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ESTIMATION OF SEASONAL DAILY TRAFFIC FLOW OF AGRICULTURAL PRODUCTS AND ITS IMPLICATION ON IMPLEMENTATION OF AUTOMATIC TRAFFIC RECORDERS

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ABSTRACT

Reliable traffic counts on a highway system are critical for sound decision making about the maintenance, operation, and expansion of the system. Portable short-term Automatic Traffic Recorders (ATRs) are a cost-efficient way to complement traffic counts from permanent ATR sites by performing temporary traffic counts on the highway system. Complicating the collection of traffic data using these short-term devices is the seasonal variation in vehicle operations seen throughout the year. This work focuses on predicting the spatial distribution of seasonal traffic resulting from agricultural activities using a new method that combines GIS spatial functions and the four-step travel demand model. This research collected information about township grids for Montana (as proxies for trip origins), grain elevators (trip destinations), agricultural ground cover, and crop yield estimates, to estimate flows in tonnage at a grid level on the road network.

Results suggest that the proposed method using the location of major crops and the locations of grain elevators can be used to predict tonnage of product that will be added to individual routes. The predicted values can then be compared to reported heavy truck traffic to locate sites that may have underrepresented traffic flows. While this work looked specifically at three crops, the method could be applied to any resource flow that has known origin and destination information. The method could be enhanced by refining assumptions of the composition of heavy trucks transporting agriculture product and by field measurements of vehicle flows to better test the validity of the model.

Keywords: agriculture product, automatic traffic recorders, daily truck traffic, travel forecasting

INTRODUCTION

Detailed knowledge of traffic demand on a highway system is critical for the maintenance, operation, and expansion of the system. Traditionally, traffic volume is measured using automatic traffic recorders (ATRs) placed along the roadways. These traffic monitoring systems are able to determine both the volume and vehicle composition of the traffic. One limitation of ATR deployment is the cost associated with the systems, approximately $8,700 for a two-lane installation (1). For example, the Montana Department of Transportation (MDT) spends nearly $1.7-million annually on its traffic monitoring program (*1*). The program includes 85 permanent ATR sites primarily on more heavily travelled routes in the state highway system (*2*).

Currently MDT uses portable ATR equipment to capture additional and critical traffic flows on more than 5,000 segments of highway throughout the state. These portable traffic counts are performed for 36 to 48 hours one time every three years. Therefore, the timing and siting of the short-term count can have a significant impact on the reported annual average daily traffic (AADT) on a given highway segment.

Complicating the collection of traffic data using short-term portable ATR equipment is the temporal variation in vehicle operations seen throughout the year. Much of the temporal variation is associated with traffic from industries such as agriculture, tourism, and resource extraction, industries that are a significant part of Montana's economy. As is the case for many industries, several relatively well known factors drive the seasonal and geographic nature of their operations and their attendant transportation networking needs. With the increasing ability to represent spatial and other knowledge of these factors in geographic information systems (GIS), it is also increasingly possible to investigate their effect on traffic flows in new and useful ways.

Supported by MDT, this work focuses on predicting the spatial distribution of seasonal traffic resulting from agricultural activities using ArcGIS® spatial functions and the four-step travel demand model coded in TransCAD®. More specifically, this new prediction methodology is demonstrated using elements of the agriculture industry in Montana, which is somewhat typical of many central and western states with significant agricultural production. Montana has 61,388,467 acres of agricultural lands with the agricultural sector accounting for $4.7 billion of the state's gross domestic product in 2012 (*3*). Often, agricultural lands are in regions of low population, which leads to low traffic volumes. However, during the harvest season, a large volume of heavy trucks take to the road network to transfer the harvest from the fields to storage, processing or loading facilities. In Montana, these movements often last for a few weeks from late July to mid-September.

Measuring traffic in regions with low population can be a low priority. This is due in part to low traffic volumes and little to no commercial traffic. However, during the harvest season large amounts of heavy traffic utilize the roadways. If short-term traffic counts are not performed during the harvest season, it is possible that these flows will be under-reported. Creating a predictive model of when and where agricultural traffic impacts the roadways can help aid transportation agencies in planning their traffic data collection programs to better capture such important flows. To offer some perspective on the background traffic environment these movements occur in, according to the 2010 Census, Montana has a population of 989,417 people, or an average population density of only 6.8 persons per square mile. However, this population is not evenly distributed throughout the state. An example is Chouteau County in north central Montana. With a population density of only 1.5 persons per square mile, Chouteau County is one of the least dense counties in the state but produces more agricultural income than any other county in the state (*4*). Better data on such traffic can lead to longer lasting roadways, better weight limit enforcement, and a clearer picture of how the road network is utilized.

This work used a standard four-step traffic demand model to predict when and where heavy truck traffic associated with agricultural grain harvesting occurs. This work specifically considered wheat and barley production in Montana.

LITERATURE REVIEW

Directly relating location of agricultural production (at the field level) and grain elevator locations is a relatively novel approach to determining traffic demand caused by agriculture at the route level. That being said, using traffic demand models for predicting commodity flows at the route level, specifically oil production, has been researched for MDT (*5*). The study (*5*) utilized a GIS to aggregate oil production data based on the United States Geological Survey (USGS) Land Survey System. Townships were used as the traffic analysis zones (TAZs). Use of a four-step model for commodity flow has also been outlined in NCHRP Report 606 (*6*). This model shares many similarities with a passenger trip model, but differs by using tons of commodities instead of passenger trips.

