MODELING CAPITAL INVESTMENT IN LARGE SCALE, INTERMODAL, GRAIN HANDLING FACILITIES

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Road Map....

- Objective
- Background
- Modeling Approach
- Data Sources
- Quantifying Impacts

Questions ?
Objectives:

- Develop a multi-modal transportation (transshipment) model of Eastern Washington which accurately portrays grain shipments throughout the transportation network.
- Use this model to quantify the impacts associated with infrastructure investments in Ritzville, Washington (120 Car Rail Loading Facility).
  - Changes in total transportation shipping costs for grain producers/handlers.
  - Identify modal share changes.
  - Highway infrastructure impacts for truck shipments, by highway type.
  - Quantify which elevators are likely to be impacted and associated magnitude of change in drawing-power.
Background:

- Modeling approach applied to the Snake River drawdown several years ago.......represented potential for many other applied analyses.

- Investment in infrastructure by Ritzville Grain Grower Association (120 Rail Car Loading Facility) may significantly alter the way grain currently moves throughout the entire transportation network, resulting in sizeable impacts to different constituents.
Modeling Approach:

Combine the power and flexibility of GIS (ArcInfo) with the optimization capability of GAMS.

ArcInfo is used to:
- Spatially organize all geographic information including the grain production areas, grain handling and processing facilities (grain elevators and warehouses), transportation network (highway, rail, barge) shipment destinations (river ports, feedlots and ocean ports).
- Create all route combinations and cost coefficients.
- Geographically display results.

GAMS is used to:
- Minimize total transportation costs across all modes, routes and shipping options, subject to capacity constraints.
Data Sources / Layers:

- Agricultural Soil and Conversation Service (ASCS) provided grain (wheat and barley) production data:
  - Acreage and yield provided by section/township/range.
- Rail and barge shipping rates provide by (BNSF and Tidewater).
- Transportation Network developed from WSDOT and TIGER files.
Arc Info:

ArcInfo is utilized to generate all potential route combinations including, distances and cost coefficients:

- Farm to Elevator (both Rail and No Rail) (Truck)
- Farm to River Port (Truck)
- Farm to Feedlot (Truck)
- Elevator without rail to Elevator with Rail (Truck)
- Elevator to Feedlot (Truck)
- Elevator to River Port (Truck and Rail)
- Elevator to Portland (Truck and Rail)
- River Port to Portland (Barge)
GAMS:

GAMS is used to optimize all flows throughout the transportation network:

- Minimize Total Transportation Shipping Cost
  - Subject to capacity constraints at
    - Elevators
    - River Ports
Eastern Washington Wheat Production (ASCS)
Highway Segment Analysis
(Volumes by Arc Segment)

Legend

Interstate Flows (Tons)
- 1 - 4,900
- 4,901 - 29,911
- 29,912 - 98,456
- 98,457 - 237,042
- 237,043 - above

US Hwy Flows (Tons)
- 1 - 4,900
- 4,901 - 29,911
- 29,912 - 98,456
- 98,457 - 237,042
- 237,043 - above

State Hwy Flows (Tons)
- 1 - 4,900
- 4,901 - 29,911
- 29,911 - 98,456
- 98,456 - 237,042
- 237,042 - above

Ritzville Rail Expansion Site
Location of Ritzville Facility Relative to Production Areas

Legend

**Elevator Without Rail (bu.)**
- 14,000 - 180,000
- 180,001 - 359,000
- 359,001 - 746,000
- 746,001 - 1,478,000
- 1,478,001 - 2,855,000

**Elevator With Rail (bu.)**
- 44,000 - 330,000
- 330,001 - 745,000
- 745,001 - 1,283,000
- 1,283,001 - 1,971,000
- 1,971,001 - 3,888,000

**Railroad**

**Avg. Yields (bu/acre)**
- 20 - 41
- 42 - 56
- 57 - 71
- 72 - 91
- 82 - 130

Ritzville Rail Expansion Site
Next Steps:

- Update all GIS databases:
  - 2001 Grain Elevator Survey (geographic location, capacities, turnover rates, storage and handling costs, trucking rates).
  - ASCS Grain Production.
  - Rail and Barge Rates.
  - Quantity Demanded at Feedlots (and geographic location).
Additional Applications

- Model transportation flows of other commodities (forest products, fruits and vegetables, general freight).
- Any type of infrastructure or transportation network analysis involving impacts to the network (constraints or expansions).
- Modal Competition.
- Geographic Attribute Analysis.