Final Project

Rio Concho Drive Bike Path

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Abstract:

Planning departments across the nation are developing plans to create safer bike lanes to promote biking as a form of transportation. City's encouraging health and environmental lifestyles should have developed bike lanes for citizens safety. Accommodating bicyclist with proper speed limits and signage on bike lanes are requirements to improving bicyclist safety. The targeted bike route is located in the City of San Angelo on Rio Concho Drive. The City of San Angelo implemented bike routes across the city years ago; however, today traveling safely by bike routes are unknown. Here we show signage is abundant enough for vehicles to understand they share the road with bicyclists on the Rio Concho Drive Bike Route. The speed limits signs are 30mph which meets the requirements of 35mph or less. Other than the signage, the road itself is unsafe for bikers because the road is narrow with bridges next to a river. Since this road is environmentally unsafe, the shared road between bikes and vehicles should be developed into two separate lanes. Anticipating this evaluation will be a starting point to develop proper bike lanes before promoting bicycling. For example, instead of a shared lane with vehicles, develop proper pavement marking lines on the road for bikes. Bicyclist will be able to ride with ease knowing they have their own lane. Furthermore, having the proper bike lanes will self-promote itself because it creates more of a desire for citizens to use the lanes knowing they will be riding safely.

Introduction:

It seems well established that bicycling for travel and leisure appeals to more and more citizens than ever before. However, the road conditions appealing to bicyclist safety on shared roads are

unknown. Therefore, the primary goal of this study was to implement queries in PostGIS to discover bike and speed limit signage on the Rio Concho Drive shared lane bike route. To test the hypothesis that shared bikes lanes are not safe for promoting bicyclist to use, we performed PostGIS queries through the data life cycle and investigated the type of signage located on the Rio Concho Bike Route. Bike signage play a central role in bicyclist safety along with the street condition and speed limit. The motivation behind the study of bike signs is to examine a shared bike lane safety because city's have promoted citizens to use shared lanes for travel. Making proper improvements will decrease bicyclist accidents and deaths. This could be significant to develop bike lanes with proper pavement marking and abolishing shared lanes because a separate bike lane means a safer street.

Research and Background:

Ten years ago, The City of San Angelo's MPO developed a 'San Angelo MPO Bicycle and Pedestrian Plan' addressing the need of bike routes for bicyclist travel. The goal of the plan was to improve bicycle safety for travel, promote bicycle activities, and perceive the city as a "healthy" place (Wilbur Smith Associates 8). The plan helped guide the development of bike routes around the city that could be outdated currently. Today, San Angelo provides 56 bike routes for citizens to travel on within the city. A survey was complete by the University of New South Wale on if bike signage or bike pavement markings worked best. "Although Shared Lane Markings did increase comprehension in some cases, they did not deliver the message as consistently as "Bicycles May Use Full Lane" signage. We speculate that a combination of "Bicycles May Use Full Lane" signage and Shared Lane Markings might be particularly comprehensible. "Share the Road" signage failed to provide any additional comprehension in this regard when compared to the unsigned roadways in any of our tests." (Hess 1). The research concluded that signage worked over pavement marking lines. In our case we have signs over pavement lines so that is a plus to the safety factor. Additionally, the research concluded that both would be ideal over just one or the other. Adding pavement marking line to Rio Concho Drive Bike Route

would be beneficial to the safety of bicyclists. Incorporating bikes into a city should consist of a process that adjusts the road infrastructure to accommodate a bike lane. Additionally, bike signs should be added to ensure a safe travel while giving bikes the right of way on the road (Institute for Transport Studies 2). Rio Concho Dr. did not change the infrastructure of the road when adding in the shared bike lane. They only added signs when the road should have been widened. According to the National Conference of State Legislatures, Texas does not have any laws for passing a bicyclist safely. Other states, such as Oregon and Rhode Island have speed limits for when passing a bicyclist in a vehicle. In Oregon, the vehicle cannot exceed 35 mph while passing while keeping a safe distance. In Rhode Island, the vehicle cannot exceed 15 mph with a safe distance (Shinkle 1). All states should pass laws as such to ensure bicycle safety on shared lanes. For example, on Rio Concho Drive, the road is very narrow and has bridges, no passing on bridges and reduction of the speed to 20 mph should be in place. The current speed limit of 30 is a little to high for a bicyclist's comfort, especially going over a bridge. According to the National Safety Council, 80 million people today ride bikes for traveling. The growth of riders also means an increase of deaths due to bicycle accidents. Deaths have escalated over the years from 6% to 37% (National Safety Council 1). This statistic proves more bicyclists are on the roads today and laws should be placed to accommodate this change.

