UMR-IWW System Navigation and Ecosystem Sustainability Program
Navigation Economic Re-Evaluation
Navigation Economic Technologies (NETS)
Modeling and Draft Interim Report Meeting Minutes
August 29-30, 2007
Holiday Inn Select, Bloomington
Bloomington, MN

Attendees:

Barr, Ken	CEMVR-PM-A	Metcalf, Alexander	
Bluhm, Kevin	USACE	Muller, Mark	
Brown, John	CELRB-PM-PB	Nelson, Katie	CEMVR-PM-A
Carlson, Rick	USACE	Ray, Daryll E.	
Carr, Jack	CEMVR-PM-A	Schoonover, Heather	IATP
Dager, Chrisman	TVA	Smith, Terry	USACE
DeZellar, Jeff	USACE	Soileau, Rebecca	USACE
Fuller, Stephen		Spitzack, Chuck	CEMVR-PM-A
Granados, Rick	CEMVR-OD	Stamper, Jeff	USACE
Hammond, Mark		Starbuck, Max	NCGA
Holley, Travis	CELRH-PM-PDF	Tolliver, Denver	
Hommes, Harold	IA Dept Ag	Vogt, David	ORNL
Lambert, Dick		Walker, Brad	(CALL IN)
Langdon, Buddy	CELRH-NC	Walker, Wes	
Manguno, Rich	USACE	Whitney, Scott	CEMVR-PM
McGrath, Jeff		Worthington, Rich	USACE

Meeting Objectives:

1) Present the framework and results of the Survey Model and Draft Interim Report to the stakeholders and Peer Reviewers in a format that allows the participants to come away with as clear an understanding of model and Report as possible.
2) Document participant input.

<u>Wednesday, August 29, 2007</u>

Normal font = question or comment from audience
Italic Font = presenter answering

1:00 Welcome and Introductions **Spitzack and Soileau**

- Comments on Re-Evaluation Report due from NECC/ECC in early Sept 07. Fully reviewed draft 31 Dec 07. Final report 31 Mar 08.
- EPR and ITR received details of results from survey model then NECC/ECC.
- EPR are under contract of Corps of Engineers. The EPR panel is to remain independent of re-evaluation team and process. All communication should be directly between EPR and PDT per contractual arrangements. Other communications are not a part of contract and EPR should not be communicating information to others.

1:20 Presentation on TVA Transportation Rates **Chrisman Dager**

Slide Presentation 1

1) Is it O.K. to show this information?

One example is O.K. only for this group. There is a confidentiality feature. You can't use it for a competitive advantage. The camera is only for the absent EPR member.

1A) What is frequency and origin/destination of corn moving north? I assume they are short loads.

Iowa going north. 200-500 miles..

2) Have you synthesized this data into a set of networks by mode and commodity?

Yes. 5 digit zip codes is as close as I can get for a network. I can apply 5 digits to rail and barge. Trucking is at best 3 digits.

At that level you feel comfortable you can represent movements?

Yes, I've done it for USDA. I can take freight cost by state and apply it.

Did you say you were doing seasonal rates?

Yes, shipping season by quarter. This is designed from a bottom up approach. It's an extreme micro approach.

3) Your example was helpful for elevator that handled 15 million bushels onto river, but WCSC trip reports may be deficient. What you are looking at is from that origin to a particular destination. Say there is an ethanol plant or feed lot 20 miles away- are you looking at that demand drawing away from river?

The average distance to river for corn is less than 60 miles. Average distance to river for wheat is 120-125 miles. Soybeans average distance is around 50 miles. Your feed lot and or ethanol production tend to be outside that drawing area-up until this year. Now they are starting to come in. EPA mandated feedlots couldn't be in flood plain. Look at livestock inventory on counties adjacent to river- it's lowest. That is the drawing area for grain. Ethanol is now kicking in a little bit but feedlot is not a major influence on Navigation. It influences drawing area-not over all quantity on river. An ethanol plant being built that will influence what we are doing. 15% of grain moving on waterway system is IP. High starch switch is possible.

4) Is transit time in your database?

Yes.

4A) Do you see percentage of IP growing in future?

I see a growth of IP on river. Stagnant overall.

Percent stable through time?

Yes, what you are seeing is specific – 5 types of corn being planted now. IP export market through river. Feed corn not on river. High starch going to ethanol. At farm decision based on market conditions and geographic area farm is serving.

2:30 Survey Model Description **Rich Manguno**

Slide Presentation 2

5A) Carr to Walker: Please bring up issue of loss of farmland.

There is no consideration for historic farmland loss in model.

One comment I would make is they don't use total land base, but actually sum of land for three crops in model. Those would be two different concepts. You wouldn't have a constraint on those three that you would have for loss of farm land.
There's much more than just the loss of cotton or soybeans. I didn't see correlation. We're not comparing apples to apples. It's more market driven than availability of acres. I disagree that you can not use one of seven.
I understand what you are saying. But we are talking about 50-60 years here. If you don't look at the large volumes of land lost in the previous 50 years and use that to forecast the potential amount lost over the next 50-60 years you are missing the entire picture. Other things come into play too. The Central Valley of California and Florida are having high rates of land conversion and loss of irrigation water. These are areas that are double or triple cropped. If the goal is to continue to export corn and import all other food that we've lost then…I find it hard to believe that we would continue to export corn in lieu of growing crops we need. One other point, if you take a look at NRCS maps of converted prime farmland in 2002 a lot happens to be right around the Illinois Waterway. It's an area of prime farmland conversion and will likely be for next 50 years. IWW is providing the prime share of corn going down the UM river. It's almost like wearing blinders in saying we only have to consider the area for corn, wheat, & soybeans.
You asked if that was included in model. It's not. If model looked at all commodities that land constraint could be able to be included.
One more issue of concern, land use in low traffic scenario showing declining exports until 2030 from ethanol. Then, expansion of corn exports after 2030 due to conversion to cellulosic ethanol. Is that increase in cellulosic ethanol accounted for? Need more information on this.
There has been a huge amount of effort put into portions of the model such as barge delays, traffic surveys and transportation rates. One area that needs considerably more work is the agricultural supply side. If the model does not calculate that corn volume accurately then the results of the model come into question.

3:30 Survey Model Continued, Application of model Rich Manguno

5B) 2004 is that just straight from PMS data?
These were numbers the model produced. They calibrate closely to actuals. 2060 is model generated.

5C) I'm confused because I'm not seeing a difference in utilization or time. Traffic must be similar. Does model take into account performance of lock will be different in 50 years (maintenance & deterioration.)
Yes, it does consider deterioration.
Utilization tells me they are getting the same amount of traffic.
This is not unconstrained traffic correct?
It is equilibrium traffic.
Ok, it's dampened by that- but given same amt of traffic showing up there's not much difference in lockage times and 50 years out- on an older system is that realistic?
For all of the locks there was performance over time. With rehabs scheduled that performance, while it deteriorates to some extent, stays close.
This assumes major rehabs will be done as needed. We've had moratorium for 8 years now on major rehabs.
It assumes that major rehabs will be done as scheduled.

Is that realistic?

6) Why are the non-critical locks not run through WAM (Waterway Analysis Model)?
Cost prohibitive..
When you got 2030 result for non-critical locks did you run through WAM?
No, relationship for queuing in model. You are asking how do you know what that would look like if you would use something more rigorous to evaluate it. I think it's safe to say if you used WAM on those locations you would get answers very similar. It's been the case when you're operating over low utilization levels your able to change volume of traffic by a fair amount before you see a change in level of what queues are.
I think it needs to be explained.

7) Might it help- on top three locks in Minneapolis there is no change in utilization and we can conclude that because Minneapolis is going a different direction. If you eliminated those three locks you do see some additional utilization on rest of locks. Further down where you're moving more grain there is a change.
I think that is true. The traffic through upper three locks is modest. They all handle same tonnage.

7A) For that lock with cap of 50.9 k=1.4- is there a series of values?
You have a set of data points describing hours of transit time and tonnage. I have to fit a function that has that as its definition to those. The cap and k that result in best fit become cap and k for function. Differ by lock and various individual curves that make up family of curves.

7B) The family of curves reflects changing capacity right?
They do reflect different capacities. There are great degrees of lock outage times. You would expect that everything else equal more outage time would mean lesser capacity.
So as you build a bigger lock and k is fixed…
This is for a particular state of affairs at lock 25. Base line runs which has unavoidable about of outage time built in. I have to include outage time either because I have observed it or forecast I might need to specify additional outage time than in original curve. I run that for a range of traffic volume. I get a new set of points and I fit the function again. You would expect if I had a significant enough difference in lock availability time that when I ran new case cap would be lower.

8) The part I don't understand relates to the time span you're using for functions. Lets suppose you had a lock that could handle 50 in one year but suppose that the demand for lock was 20 and it happened all in one month. How would you handle that?
When the simulation is run the pattern of traffic for that year would reflect that. The pattern of arrivals could be dictated. If every ton showed up in July you could force arrivals to replicate that condition. You would get a different look to things.
You'd be able to incorporate that effect into survey model?
The transit curve carries that effect with it. Survey model is run on annual basis. It's that connection between transit curve which is now expressed as a transit curve for year and its put into survey model which is run for a year.

9) Distribution is an annual function of some average of how traffic arrives through year? In WAM?
Simulated in WAM there is a years worth of traffic that is known by day by week by month and that pattern is the pattern of arrivals that is processed by lock. So if its loaded for particular month that's the pattern reflected in simulation.
10) So a transit curve for a uniform loading would be different than the same volume in one month?

11) Isn't it true these transit curves are generated with historic data? With survey model how does it pick which curve out of family?
We'll get there with next slide.

12) I'm assuming transit curve for one lock is independent of transit curve for other locks. Simulations are done as single events. As I appreciate it, other than to extent that real world presence of other locks influences historical arrival patterns, these are done independently. Two locks are independent curves in simulation so locks can't affect each other up/down stream?
Influences are reflected in arrivals at other lock. They are independent.

13*) That influence should be minimal*
It's a point of some discussion. Follow up later.

14) What's the closure duration?
You don't see it defined here. It is whatever you decided it needs to be going into simulation runs to capture outage times needed to be captured? This information is in survey model. It's not the case that one of these things gets selected. It's computed in combination and that number is used for delay.
It's a function of lock availability. Lock is not always available. Does survey model assume every lock performs with zero closures?
The question you're asking is operative in WAM level. If you think base case is small periodic short events for closure that's built into base case. That's not all I might expect in whatever year. It will include planned and unplanned events. Ex major rehab I can put specifically in to the simulation. It would be an additional closure case. WAM only generates individual point for each time its run. Points than get fitted using form to produce transit curve. That curve represents something regarding lock availability. Your real question is why couldn't you incorporate all of closure event you expected for a particular year in one WAM run or set of runs and fit the function to that set of points and not worry about all of this stuff right here. I don't have an answer to that. This is the way I have been lead to believe is the standard operation for use of WAM in transit curves.

15) If I'm forecasting for 2060 tonnage, apart from maintenance events, am I assuming distributions for turning up at lock are same in 2060 as base case (2004)?
The distribution of which time?
Arrival times.
You can change that in WAM if you have a reason to change it.
For practical purposes we are ignoring it?
Yes.

Buddy's response is you have some pattern of arrivals and arrivals have to be scaled up and down they are done maintaining same pattern of arrivals.
16) In base year we have so much grain and traffic. In 2060 ethanol reduces that. Are we going to change distribution in forecast numbers for that?
The distributions from historic patterns are same. If mix of traffic changes in future you end up with different mix feed into model. Frequency by month day of week hour of day. If commodity mix was certain pattern in base year. In future if mix is different there is an adjustment made. It's going to adjust for that for each lock.

17) If we only have forecast for total system lock reaches 1-4 are we assuming all locks in it are having same distribution in future?
That's on disconnect that when you run WAM and escalate traffic to millions of tons more you can estimate up historic commodity share or future commodity mix rates. It's done at demand level not necessary equilibrium level.

18) Severe change will make it more important to do that
The average transit time you get out is assuming a certain mix.

19) If we are treating reaches 1-4 as common it will be important to check distributions in base year and forecast year.

20) One reason is when we did WAM run we did thousands of runs and different mixes of commodities. Shipping mix was adjusted. Lots of variations of Waterway Analysis Model curves that reflect different scenarios.

21) Essentially we have a big change in low forecast and therefore it would be a really big factor if it all turned up in June. It would be a big factor in problems in locks. If they grow at different rates it's an issue.

22) We are talking about cause for different arrival patterns. I don't see how arrival patterns affect transit curves. When you end up with curve you have delays on vertical and total cap for year on vertical so I don't see how arrival patterns get reflected in curve.
The data point for simulation represents average for entire year. If, monthly, I had: 0 delay, 0 delay, big delay, 0 delay. Average delay for year would not be 0 or large number.

23) What's the cost of not having that delay? Cost is not average but cost of not having the capacity when you need it.
I agree it should be a subject of some discussion. Are we loosing anything in averaging effect. Having said that this is how the curve captures it for this tonnage level.

24) Because you are being more efficient in moving stuff through when you have ten boats peaks Traffic management
He's saying he can adjust delays for…
You adjust traffic and delay is consequence of that.
Transit curves with seasonal peak would edge up sooner. Axis is tonnage processed.
Tonnage transit curve slopes vertically.

25) So question is: Tonnage is estimated at asymptote. Are arrival patterns drastically different in future to warrant different transit curve being used.
Transit curves used here are from 2004 study.
You definitely have to run 2025 as independent. I'm absolutely convinced you don't reflect situation of declining grain. Range in that year is from 15 thousand to 60 thousand tons on grain. It's a novel experience for you to be faced with.
That's the one that won't be matched as well. There was one of 5 scenarios that showed continuously declining volumes. We didn't have a scenario previously like that. It won't match well. For what's defined as high traffic case we have match.

4:30 End of Stakeholder Meeting Day 1
4:40 EPR Only Meeting Begins

<u>Thursday, August 30, 2007</u>

8:00 Survey Model Results **Rich Manguno**
Slide presentation 2 continued.
1) How did you treat empty barge movement on upper? How did you incorporate that when you were evaluating tons?
Empty barge percentages are built into rates and opportunity cost numbers. They are also part of WAM curve estimations that describe lock performance. It is not in survey model specifically. The effect is captured in other three areas.

2) For survey model, Chris Dager provided in rate analysis for any movement you have 9 existing rates. St Louis, four seasonal rates, average grain rate. In your NED analysis with survey model what rates are you using? Just classic two?
Yes, but as demand functions are used (unlike traditional treatment) we can have positive waterway quantity at rate that exceeds alternative.

3) Are you able to divert St. Louis route prior to diverting from water completely?
One aspect we are doing, partial in nature, particulars to where movement winds up once it's off water, is not tracked here. Demand curve estimates quantity as price changes. Don't track where it went.
Then the value of Chris Dagers' rate study is to give you a base comparison of savings?
Yes.
Does that mean all analysis will be in real terms?
Yes

3A) Is that a specific army corps number (4.875%)?
As part of budget process once projects are authorized and in construction phase, we are asked to show remaining costs at that rate. But OMB has asked for 7%.
This rate comes from P&G guidance doesn't it?
It represents average yield on outstanding yields that have a return on some duration. It's an average of those values. By policy we don't let it change year to year by more than a quarter

percent. Our discount rate is always chasing market either up or down. We've been in falling mode here of late. I don't know which direction this will go.
3B) Seems to me discount rate is following government bond market. In other sectors of DOT there isn't an established rate. As I looked at bond rate it's 4.8%, with inflation at 2%, real rate should be 2.8% if you're going to follow that.
The value gets specified without much leeway for interpretation. There are these questions about it.
The 7% OMB puts out encourages short term investment and discourages long term investment.
I would agree with that yes.

3C) I'd like a clarification on rate under alternative two which is P&W that you've got Chris' rate but when it's converted…
We don't do accounting of that to say that...
So is cost savings based on river vs. alternate river rate to same destination?
Benefits measured as consumer surplus looking at area under demand curve. Traditionally top point of demand curve has been defined by least cost water alternative. That's not the case anymore.

9:45 Draft Interim Report Walk Through
Introduction **Chuck Spitzack**
Slide Presentation 3
4) Could you give an example of what you mean by adaptability on navigation side?
We are approaching this in increments. We have a first increment- Then a follow on second increment. Before we do second phase we will re-evaluate system. Look at adaptability as resiliency & flexibility of system.

5) Report doesn't contain info on recent & future major rehabs. Will that be added?
Assumptions for major rehabs will be consistent with feasibility study.
It would be nice to see re-habilitation schedule.
We can add that or refer to where you can find it.