A study (*7*) published a state-of-practice report presenting a variety of freight forecasting models. In this report, five models were presented: 1) direct facility flow factoring, 2) origin/destination factoring, 3) truck model, 4) four-step commodity, and 5) economic model. The first two models utilized direct factoring of traffic. The second model improved upon the direct facility flow factoring model by including mode split and traffic assignment. The remaining three models did not directly factor flow, but instead used a combination of trip generation, trip distribution, mode split, and traffic assignment. The truck model and four-step model differed from the economic activity model in that the economic model bases trip generation on an economic forecasting model, not exogenously supplied zonal activity. These models were all recommended by NCHRP Report 606 (*6*).

Further use of traffic demand models in rural areas has been used to predict the traffic demand on low volume roads that did not have traditional count data associated with them (*8*). To confirm results, the study made the assumption that if their model matches the actual flows on major roads then the model would also correctly predict the low volume road flows.

METHODOLOGY

A four-step model was used to determine the expected commodity flow (in this case specifically for wheat and barley) by highway route in units of tons created by agricultural movement. The four-step model consists of:

1) Trip generation, how much tonnage is going to and from a given traffic analysis zone (TAZ);
2) Trip distribution, how much tonnage is distributed between the TAZs;
3) Mode choice, in what capacity are the crop flows carried by different transportation modes; and
4) Route Choice, what routes are being used for the crop flows (by type and mode).

A total of 4,209 township grids (at 6 by 6 mile square each) for the state of Montana were selected as the origin TAZs, while the 82 grain elevators are treated as destination TAZs. The following sections will present the processes that were used to complete each of the aforementioned four steps using TransCAD® 4.8.

Trip Generation

The four-step traffic demand model starts with estimating the number of trips that are produced from an origin and attracted to a destination. For a passenger traffic demand model, demographic and land use attributes are used as the primary predictors of trip productions and attractions via ordinary least squares regression. The resulting production/attraction equations are used to predict aggregated trip generation across TAZs.

This work proposed a new GIS approach, using readily available data on crop and grain elevator locations to predict trip production and attraction, respectively. Crop production is estimated using the remote-sensed crop acreage times the average yield per acre by type at the 30-meter grid cell level, while crop attraction is proxied by the capacity of grain elevators during harvest season (from July 22 through September 13), with details provided in the Data section.

Trip Distribution

Trip distribution develops a trip table (or matrix), with each cell indicating the crop flow between a given origin (township) and a given destination (grain elevator). A gravity model is used to allocate the flow attraction and generation (in tonnage) to each origin-destination pair. The gravity model is expressed as:

$$T_{ij} = P_i \frac{A_j F_{ij} K_{ij}}{\sum_j (A_j F_{ij} K_{ij})} \qquad (1)$$

where T_{ij} denotes the tonnage from township grid i to grain elevator j, P_i represents the tonnage production at the origin (i), A_j is the attraction (in tonnage) at destination (j) assumed to equal to the capacity of the grain elevator, F_{ij} is the friction factor and an inverse function of the travel time between i and j, and K_{ij} adjustment factors assumed to be ones. Travel time is estimated using the segment length divided by the speed limit (summarized in the Data section) and then attributed to each road segment.

Furthermore, it is necessary to connect the centroid of each TAZ with nearby road links via connectors. Centroids are geometric centers of a polygon or township and are used as proxies for the origin and destination for crop flows. Connectors—automatically generated by TransCAD—are "dummy" roads that connect production/attraction points to the state highway network. Explicit modeling of traffic flow on these connector roads would be difficult to perform, and was not essential to the objectives of this study. For this work, two connectors were used for each centroid and attached to the two closest recognized roads within 10 miles of the centroid. Two connectors were used to ensure that the trips could be distributed more evenly across the road network.

Mode Choice

Normally, the mode choice step would be used to separate person trips into vehicle trips across a range of modes, i.e. automobile, bicycle, bus, etc. For this work, only one mode was used, heavy truck trips. As a result, this step was not performed as part of the four-step model; rather units of tons were used and converted to trips after the results were determined. More information on this process is given in the Flow Conversion section of this report.

Route Choice

Route choice was conducted using a user equilibrium method assuming truckers know the travel times of all available routes between an origin-destination pair and tend to select the route with the minimum travel time. The cumulative effect can be that everyone tries to use the shortest path and as a result the shortest path is congested and the trip time is made longer. At this point some of the traffic will re-route to a different path in hopes of faster travel times. This will continue until changing ones path does not result in faster travel times. This iterative process will result in the shortest travel time for all users. The relationship between link-level traffic volume and travel time is captured by the Bureau of Public Road (BPR) function, expressed as (*9*):

$$t_n = t_{fn}\left[1 + \alpha(x_n/x_{cn})^{\beta}\right] \qquad (2)$$

where t_n is travel time on segment/route *n*; t_{fn} is the free-flow travel time computed as segment length divided by speed limit; x_n is the hourly volume on segment *n*; x_{cn} is the capacity of the segment. Values of the parameters (α and β) depend on the capacity and speed limit of road segments, with typical values suggested in (*9*).

