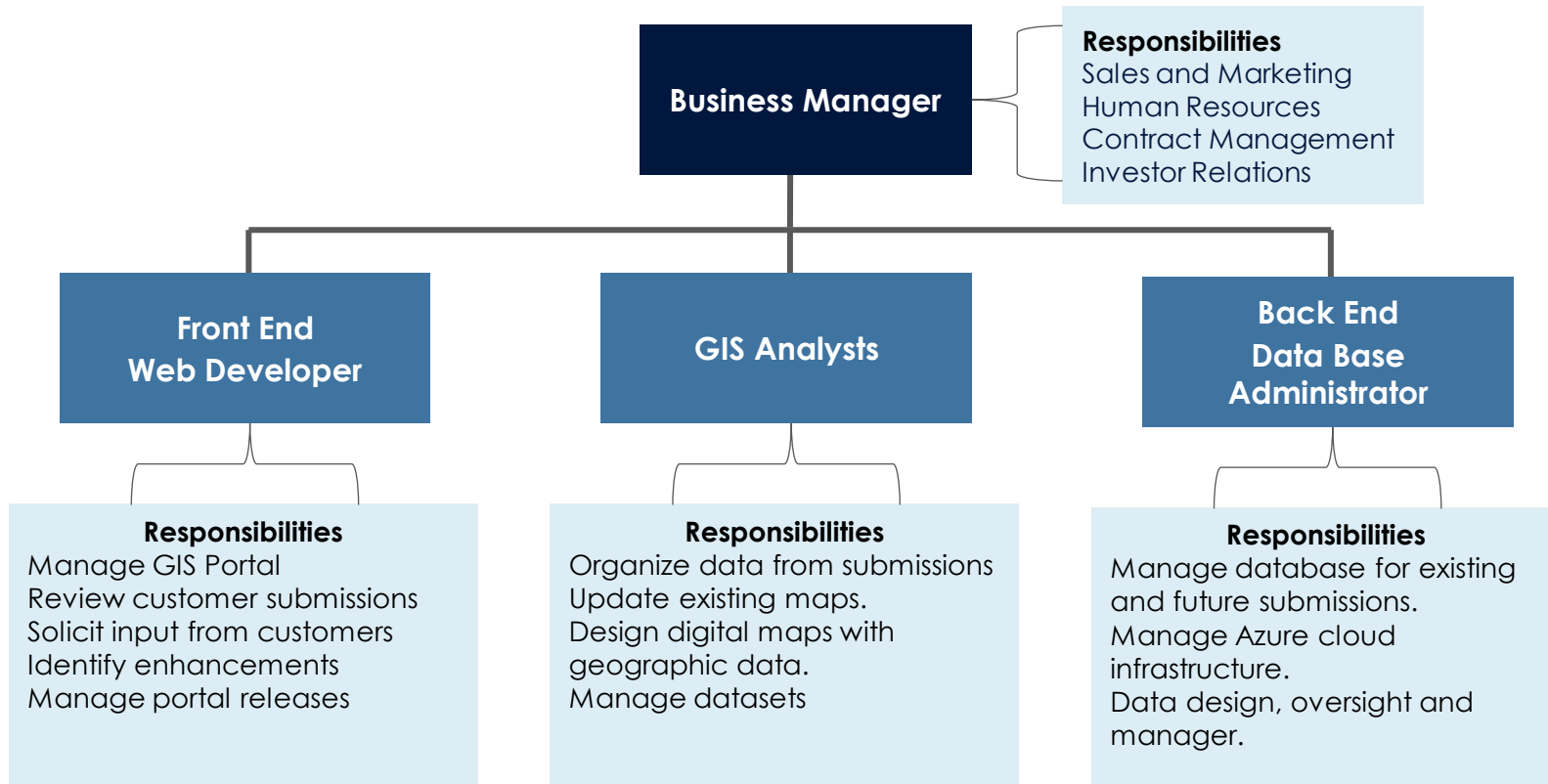
■ Business Plan – 1 of 2.