Environmental Quality **Ken Barr**
Slide Presentation 4
6) The figure 202 million for mitigation. How does that relate to 5.3 billion ecosystem restoration framework.
It is in addition to 5.3 billion. 2.4 billion put into cost benefit from increased traffic.

7) If you change type of vessel on Mississippi, would that change impact on ecology?
Yes. We looked at kort nozzle and open wheel. The findings are mixed. We think the kort nozzle concentrates fish and they can't get out of way quite as easily.
Is there any rule of thumb that faster and bigger do more damage.
Long pulsating waves from boats. Speed doesn't help. For recreation boats slower helps. For large boats going slower uses more water and entraps more fish. We couldn't come up with a operating speed change strategy. Maybe we can move boats away from critical resources.
Lower waves happier you are?
Yes, except we can't control wind. Wind fetch may be as damaging.

8) I'm not sure you made point that major fishery impact isn't from entrainment on adult fish but on larvae fish that couldn't get out of the way.
The larval fish are free floating in main channel. They can't swim out of way. Three per cubic meter. Exposed 5 species of larvae, 50-80% mortality.

9) How impact model works? Took increment of tows. 12 tows a day or 16 tows a day increment not as bad as just 4 tows.
Some of things it's linear. With others it's not. Larval fish entrainment-linear. Sediment suspension-non-linear. Increment above without that was important to us.
We don't have what it would have been without project barge traffic.

10) You mentioned total number of tows. Is that reflecting efficient tow size with project?
We did analysis and made Rich give us empty and full. Horsepower's, speeds, water levels. We modeled under 15 different conditions.

Chapters 1-2, Re-Evaluation Report **Scott Whitney**
Slide Presentation 5, Handout: KeyFindings.doc
11) Where are numbers on US Trade Trends slide from?
Astho Report.

12) There's a discontinuity in railway system at the Mississippi River that impacts rails ability to service west coast prots. It's hard for UP or BSF to serve Ohio from Pacific or West Coast. Are bringing east coast trucks or up Mississippi as an alternative. That discontinuity has a critical impact.

13) Do you have that documented anywhere?
We've just finished an Inter-modal strategy for Ohio. Shows East of Miss is isolated from west coast ports. There are few ramps in Ohio. As a result that market is poorly served by current system. Mississippi alternative should be considered.

14) Are you including distances as well? It depends on origin and destination- you can't just say barges are more efficient than rail. Energy and efficiency of barges over other modes depends on distance.
Good point.

15) Could you include delay times in "UMR Locks and Dams"?
Yeah, we need to include that in there.

16) On the graphic showing amount shipped by barge. Corn 35%?
Of 81.9 mil tons on river, roughly 35% of that is corn. For this time period.

17) How is reference to major rehab schedule included? That schedule has been stalled for last 10 years. We're looking at 1.4 billion in backlog maintenance. UMR and IWW.
Delays cause us to do rehabs for more money than originally planned.

NED Multi Modal Qualitative Analysis **Jeff McGrath**

Slide Presentation 6

18) Is there any discussion of whether or not some of those items are externalities or not? Seems to me some of those are measurable costs. For example: measuring congestion. Noise and National security I understand, but some of the others should have been in NED- they are not externalities.

These kinds of costs are outside of our current guidelines. We are restricted by P&G which restricts us to cost reduction benefits. We have begun to petition HQ about need to include these other benefits. We do not currently have a green light to quantify congestion reduction.

19) If an inefficient waterway is converting traffic to rail, and rail is more and more congested where do you go from there?

Expectation in future is rail will be more congested and might expect diversion from rail onto waterway. Based on projections of rail traffic growth.

20) We have such a backlog in O&M and yet we are surprised traffic has been flat for 10 years. Investor or user confidence in systems. They are getting less reliable system and take that into account as they make their transportation choices.

21) In terms of quantitative analysis, couldn't you do something like the shipper response report? The way the re-evaluation report is framed it focuses around multi-modal transportation and yet that research is the speculative and qualitative. There is a disconnect from the research to the report.

MIRAD is finishing comprehensive study on impacts to or from water to land modes. I'd asked them to send report to you. I'll send draft report to you. They are making an attempt, a generalized quantification, of differences of traffic on rail, land, and water.

One thing that could be done easily would be to look at volumes moving by rail and highway and speculate what impact would be on water if we moved 1% 10% to water. Even a 5% shift could have a significant impact.

RED and Other Social Effects **Jack Carr**

Slide Presentation 7

22) For many of the elements you were able to quantify for specific cases and some had to provide qualitative, for example noise.

We did but only for examples of probable routings. The only study I mentioned that is qualitative is social well being, quality of life, and recreational opportunities. We have numbers for rest.

23) You have to have very specific alternative routings to compute noise and costs of delay. We took traffic still heading to gulf. Other stuff to PNW and elsewhere we didn't know what routings you could take. What we did was a minimal component of traffic.

It's an area we'd like to go. Idea of impact on St. Louis with additional potential rail and highway traffic on St. Louis.

24) One thing we need to be clear about on benefits is the distinction between demand benefits and supply benefits. NED demand benefits. Once we talk about REMI they are supply benefits. Mirror image NED benefits in supply system. Two sets of benefits one from each side. REMI

don't include economic rent. Economic impact supply side benefits are powerful-number of jobs created. That's demand side. Have to make it clear that they are the same benefits interpreted in two different ways. Don't represent RED and NED as additive. Both exist- one supply side one demand side.
We started to present this by system of accounts. NED RED OSE EQ. They are not additive. REMI benefits are RED benefits. We included more than normal based on request for states.
REMI takes travel time cost savings and computes accessibility index and shows productivity benefit. There is some component of REMI that is more dynamic in nature. It's some component of economic rent- a supply side benefit.

25) There needs to be a distinction between economist view of externalities and how it's external to model.

26) If you're familiar with REMI, when they did this it was regions 5 midwest states, lower miss, and rest of US. Total of those is whole country. Supply side. What do you call that?
REMI says if region 1 is more accessible due to improved transportation than that has a spatial economic effect. Trade Flow.
Incorporating economic rent analysis. Look at accessibility between areas and impact on trade productivity. How transportation efficiency is impacting ability of market to perform.
Regional economy is linked to national economy.

27) You referred to excess capacity 50-100 million tons of rail capacity. Is that specific to region?
That was looking at the example routings that were looked at. Not larger set. Just regional.
Do you segment lines within region? MP line through IA.
It wasn't a complete regional analysis. It was specific examples of routes that could take grain. Focused on alternative rail options.
But there would be some costs with that too. Just looking at overall capacity. Burton says this is a real question moving forward.

Conclusions and Recommendations **Chuck Spitzack**
Slide Presentation 8

Follow up on 8/29/07 Discussion **Rich Worthington**
28) What I was hearing was somehow the Corps had come short of what it committed to, in that it did not develop a multimodal spatial model and evaluate this project using it. Just wanted to clarify that the Chief of Engineers' and ASA commitment was to take tools being developed as part of NETS program and apply those tools to the recommended plan from December of 2004. It became clear to us early on that NETS would produce valuable things: spatial global grain model, shipper responses to increasing waterway prices. National Resource Council criticized us for not having the shipper responses. It's not fair to say we ever made a commitment that this project would produce a multi-modal model or that we were going to evaluate this project with a multi-modal model. There was never such a commitment.

We are promoting multi-modal model as a long run concept. In the time frame you have for these studies that model is beyond scope of anything you can develop. That's a tremendous

undertaking. It would have been impossible to do in this study. In the long run, as you improve models, that's the next evolution that I see. Having been involved in review processes in 2000, with the global grain model there has been a huge improvement in theory and credibility of model. We were looking at it as here's an ideal model framework for future.

29) I think there's another perspective that deals with helping the reader of the report to know what the limitations are. Also, acknowledge that abiding by the limitations could produce criticism. If Corps addresses those limitations the EPR could comment in that context.

The issue here is best practice. This is what you could do with what you had. The issue is this is a major investment and major infrastructure. In terms of developing good practices and making sure investment we make is effective we need an appropriate framework. There is a lot of upside to analysis you have produced vs. whatever downside. Methods you have used and developed were developed within context of an isolated system. We are moving into crisis mode of multi-modal system. The more we can relate to what's happening outside of water the better the results. Clearly it means we are being extremely conservative about response of traffic to mode if there is diversion to water from rail. Railroad could deliberately shed traffic to water. Highway has high volumes of trucks given NAFTA and having trouble handling it. Practical results you produce could be conservative compared to what end use has to be for Mississippi River System. Fact that we haven't quantified that is something we need to recognize. There are equilibrium models out there being used. Situation is that if we had used one it would have only been upside in terms of results for study. We have to compare what has been done with what is possible. We want to ensure context is properly documented so it can be seen. The impact of using latest techniques would have enhanced results.

I agree, I think for stakeholder perspective the limitations and scope needs to be laid out and clearly defined up front. This report doesn't show what you are attempting up front and that is maybe where these concerns are coming from.

30) If you look as some of the advancements, Alex and Denver alluded to them, there was some sub standards for how you measured and what went on. Upper Miss has been held to different standard. Is that the norm nationwide? Are we comparing conditions like subsets some of research Alex alluded to? If you can't justify Upper Miss than where? Invest system wide- is that a HQ idea too?

Wes represents inland navigation center of expertise-
Expectations are that we use similar tools and techniques. NETS has focused on getting these tools ready for this study because it's still going on. The NETS program is helping us develop shipper response curves and we are struggling modifying models for this data. Forecast coal model has same functionality as grain model. I think on two major systems we are in concert. Great lakes system is number 3 on list. NETS trying to bring those models up to same level.

11:45 Closing Remarks **Chuck Spitzack**
12:00 Adjourn
After the Meeting:

- Distribute a report record of the meeting minutes to the participants.

Upper Mississippi/Illinois 2006 Transportation Study

Chrisman A. Dager
Tennessee Valley Authority
August 29, 2007
St Paul, MN

INTRODUCTION

- Qualifications
- Study objective
- Sample
- Set-up
- Interviews
- Land routing
- Rate modeling
- Compiling
- Work Summary

Qualification

- Prior work
- Additional projects
- Staff
- Tools

U.S. Army

Corps of Engineers and TVA

- Lock and Dam 26—1976
- Missouri River master manuals—1991, 1996, 2002
- Upper Mississippi River—1996, 2006
- Inner Harbor Lock—1991
- Montgomery Point Lock—1992
- Green and Barren Rivers lock closure—1993
- Upper Tennessee River—1989,1999, 2003
- Kentucky Lock—1990
- Ohio River studies—1995, 1997, 2000, 2003
- Rate studies for ports, harbors, and rivers—1994–2007 (0ver 85 studies)

TVA

Great Lakes

- Soo Lock—2000, 2003
- 18 harbor dredging studies, Lake Erie—1996–2006
- 2 harbor dredging studies, Lake Michigan—2000–2006
- Modal shifting of containers, Great Lakes Recognizant Study—2002
- Update Soo Locks—2003

Great Lakes Master Plan 2005

Additional

Projects

- Fuel tax modeling
- Web page data—Institute for Water Resources
- Elasticity of demand for navigation
- Independent technical reviews
- National peer reviewed publications
- Lock Graphics Program

RATES STAFF

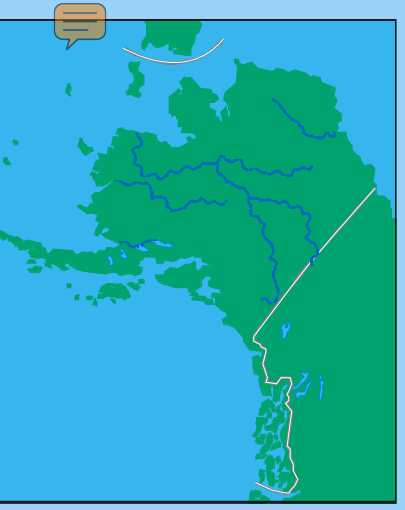
- Carolyn Koroa-Rotational Manager Navigation
- Chrisman Dager-Navigation Economist
- David Arbogast-Programmer
- Arland Whitlock-Contractor Interviewer

TVA

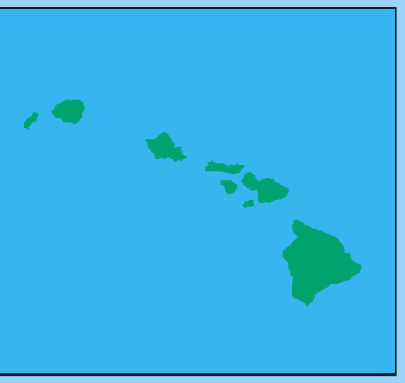
Tools

- Barge Costing Model
- Great Lake Vessel Costing Model
- Reebie Rail Costing Model
- Waterborne Commerce Statistics Center Commerce File—1977-2005
- Lock Performance Monitoring System national basis—1990-2006
- Surface Transportation Board waybill sample—1994–2005
- Inland Waterway marine terminal profiles and surveys

Inland Waterway System



- 237 lock chambers at 192 sites
- 12,000 commercially navigable miles



Study Objectives

- Shipper savings
- Rate sensitivity
- Alternative destination
- Alternative trans-load location
- Transit time

SAMPLE

- Criteria
  - Top 1300 O/D pairs by annual tons
  - Break-point approximately 10,500 tons annually
  - Passing Lockport, IL
  - Above L/D 27
  - Minimum three O/D’s per reach per commodity group
  - Special over dimension moves
  - Represents 76% of annual tons
  - Total O/D pairs 1353 in sample

SET-UP

- Commodity
- Ship location-Ship dock
- Received location-Received dock
- Annual tons
- Dock address, phone, contact
- Shipping profile

INTERVIEWS

- Initial telephone introduction
- Fax or email questions
- Telephone to set appointment
- Visit dock 20-30 minutes to ask questions
- Record interviews on Corp’s template
- 9-12 interviews per day
- Two persons in urban area-one person rural
- All grain elevators-50 largest non grain docks plus nearby docks to fill in day
- Missed or uncooperative docks-used prior survey

LAND ROUTING

- Based on dock interviews
- Off river origin/destination
- Truck and rail mileage
- Unit train or shuttle train load out
- Rail carrier specific to dock
- Mid-stream transfer nearby land based dock that handles similar commodity
- Non rail served, truck to or from railhead
- Dredged or river mined material-nearest land point

RATE MODELING

- Water
  - USDA percent of tariff
  - Published spot market
  - TVA Barge Costing Model
- Rail
  - Rail web page tariff
  - STB Revenue per mile by 7 digit STCC, railroad, GT/LT 500 miles, type of service, de-masking factor
- Truck
  - Dock interview response-Rate per loaded mile max legal truckload weight
- Pipeline
  - Tariff

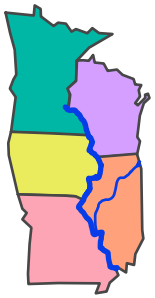
COMPILING

- Water- Grain Five Year Average, other commodities spot, TVA-BCM
- Land-Lesser truck or rail, rail tariff or waybill
- Alt 1-St Louis
- Alt 2-Export Grain PNW
- Alt 3-Grain & Grain Products 5 year average DJF
- Alt 4-Grain & Grain Products 5 year average MAM
- Alt 5-Grain & Grain Products 5 year average JJA
- Alt 6-Grain & Grain Products 5 year average SON
- Alt 7-Grain Average Annual 2004

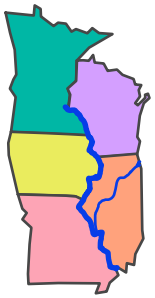
WORK SUMMARY

- Start June 2006-Complete June 2007-13 months-over ran schedule by three months
- Returned $3000 first FY as unspent travel
- Added ocean vessel charter rates, transit time computation, grain drawing distance, and water compel and rail corridor capacity to scope of work
- Completed work within budget

Review Comment Topics

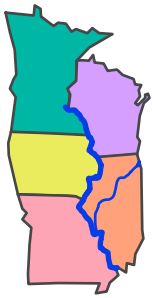


- Scope of Modeling
- Implementation of Traffic Forecasts
- Implementation of Train-Wilson
- Consumer Surplus Measurement
- Lock Performance
  - Non-Critical
  - Critical
- Opportunity Costs
- Backhauls
- Baseline Costs
- Alternative Mode Costs
- Discount Rate



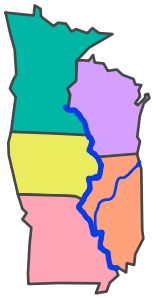
Scope of Modeling

- Survey Model is not explicitly multi-modal
  - It attempts to capture the influences of non-water modes through the mode choice shipper responses from Train-Wilson.
  - Grain forecasts are developed with some consideration for alternative mode constraints
- The prospects for container-on-barge was investigated in a primarily “traditional” context. The conclusion was to not modify the forecasts to reflect any additional traffic.