Materials and Methods:

Data One's Data Observation Network for Earth provides the best direction to complete the data life cycle. There are 8 steps: plan, collect, assure, describe, preserve, discover, integrate, and analyze (Strasser 3). These steps were implemented in order to create the 27 signs collected for data to research on Rio Concho Drive. The Primary dataset consisted of 15 bikes may use full lane signs, 7 speed limit 30 signs, 2 bike crossing signs, 1 share the road sign, 1 bike trail sign, and 1 slow down sign. During the 'plan' step, the creation of a project proposal that implemented the collection of all bike routes in the downtown area of San Angelo. After revisiting the idea, the best way to fit the project rubric of the

data collection was to just collect signs on Rio Concho Drive bike route. The 'collect' step is where collecting the data was executed. The coordinates of the signs were collected from geotagging photos. This data was formatted into ArcMap by using the geotagged photos to points tool. The 'assure' step was applied when the points were in a layer in ArcMap to identify missing values. The data was configured to create attributes with the add field tool. Each sign consisted of four attributes: name, xy coordinates, date and time of collection, and direction. By applying the 'describe' step, the layer was then exported into a shapefile called export_output. This shapefile was store in the Final Project folder on my computers drive, applying the 'preserve' step. PGAdmin 4 is where the shapefile was used to create the queries. The 'discover' and 'integrate' steps were applied once importing the data in the PGAdmin 4 application to create queries and in ArcMap to create visual map of the data. Shapefile format works with PostGIS and was imported into PGAdmin 4 through PostgreSQL's PostGIS Shapefile Import/Export Manager. The primary and secondary datasets were used to display information about the data such as lengths of polylines, names of signs, and names of streets. The data was then examined and interpreted in the 'analyze' step of the data life cycle. The creation of the map in ArcMap included of many geoprocessing components, some of which were already named, that resulted in the collected signs spatial placed correctly on the WGS84 coordinate system. Once the points were in ArcMap program, selecting each different type of sign with select tool to then create layers for the different types of signs made the data easier to understand. The tool used what the 'create from selected feature', which then one could create separate shapefiles for each sign type if necessary. This made it possible for assigning symbols to each sign type and being able to distinguish the location. This also made creating a legend simpler because everything being displayed in the legend was already separated out with the correct names in layers. Adding a base map created a topological background for the sign display. Map elements were adding to the map to identify and relate the data in the frame (ESRI 1). The

elements that were inserted on the map was a north arrow, scale bar, legend, author, description and the projects title.

Results:

Different Types of Signs:

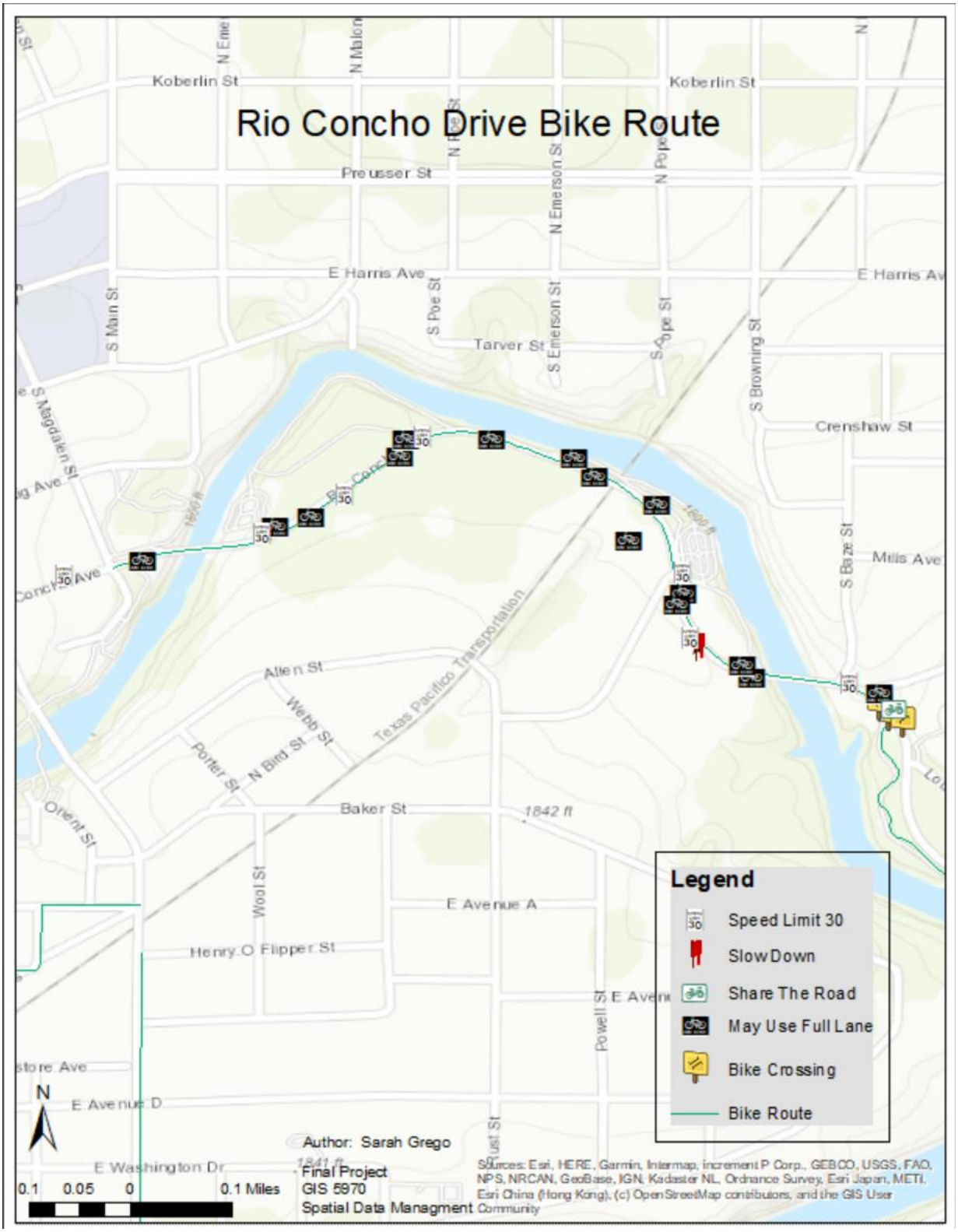
Slow Down

Speed Limit 30

May Use Full Lane

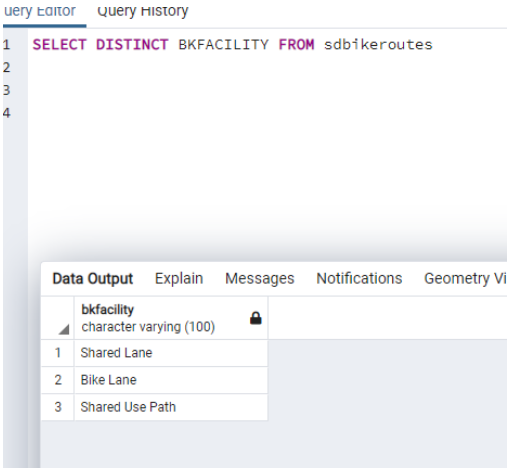
Bike Crossing

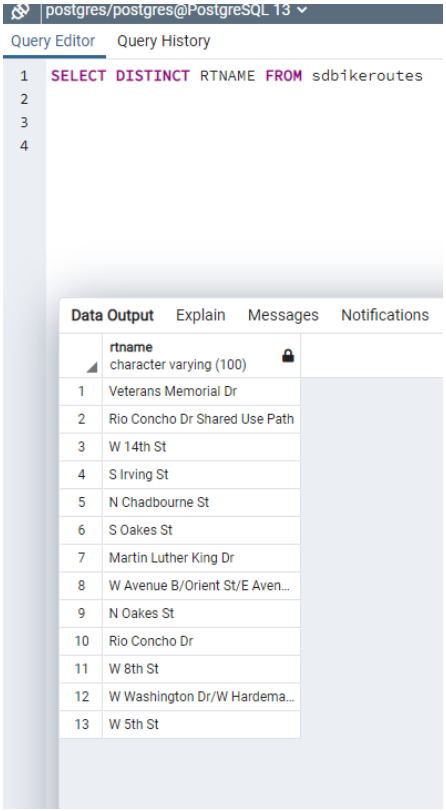
Share The Road


Rio Concho Drive Bike Route
Koberlin St
Koberlin St
Preusser St
E Harris Ave
E Harris Av
S Main St
S Poe St
N Emerson St
S Emerson St
Tarver St
S Browning St
Crenshaw St
S Magdalen St
S Baze St
Mills Ave
Allen St
Webb St
Texas Pacifico Transportation
Porter St
N Bird St
Baker St
1842 ft
Orient St
Wool St
E Avenue A
Henry O Flipper St
Powell St
E Avenue D
E Washington Dr
1841 ft
Author: Sarah Grego
Final Project
GIS 5970
Spatial Data Managment
0.1 0.05 0 0.1 Miles
N
Legend
Speed Limit 30
Slow Down
Share The Road
May Use Full Lane
Bike Crossing
Bike Route
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

PostGIS Queries:

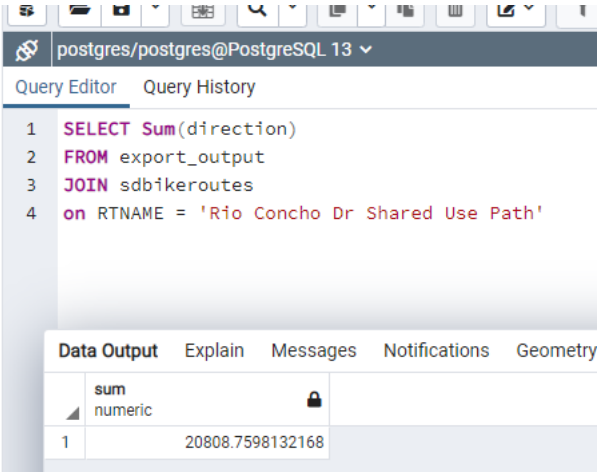
A query of the different types of Bike Paths in San Angelo. Mostly shared lanes with vehicles. >





< This query displays the street names of all bike routes within San Angelo. This area has 13 different paths for bicylists to take.

This is the length of the Rio Concho Drive bike route. It is 20808ft. Which is 3.9 miles long. >



Query Editor Query History

```
1  SELECT DISTINCT direction FROM export_output
2
3
4
```

Data Output Explain Messages Notifications Geo

	direction numeric
1	356.296264856
2	125.797165035
3	240.459686450
4	335.934082031