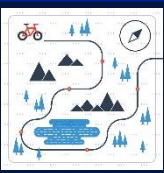
- **Executive Summary**: Geospatial Information Provider that manages a web portal that allows users to view, submit and rate cycling trails across the United States.
- **Description and Structure**: The portal will partner with Federal, State and Local governments to overlay cycling trails over base maps of boundaries, terrains, roads and points of interest.
- **Market Research and Analyst**: Our initial offering will be a 'grass-roots' and free public offering to gauge public interest and usage. This initial user analysis will allow us to target specific regions in the CONUS for map development. We will solicit advertising from bike manufacturers, clubs, and organized events to cover initial operating expenses.
- **Financial Information**: Hosting services will be provided by Microsoft Azure services to include the following costs:

Item	Costs
Azure Hosting	TBD
ArcGIS License	TBD
Oracle Enterprise License	TBD
Other	TBD
Totals	TBD



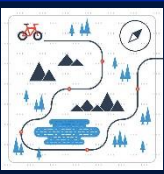
- Business Plan – 2 of 2.
 - Management and Personnel:





■ ArcGIS System Pattern.

- **What are patterns?** Assists businesses in choosing the infrastructure that meets their business need. Conceptual overview.
- **Pattern:** Enterprise Application Hosting and Management System.
- **Defined:**
 1. Deliver applications to enterprise and/or public stakeholders;
 2. Applications delivered from this system pattern tend to be web or mobile applications;
 3. Applications have rigid technical requirements and SLAs for areas like reliability, performance, and scalability. **(PARTNERS)**
- **Focus:** This system pattern focuses on delivering robust, secure, and high performing applications to broad groups of stakeholders performing critical functions for the enterprise
- **Value:**
 1. Delivering business and mission critical applications to the enterprise
 2. Engaging stakeholders through focused web and mobile applications.
 3. Enforcing enterprise-level technical requirements including performance, security, scalability.
 4. Ensuring high trust in the accuracy, readiness and availability of the data displayed via enterprise applications.



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■ ArcGIS Architecture.

– **Applications** (Presentation)

1. Web, mobile, desktop clients;
2. Applications designed for office of field;
3. Apps connected or disconnected from network.

– **Services** (Logic)

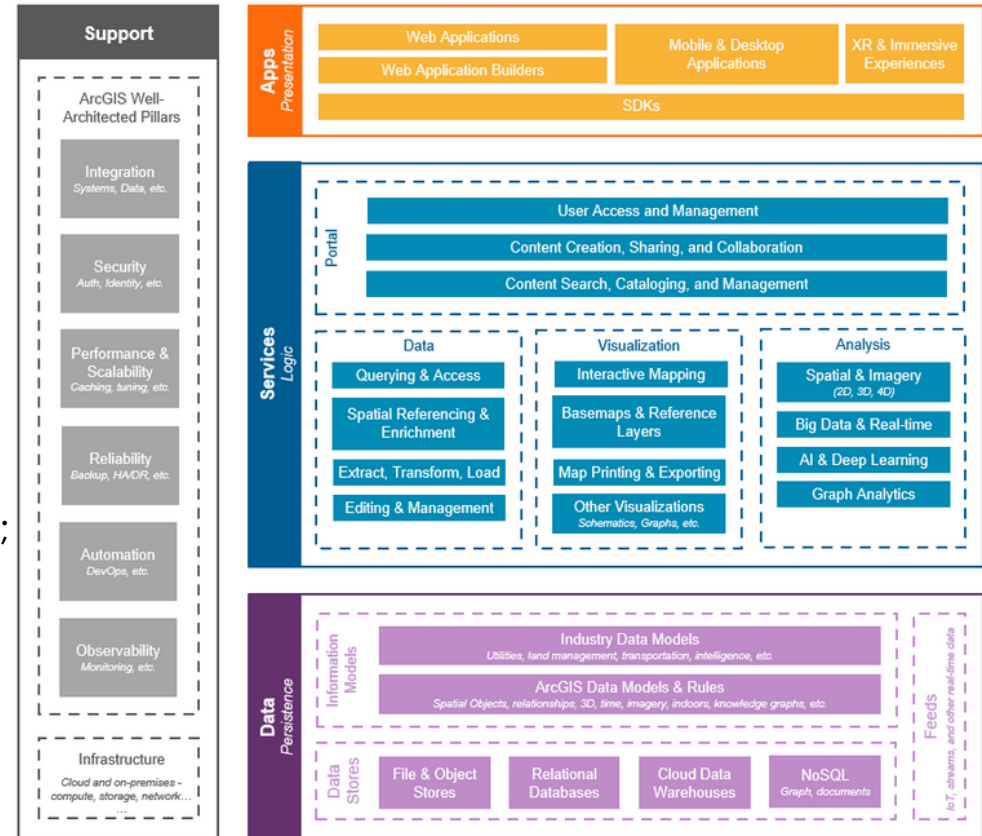
1. Data, visualization, analysis services;
2. Content and access management.