The user-equilibrium model is formulated as an optimization program:

$$\min S(x) = \sum_n \int_0^{x_n} t_n(w)dw \qquad (3)$$

s.t. $\sum_n x_n = q$

$x_n \geq 0$

where the objective function is to minimize the total travel time, $S(x)$, with respect to traffic volume on segment *n*, while subject to constraints including the non-negativity of flows (x_n) and flow conservation (i.e., the sum of flows of all routes between an origin and a destination must equal to the corresponding trip distribution between the two locations).

The routing method used here overlooks road restrictions such as bridges or culvert structures that may impose certain weight and dimension limits. There are approximately 272 bridges across the state; the majority of them are located along local streets over creeks or other waterways. Omitting bridge/culvert structures presents a limitation of the work and should be considered in future studies. Presumably, the free-flow travel time in the BPR function provides a partial remedy to account for impedance caused by culvert structures because speed limits usually reflect the presence of these structures.

Flow Conversion

The final product of the four-step process was a vector data set containing the roadway network with one-way tonnage for each road. Heavy trucks are approximated by five-axle tractor semi-trailers, a common vehicle type to transport grain and wheat in Montana. On average, a five-axle truck-trailer can carry 25.5 tons of product per load (*10*). Tonnage was then used to estimate daily heavy truck trips using Equation 4:

$$\widehat{TT} = \frac{\frac{Tons}{25.5}}{52} \qquad (4)$$

where $\widehat{TT}$ indicates the number of trips by heavy trucks per day for a period of 52 days during harvest.

DATA

For this work, four major data sets were used, summarized in Table 1. First, the township grid for Montana was used to delineate TAZs. This vector data set consisted of a total of 4,209 polygons. The data were acquired from the Montana State Library. The second data set was a raster representation of ground cover across the state of Montana. This data set was remotely sensed ground cover with 30-m grid cells. Each grid cell was given a single ground type attribute (i.e., agriculture, urban, forested, and water). Agriculture land are extracted and used to calculate tonnage of agriculture products, with yield per acre information available from the Montana Wheat and Barley Committee. The third data set was the locations (latitudes and longitudes) and capacities of the grain elevators throughout the state.

Road network maps are available from the U.S. Census Bureau Tiger/Line®, which contains the full network including all freeways, major highways, arterials, and local streets. While Tiger/Line® network is useful in constructing the base map to implement the four-step forecasting model, it offers no information about traffic and road capacity. The traffic information is obtained from the on-system network maps that consists of only the highway segments that are monitored by MDT.

Assessment of the temporal relationship of the increased heavy truck traffic due to transporting agriculture products was done by determining the time of year in which harvest occurs. This information was obtained through the United States Department of Agriculture (USDA) and summarized in Table 2. For this work it will be assumed that harvest season traffic is evenly distributed across the 52 days from July 22 through September 13.

Crop location data are made available through the USDA as a 30 meter grid cell raster. The ground cover attribute for each grid cell was remotely sensed and varied from urban land use to specific crop types. Using the "tabulate area" tool in ArcMap 10.0, the number of raster cells within each township was determined. From this point, it was possible to determine the acres of a given land use by converting the number of grid cells per township to acres. After calculating the amount of each ground cover type in each township, the data was further refined and condensed by removing the cover types that are not of interest. Table 3 presents the crop types that were left in the data and the total area of that crop type. The decision was made to use a single year of data for this proof-of-concept effort; the most recent data available is for 2012.

These three crops were selected and analyzed concurrently due to their relatively known destination when leaving the field (grain elevators), similar harvest seasons, and high production within Montana's agriculture sector in terms of tonnage. Relative to agricultural products grown in Montana, these grains are the top agriculture commodities by volume, and significant commodities by weight. Notably, alfalfa production did produce more tonnage of product in 2012 relative to wheat and barley, 4,120,000 tons, but transportation of alfalfa is more complicated as it is not directly transferred from a field to an elevator, instead it can be stockpiled in a variety of locations or transported out-of-state by truck. Barley and wheat are generally transported out of state by rail (*12*), and grain elevators are the interface between the highway and rail systems. Note that, while a major industry in Montana, livestock were not investigated due to the lack of specific in-state destination data.

Location and capacity data for grain elevators were obtained from the Montana Wheat and Barley Committee. This data set gives the point location, silo capacity, and rail capacity for each grain elevator in Montana. This data was combined with the township data in a similar manner as the ground cover raster data. The final result of the data aggregation phase is a polygon data set with the attributes given in Table 4.

Table 5 presents the speed limits used to compute travel time in the *Trip Distribution* step. The shortest paths between all centroid pairs were then calculated using TransCAD's built-in implementation of Dykstra's algorithm. Productions and attractions where then balanced, keeping the productions constant and adjusting the attractions accordingly. Using the balanced productions and attractions along with the shortest path data trip distribution was performed using a doubly constrained gravity model using the free-flow travel time as the friction factors. The trip distribution step produced two-way trips with units of tons.

RESULTS

Figure 2 presents the product flows in daily seasonal heavy truck trips that this model predicts for highways in Montana. Figure 3 presents a comparison of reported and predicted daily heavy truck flows. In reference to Figure 3, only roads classified as A3* or higher are shown for clarity.