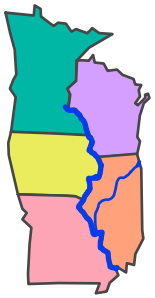
Scope of Modeling

- To the degree that there is an expectation of a order of magnitude expansion in the demand for non-water mode transportation services resulting in a previously unidentified spill-over to water demand, the model is not capable of identifying such an effect.



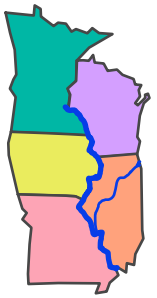
Traffic Forecast Implementation

Global Grain Model Reaches



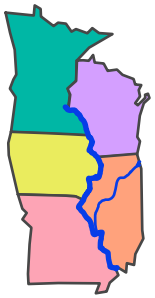
- **Reach 1: Cairo, IL to LaGrange, MO (Miss River)**
- **Reach 2: LaGrange MO to McGregor, IA (Miss River)**
- **Reach 3: McGregor, IA to Minneapolis, MN (Miss River)**
- **Reach 4: Illinois Waterway (IWW)**
- **Reach 5: Cairo, IL to Louisville, KY (Ohio River)**
- **Reach 6: Louisville KY to Cincinnati. OH (Ohio River)**

Grain Model Base Case Calibration



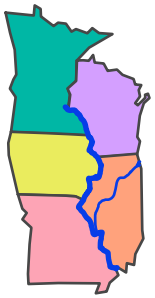
Reach	Total	Corn	Soybeans	Wheat
Avg. 2000-04	(000 MT)	(000 MT)	(000 MT)	(000 MT)
Reach 1	7,909	4,144	2,227	1,538
Reach 2	10,626	7,483	3,007	136
Reach 3	7,450	5,384	1,680	386
Reach 4	14,608	10,853	3,557	199
Reach 5	4,169	2,758	982	430
Reach 6	2,317	1,214	985	118
Total	47,079	31,836	12,438	2,805
Base Case	(000 MT)	(000 MT)	(000 MT)	(000 MT)
Reach 1	7,154	2,834	2,556	1,764
Reach 2	3,781	3,781	0	0
Reach 3	12,235	8,657	3,578	0
Reach 4	21,771	14,463	6,945	364
Reach 5	4,184	2,625	1,283	276
Reach 6	2,050	408	804	838
Total	51,175	32,767	15,166	3,242

Grain Forecast Implementation



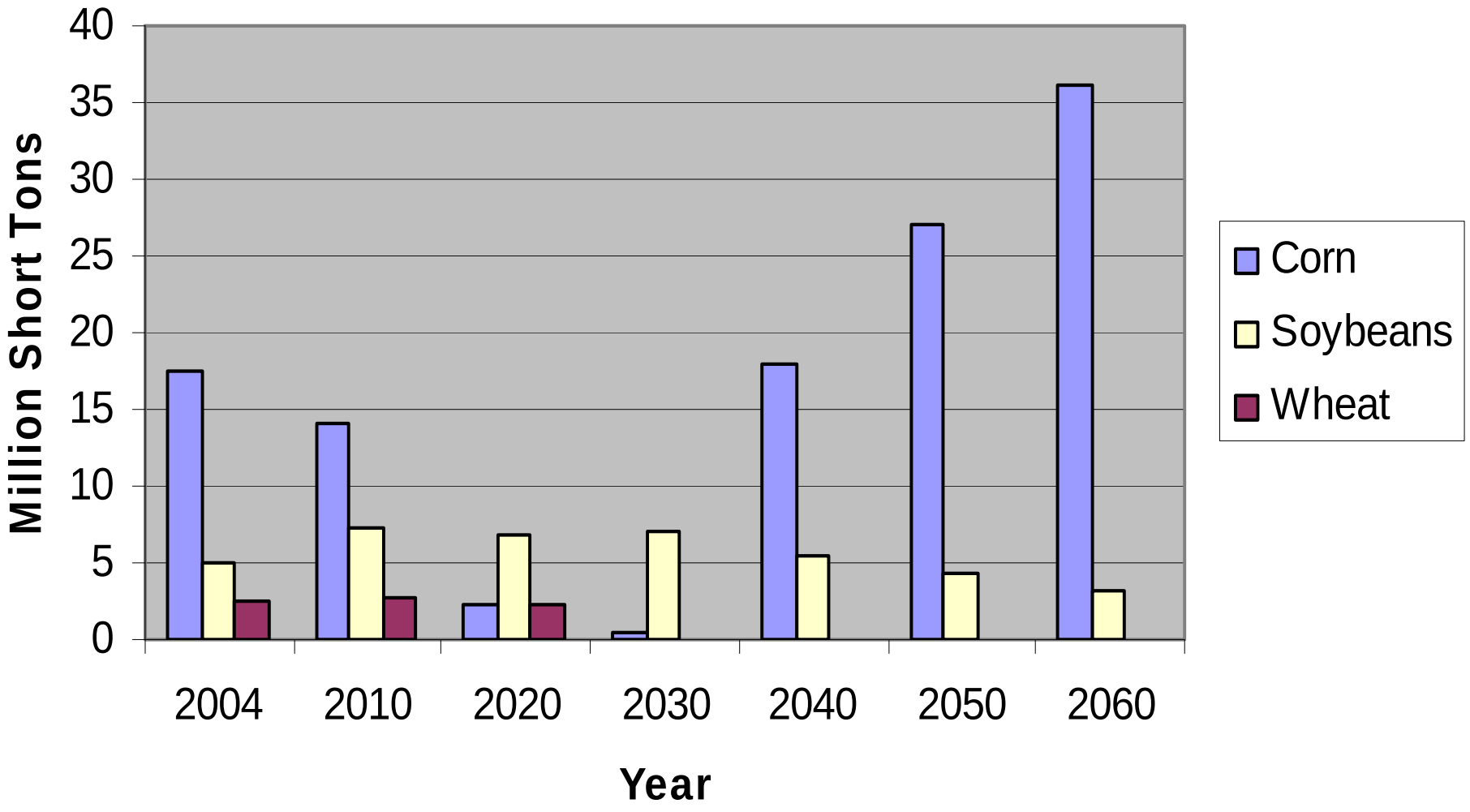
- Model tonnage forecasts, by commodity, were combined for Reaches 1-4 for all forecast years
- The ratio of combined tonnage for Reaches 1-4 tonnage for a forecast year to model base tonnage (2000-2004 average) was computed and used to increase/decrease the movement specific tonnages that make up the Survey Model traffic base
- The result for each forecast year represents the unconstrained forecast

Grain Forecast Implementation

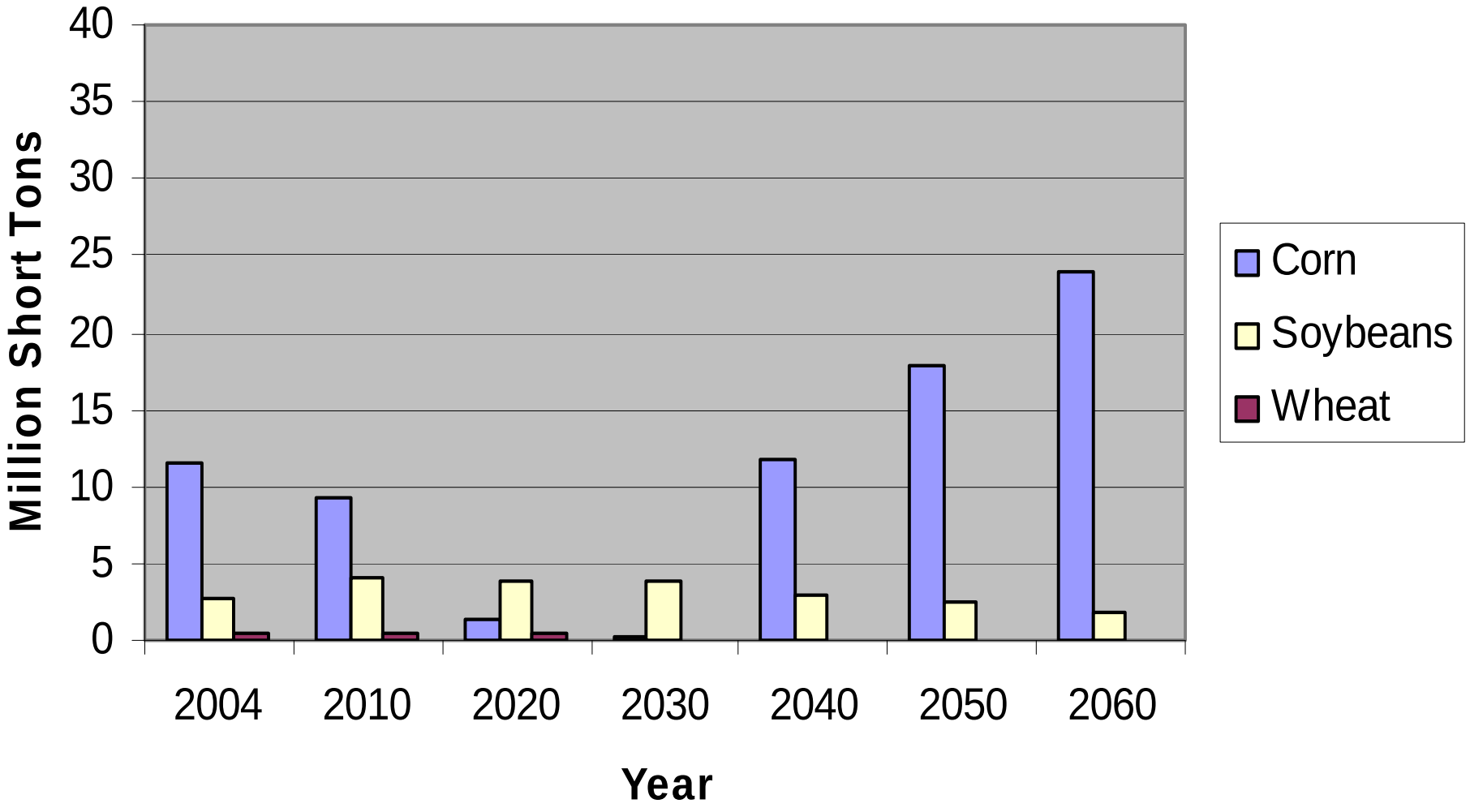


- Unconstrained traffic for each Survey Model movement is subsequently increased/decreased to reflect the “annual volume” effect of the Train-Wilson shipper response

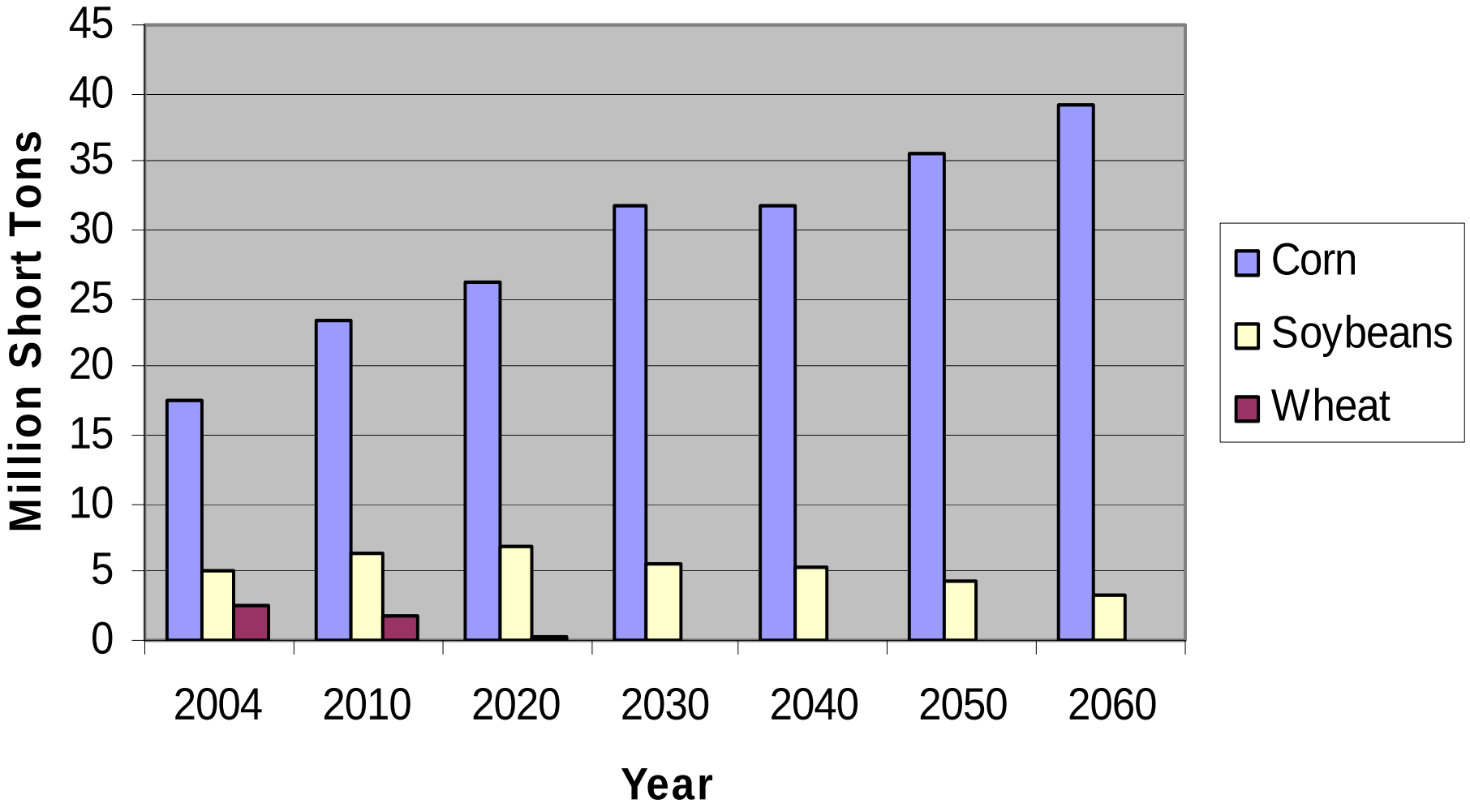
Unconstrained Low Traffic Scenario
Mississippi River