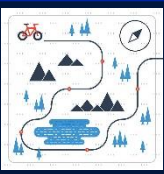
– **Data** (Persistence)

1. Integrate data stored and managed;
2. Models for spatial and time analysis.

– **Support**

1. Infrastructure to support portal;
2. Software as a service (SaaS);
3. Architectural pillars (Integration, security, scalability, reliability, automation, observability)





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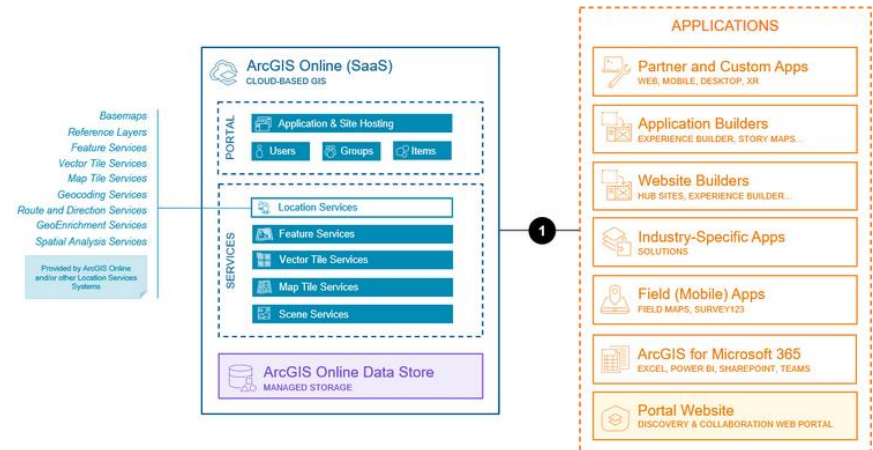
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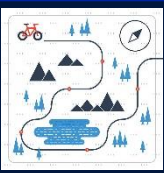
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Deployment Pattern.

- **Purpose:** Critical factor to align organizational IT direction on a deployment approach.
- **Selection:** Software as a Service (SaaS).
- **Platform Selected:** Portal for ArcGIS.
- **Capabilities:**
 1. Mapping and visualization;
 2. Application building;
 3. Site building;
 4. Data publishing and hosting;
 5. Data editing;
 6. Data import and export ;
 7. Spatial joins and relationship;
 8. Network analysis;
 9. Pattern analysis;
 10. Proximity analysis.





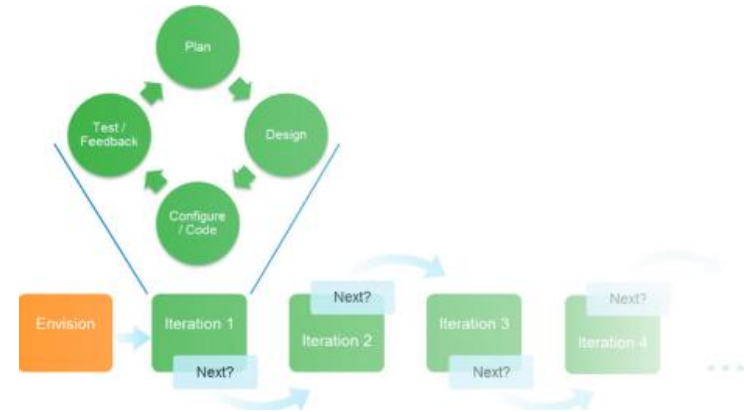
■ Capability Delivery.

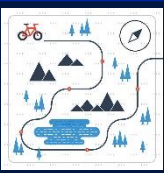
– Defined

- Delivering capabilities that support key requirements, goals, and initiatives helps you improve business outcomes.
- Working with stakeholders to define the capabilities we will deliver to align our solutions to meet customer needs.

– How?

- Collaborate with customer stakeholders to envision their capability needs;
- Iterate rapidly on existing solutions so we can deliver new value quickly and often (Agile);
- Adhere to a capability delivery lifecycle with a regular cadence, business gains value from each iteration.