A scale with five categories is devised to measure the difference between the reported heavy truck volume traffic and the predicted heavy truck volume over a similar time period and identify segments with low reported numbers of heavy trucks but high predicted heavy truck volumes during harvest season. For the reported daily heavy truck, the categories were determined by using the natural breaks method of classification that is built into ArcMAP 10.0. These break points were then used to cast reported heavy truck traffic into qualitative metrics from 1 to 5 with 1 representing the highest volume and 5 representing the lowest. A similar process was performed on the predicted seasonal heavy trucks, with the exception that 1 represented the lowest volume and 5 represented the highest volume.

After the reported and predicted (seasonal) truck volumes were categorized, respectively, a score is computed for each segment by adding up the two numbers, with results ranging from 2 to 10. A color scheme is employed to symbolize the deviation between the reported and the predicted seasonal truck traffic, as illustrated in Figure 1. Red (score=10) represents segments where reported heavy truck traffic severely underestimates the predicted seasonal heavy truck volume. Green (score=2) represents segments where the predicted truck volume is severely lower than the truck traffic.

Validation of this model was performed by comparing published traffic flow data collected by MDT to the model results. Using AADT as the benchmark value may lead to erroneous conclusions since AADT tends to average out the seasonal fluctuation, which the predicted heavy truck traffic measures. As such, the average September weekday (Monday through Friday) value given in the 2012 Yearly ATR Report was multiplied by the large truck percentage given in the same report (*13*). Root mean square error (RMSE) measures how far off the predicted values are from the reported ATR value on average across the study region. It is computed as $\sqrt{\frac{\sum_i (T_{R,i} - T_{P,i})^2}{n}}$, where $T_{R,i}$ and $T_{P,i}$ represent the reported and predicted daily heavy truck traffic, respectively, on the i^{th} segment (total number of segments = n).

In general, the predicted values tend to outnumber the reported values, with a RMSE of 639 vehicle per day on average for the 99 segments with permanent or portable ATRs in Montana, as shown in Figure 3.

DISCUSSION

Qualitatively, it can be seen in Figure 2 that much of the predicted heavy truck traffic is located in areas with high agricultural production and densely located grain elevators. This is an expected result of the four-step model that was used. It also appears that the segments with high heavy truck volumes follow the major corridors through Montana. This is an expected result in light of the synergistic relationship between transportation needs and the associated evolution of the transportation network often resulting in major roadways providing the shortest paths between locations of codependent economic activity.

Comparing the reported daily heavy truck traffic against the predicted heavy truck traffic shows that in many locations it may be possible that a large number of heavy truck trips are a result of agriculture and not captured by the current short-term traffic count program. That being said, these segments, symbolized as red in Figure 3, may also be areas where the predictive model is incorrectly predicting high values. Confirmation of the model on these segments would require a large amount of resources and most likely manual on-site counts during the harvest season. With no way to easily determine which heavy trucks are directly associated with agriculture it would be necessary to visually monitor the segments.

Close inspection of Figure 2 reveals segments of highway that appear to be cut-off from a seemingly connected segment. One example is shown in Figure 4. The disconnected road network is a result of Fork Peck reservoir separating the road ways. Other locations that show this issue are the Bob Marshall Wilderness Area and Glacier National Park in the north-west, and the Bear Tooth Mountain Range in south-central Montana. Many times, these areas tend to be rugged terrain with little agriculture and low road density.

Comparing the model results to locations that have reliable information about heavy truck traffic is necessary so that it can be shown that the model is within expected ranges. Table 6 compares a sample of permanent ATR sites, sites with accurate heavy truck traffic volumes, for the given time frame against the predictive model. It can be seen that only two of the ten sites show higher predictions than reported volumes. This indicates that the other eight sites are adequately capturing the heavy truck traffic and that more than just agricultural traffic is seen on these segments. It would be reasonable to assume that the ATR sites would capture all traffic on the segments, and therefore account for the agriculture trucks.

Looking at locations without permanent ATR stations, it is possible that the time-of-year that the short-term count was performed could have a large bearing on the predicted truck traffic. A good example of a location with high predicted heavy truck traffic but low reported heavy truck traffic is Chouteau County, shown in Figure 5. In terms of agricultural production, Chouteau County is the most productive in the state. However, only one permanent ATR is present in the county and this ATR measures only volume. Referring to Figure 5, it can be seen that many of the major roads in Chouteau County can be considered low reported daily heavy truck traffic with high predicted heavy truck traffic. This county would be a good candidate to conduct manual traffic counts to assess the validity of this model.

CONCLUSION

Using portable short-term ATR equipment to capture traffic flow on a highway system is necessary due to the infeasibility of using permanent ATR equipment on every highway segment in a system.

As such, certain types of traffic flow are bound to be under-represented in the data that are collected. The short time that short-term counts are performed, one time every three years for a period of 36 to 48-hours, can lead to seasonal traffic flows being missed.

This work strove to present a method for locating sites that may have high seasonal traffic, specifically heavy truck traffic due to agricultural activities. It has been shown that a four-step model using the locations of major crops and the locations of grain elevators can be used to predict tonnage of product that will be added to specific routes on the road network. This data can then be compared to published heavy truck traffic data to locate sites that may have underrepresented traffic flows. While this work looked specifically at three crops, the method could be applied to any resource flow that has known origin and destination information.