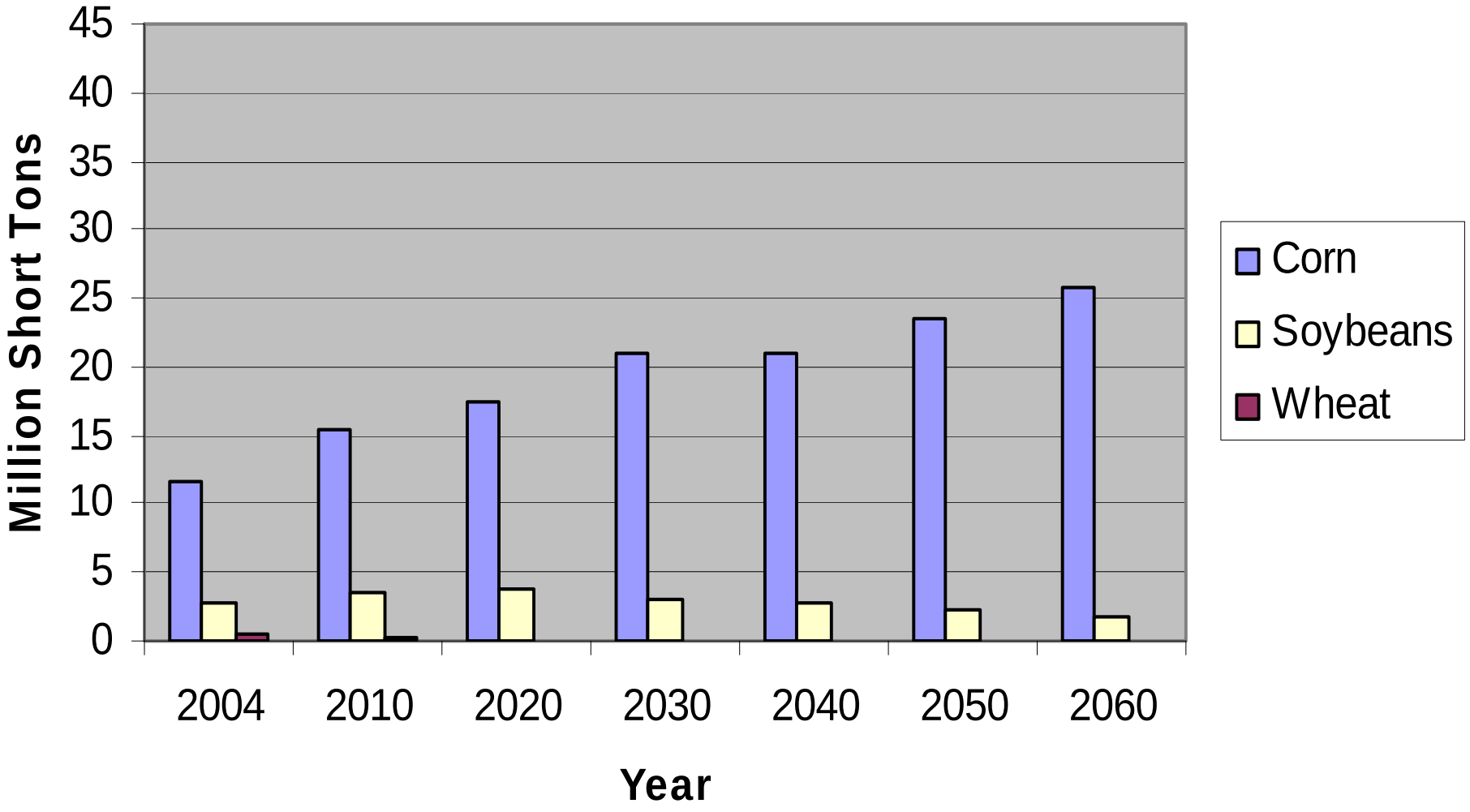
Unconstrained Low Traffic Scenario
IWW



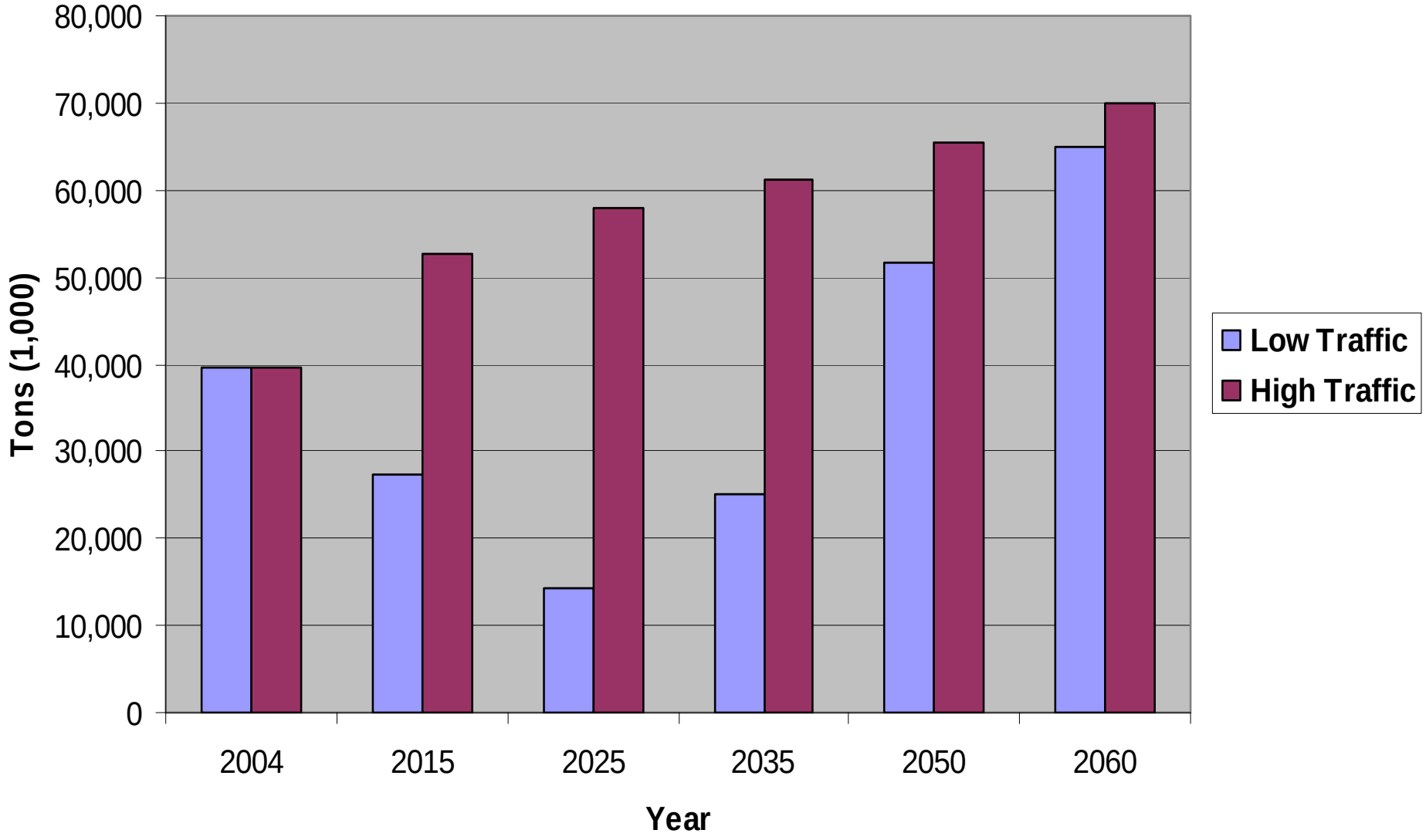
Unconstrained High Traffic Scenario
Mississippi River

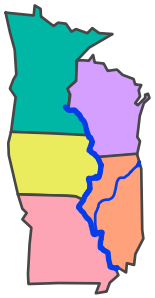


Unconstrained High Traffic Scenario
IWW



Grain Unconstrained Forecast
System Tonnage

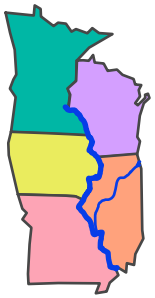




Non-Grain Forecast Implementation

- Forecasts were generally by MR and IWW (Coal on MR was the exception- broken down into northbound and southbound)
- The ratio of commodity tonnage for a forecast year to model base tonnage (2004) was computed and used to increase/decrease the movement specific tonnages that make up the Survey Model traffic base
- The result for each forecast year represents the unconstrained forecast

Non-Grain Forecast Implementation

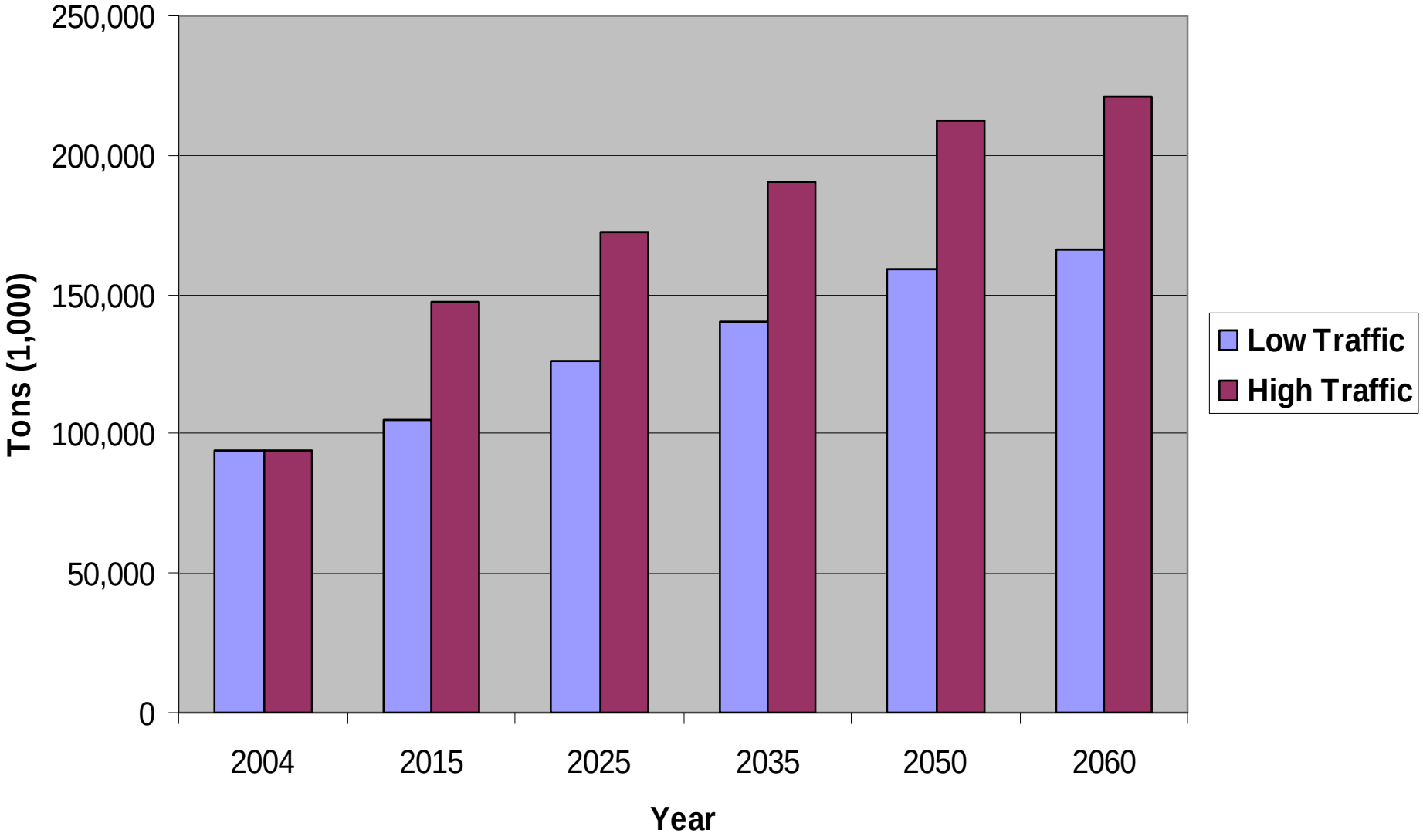


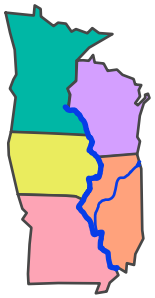
- Adjustments/Additions
  - Forecast of “Other” commodity group was modified from the original analysis to reflect 8-yr historical trend vs. percentage of forecast total non-grain total
  - “Farm NEC” commodity group not considered in grain or non-grain forecasts was added and forecast based on 8-yr historical trend
- Unconstrained traffic for each Survey Model movement is subsequently increased/decreased to reflect the “annual volume” effect of the Train-Wilson shipper response

Unconstrained Non-Grain Traffic Forecasts							
Low Traffic							
(Million Short Tons)							
Waterway/Commodity	**2004**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
UMR							
Farm NEC	2.0	1.6	1.6	1.6	1.6	1.6	1.6
Coal (north)	5.5	6.7	10.1	13.9	14.5	15.0	15.3
Coal (south)	16.6	17.3	17.3	21.5	22.3	23.0	23.4
Petroleum	4.6	3.4	4.3	2.6	1.7	1.2	1.0
Agricultural Chemicals	3.5	2.9	3.3	3.5	3.7	3.9	4.0
Aggregates	23.5	26.3	33.4	38.4	42.9	47.0	49.1
Industrial Chemicals (w/o Ethanol)	1.1	1.0	1.1	1.3	1.5	1.7	1.8
Ethanol	0.2	0.4	0.5	0.5	0.5	0.6	0.6
Iron & Steel	2.7	2.1	3.3	4.1	4.9	5.7	6.1
Miscellaneous	4.6	3.8	3.8	3.8	3.8	3.8	3.8
Total Non-Grain	64.3	65.5	78.6	91.2	97.6	103.4	106.6
IWW							
Farm NEC	1.3	1.2	1.2	1.2	1.2	1.2	1.2
Coal	4.2	3.3	5.2	7.1	8.3	9.8	10.6
Petroleum	6.2	3.4	5.2	2.1	1.0	0.6	0.4
Agricultural Chemicals	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Aggregates	5.2	7.7	12.5	16.1	19.7	23.1	25.0
Industrial Chemicals (w/o Ethanol)	2.6	2.4	2.7	3.1	3.6	4.0	4.2
Ethanol	0.7	0.8	0.8	0.8	0.8	0.8	0.8
Iron & Steel	6.5	5.2	8.0	9.9	11.7	13.5	14.4
Miscellaneous	2.2	1.8	1.8	1.8	1.8	1.8	1.8
Total Non-Grain	29.9	26.9	38.5	43.3	49.3	55.8	59.5
UMR + IWW Total	**94.1**	**92.3**	**117.1**	**134.5**	**146.8**	**159.2**	**166.2**

Unconstrained Non-Grain Traffic Forecasts							
High Traffic							
(Million Short Tons)							
Waterway/Commodity	**2004**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
UMR							
Farm NEC	2.0	2.3	2.3	2.3	2.3	2.3	2.3
Coal (north)	5.5	9.7	13.3	16.8	17.6	18.2	18.5
Coal (south)	16.6	17.3	17.3	21.5	22.3	23.0	23.4
Petroleum	4.6	7.0	8.5	7.3	6.5	5.9	5.6
Agricultural Chemicals	3.5	5.2	5.6	5.9	6.2	6.3	6.4
Aggregates	23.5	32.6	41.2	47.4	52.9	57.8	60.4
Industrial Chemicals (w/o Ethanol)	1.1	1.2	1.3	1.6	1.9	2.2	2.3
Ethanol	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Iron & Steel	2.7	4.6	6.1	7.1	8.1	8.9	9.4
Miscellaneous	4.6	5.3	5.3	5.3	5.3	5.3	5.3
Total Non-Grain	64.3	85.4	101.2	115.5	123.3	130.3	134.0
IWW							
Farm NEC	1.3	1.4	1.4	1.4	1.4	1.4	1.4
Coal	4.2	7.5	8.7	9.8	11.5	13.5	14.6
Petroleum	6.2	9.6	12.3	10.2	8.8	7.8	7.4
Agricultural Chemicals	1.1	1.2	1.2	1.2	1.2	1.2	1.2
Aggregates	5.2	11.5	17.5	21.8	26.1	30.1	32.3
Industrial Chemicals (w/o Ethanol)	2.6	2.7	3.1	3.8	4.5	5.1	5.5
Ethanol	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Iron & Steel	6.5	10.2	13.6	16.0	18.1	20.0	21.1
Miscellaneous	2.2	2.5	2.5	2.5	2.5	2.5	2.5
Total Non-Grain	29.9	47.4	61.1	67.5	74.8	82.3	86.6
UMR + IWW Total	**94.1**	**132.8**	**162.2**	**183.0**	**198.2**	**212.6**	**220.6**

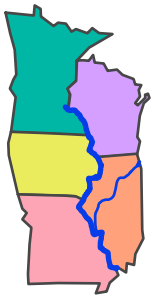
Non-Grain Unconstrained Forecast
System Tonnage





Train-Wilson Implementation

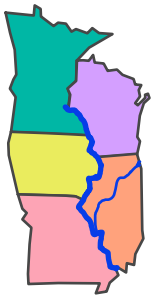
Train-Wilson Implementation



- **Annual Volume Responses**
  - operative on the unconstrained volume of each movement
  - used unconditional elasticities (calculated for all shippers, even those with no change)
  - used elasticities that assumed change applied to shipper and competitor shipper

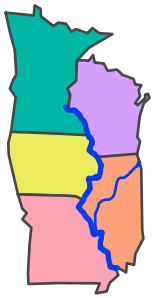
- **Mode Choice Responses**
  - used to compute how much of the annual volume-adjusted forecast is moved by water

Train-Wilson Implementation



- **Commodity Class**
  - **Agricultural Products** (corn, soybeans, wheat)
  - **Non-Agricultural Products** (Group A, Group B, Group C)
- **Effect**
  - **Rate**
  - **Reliability**
  - **Time**

Train-Wilson Implementation



- The basic approach was to use the composite results of Train-Wilson to generate functions describing volume response to changes in water rates. These functions are incorporated into the model such that the functions compute increases or decreases to the initial base year volumes as the water rate change. Water rate changes result from changes in congestion as water volume changes.