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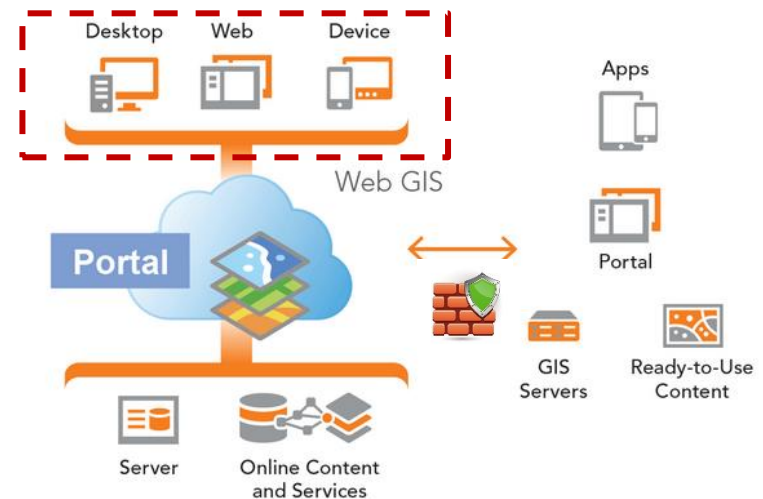
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■ ArcGIS Portal System Architecture.

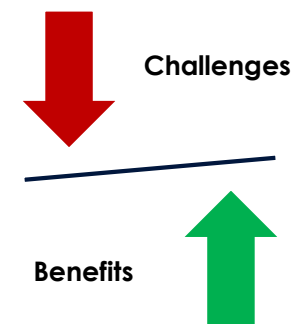
- **Portal:** The central hub where users' access cycling maps, apps, and spatial data to share with collaborators.
- **Client Access:** Users can submit routes via Desktop, Web, Mobile Devices.
- **Server and Online Content:** Repository for Portal content and index files, application templates to deploy web apps, API that allows connectivity to other map services, Analytical tools.
- **GIS Server:** Front end server to provide mapping services.
- **Portal:** Used by external users to access and submit content.
- **Apps:** Application layer interface for external users.
Downloadable images to mobile device.





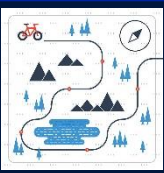
■ Portal Benefits.

- **One Platform**: Single platform allows uniformity in processes;
- **Security**: External users authenticate at the web-tier;
- **Content Management System**: Provides a framework for the management of GIS content and promotes collaboration between staff within an organization;
- **Content**: Store multiple types of GIS content (web apps, map documents, layer packages, Shapefiles).



■ Portal Challenges.

- **Phased Implementation**: Mobile application planned for future release;
- **Cost**: License cost for a new company is expensive;
- **Maintenance**: Need dedicated individuals to deliver services;
- **Infrastructure**: SaaS deployment model increase the need for hardware (i.e. load balancers) to procure and maintain for increased user availability (Confidentiality-Availability-Integrity).



■ Data Methodology.

OpenCycle Map API

- Cycling routes, elevation, and path type integrated into a user friendly map. API is available by request to be added to websites or apps.
- <https://www.thunderforest.com/docs/map-tiles-api/>

Department of Transportation National Transit Routes and National Transit Stops

- Shapefile of transit routes and stops to identify closest public transportation
- https://geodata.bts.gov/datasets/80086198b67c456194b064ba21b82326_0/explore?location=39.304663%2C-115.293335%2C6.59
- https://geodata.bts.gov/datasets/b7832004516e4d02b60631bbd7bef4e1_0/explore?location=14.439155%2C147.000767%2C2.03

TrailForks Mountain Bike Trails API

- Crowd-sourced databases of trails to be added and filtered for bike trails. API is available by request to be integrated into websites or apps.
- <https://www.trailforks.com/about/api/>

ESRI State Boundaries

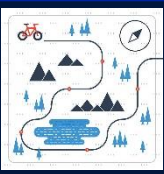
- Shapefile or geoJSON to specify location of interest by user.
- <https://hub.arcgis.com/datasets/1612d351695b467eba75fdf82c10884f/explore>

User Submitted Information

- Cycling trails submitted by website users identifying trails information to be vetted and added to the website.

Future State

- Weather data



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- Application Front End (Mockup) 1 of 2.
 - User Interface:** Primary interface for user to map and submit route(s):

The screenshot displays a web-based mapping application interface. The map shows a route in Easton, Maryland, with callout boxes highlighting various features:

- Zoom Functionality:** A callout box pointing to the zoom controls in the top-left corner.
- User Route (Start / Stop):** A callout box pointing to the blue route line on the map.
- Walk / Bike / Drive Total Time Options:** A callout box pointing to the mode selection icons (walking, biking, driving) in the top-center.
- Search Routes in Area:** A callout box pointing to the search bar in the top-right corner.
- Submit:** A callout box pointing to the 'Submit' button in the bottom-center.
- Route Mileage:** A callout box pointing to the '1.62 mi' distance indicator in the bottom-right corner.
- Show Location / Terrain / Viewpoint:** A callout box pointing to the map controls in the bottom-left corner.