Limitations of this work includes several simplifying assumptions that were made and the lack of field measurements of vehicle flows. First, the production of agriculture commodity was estimated assuming the unit yield remains constant over space, while the attraction of agriculture commodity was assumed to equal the capacity of grain elevators. These assumptions could be refined by using more realistic production and attraction estimates from surveys of the local agriculture industry. Second, the routing method used here overlooks restrictions such as bridge and culvert structure that may impose weight or dimension limits. Lastly, the estimated truck volume from the selected segments shows sizable discrepancy from the observed volume collected from temporary/permanent count stations. This is expected because the model currently omits other seasonal or non-seasonal uses of the highway systems. To truly validate the model, new data about the whole economic sectors that generate truck traffic should be collected on both spatial and temporal domains.

Given the varied nature of grain haul trucks, it will most likely require manual classification of vehicle traffic. This would be further complicated by other crops that are harvested at the same time as the three crops assessed in this work. Aside from refining those model assumptions, future work could also focus on incorporating flows from grain elevators to market and to transfer stations (e.g., railway stations) and agriculture flows from external sources and through trips for both medium and heavy truck types.

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TABLE 1 Data Sets Collected for Montana

Data Set	Type	Description	Source
Township Grid	Polygon	Location of each township	Montana State Library - http://geoinfo.montanastatelibrary.org/
Crop Locations	Raster	Remotely sensed ground cover data	United States Department of Agriculture - http://nassgeodata.gmu.edu/CropScape/
Elevator Locations	Point	Location of each grain elevator	Montana Wheat and Barley Committee - http://wbc.agr.mt.gov/wbc/Buyers/Transportation/
Highway Network	Line	Location of all roads	TransCAD – Built-in
On-system Highway network	Line	Location of all National highway system roads	MDT

TABLE 2 Harvest Dates (*3*)

Crop Type	Usual Harvesting Dates		
	Begin	Most Active	End
Barley	July 27	August 3 – September 2	September 10
Spring Wheat	July 30	August 7 – September 6	September 13
Winter Wheat	July 22	July 26 – August 12	August 17

TABLE 3 Crop Types Utilized (*11*)

Crop Type	Acres Planted in 2012	Yield per acre (bushels)	Density (lb/bushel)	Weight of total harvest (tons)
Barley	0.75 million	53.0	48	1,004,880
Spring Wheat	0.29 million	33.0	60	2,871,000
Winter Wheat	2.1 million	39.0	60	2,538,900

TABLE 4 Township Attributes

Attribute	Description
AREA	Total area of township in square meters
TOWN_RANGE	Township and range of each township
Barley_acr	Acres of barley in each township
Swheat_acr	Acres of spring wheat in each township
Wwheat_acr	Acres of winter wheat in each township

Sum_Fac_C	Total facility capacity, in bushels, for all grain elevators within each township
Sum_Rail_C	Total rail capacity, in rail cars serviced, for all grain elevators within each township
Barley_Ton	Tons of barley produced for each township
Swheat_Ton	Tons of spring wheat produced for each township
Wwheat_Ton	Tons of spring wheat produced for each township
Sum_Ton	Sum, in tons, of barley, spring wheat, and winter wheat produced for each township
Elev_Ton	Elevator capacity and rail capacity in tons

TABLE 5 TIGER/Line® Road Classification

TIGER/Line® Classification	Description	Speed limit (mph)
A1*	Primary highway with limited access	65
A2*	Primary road without limited access	60
A3*	Secondary and Connecting road	45
A4*	Local, neighborhood, and rural road	25
A5*	Vehicular trail	15
-	Centroid connector	25

TABLE 6 Numerical Comparison of Results

Segment FID	Reported Heavy Truck Volume	Predicted Heavy Truck Volume	Difference in Percent
339	265	269	1.50
429	291	9	-96.90
861	153	32	-79.10
976	189	4	-97.90
30	278	14	-95.00
1513	69	194	181.2
1313	1943	138	-92.90
788	70	45	-35.70
995	252	176	-30.20
266	781	1	-99.90