Agricultural Products				
Elasticity Estimates for				
Annual Volume with Respect to Changes in				
Rate/Time/Reliability				
(Barge)				
% Increase in:		Rate	Reliability	Time
10		-0.075	0.619	-0.310
20		-0.153	0.388	-0.321
30		-0.208	0.311	-0.335
40		-0.246	0.272	-0.344
50		-0.272	0.248	-0.348
60		-0.289	0.231	-0.349

Non-Agricultural Products
Elasticity Estimates for
Annual Volume with Respect to Changes in
Rate/Time/Reliability
(Barge)

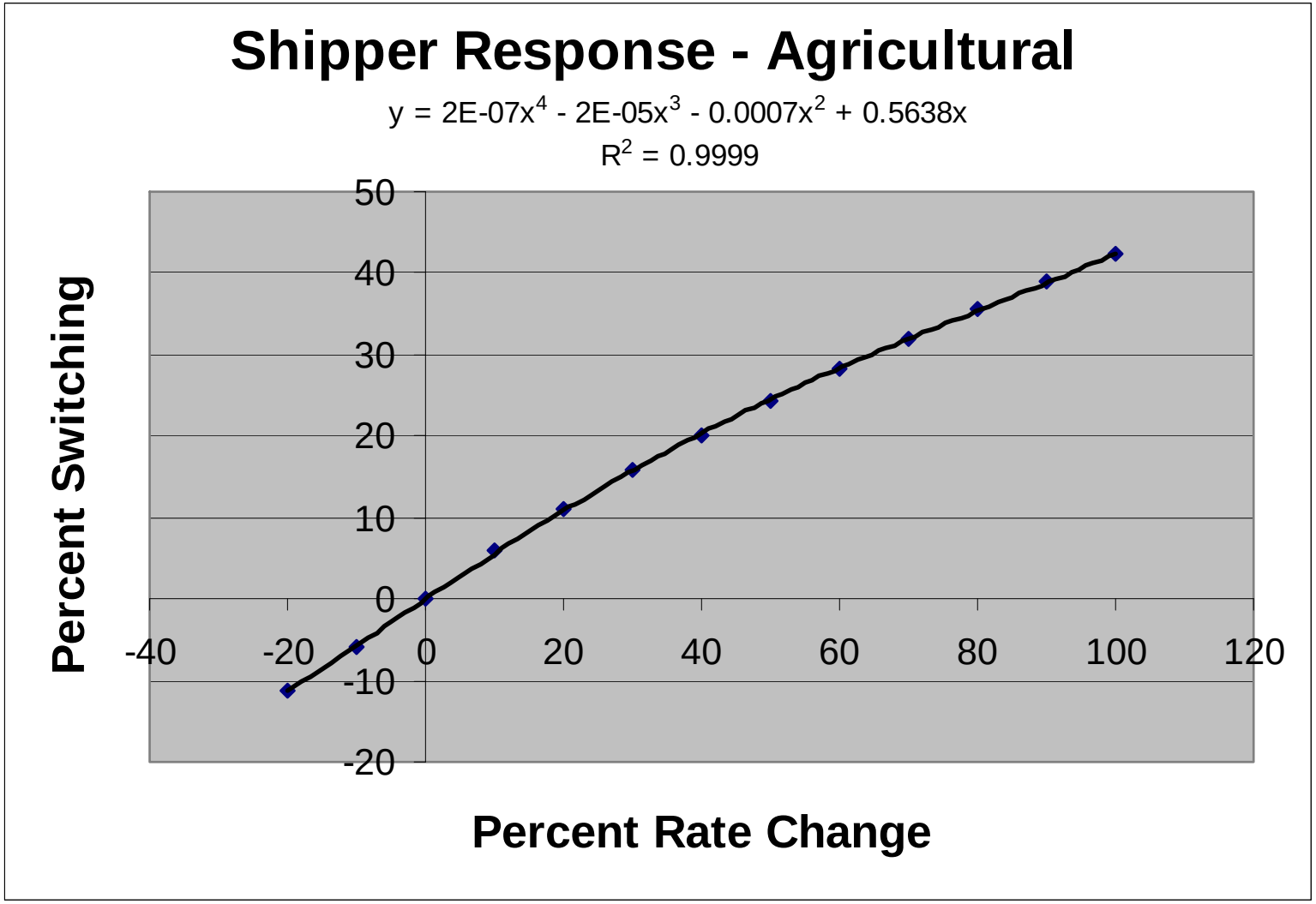
	Rate			Reliability			Time		
% Increase in:	Grp A	Grp B	Grp C	Grp A	Grp B	Grp C	Grp A	Grp B	Grp C
10	-0.866	-0.637	-0.418	0.859	0.501	0.482	-0.905	-1.155	-0.404
20	-0.554	-0.417	-0.281	0.614	0.378	0.365	-0.572	-0.717	-0.269
30	-0.466	-0.358	-0.248	0.565	0.366	0.355	-0.475	-0.585	-0.234
40	-0.433	-0.341	-0.242	0.565	0.385	0.374	-0.438	-0.529	-0.227
50	-0.423	-0.340	-0.247	0.583	0.416	0.405	-0.423	-0.504	-0.230
60	-0.424	-0.347	-0.259	0.607	0.452	0.441	-0.420	-0.493	-0.239

Agricultural Products				
Switching Elasticity Estimates				
with Respect to Changes in				
Rate/Time/Reliability				
(Barge)				
% Increase in:		Rate	Reliability	Time
10		-0.586	0.191	-0.025
20		-0.559	0.187	-0.025
30		-0.530	0.181	-0.025
40		-0.506	0.175	-0.025
50		-0.486	0.169	-0.025
60		-0.470	0.165	-0.025
70		-0.456	0.160	-0.025
80		-0.444	0.156	-0.025
90		-0.433	0.153	-0.025
100		-0.423	0.149	-0.025

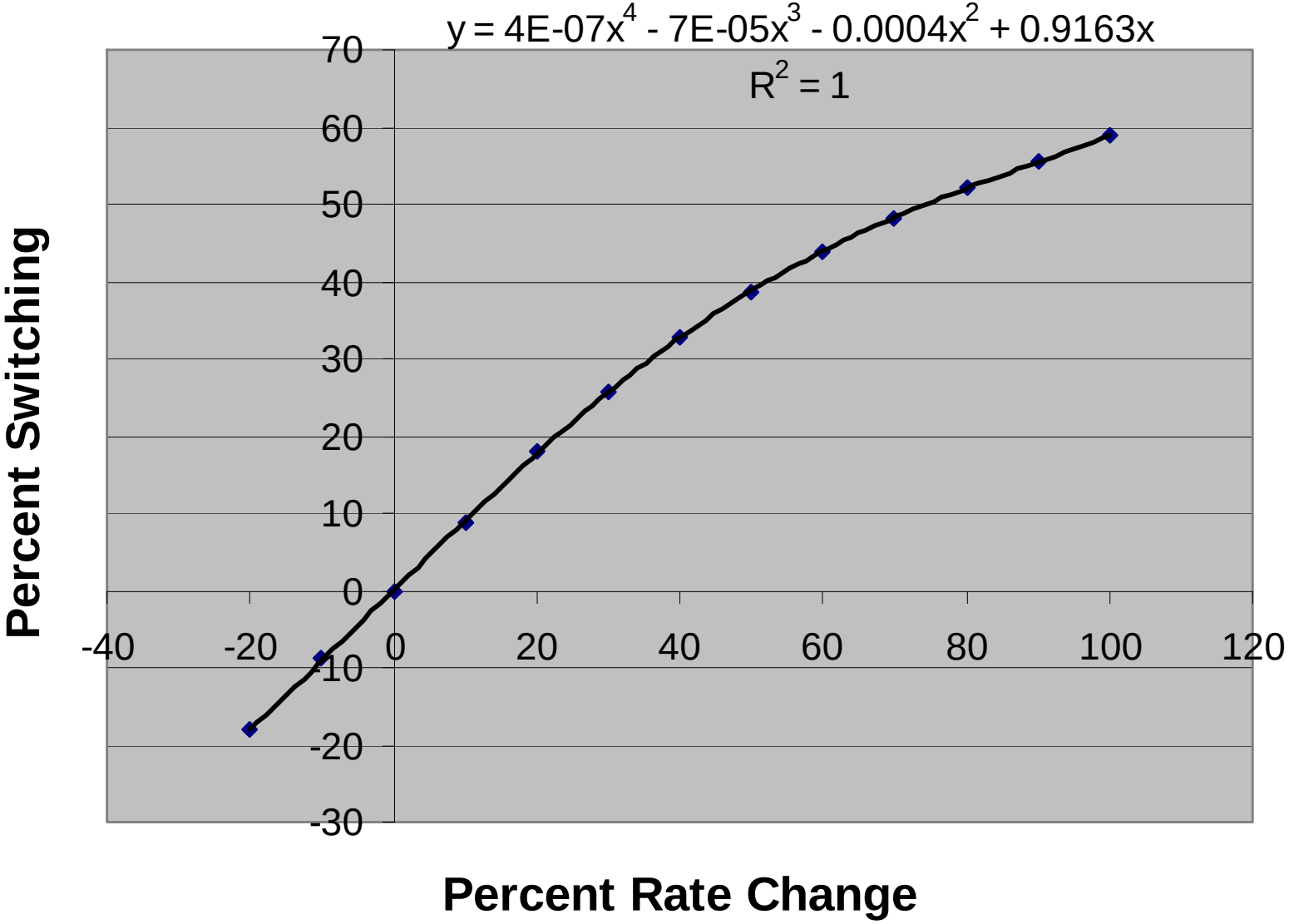
Non-Aricultural Products
Switching Elasticity Estimates
with Respect to Changes in
Rate/Time/Reliability
(Barge)

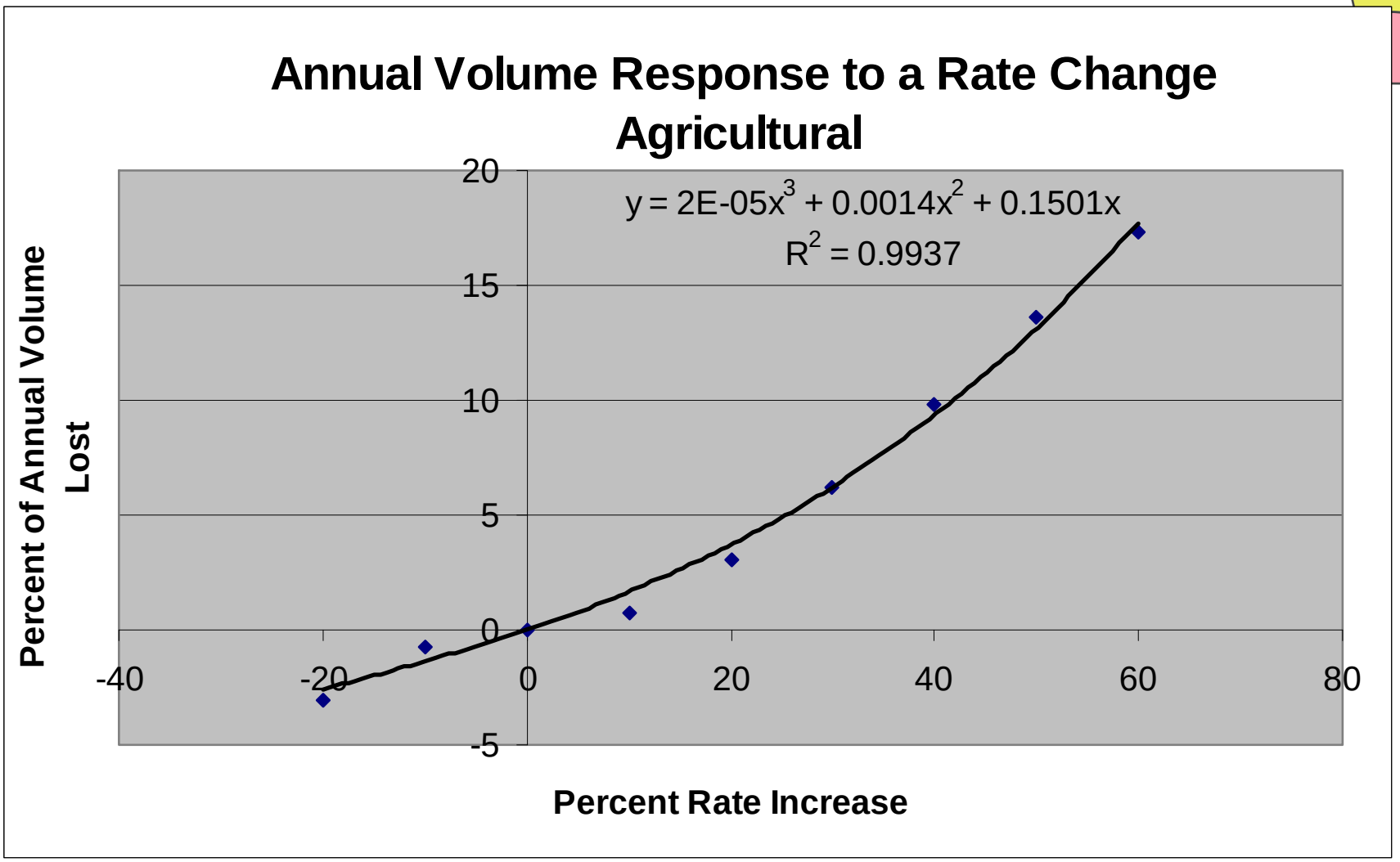
	Rate			Reliability			Time		
% Increase in:	Grp A	Grp B	Grp C	Grp A	Grp B	Grp C	Grp A	Grp B	Grp C
10	-0.860	-0.890	-0.950	1.560	1.030	1.150	-1.160	-1.110	-1.060
20	-0.870	-0.895	-0.945	1.280	0.880	0.970	-0.895	-0.860	-0.825
30	-0.840	-0.860	-0.907	1.103	0.780	0.857	-0.760	-0.730	-0.700
40	-0.803	-0.818	-0.858	0.975	0.708	0.773	-0.668	-0.645	-0.618
50	-0.758	-0.774	-0.808	0.876	0.652	0.706	-0.602	-0.580	-0.558
60	-0.717	-0.730	-0.760	0.797	0.603	0.652	-0.550	-0.532	-0.512
70	-0.679	-0.690	-0.716	0.733	0.564	0.606	-0.507	-0.491	-0.474
80	-0.643	-0.651	-0.674	0.679	0.529	0.568	-0.473	-0.459	-0.443
90	-0.609	-0.617	-0.637	0.631	0.499	0.533	-0.443	-0.430	-0.416
100	-0.578	-0.585	-0.603	0.591	0.472	0.503	-0.418	-0.406	-0.393

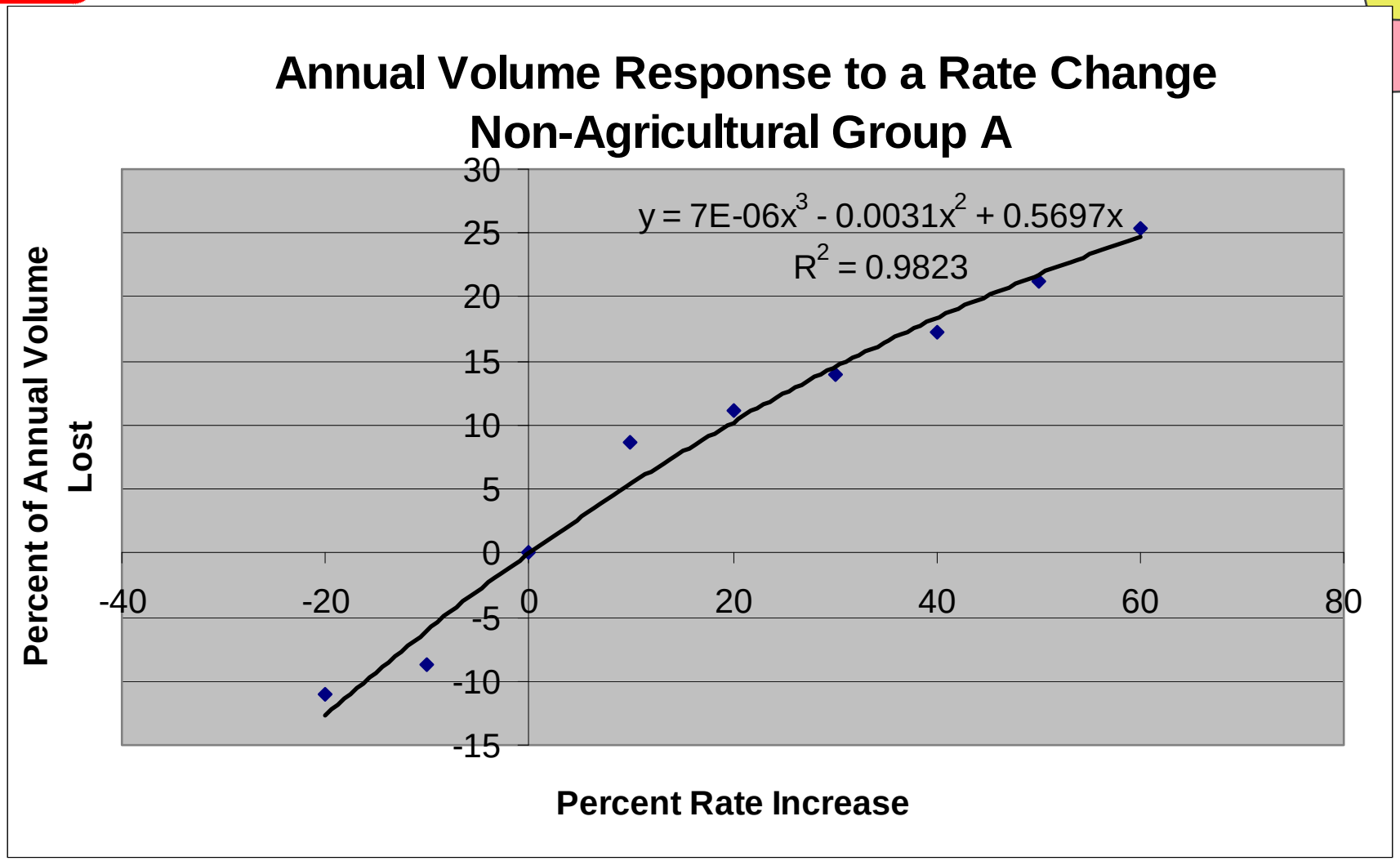
Shipper Mode Choice Response as a Function of Rate						
Agricultural and Non-Agricultural						
				Agricultural		Non-Agricultural
		Percent Rate		Percent		Percent
Source		Increase		Switching		Switching
Extension of results		-20		-11.2		-17.9
Extension of results		-10		-5.9		-8.9
Train - Wilson		0		0.0		0
Train - Wilson		10		5.9		8.9
Train - Wilson		20		11.2		17.9
Train - Wilson		30		15.9		25.8
Train - Wilson		40		20.2		32.7
Train - Wilson		50		24.3		38.7
Train - Wilson		60		28.2		43.8
Train - Wilson		70		31.9		48.3
Train - Wilson		80		35.6		52.1
Train - Wilson		90		39.0		55.5
Train - Wilson		100		42.3		58.8

