Appendix

Table of Contents

# 1 Appendix

## 1.1 Park units excluded from analysis

Parks were excluded from the analysis for several reasons. Some parks were excluded from the project sample entirely, others were excluded from portions of the analysis but remained in the project sample. This appendix documents the basis for these exclusions.

### 1.1.1 Geography-based exclusions

Several units were dropped before any LBS analyses were run due to geography issues (Table 1.1). Islands were removed, as were parks less than 10,000m in area. Islands were excluded because the LBS provider does not explicitly measure boat activity. Units under 10,000m were excluded due to data coverage concerns (the LBS provider flags any areas under this threshold).

Table 1.1: Park units excluded from all analyses due to their geography.

| **System** | **Unit** | **Cause** |
| --- | --- | --- |
| DNR State | Garden Island (State Recreation Area) | Island |
| DNR State | Lake Minnetonka Islands, Three Rivers | Island |
| DNR State | Saint Croix Islands (State Recreation Area) | Island |
| Metro Regional | Sam Brown Memorial (State Wayside) | Less than 10,000 square kilometers |

### 1.1.2 Coverage-based exclusions

Several units were excluded from the project sample after LBS analyses were run. Units which were missing vehicle data for >50% of the weeks in the analysis period were excluded (Table 1.2). Several units returned vehicle and pedestrian, but no bicycle data (Table 1.3). These parks remained in the project sample and bike activity was assumed to be 0. Finally, a number of parks returned bike data for <50% of months in the analysis period (Table 1.4). These parks remained in the project sample, but no imputation was performed to fill missing bike estimates due to insufficient data. Bike use was assumed to be 0 for missing months at these units.

Table 1.2: Park units excluded after running LBS analyses due to low coverage (missing >50% of weekly records).

| **System** | **Unit** |
| --- | --- |
| DNR State | Devils Track Falls (State Wayside) |
| DNR State | Hill Annex Mine |
| DNR State | Joseph R. Brown (State Wayside) |
| Greater MN Regional | Northerly (Eligible) |

Table 1.3: Park units for which no bike data was returned

| **System** | **Unit** |
| --- | --- |
| DNR State | Franz Jevne |
| DNR State | Greenleaf Lake (State Recreation Area) |
| DNR State | John A. Latsch |
| DNR State | Kilen Woods |
| Greater MN Regional | Collinwood |

Table 1.4: Parks for which no bike imputation was performed due to low coverage (missing >50% of monthly bike records).

| **System** | **Unit** |
| --- | --- |
| DNR State | Beaver Creek Valley |
| DNR State | Big Stone Lake |
| DNR State | Buffalo River |
| DNR State | Caribou Falls (State Wayside) |
| DNR State | Carley |
| DNR State | Flood Bay (State Wayside) |
| DNR State | Franz Jevne |
| DNR State | George H. Crosby-Manitou |
| DNR State | Grand Portage |
| DNR State | Greenleaf Lake (State Recreation Area) |
| DNR State | Hayes Lake |
| DNR State | Inspiration Peak (State Wayside) |
| DNR State | John A. Latsch |
| DNR State | Judge C. R. Magney |
| DNR State | Kilen Woods |
| DNR State | Kodonce River (State Wayside) |
| DNR State | La Salle Lake (State Recreation Area) |
| DNR State | Lac qui Parle |
| DNR State | Monson Lake |
| DNR State | Old Mill |
| DNR State | Ray Berglund (State Wayside) |
| DNR State | Schoolcraft |
| DNR State | Split Rock Creek |
| DNR State | Upper Sioux Agency |
| DNR State | Zippel Bay |
| Greater MN Regional | Bend in the River (GRPC) |
| Greater MN Regional | Big Elk Lake |
| Greater MN Regional | Big Falls Campground and Horse Camp |
| Greater MN Regional | Collinwood |
| Greater MN Regional | Fish Lake (Eligible) |
| Greater MN Regional | Garvin |
| Greater MN Regional | Granite Falls Memorial |
| Greater MN Regional | Hok Si La (Eligible) |
| Greater MN Regional | Hole in the Mountain |
| Greater MN Regional | Irving and John Anderson |
| Greater MN Regional | Kraemer Lake |
| Greater MN Regional | Lac qui Parle |
| Greater MN Regional | Lake Washington |
| Greater MN Regional | Milford Mine Memorial |
| Greater MN Regional | Mississippi River (GRPC) |
| Greater MN Regional | Ney Nature Center (Eligible) |
| Greater MN Regional | Northland |
| Greater MN Regional | Plum Creek |
| Greater MN Regional | Robert Ney Memorial |
| Greater MN Regional | Rockville |
| Greater MN Regional | Root River (Eligible) |
| Greater MN Regional | Sandstone Robinson |
| Greater MN Regional | Springvale (Eligible) |
| Greater MN Regional | Stanley Eddy |
| Greater MN Regional | Twin Lakes |
| Metro Regional | Cedar Lake Farm, Scott County |
| Metro Regional | Kingswood, Three Rivers |
| Metro Regional | Lake Sarah, Three Rivers |
| Metro Regional | Noerenberg Gardens, Three Rivers |
| Metro Regional | Square Lake, Washington County |