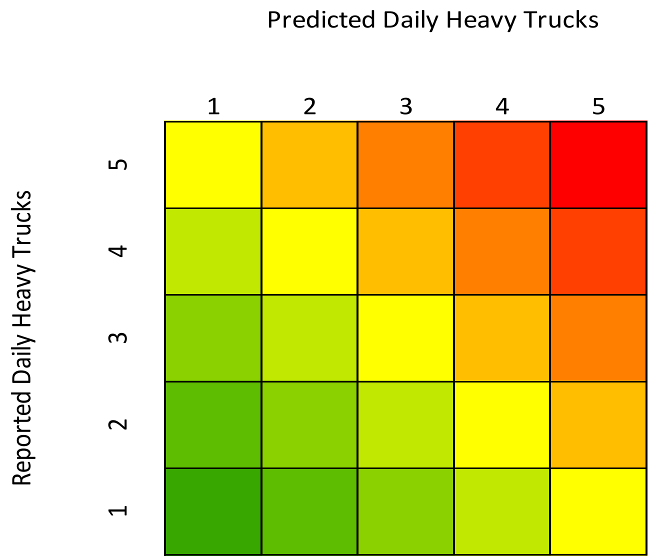

FIGURE 1 Reported versus Predicted Daily Heavy Truck Traffic

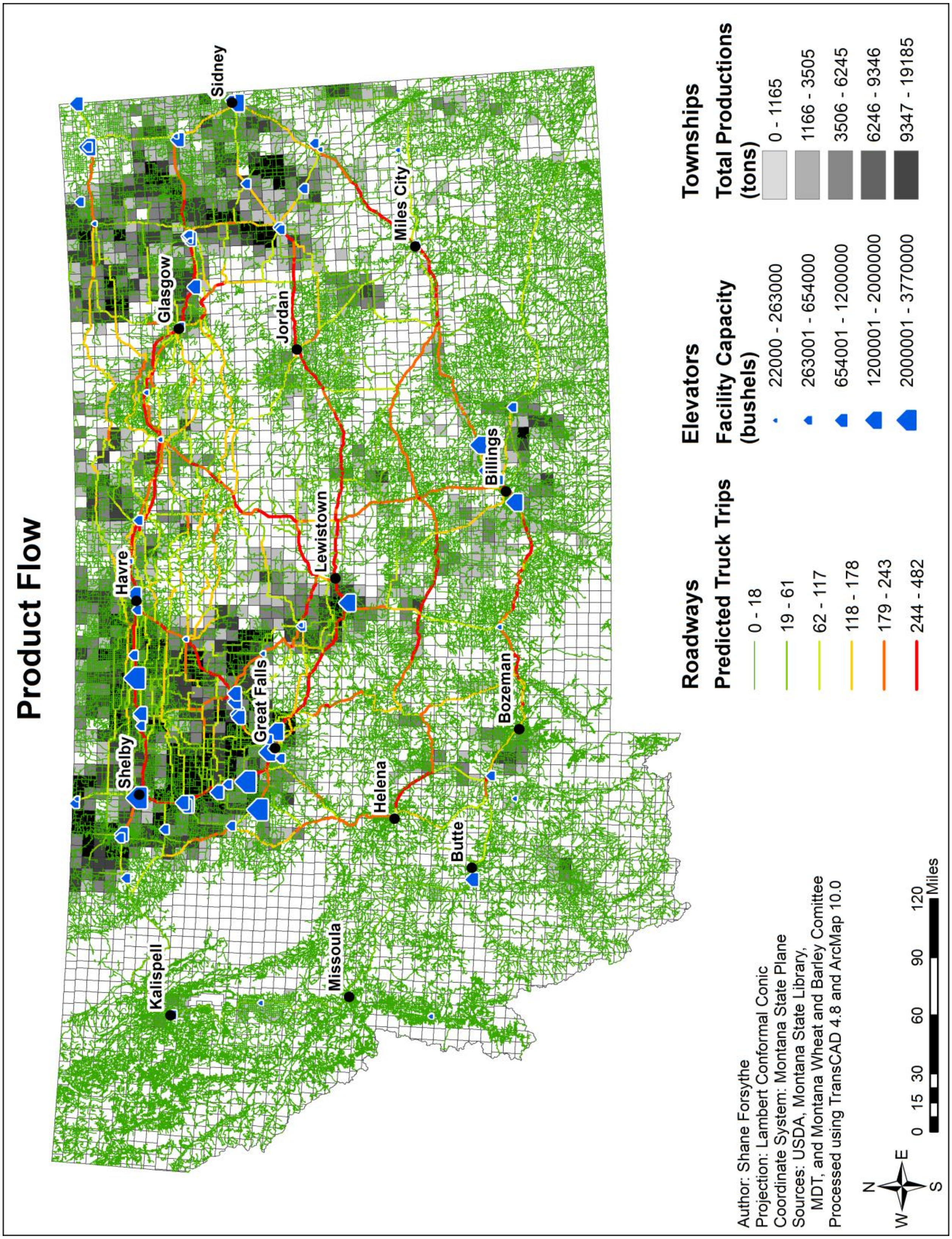

