Evolving Supply Chains & Local Freight Flows:
A GIS Analysis of Minnesota Cereal Grain Movement

Travis Fried, Lee Munnich, Tom Horan, & Brian Hilton
Quick MN grain facts

- 340,000 state residents work in Minnesota’s agriculture sector
- 28 percent of all freight on state roadways is grain-related
- Produced 43.2 million tons in corn, 11.7 million in soybeans
- $5 billion in corn sales
Minnesota corn production, 2014

Corn Production, Tons
- 0 - 200
- 201 - 650
- 651 - 1,250
- 1,251 - 2,250
- 2,251 - 3,750
- 3,751 - 7,250
- 7,251 - 13,000
MNDOT looks to improving freight network

[There is a] need to recognize and adapt to evolving supply chain operations. Changing definitions of “value” have led modern supply chains to operate on a just-in-time schedule... This has changed the nature of the freight transportation system, increasing the need for resiliency and redundancy across all transportation modes and along the supply chain

(MnDOT 2016: pg. 51)
So where does all that grain go?

- Overview of the evolving grain supply chain
  - A focus on roads
- GIS and grain flow modeling
  - Commodity-based approach
    - Visualizing disaggregated CFS data
    - Simulating county-level, producer behavior
- Informing strategic freight network investment decisions
  - Value-added, grain-derived markets
  - Multi-modal carriers (i.e., rail, barge)
  - Load-weight restrictions
- Learn more at freigtheconomyatlas.org!
An evolving grain supply chain
Industry focus—Ethanol

U.S. corn domestic shipments by mode, 1998-2013

- Barge
- Rail
- Truck
Industry focus—Railroads
“In Minnesota and elsewhere, farmers are [trucking] more outputs over longer distances compared to the previous pattern where farmers would focus on short moves to local consolidation points and rail terminals”

(MnDOT 2016)
Mapping grain flow—CFS Analysis
Identifying grain related bottlenecks
Mapping grain-flow—
a micro-level, optimized approach

• Grain flow impact from Snake River Drawdown, East Washington
  —E. Jessup & J. Ellis (1990)

• Upper Great Plain’s Transportation Institute (UGPTI) studies on North Dakota grain markets

• Canadian grain handling models
Toward a more strategic freight network

• A focus on grain-derived, value-added supply chains
• Expanding multimodal services
• Revisiting load-weight restrictions
What next?