## 1.2 Park geography exceptions

All park geography was edited using the procedure described in the parks methodology section of this report. In a number of cases, however, we deviated from the procedure to improve LBS performance at a given park. Table 1.5 documents these changes and a brief explanation of our rationale. The most common change was to reduce the size of the buffer used to remove unrelated roads from park boundaries. This was in order to avoid removing parking lots or other amenities close to the road.

Table 1.5: Parks for which additional geographic edits were conducted.

| **System** | **Unit** | **Exception** |
| --- | --- | --- |
| DNR State | Afton | Reduced road buffer to 10m |
| DNR State | Banning | Based on feedback, manually included additional parking lot |
| DNR State | Bear Head Lake | Expanded water buffer to create consistent shoreline |
| DNR State | Big Stone Lake | Reduced road buffer to 20m, expanded water buffer to create consistent shoreline, manually added overlook area |
| DNR State | Cascade River | Based on feedback, included section of road previously removed |
| DNR State | Fort Ridgely | Based on feedback, included historic Fort Ridgely inholding |
| DNR State | Fort Snelling | Reduced road buffer to 20m |
| DNR State | Frontenac | Based on feedback, manually included additional parking lot |
| DNR State | Glendalough | Based on feedback, manually included Molly Stark boat launch |
| DNR State | Gooseberry Falls | Based on feedback, reduced road buffer to 15m to retain Gitchi Gami state trail |
| DNR State | Grand Portage | Based on feedback, manually included additional parking |
| DNR State | Hayes Lake | Based on Feedback, included section of road previously removed |
| DNR State | Itasca | Based on feedback, included SNA |
| DNR State | Kilen Woods | Reduced road buffers near bridge to 10m |
| DNR State | Kodonce River (State Wayside) | Based on feedback, manually included additional parking |
| DNR State | Lac qui Parle (DNR) | Based on feedback, manually included park office which lies outside of park boundary |
| DNR State | Lake Bronson | Reduced select road buffers to 5m |
| DNR State | Lake Carlos | Based on feedback, manually included lazy river parking lot |
| DNR State | Lake Shetek | Based on feedback, remove previously included cabins |
| DNR State | Lake Vermilion-Soudan Underground Mine | Based on feedback, manually included additional parking |
| DNR State | Maplewood | Based on feedback, removed previously included cabins |
| DNR State | McCarthy Beach | Based on feedback, manually included additional parking |
| DNR State | Ray Berglund (State Wayside) | Reduced road buffer to 3m |
| DNR State | Rice Lake | Based on feedback, manually included park entrance and filled in gap in original shapefile |
| DNR State | Saint Croix Boom Site (State Wayside) | Reduced road buffer to 3m |
| DNR State | Split Rock Lighthouse | Based on feedback, excluded lighthouse, included Gitchi Gami and scenic outlook |
| DNR State | Temperance River | Based on feedback, manually included additional parking |
| DNR State | Upper Sioux Agency | Based on feedback, manually included historical site |
| Greater MN Regional | Alexander Ramsey | Reduced road buffer to 5m |
| Greater MN Regional | Appleton OHV (Eligible) | Reduced road buffer to 25m |
| Greater MN Regional | Bend in the River (GRPC) | Reduced road buffer to 20m |
| Greater MN Regional | Bluffs Traverse | Manually included additional parking |
| Greater MN Regional | Cohasset Tioga | Reduced road buffer, reduced water buffer to create consistent shoreline |
| Greater MN Regional | Collinwood | Reduced buffer on city roads to 15m |
| Greater MN Regional | Fish Lake (Eligible) | Original shapefile was misaligned: edited polygon to reflect published maps of the park, reduced road buffer to 10m. Further refinement requires revised shapefile. |
| Greater MN Regional | Garvin | Reduced road buffer to 10m |
| Greater MN Regional | Grand Marais Recreation Area (Eligible) | Reduced road buffer to 10m |
| Greater MN Regional | Granite Falls Memorial | Reduced road buffer to 20m |
| Greater MN Regional | He Mni Can - Barn Bluff | Reduced select road buffers to 5m |
| Greater MN Regional | Irving and John Anderson | Reduced road buffers to 20m |