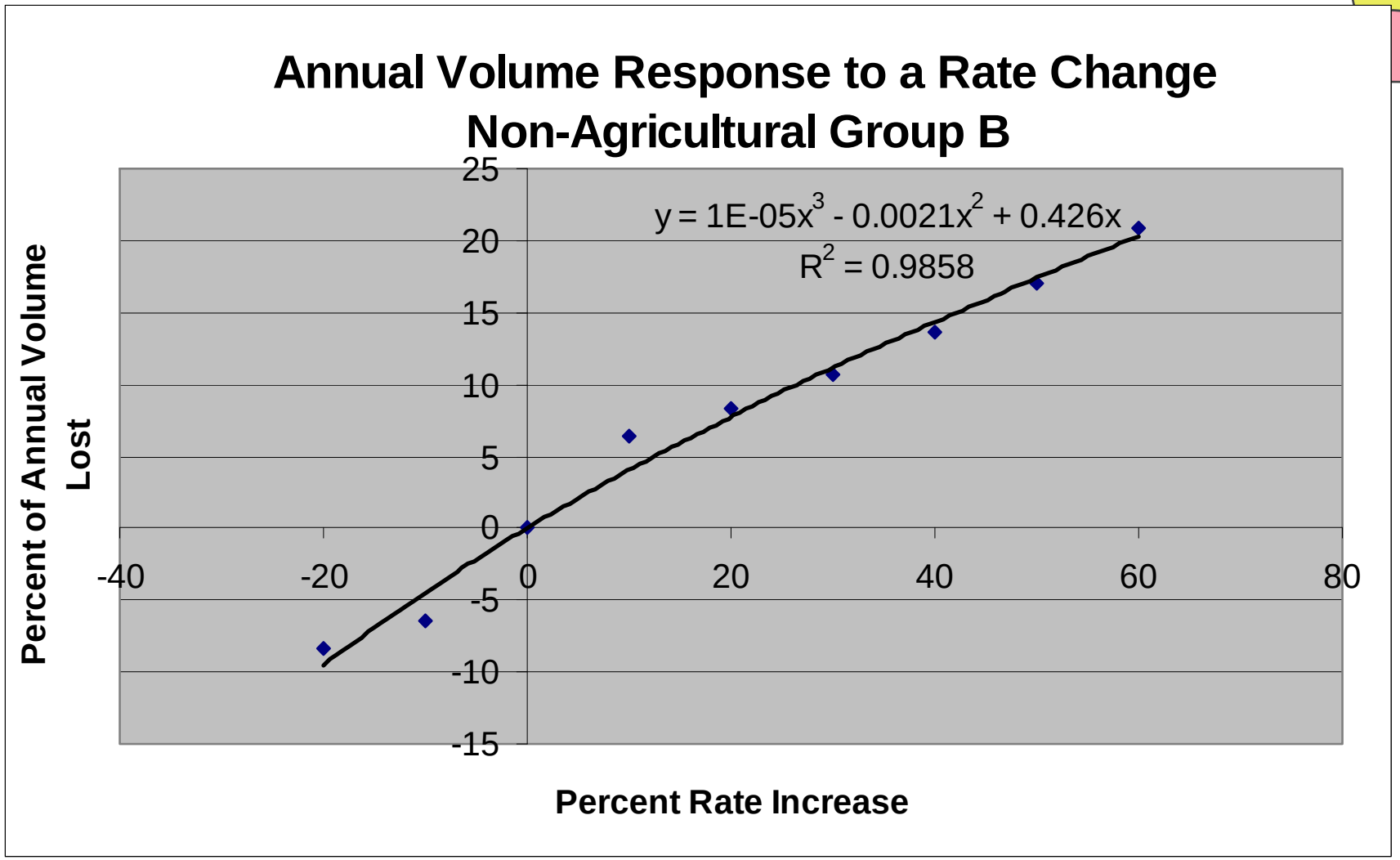

Shipper Response - Agricultural
y = 2E-07x4 - 2E-05x3 - 0.0007x2 + 0.5638x
R2 = 0.9999
Percent Switching
Percent Rate Change
50
40
30
20
10
0
-10
-20
-40
-20
0
20
40
60
80
100
120

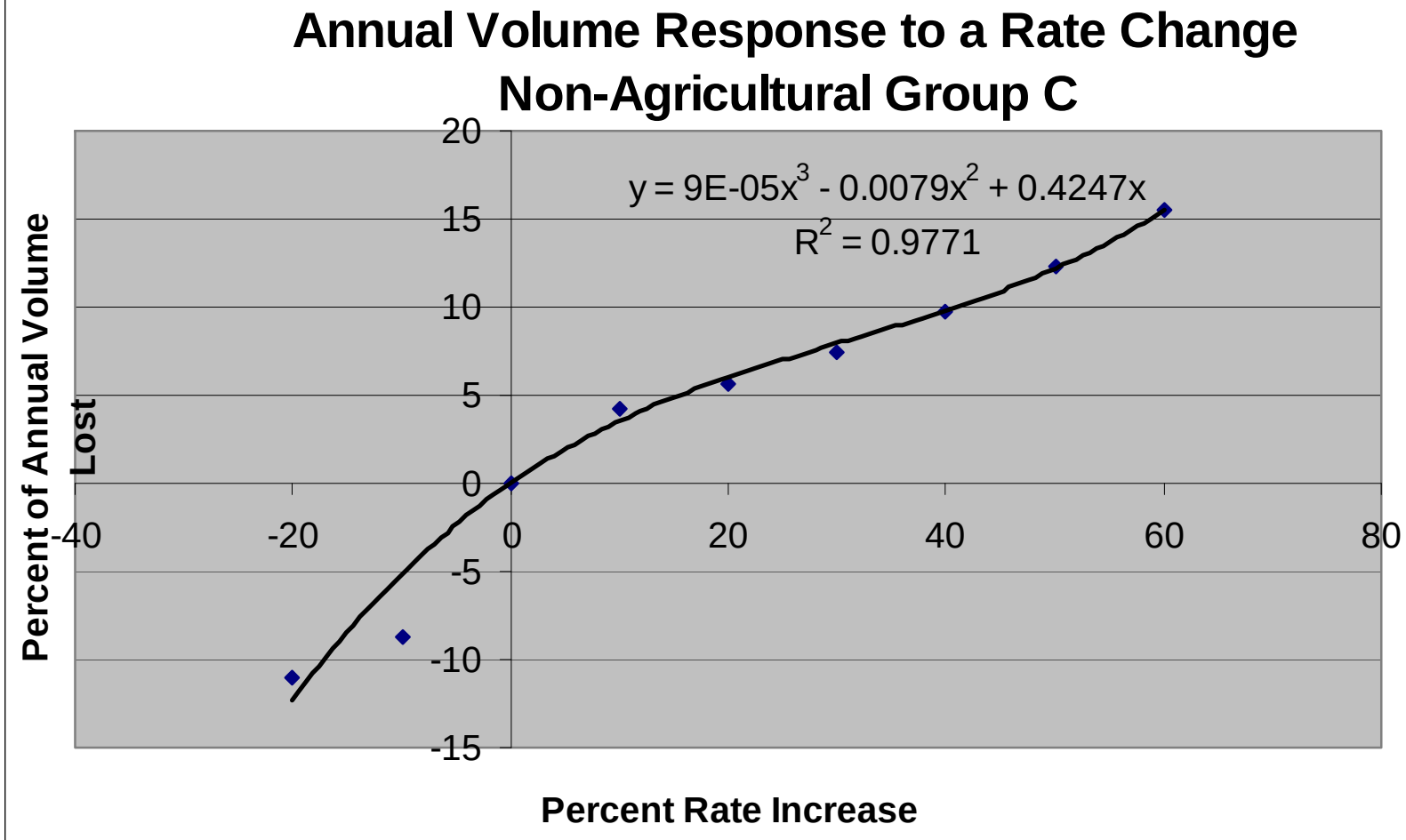
Shipper Response - Non Agricultural



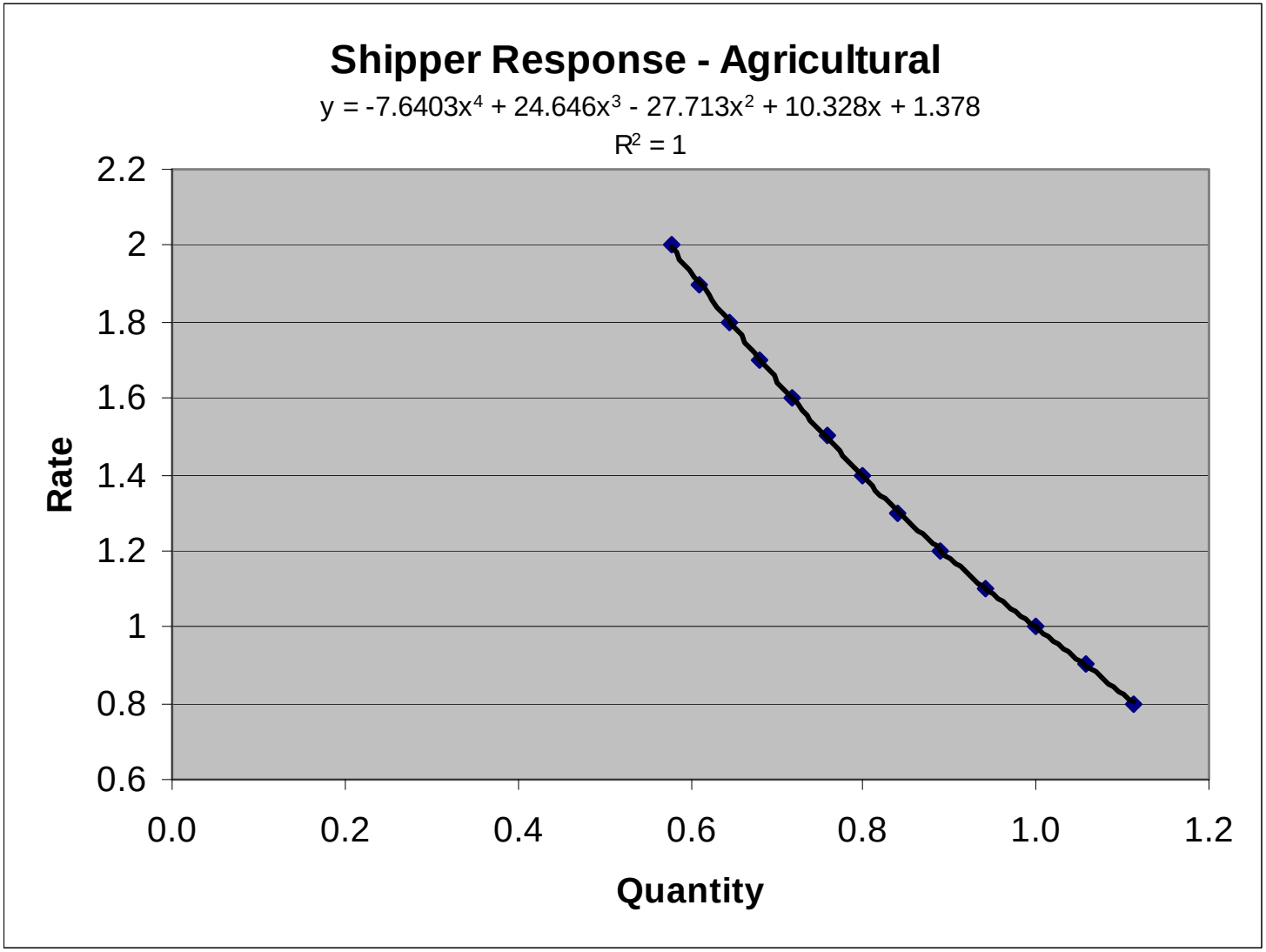

Annual Volume Response to a Rate Change
Agricultural
y = 2E-05x3 + 0.0014x2 + 0.1501x
R2 = 0.9937
Percent of Annual Volume Lost
Percent Rate Increase
20
15
10
5
0
-5
-40
-20
0
20
40
60
80


Annual Volume Response to a Rate Change
Non-Agricultural Group A
y = 7E-06x3 - 0.0031x2 + 0.5697x
R2 = 0.9823
Percent of Annual Volume Lost
Percent Rate Increase
30
25
20
15
10
5
0
-5
-10
-15
-40
-20
0
20
40
60
80

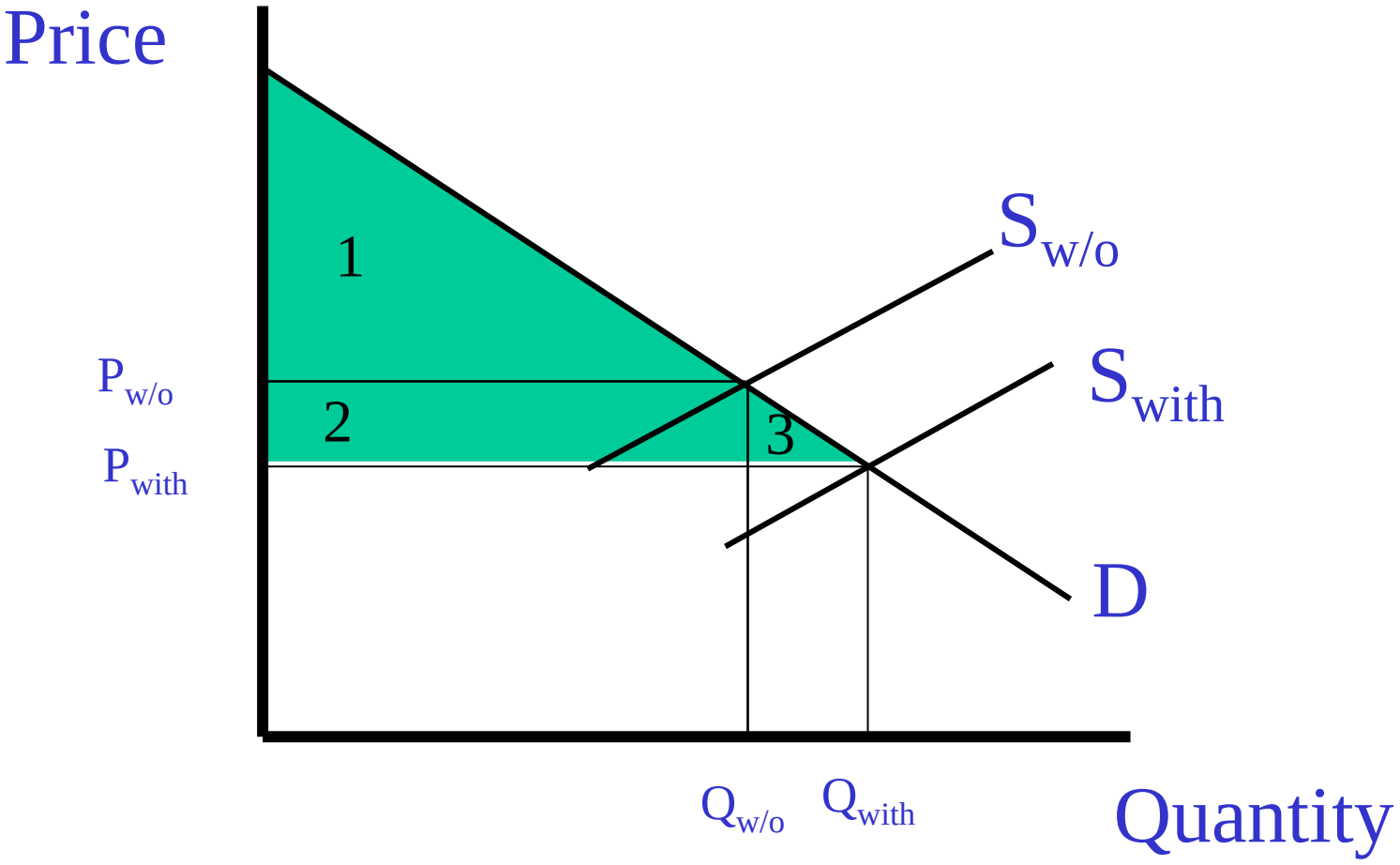

Annual Volume Response to a Rate Change
Non-Agricultural Group B
y = 1E-05x3 - 0.0021x2 + 0.426x
R2 = 0.9858
Percent of Annual Volume Lost
Percent Rate Increase
25
20
15
10
5
0
-5
-10
-15
-40
-20
0
20
40
60
80