5	277.439758262
6	104.071563802
7	311.002960332
8	285.151183971
9	291.169555388
10	136.349044813
11	55.4588432925
12	149.532669138
13	106.571037316
14	96.9634247714
15	159.063415539
16	50.5421981004
17	328.184997180
18	60.4764518925
19	226.307495195
20	50.4294013640
21	225.860779020
22	310.665924276
23	76.4849395664
24	216.261184491
25	158.395095838
26	345.372436423

< This query displays the direction of each sign collected along the Rio Concho bike route.

This query diplays the names of each sign collected. This is what I names each photo before exporting into ArcMap. >

```
1  SELECT postgis_full_version();
2  SELECT name FROM export_output
```

Data Output Explain Messages N

	name character varying (34)
1	Bike Crossing (2).JPG
2	Bike Crossing (3).JPG
3	Bike Crossing.JPG
4	May Use Full Lane (10).JPG
5	May Use Full Lane (11).JPG
6	May Use Full Lane (12).JPG
7	May Use Full Lane (13).JPG
8	May Use Full Lane (14).JPG
9	May Use Full Lane (15).JPG
10	May Use Full Lane (2).JPG
11	May Use Full Lane (3).JPG
12	May Use Full Lane (4).JPG
13	May Use Full Lane (5).JPG
14	May Use Full Lane (6).JPG
15	May Use Full Lane (7).JPG
16	May Use Full Lane (8).JPG
17	May Use Full Lane (9).JPG
18	May Use Full Lane.JPG
19	Share The Road.JPG
20	Slow Down.JPG
21	Speed Limit 30 (2).JPG
22	Speed Limit 30 (3).JPG
23	Speed Limit 30 (4).JPG
24	Speed Limit 30 (5).JPG
25	Speed Limit 30 (6).JPG
26	Speed Limit 30 (7).JPG
27	Speed Limit 30.JPG