| Greater MN Regional | Jay C. Hormel Nature Center | Removed private property (Gerard Academy, Austin Country Club) |
| Greater MN Regional | Kensington Rune Stone | Increased water buffer to create consistent shoreline |
| Greater MN Regional | Pine Valley (Eligible) | Reduced road buffer to 15m |
| Greater MN Regional | Plum Creek | Reduced road buffer to 15 |
| Greater MN Regional | Robbins Island | Reduced road buffer to 5m |
| Greater MN Regional | Robert Ney Memorial | Reduced road buffer to 5m |
| Greater MN Regional | Rockville | Reduced road buffer to 15m |
| Greater MN Regional | Root River (Eligible) | Increased water buffer to create consistent shoreline |
| Greater MN Regional | Sandstone Robinson | Reduced road buffer to 15m |
| Greater MN Regional | Spirit Mountain | Reduced road buffer to 15m |
| Greater MN Regional | Stanley Eddy | Original shapefile was misaligned: edited polygon alignment to reflect published maps of the park. Reduced road buffer to 20m. Further refinement requires revised shapefile. |
| Greater MN Regional | Twin Lakes | Increased water buffer to create consistent shoreline |
| Metro Regional | Above the Falls, MPRB | Reduced road buffer |
| Metro Regional | Central Mississippi Riverfront, MPRB | Reduced buffer on all non-highway roads |
| Metro Regional | Hyland-Bush-Anderson Lakes, Bloomington | Reduced select road buffers to 5m |
| Metro Regional | Hyland-Bush-Anderson Lakes, Three Rivers | Reduced select road buffers to 5m |
| Metro Regional | Keller, Ramsey County | Reduced road buffers to 5m |
| Metro Regional | Lake Byllesby, Dakota County | Based on feedback, expanded park boundary 50ft east of Harry Ave |
| Metro Regional | Lake Elmo, Washington County | Increased water buffer to create consistent shoreline |
| Metro Regional | Lake George, Anoka County | Reduced road buffers to 5m |
| Metro Regional | Lake Sarah, Three Rivers | Reduced road buffers to 15m |
| Metro Regional | Lake Waconia, Carver County | Based on feedback, manually removed access to DNR managed boat launch. Further refinement requires revised shapefile. |
| Metro Regional | Lebanon Hills, Dakota County | Based on feedback, removed Camp Butwin inholding |
| Metro Regional | Lilydale-Harriet Island, Saint Paul | Reduced road buffers to 15m |
| Metro Regional | Long Lake, Ramsey County | Reduced road buffers to 15m |
| Metro Regional | Miesville Ravine, Dakota County | Based on feedback, manually included portion of park in Goodhue County. Further refinement requires revised shapefile. |
| Metro Regional | Minneapolis Chain of Lakes, MPRB | Created road-inclusive and road-exclusive polygons. Reduced road buffers to 15m in road-exlusive polygon. |
| Metro Regional | Minnehaha, MPRB | Created road-inclusive and road-exclusive polygons. Reduced road buffers to 15m in road-exlusive polygon. |
| Metro Regional | Mississippi Gateway, Three Rivers | Reduced road buffer to 15m |
| Metro Regional | Mississippi Gorge, MPRB | Reduced road buffer to 5m |
| Metro Regional | Mississippi Gorge, Saint Paul | Reduced road buffer to 5m |
| Metro Regional | Noerenberg Gardens, Three Rivers | Reduced road buffer to 20m |
| Metro Regional | Nokomis-Hiawatha, MPRB | Created road-inclusive and road-exclusive polygons. Reduced road buffers to 20m in road-exclusive polygon. |
| Metro Regional | North Mississippi, MPRB | Reduced road buffer to 15m |
| Metro Regional | North Mississippi, Three Rivers | Reduced road buffer to 15m |
| Metro Regional | Phalen, Saint Paul | Created road-inclusive and road-exclusive polygons. Reduced road buffers to 5m in road-exclusive polygon. |
| Metro Regional | Pine Point, Washington County | Reduced road buffer to 15m |
| Metro Regional | Rice Creek Chain of Lakes, Anoka County | Reduced road buffer to 5-20m |
| Metro Regional | Rum River Central, Anoka County | Increased water buffer to create consistent shoreline |
| Metro Regional | Spring Lake, Dakota County | Based on feedback, removed previously included road segments |
| Metro Regional | Spring Lake, Scott County | Based on feedback, manually added two parking lots |
| Metro Regional | St. Croix Bluffs, Washington County | Based on feedback, included additional land |
| Metro Regional | Theodore Wirth, MPRB | Reduced road buffer to 20m |
| Metro Regional | Whitetail Woods, Dakota County | Based on feedback, manually included trailhead |