Note: When a User Selects 'Submit', a popup window will open and allow users to enter attributes/metadata for the route.



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Application Front End (Mockup) 2 of 2.

- **User Interface:** When a User Selects 'Submit', a Survey123 window will open and allow users to enter the following attributes/metadata for the route.

Cycling Trail Submission

Thank you for your help in increasing biking visibility throughout the US!
Please provide as much detail as possible for cycling trail submissions. If you are comfortable, please include your contact information in the comments so we can contact you if we have any questions.

Type of Trail*

Road

Gravel

Dirt

Combination

Other

Bike Recommendation

Road

City

Mountain

Gravel

Other

Difficulty Rating*

1 2 3 4 5 6 7 8 9 10

Reset

Food/Water Availability

Landmarks

Recommended Hotels

Safety Rating*
(1) Low - (10) High

1 2 3 4 5 6 7 8 9 10

Reset

Comments

1000

Route Information
Please draw the bike route on the map if possible. If not, leave a comment below with additional information.

Find address or place

+ -

Tip: This question will try to use your location. Press to continue.

Map showing continents: NORTH AMERICA, SOUTH AMERICA, AFRICA, ASIA, AUSTRALIA, ANTARCTICA.

Powered by Esri

No geometry captured yet.

Submit

Link: <https://arcg.is/1ajy4S0>



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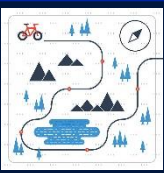
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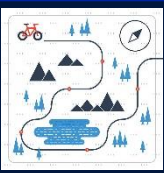


■ References.

- Study: 103.7 million American ride bikes. (Unpublished Date). Velo Powered by Outside. <https://velo.outsideonline.com/news/study-103-7-million-americans-ride-bikes/>.
- Number of bicycling participants in the United States from 2010 to 2022. (2023, October 11). Statista. <https://www.statista.com/statistics/191204/participants-in-bicycling-in-the-us-since-2006/>.
- Bicycle Industry Statistics 2024 – By Country, Region, Type, Habits and Gender. (2024, February 19). Enterprise Apps Today. <https://www.enterpriseappstoday.com/stats/bicycle-industry-statistics.html>.
- 2023 Census Data. (Unpublished Data). US Department of Census. https://www.census.gov/popclock/data_tables.php?component=growth.
- ArcGIS Architecture Center. <https://architecture.arcgis.com/en/>.
- Presentation. <http://52.168.92.114/project.html>.



- Appendix.
- **Case Study:** ESRI: Designate Bike Routes for Commuting Professionals
 - “This example use case presents an approach to using ArcGIS to select and analyze bike routes for people commuting to and from work. While the data is real, the scenario, analysis, and resulting decisions are hypothetical”.
 - Link: <https://desktop.arcgis.com/en/analytics/case-studies/designate-bike-routes-for-commuters.htm>
- **Case Study:** Rails to Trails Conservancy
 - “More than 150 known multiuse trail networks are in development nationwide, with trail networks underway in all 50 states, Washington, D.C., and Puerto Rico. This infrastructure creates space for people to walk and bike that is separated from traffic and creates new connections within and between communities. At least half of Americans (49.75%) live in a county that is home to a developing trail network, demonstrating the scale of demand and potential impact for significant portions of the U.S. population. example use case presents an approach to using ArcGIS to select and analyze bike routes for people commuting to and from work. While the data is real, the scenario, analysis, and resulting decisions are hypothetical”.
 - Link: <https://www.railstotrails.org/trailnation#map>



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- Appendix
- Application Front End (Mockup) 2 of 2.
 - **User Interface:** When a User Selects 'Submit', a Survey123 window will open and allow users to enter the following attributes/metadata for the route.

Type of Trail.

Road, Gravel, Dirt

Bike Recommendations.

Road, City, Mountain, Gravel

Difficulty Rating.

(1) Low – (10) High

Area of the Country.

Northeast, Midwest, West, South

Food / Water Availability.

Free Text

Landmarks.

Free Text

Recommended Hotels.

Free Text

Safety Rating.

(1) Low – (10) High

Comments.

Free Text

DRAFT