**Introduction**

- In the last three months there have been 21 bicycle collisions reported to Bike Portland.org and 33 close calls
- Portland is 6th in the nation for biking cities
- The number of bicyclist in Portland will continue to grow in the coming years
Project Information

- Our goal was to create the safest routes as possible, ideally for recreation rides. For commuting rides bikers often make a trade off between safety and distance (OTREC 2008)

- Our Study area is West of 205, South of I-84, East of 405 and North of Powell
Factors

- Street type
- Difficult intersections
- Roads that parallel Max and Streetcar lines
- Direction of street

Layers

- RLIS: Streets, bike routes, river, city boundary, max and streetcar lines
- Created: Locations, dangerous intersections form PDOT information
Network Geodatabase

- ArcMap and ArcCatalog both have an extension known as “Network Analyst”
- Finds the shortest route which takes the user’s specifications into account
- Designed to work specifically with street maps.
- Must be built in ArcCatalog

Creating the Network

- Specify attributes
- Assign risk as cost
- Hierarchy Risk
**Network Properties**

- Set Usage, Units, Data and Type
- Select Restriction
  - One-way streets
- Select Cost
  - Risk
  - Length
- Select Usage
  - Hierarchy

**Network Analysis**

- Three main components
  - Route
    - User creates route by specifying starting and ending points
  - Stops
    - User specifies points the route must cover
  - Barrier
    - User specifies points the route must avoid
**Bike Route Layer**

- Metro has a “bikemode” and a risk value to each street type

- **Multi-use path**
  - Separated from motor vehicle traffic; used by only bicyclists, pedestrians etc.

- **Bike lane**
  - Designated as a bicycle lane; one way traffic only

- **Low traffic through street**
  - <3,000 vehicles, <25 mph speed limit

- **Moderate traffic through street**

- **High traffic through street**

- **Caution area**

**Street Type**

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Street Type

- Moderate traffic through street
  - Between 3,000 and 10,000 vehicles per day
  - Speed limit about 35 mph
- High traffic through streets
  - >10,000 cars per day
  - Speed limit > 35 mph
- Caution Area
  - Sharp curves, high traffic volumes, narrow lanes etc.

Street Type

- Assign a risk value to each street type
- The risk range is 1-6. With 1 being the safest to 6 the most dangerous.
  - Highways are at a risk level of 6
  - Local streets are at a risk level of 3
<table>
<thead>
<tr>
<th>Type</th>
<th>Risk</th>
<th>Street classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1110</td>
<td>6</td>
<td>Freeway</td>
</tr>
<tr>
<td>1120</td>
<td>6</td>
<td>Ramps; interchanges &amp; feeders</td>
</tr>
<tr>
<td>1121-1123</td>
<td>6</td>
<td>On- and off-ramps</td>
</tr>
<tr>
<td>1200</td>
<td>6</td>
<td>Highway</td>
</tr>
<tr>
<td>1221-1223</td>
<td>6</td>
<td>On/Off ramps to highway</td>
</tr>
<tr>
<td>1300</td>
<td>5</td>
<td>Primary arterial</td>
</tr>
<tr>
<td>1400</td>
<td>4</td>
<td>Secondary arterial</td>
</tr>
<tr>
<td>1450</td>
<td>4</td>
<td>Other arterial</td>
</tr>
<tr>
<td>1500</td>
<td>3</td>
<td>Minor streets</td>
</tr>
<tr>
<td>1521</td>
<td>3</td>
<td>Local street to local street connector</td>
</tr>
<tr>
<td>5101</td>
<td>6</td>
<td>Freeway with rapid transit</td>
</tr>
<tr>
<td>5201</td>
<td>6</td>
<td>Highway with rapid transit</td>
</tr>
<tr>
<td>5301</td>
<td>6</td>
<td>Primary arterial with rapid transit</td>
</tr>
<tr>
<td>5401</td>
<td>5</td>
<td>Secondary with rapid transit</td>
</tr>
<tr>
<td>5500</td>
<td>5</td>
<td>Minor with railroad</td>
</tr>
<tr>
<td>5501</td>
<td>5</td>
<td>Minor with rapid transit</td>
</tr>
</tbody>
</table>
One-way streets

– Flipped the direction of streets and bike route segments with the wrong direction
– Created new text field “oneway”
– Selected all one-way segments and assigned “F” to them
– Now when creating the network all streets with F will only allow traffic from origin to end direction
**Difficult Intersections**

- PDOT has maps available identifying difficult intersections
- We created point features to represent each dangerous intersection
- These points were then used as barriers in the network
- They have a risk value of 6

**Parallel Max/ Streetcar Roads**

- Selected parallel roads by select by location
- Raised the risk value of parallel roads to a 5 if not already at a level 5 or higher
Creating Routes with Network Analysis

- Use ArcToolbox to Create a new Route Layer
- We used our bike safety network for the input analysis
- Selected impedance attribute
  - Risk
  - Length

Create Routes

- Add location points
- Add Barriers
- Solve Route
Locations

- Laurelhurst Park
- McMenamins Bagdad Theater
- Mt Tabor Park
- Stumptown Coffee
- Ankeny Square Saturday Market
- PSU Farmers Market
On average our safe routes were 1.55 x safer than the shortest routes.
Conclusions

- We were able to crate safer routes
- Distance is sacrificed for safety
- Our Routes differed from ByCycle.org’s because we took in additional factors into account.
- Our route can create complex directions
- For further study: We would expand the network, take crash data into account

References

- Geoffrey Duh
- ByCycle.org
- ‘Bike there” map
- ArcHelp Desktop
- BikePortland.org
- Americasbestonline.net
Questions?