## 1.3 Unresolved park geography concerns

The project team was not able to resolve every concern regarding park geography. Table 1.6 documents parks for which additional geography edits may be appropriate. There are a few key concerns remaining. Some park shapefiles may not include all relevant parking; others were misaligned and manually edited. Narrow parks or parks with complex geographies are challenging to isolate and may be better-refined by staff more familiar with the park.

Table 1.6: Parks with unresolved geography concerns.

| **System** | **Unit** | **Concern** |
| --- | --- | --- |
| DNR State | Cuyuna Country (State Recreation Area) | Complex or narrow geography, difficult to isolate |
| DNR State | Gooseberry Falls | Difficult to isolate from Hwy 61 and/or Gitchi Gami State Trail |
| DNR State | Grand Portage | Difficult to isolate from Hwy 61 and/or Gitchi Gami State Trail |
| DNR State | Kodonce River (State Wayside) | Difficult to isolate from Hwy 61 and/or Gitchi Gami State Trail |
| DNR State | Split Rock Lighthouse | Difficult to isolate from Hwy 61 and/or Gitchi Gami State Trail |
| DNR State | Temperance River | Difficult to isolate from Hwy 61 and/or Gitchi Gami State Trail |
| DNR State | Tettegouche | Difficult to isolate from Hwy 61 and/or Gitchi Gami State Trail |
| Greater MN Regional | Bluffs Traverse | Parking may lie outside of boundary |
| Greater MN Regional | Cohasset Tioga | Complex or narrow geography, difficult to isolate |
| Greater MN Regional | Fish Lake (Eligible) | Original shapefile misaligned |
| Greater MN Regional | Frazee (Eligible) | Roads could not be removed |
| Greater MN Regional | Grand Marais Recreation Area (Eligible) | Roads could not be removed |
| Greater MN Regional | Lake Brophy | Water boundary may include private waterfront and/or exclude public waterfront |
| Greater MN Regional | Mississippi River (GRPC) | Complex or narrow geography, difficult to isolate |
| Greater MN Regional | Robbins Island | The portion of the park on County Hwy 41 (Rau park unit) is challenging to separate from the highway itself. |
| Greater MN Regional | Sawtooth Bluff (Eligible) | Parking may lie outside of boundary |
| Greater MN Regional | Stanley Eddy | Original shapefile misaligned |
| Metro Regional | Above the Falls, MPRB | Complex or narrow geography, difficult to isolate |
| Metro Regional | Central Mississippi Riverfront, MPRB | Complex or narrow geography, difficult to isolate |
| Metro Regional | Hyland-Bush-Anderson Lakes, both units | Original shapefile incorrectly assigned parcels to implementing agencies |
| Metro Regional | Mississippi Gorge, MPRB | Complex or narrow geography, difficult to isolate |
| Metro Regional | North Mississippi, Three Rivers | Complex or narrow geography, difficult to isolate |

## 1.4 Trail units/segments excluded from analysis

### 1.4.1 Geography-based exclusions

Trails were excluded from the analysis for several reasons. Some trails were removed before LBS analyses were run due to limited OSM data (Table 1.7. In these cases, some OSM segments may have been identified, but coverage was insufficient for reasonable analysis. Additionally, any identified OSM segments less than 50ft in length were excluded (Table 1.8. In these cases, trails remained in the analysis.