FIGURE 2 Predicted Daily Truck Traffic for Wheat and Barley

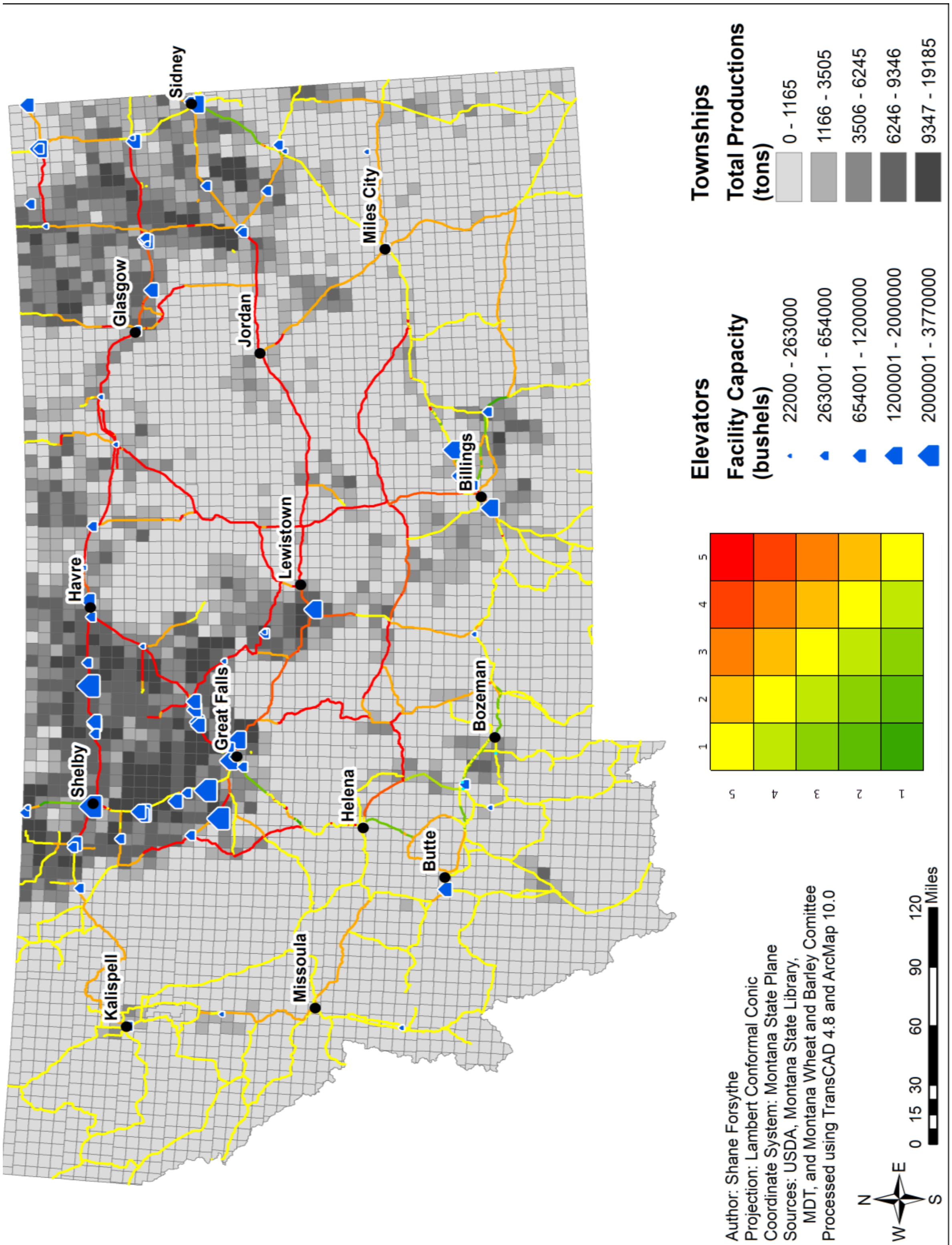

FIGURE 3 Deviation between Reported and Predicted Truck Volumes Carrying Wheat and Barley