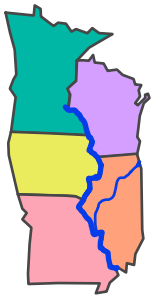

Annual Volume Response to a Rate Change
Non-Agricultural Group C
y = 9E-05x3 - 0.0079x2 + 0.4247x
R2 = 0.9771
Percent of Annual Volume Lost
Percent Rate Increase
20
15
10
5
0
-5
-10
-15
-40
-20
0
20
40
60
80

Shipper Mode Choice Response as a Function of Rate (Proportions)			
Agricultural and Non-Agricultural			
		Agricultural	Non-Agricultural
	Proportion	Proportion	Proportion
Source	of Rate	Retained	Retained
Extension of results	0.8	1.1118	1.1790
Extension of results	0.9	1.0586	1.0890
Train - Wilson	1	1	1
Train - Wilson	1.1	0.9414	0.9110
Train - Wilson	1.2	0.8882	0.8210
Train - Wilson	1.3	0.8410	0.7420
Train - Wilson	1.4	0.7978	0.6730
Train - Wilson	1.5	0.7572	0.6130
Train - Wilson	1.6	0.7183	0.5620
Train - Wilson	1.7	0.6806	0.5170
Train - Wilson	1.8	0.6445	0.4790
Train - Wilson	1.9	0.6100	0.4450
Train - Wilson	2	0.5773	0.4120

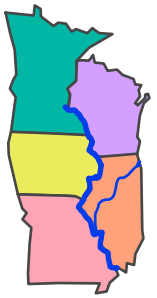

Shipper Response - Agricultural
y = -7.6403x4 + 24.646x3 - 27.713x2 + 10.328x + 1.378
R2 = 1
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
Rate
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Quantity

Consumer Surplus





Lock Performance

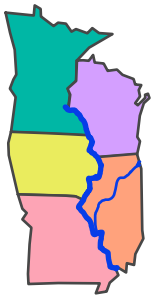


Non-Critical Locks
Utilization and Delays (Hrs)
High Traffic Forecast

	2004		2060	
Lock	Utilization	Delays	Utilization	Delays
UM USA	11%	0.3	11%	0.3
UM LSA	10%	0.4	10%	0.4
UM 01	14%	0.6	14%	0.6
UM 02	23%	1.5	26%	1.6
UM 03	24%	1.5	27%	1.5
UM 04	22%	1.5	25%	1.6
UM 05	21%	1.5	24%	1.5
UM 05A	20%	1.4	23%	1.4
UM 06	26%	1.6	32%	1.7
UM 07	26%	1.7	32%	1.8
UM 08	26%	1.7	32%	1.8
UM 09	26%	1.7	32%	1.8
UM 10	28%	1.6	36%	1.7
IL Strvd Rck	42%	1.9	54%	2.2
IL Mrslls	52%	2.7	65%	3.5
IL Drsdn Isl	39%	1.7	47%	1.9
IL Brndn Rd	41%	1.9	57%	2.4
IL Lckprt	39%	1.8	55%	2.3
IL Tm O'brn	25%	0.5	33%	0.5

Transit Curves

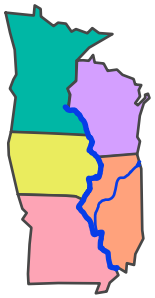
Critical Locks



- Describe relationship between traffic and expected annual delay (queue + lock time)
- Developed with use of the simulation tool Waterway Analysis Model (WAM)
- WAM output (observations of average delay and traffic) are fit to a function representing an individual transit curve

Transit Curves

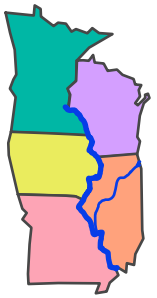
Critical Locks



- Transit curves were developed for each critical lock for a “family” of lock availability conditions. As a set, the “family” of transit curves defines the composite traffic/expected delay relationship

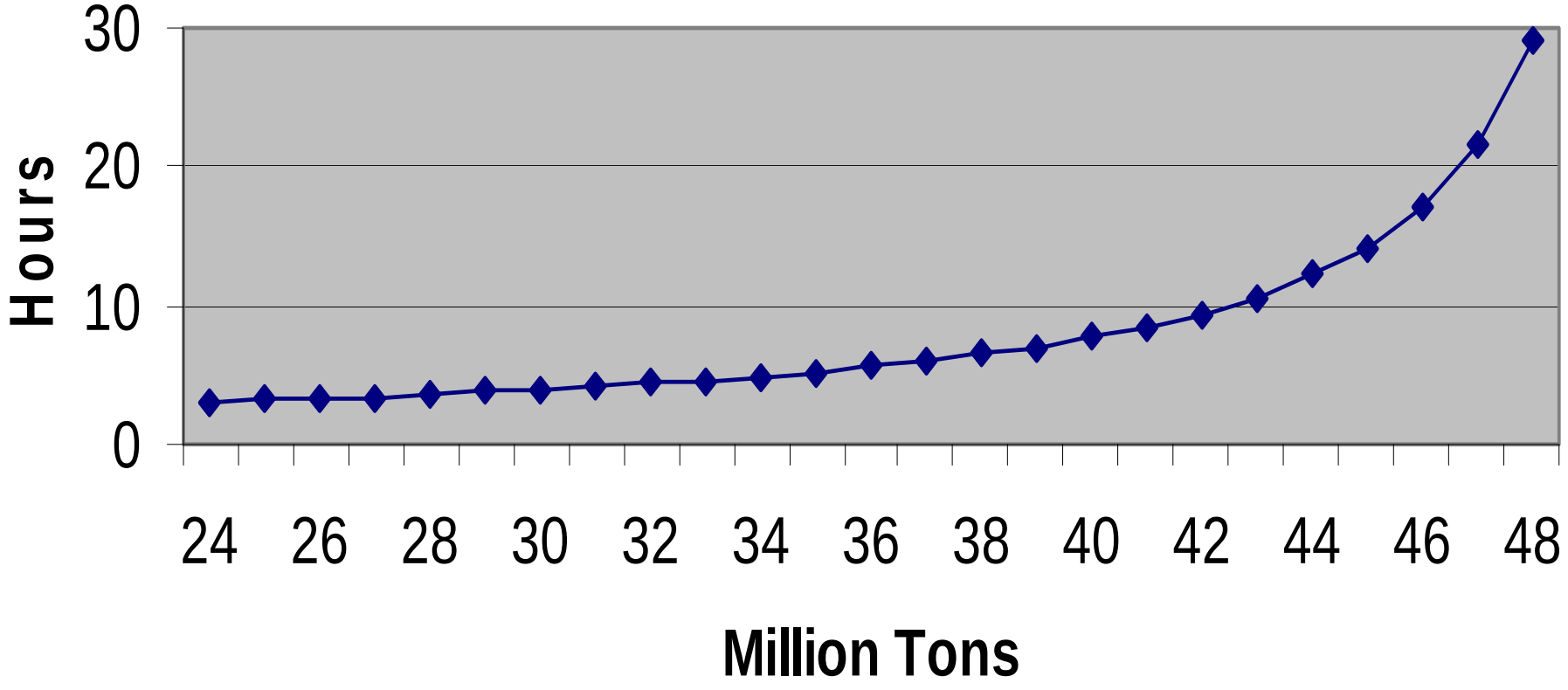
Transit Curve Form

Critical Locks

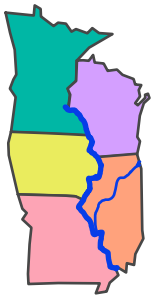


$$\text{Expected Delay} = \text{Locking Time} + \frac{\text{“K”} \times \text{Tons}}{(\text{Capacity} - \text{Tons})}$$

Transit Curve - Queue & Locking
UMR Lock 25
(Cap=50.9, K=1.4)



Family of Transit Curves



Average Delay = Lock Time + 0_closure_queue + sum [(n_closure-queue -0_closure_queue) * number_n_closures]

where each queue is calculated as:

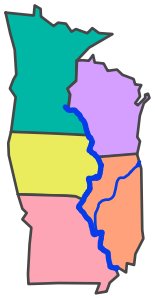
K * T/(C-T)

K = delay at half capacity
C = capacity
T = tons

and the sum is taken over all closure types

Sample Transit Curve Input

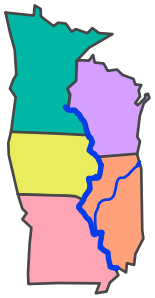
	UM 25
0 Closure Service Time (in hrs)	1.563922667
0 Closure K	1.343769966
0 Closure Cap	49,229,659
1 Closure K	1.441218478
1 Closure Cap	49,229,659
1 Closure Frequency	4
2 Closure K	
2 Closure Cap	
2 Closure Frequency	
3 Closure K	
3 Closure Cap	
3 Closure Frequency	
4 Closure K	
4 Closure Cap	
4 Closure Frequency	



Opportunity Costs

Shallow Draft Vessel Operating Costs

- Expressed as cost/ton/hour
- Reflects:
  - equipment costs (towboats & barges)
  - fuel costs
  - tow characteristics
  - commodity value
- Computed for each commodity group (range from $0.033 to $0.086)



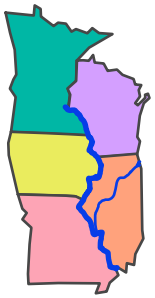
Opportunity Costs

Shallow Draft Vessel Operating Costs

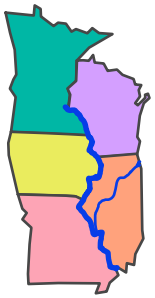
- Economic Guidance Memorandum, 05-06, Shallow Draft Vessels Operating Costs, Fiscal Year 2004
- http://www.usace.army.mil/cw/cecw-cp/library/egms/egm05-06.pdf

Backhauls

General Classes of Movements



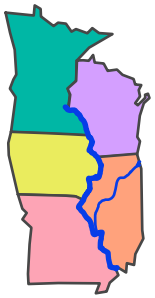
- **Backhaul/No Lock Use/Elastic**
  - Backhaul: northbound, non-liquid
  - No Lock Use: transit no locks
  - Elastic: everything else
- **Backhauls and No Lock Use are considered “inelastic” or not responsive to water price**



Backhauls

General Classes of Movements

- **Opportunity costs:**
  - inelastic movements - treated as zero
  - elastic movements – reflect round trip
- **2004 Traffic (133.8 million tons)**
  - backhaul: 24.4 million tons
  - no lock use: 54.5 million tons
  - elastic: 54.8 million tons

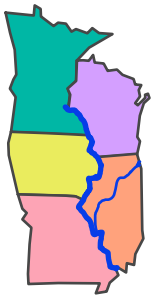


Baseline Rate/ Alternative Mode Rate

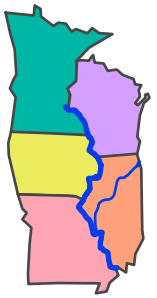
- Product of Transportation Rate Study
- Represents full cost of ultimate domestic origin to ultimate domestic destination

Discount Rate

- FY 07 – 4.875 %
- FY 08 - ? (can not change by more than 0.25 percentage points)

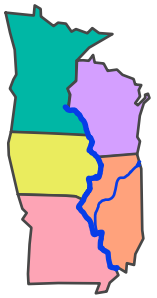


Upper Mississippi Unconstrained Low Traffic Forecast
No Lock Use
(Millions of Tons)



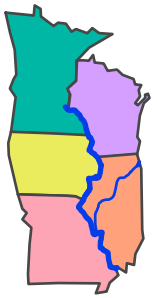
Commodity Grp	2004	2010	2020	2030	2040	2050	2060
Corn	4.5	3.6	0.6	0.1	4.6	6.9	9.3
Wheat	1.5	1.6	1.3	0.0	0.0	0.0	0.0
Soybeans	2.1	3.1	2.9	3.0	2.3	1.9	1.4
Farm NEC	0.5	0.4	0.4	0.4	0.4	0.4	0.4
Coal (north)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coal (south)	16.6	17.3	17.3	21.5	22.3	23.0	23.4
Petroleum	0.9	0.7	0.9	0.5	0.3	0.3	0.2
Agg. Chems.	0.7	0.6	0.7	0.7	0.8	0.8	0.8
Building Materials	19.5	21.8	27.7	31.8	35.6	38.9	40.7
Ind. Chems. (w/o Ethanol)	0.4	0.4	0.5	0.5	0.6	0.7	0.7
Ethanol	0.04	0.1	0.1	0.1	0.1	0.1	0.1
Iron & Steel	1.2	0.9	1.5	1.9	2.2	2.6	2.7
Miscellaneous	1.9	1.6	1.6	1.6	1.6	1.6	1.6
Total	49.9	52.1	55.2	62.1	70.8	77.1	81.3

Illinois Waterway Unconstrained Low Traffic Forecast
No Lock Use
(Millions of Tons)



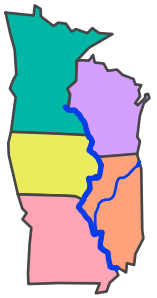
Commodity Grp	2004	2010	2020	2030	2040	2050	2060
Corn	0.019	0.016	0.002	0.001	0.020	0.030	0.040
Wheat	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soybeans	0.003	0.005	0.004	0.005	0.004	0.003	0.002
Farm NEC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coal (coke + lignite)	2.1	1.7	2.6	3.6	4.2	4.9	5.4
Petroleum	0.6	0.3	0.5	0.2	0.1	0.1	0.0
Agg. Chems.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Building Materials	1.8	2.7	4.4	5.7	7.0	8.2	8.8
Ind. Chems. (w/o Ethanol)	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ethanol	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Iron & Steel	0.04	0.03	0.04	0.1	0.1	0.1	0.1
Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	4.6	4.8	7.6	9.6	11.4	13.3	14.4

Upper Mississippi Unconstrained High Traffic Forecast
No Lock Use
(Millions of Tons)



Commodity Grp	2004	2010	2020	2030	2040	2050	2060
Corn	4.5	6.0	6.7	8.1	8.2	9.1	10.0
Wheat	1.5	1.1	0.2	0.0	0.0	0.0	0.0
Soybeans	2.1	2.7	2.9	2.4	2.2	1.8	1.4
Farm NEC	0.5	0.6	0.6	0.6	0.6	0.6	0.6
Coal (north)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coal (south)	16.6	17.3	17.3	21.5	22.3	23.0	23.4
Petroleum	0.9	1.4	1.7	1.5	1.3	1.2	1.2
Agg. Chems.	0.7	1.1	1.1	1.2	1.2	1.3	1.3
Building Materials	19.5	27.0	34.2	39.2	43.8	47.9	50.1
Ind. Chems. (w/o Ethanol)	0.4	0.5	0.5	0.7	0.8	0.9	0.9
Ethanol	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Iron & Steel	1.2	2.1	2.7	3.2	3.6	4.0	4.2
Miscellaneous	1.9	2.2	2.2	2.2	2.2	2.2	2.2
Total	49.9	61.9	70.3	80.6	86.3	92.0	95.3

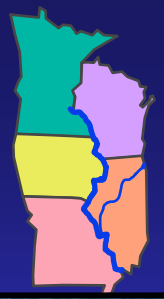
Illinois Waterway Unconstrained High Traffic Forecast
No Lock Use
(Millions of Tons)