Table 1.7: Trails excluded from all analyses due to insufficient OSM coverage

| **System** | **Unit** |
| --- | --- |
| DNR State | OHV access to Taconite via USFS Rd 11404 |
| Greater MN Regional | Houston County trail |
| Greater MN Regional | Red Lake River Corridor |
| Greater MN Regional | Zumbro River |
| Metro Regional | Mississippi Gorge/West River Parkway, Saint Paul |
| Metro Regional | Northeast Diagonal, MPRB/Three Rivers |
| Metro Regional | Rice Creek North Extension, Ramsey County |

Table 1.8: Summary of OSM segments dropped from analysis due to length (<50ft)

| **System** | **Unit** | **Dropped segments** |
| --- | --- | --- |
| DNR | Luce Line | 20 |
| DNR | Paul Bunyan | 12 |
| DNR | Sakatah Singing Hills | 10 |
| Greater MN | Duluth Traverse | 30 |
| Metro | Rum River, Anoka County | 2 |
| Metro | West Mississippi, Three Rivers | 38 |

### 1.4.2 Coverage-based exclusions

Several trail units/segments were excluded from the project sample after LBS analyses were run. Two units returned no LBS data for any segments (Table 1.9). When individual trail segments did not return LBS data, the associated trail remained in the project sample and use was assumed to be zero on missing segments. In total, 200 identified OSM segments returned no LBS data (Table 1.10).

Table 1.9: Trails for which no LBS data was available

| **System** | **Unit** |
| --- | --- |
| DNR State | Camp Ripley/Veterans Memorial |
| DNR State | Chester Woods |

Table 1.10: Summary of OSM for which no LBS data was available. Use was assumed to be zero on these segments.

| **System** | **Unit** | **Dropped segments** |
| --- | --- | --- |
| DNR | Blazing Star | 1 |
| DNR | Blue Ox | 14 |
| DNR | Brown's Creek | 2 |
| DNR | C.J. Ramstad/North Shore | 23 |
| DNR | Camp Ripley/Veterans Memorial | 2 |
| DNR | Casey Jones | 1 |
| DNR | Central Lakes | 2 |
| DNR | Chester Woods | 3 |
| DNR | Cloquet-Saginaw | 1 |
| DNR | Dakota Rail | 2 |
| DNR | David Dill-Arrowhead | 27 |
| DNR | David Dill-Taconite | 6 |
| DNR | Douglas | 11 |
| DNR | Gandy Dancer | 5 |
| DNR | Gateway | 13 |
| DNR | Gitchi-Gami | 11 |
| DNR | Glacial Lakes | 1 |
| DNR | Goodhue Pioneer | 1 |
| DNR | Great River Ridge | 4 |
| DNR | Harmony-Preston Valley | 4 |
| DNR | Heartland | 4 |
| DNR | Luce Line | 2 |
| DNR | Matthew Lourey | 3 |
| DNR | Mill Towns | 3 |
| DNR | Minnesota Valley | 1 |
| DNR | Paul Bunyan | 2 |
| DNR | Root River | 6 |
| DNR | Shooting Star | 5 |
| DNR | Taconite | 7 |
| DNR | Willard Munger, Hinkley-Duluth Fire Segment | 4 |
| Greater MN | Aitkin County Northwoods ATV, Rabey Line | 1 |
| Greater MN | Battle Lake to Ashby | 4 |
| Greater MN | Camden | 1 |
| Greater MN | Cook County Mountain Bike, Britton Peak | 1 |
| Greater MN | Cook County Mountain Bike, Pincushion | 1 |
| Greater MN | Lake Country | 2 |
| Greater MN | Lake Vermillion, Cook County | 1 |
| Greater MN | Marshal Kittson | 4 |
| Greater MN | Otter Tail County, Perham to Pelican Rapids | 2 |
| Greater MN | Prospector Loop | 9 |
| Greater MN | Soo Line, North: Aitkin County | 1 |
| Greater MN | Soo Line, North: Carlton County | 1 |
| Metro | Crow River, Three Rivers | 1 |