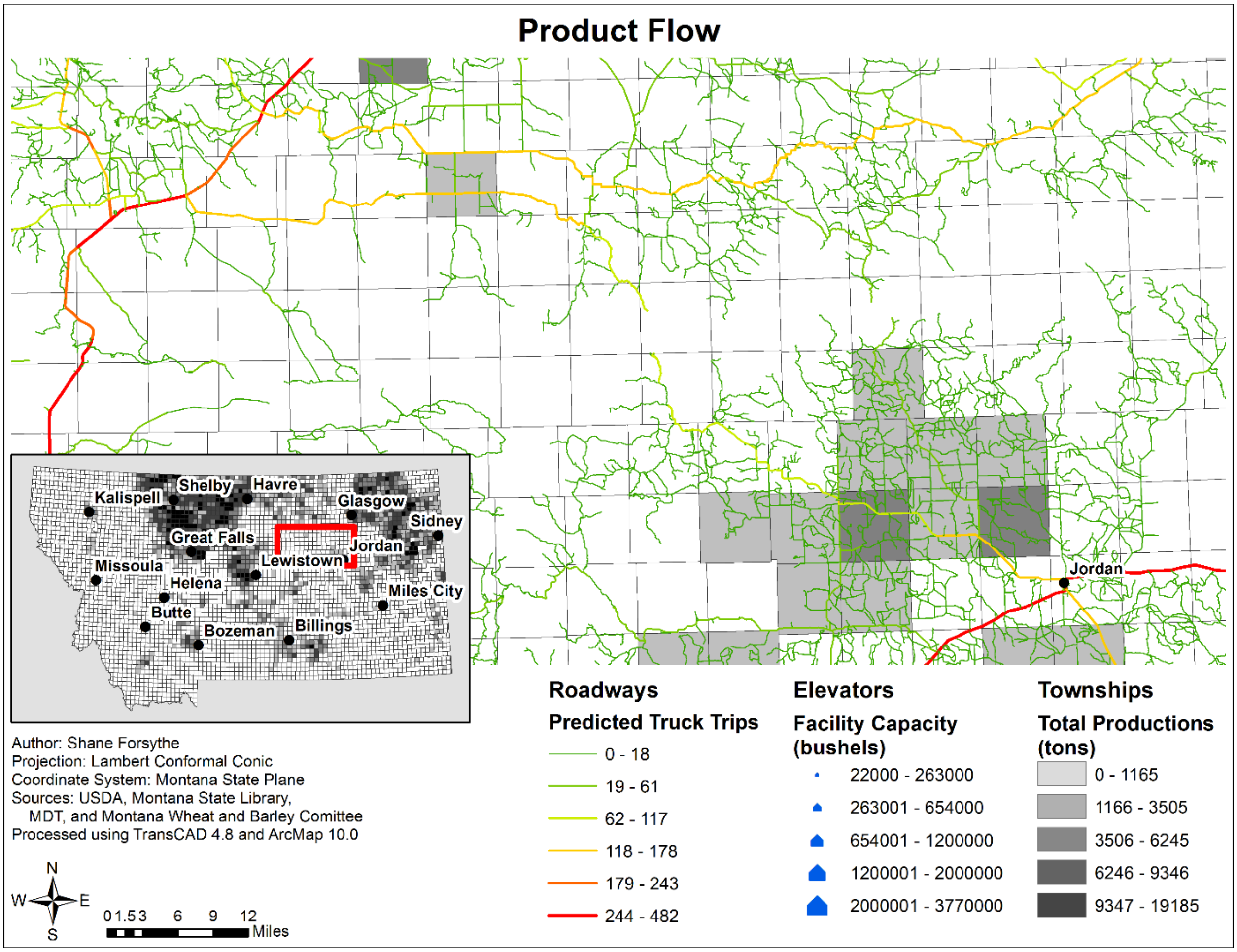

FIGURE 4 A Zoom-In View of Disconnected Road Network

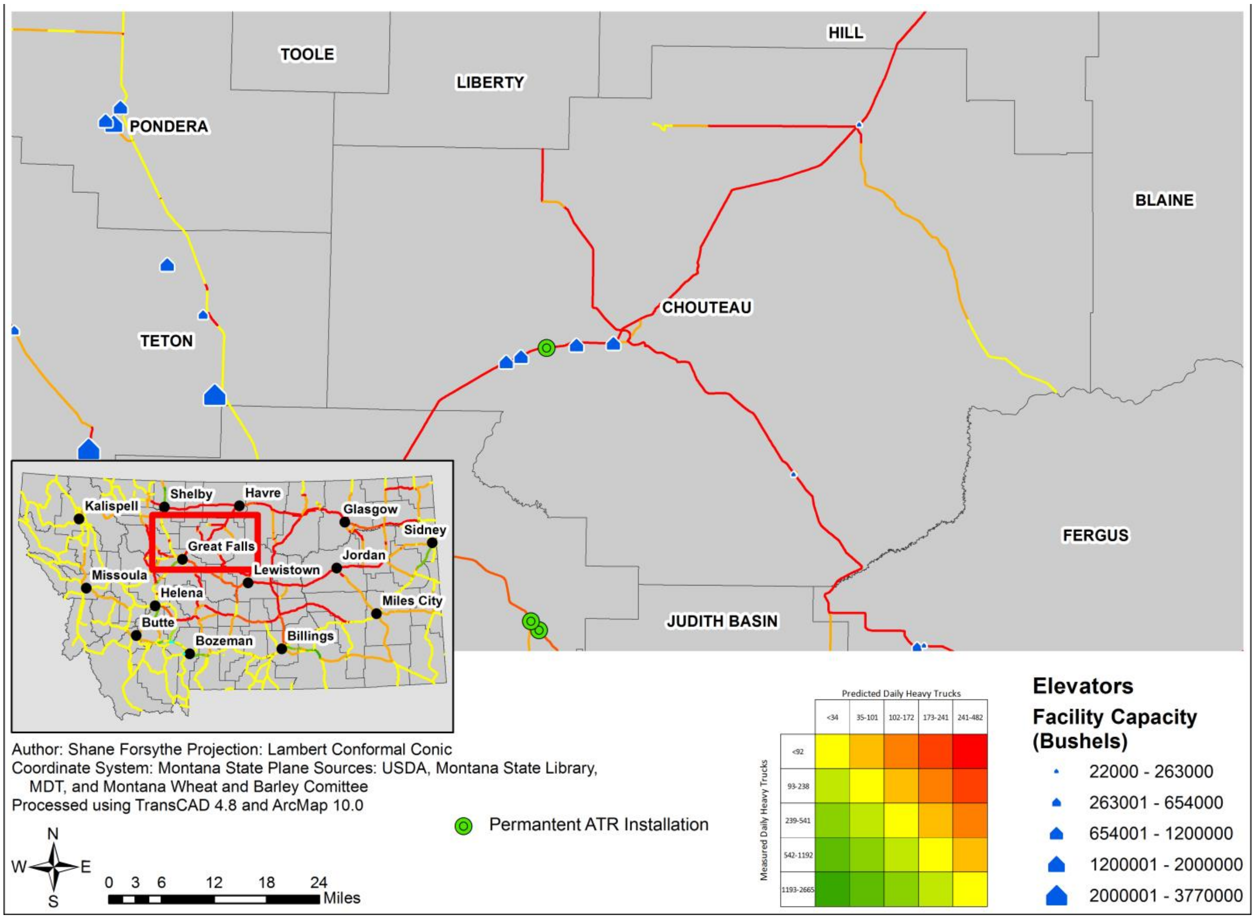

FIGURE 5 Heavy Trucks: Predicted Vs. Reported, Chouteau County

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