Query Editor Query History

```
1  SELECT Sum(ST_Length(geom)) AS length
2  FROM sdbikeroutes
3  GROUP BY SHAPE_STLe
4  ORDER BY length DESC;
```

< This is the length of San Angelo's bike route downtown of each polyline along the route. Most streets that have bike route on it have more than 1 polyline along the route. Hence why there is 13 streets and more than 13 polylines shown here.

Data Output Explain Messages Notifi

	length double precision
1	11504.26543510207
2	11073.391945999789
3	8891.814112873859
4	7792.288962200909
5	6544.496265185249
6	6136.124337334088
7	4921.961769957627
8	3728.2839125527
9	3380.0787146141975
10	3047.232521019655
11	3009.9184255499695
12	2898.0185704184223
13	1157.1445154895773
14	1082.0787069667012
15	957.5632052672613
16	766.7466273839195
17	765.6970935101178
18	572.433628630501
19	533.3387509822687
20	522.4116444239567
21	498.3362629003127
22	349.2916741914999
23	231.09376123487047

Discussion:

The meaning of the queries is to express the different types of signs, bike routes, names, lengths and directions of the primary and secondary datasets. To implement queries in PostGIS to discover the contrasting signage on the Rio Concho Drive shared lane bike route, six queries were generated along with a cartographic visual map of the data. An important query using 'select name', was put together to

display all the names of the signs that were collected. The collection included of 15 bikes may use full lane signs, 7 speed limit 30 signs, 2 bike crossing signs, 1 share the road sign, 1 bike trail sign, and 1 slow down sign. A 'select dictinct' queries produced the different types of bike route San Angelo possess which mostly consisted of routes sharing lanes with vehicles. This query also assembled the names of streets that bike routes were located, one in which being Rio Concho Drive. Lastly, 'select distinct' query generated the direction of the signs collected which could potentially show which side of the road the sign is on. Limitations occurred with the direction queries because the units were unknown and not in xy coordinates. The 'select sum' query gave the length of the cities bike routes separate polylines. This query would work best if each route was one polyline and not separated out. This query used the total sum of the length of the Rio Concho Drive bike route to calculate the route length of 3.9 miles long. With 27 signs alerting the driver along the bike route that is 3.9 miles long, it is safe to say the signs are making the route safer. The hypothesis that shared bikes lanes are not safe for promoting bicyclist to use is neither supported nor unsupported by the data collected. The evidence clearly displays an abundance of signange on the road throughout the entire path. These signs assist in keeping the drivers aware of the potential bicyclist on the road maiking the route safe enough for bicylists. Contrastingly, research and self judgement reveals that a seperate bike lane is safer than the shared Rio Concho Drive route. The goal to discover bike and speed limit signage on the Rio Concho Drive shared lane bike route was achieved by collecting, manipulating, and creating queries in PostGIS and maps in ArcMap.

Conclusion:

Traveling via bike is more common today than ever before and is important to accommodate bicyclist safety to reduce injuries to promote such travel. The signage collected on the Rio Concho Drive bike route consisted of bikes may use full lane, speed limit 30, bike crossing, share the road, bike trail, and slow down signs. This dataset has proven to have plentiful number of signs to ensure vehicles awareness as they share the road making it safe to use for bicyclists. However, the roads were not built

to accommodate bikers previously, so adding a bike route that shares a lane with vehicles is not the safest of options for developers to choose from if widening the road is not considered. Having separate bike lanes is a safer alternative that is significant to ensure safety of all. While investigating the type of signage located on the Rio Concho bike route, a better understanding of shared bike lanes was attained since signage is consistent throughout the shared route. Demonstrating the central objective of applying PostGIS to track bike and speed limit signage on the Rio Concho Drive shared lane bike route is hopefully the starting point for developers to build safer bike routes.

References

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