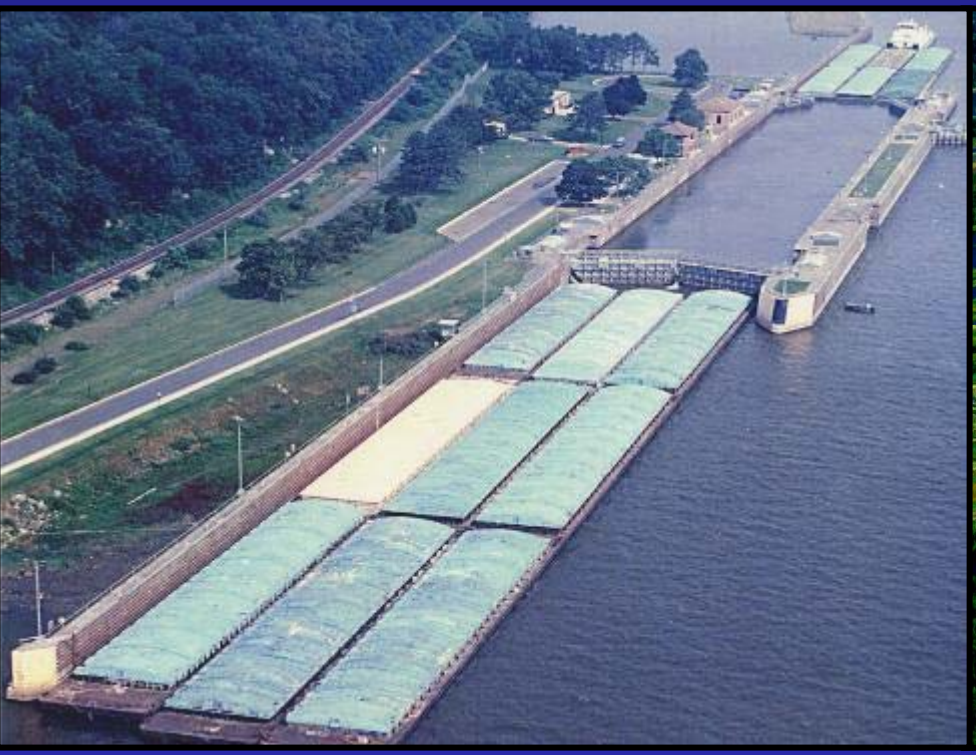


Commodity Grp	2004	2010	2020	2030	2040	2050	2060
Corn	0.02	0.03	0.03	0.04	0.04	0.04	0.04
Wheat	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soybeans	0.003	0.004	0.004	0.004	0.003	0.003	0.002
Farm NEC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coal (coke + lignite)	2.1	3.8	4.4	5.0	5.8	6.8	7.4
Petroleum	0.6	0.9	1.1	1.0	0.8	0.7	0.7
Agg. Chems.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Building Materials	1.8	4.1	6.2	7.7	9.2	10.6	11.4
Ind. Chems. (w/o Ethanol)	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Ethanol	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Iron & Steel	0.04	0.06	0.08	0.09	0.10	0.11	0.12
Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	4.6	8.9	11.8	13.8	16.0	18.4	19.7

US Army Corps of Engineers®

Upper Mississippi River System



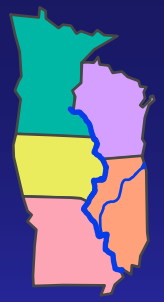


NESP - Reevaluation Introduction

One Team: Relevant, Ready, Responsive and Reliable

US Army Corps of Engineers®

Reevaluation
Interim Report - Schedule



- 15 Aug 07 — Preliminary Findings
- 30 Sep 07 — ITR & ECC/NECC Comments
- 31 Oct 07 — EPR Panel Final Reports
- 30 Nov 07 — EPR Panel Summary Report
- 31 Dec 07 — Draft Report
- Jan-Feb — Public Review
- 31 Mar 08 — Final Interim Report

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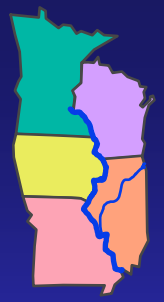
Reevaluation Presentation



- Executive Summary
- Introduction
- National Transportation System
- Waterways
  - Inland Waterway System
  - Recommended Plan
- Forecast and Evaluation
  - NED Traditional – LTS, HTS
  - NED Multimodal – MTS
  - RED, EQ, OSE
- Risks, Conclusions, Recommendations

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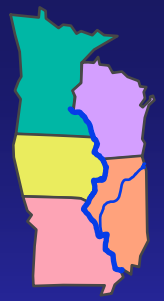
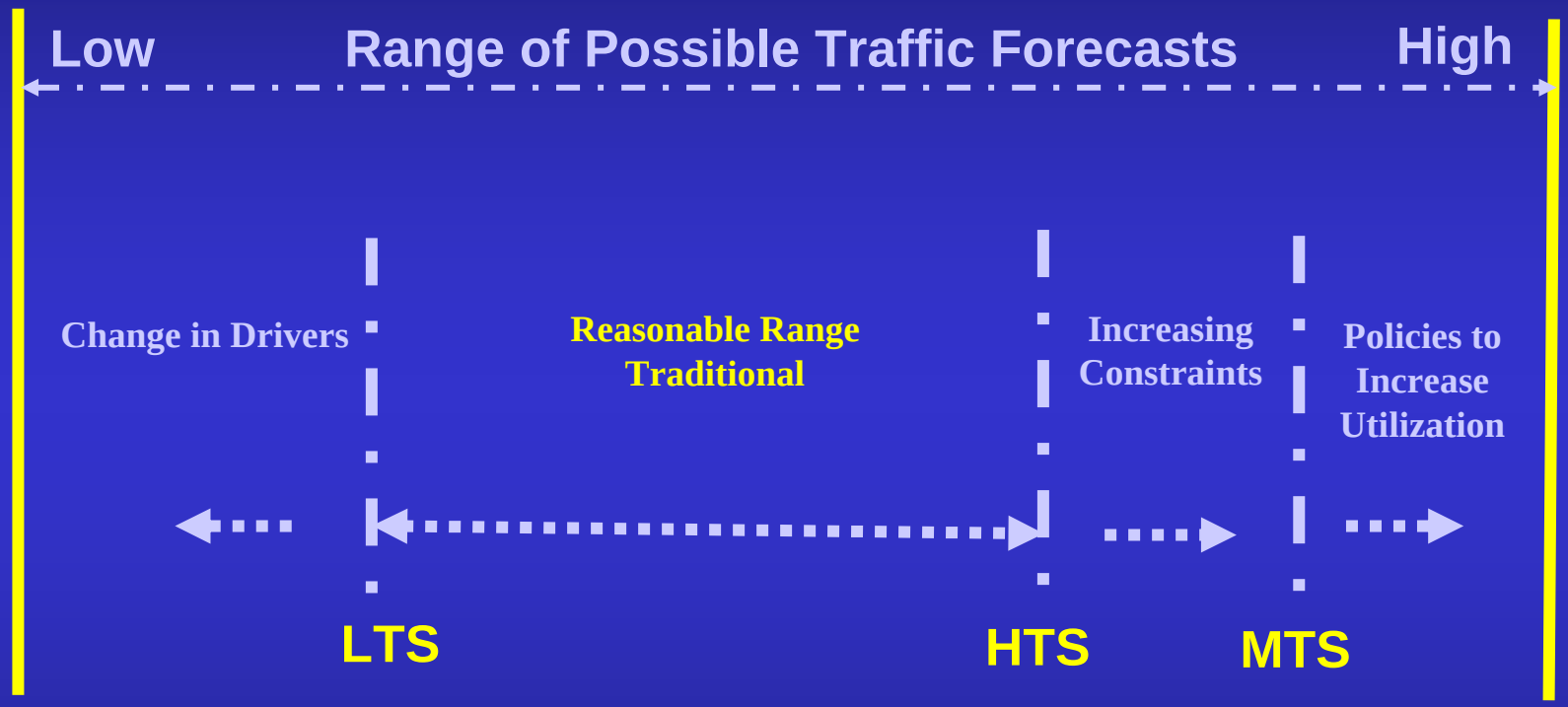
Reevaluation Risk Framework





Flat or Falling Traffic (MIN)

High System Utilization (MAX)

LTS = Low Traffic Scenario
HTS = High Traffic Scenario
MTS = Multimodal Transportation Scenario

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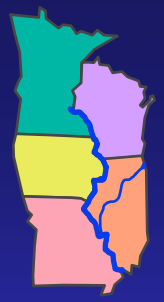
Reevaluation
National Transportation System



- Projected increases in freight will overwhelm infrastructure at current rate of investment
- Need to increase investment to ensure efficient, reliable, safe, and secure movement of goods
- Uncertainty in how need will manifest and be satisfied

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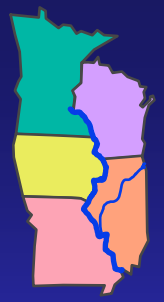
Reevaluation
Inland Waterway System



- Inland Waterway System is critical to the Nation
- System is deteriorating
- Freight movement on system is flat
- System has potential to be part of the solution

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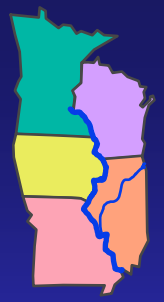
Reevaluation Recommended Plan



- Efficiency and Effectiveness
- Completeness, Acceptability, Sustainability
- Safety
- Reliability
- Adaptability
- Vision and goals for national transportation system

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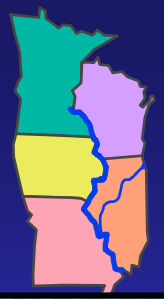
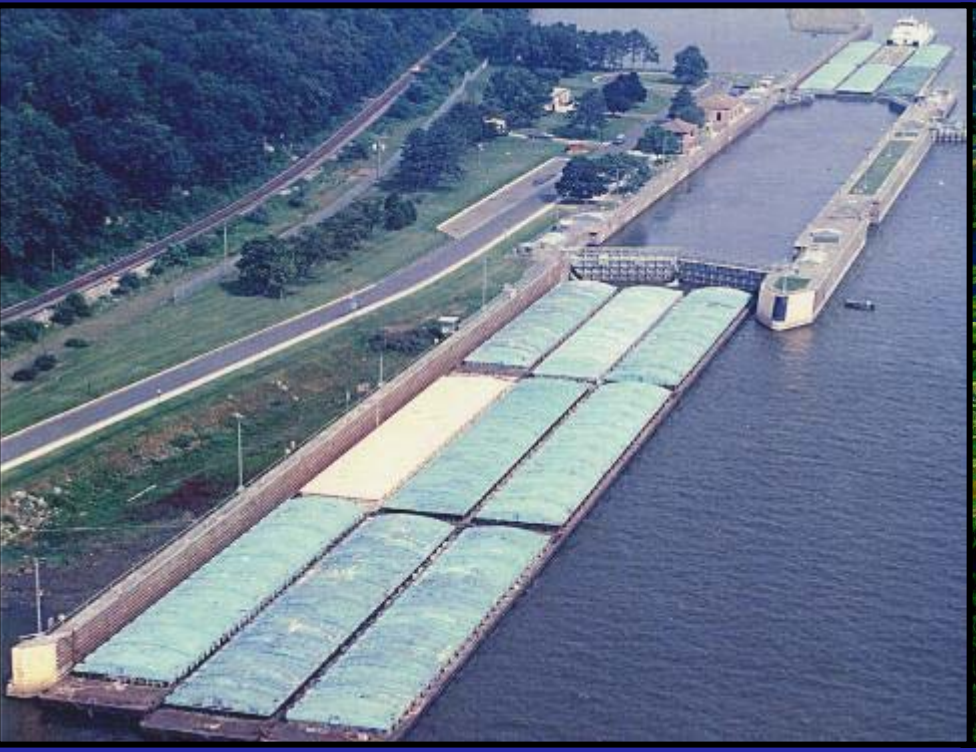
Upper Mississippi River System





To seek long-term sustainability of the economic uses and ecological integrity of the Upper Mississippi River System

One Team: Relevant, Ready, Responsive and Reliable

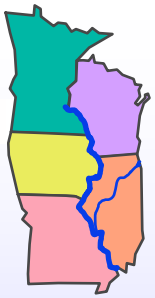
UMRS - Vision

Long-term sustainability of the economic uses and ecological integrity of the UMRS

RECOMMENDED DUAL PURPOSE PLAN

- $2.4 Billion Navigation Efficiency Framework
- $5.3 Billion Ecosystem Restoration Framework
- Adaptive Implementation
  - ✓ Nav. Eff. 15 yr increment = $1.88 B
  - ✓ Eco. Rest. 15 yr increment = $1.46 B
  - ✓ Decision Checkpoints at 3, 7, and 15 yrs.

ECOSYSTEM RESTORATION IMPLEMENTATION



$1.46 billion in First 15 years

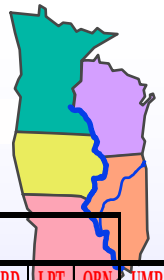
- Fish Passage @ Dams 4,8,22, and 26
- Changes in Water Level Control @ Dams 25 and 16
- Forest & Cultural Resources Mngt Plans
- Adaptive Implementation of 225 small projects of less than $25 million each
  - Island Building
  - Water Level Management
  - Backwater/Side Channel Restoration
  - Wing Dam/Dike Alterations
  - Island Shoreline Protection
- 35,000 Acres of Floodplain Restoration
- Continued Study and Monitoring

System Impacts

- Fish
- Plants
- Mussels
- Bank Erosion
- Backwater Sediment

UMR-IWW Navigation Study Economic Re-Evaluation

Incremental Traffic Comparison of Low Traffic, High Traffic, and PEIS Mitigation Traffic Forecasts



Low Traffic

	Upper Mississippi River																														Illinois Waterway									
Year	USA	LSA	P1	P2	P3	P4	P5	P5A	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P24	P25	P26	P27	OR	ALT	LGR	PEO	STR	MAR	DRS	BRD	LPT	OBN	UMRS
2010	3	3	3	15	15	13	14	14	8	8	9	15	11	7	21	20	20	22	22	23	23	19	20	20	24	25	24	19	17	17	-5	-18	-11	-24	-24	-26	-24	-25	4	322
2020	16	16	16	105	105	101	114	114	102	102	101	127	118	122	130	129	116	116	111	117	115	106	109	111	113	114	114	134	141	141	20	-2	1	-15	-16	-25	-21	-22	10	3,107
2030	36	36	36	103	103	103	121	121	114	114	114	156	148	154	167	166	155	156	155	168	166	153	157	159	159	161	161	221	220	220	60	60	61	35	30	13	11	10	37	4,520
2040	52	52	51	187	187	210	215	215	164	164	162	140	197	186	230	237	252	258	272	283	288	301	311	318	328	348	347	503	493	493	156	312	300	225	213	183	156	153	115	9,259
2050	70	70	71	221	221	254	255	255	171	171	174	136	230	208	272	285	327	338	361	375	386	415	430	444	460	488	487	477	467	467	-11	187	182	146	145	140	120	119	86	10,100

Total 27,308

High Traffic

	Upper Mississippi River																														Illinois Waterway									
Year	USA	LSA	P1	P2	P3	P4	P5	P5A	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P24	P25	P26	P27	OR	ALT	LGR	PEO	STR	MAR	DRS	BRD	LPT	OBN	UMRS
2010	5	5	4	23	23	19	22	22	13	13	14	23	17	11	31	30	30	32	34	35	34	29	30	30	37	38	37	31	27	27	-6	-28	-17	-40	-40	-44	-40	-42	9	479
2020	27	27	27	218	218	220	236	236	233	233	230	257	263	267	284	285	265	269	263	270	270	267	276	285	295	301	300	319	329	329	19	-2	2	-22	-23	-34	-27	-28	19	7,209
2030	66	66	65	271	271	297	316	316	337	337	335	371	404	408	436	442	437	456	464	480	490	509	531	559	582	637	636	1,337	1,308	1,308	701	909	903	722	705	669	446	442	243	20,211
2040	131	131	130	398	398	452	456	456	412	412	412	375	491	481	546	563	632	641	673	695	712	759	788	820	852	921	920	1,666	1,625	1,625	746	1,088	1,059	841	817	764	543	537	305	26,271
2050	153	153	154	419	419	479	478	478	401	401	408	355	513	491	573	596	704	713	753	778	802	864	899	940	978	1,052	1,051	1,337	1,300	1,300	286	603	582	469	462	450	336	333	191	23,654

Total 77,824

PEIS (Alternative 4 & 6, high traffic scenario)

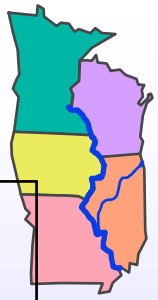
	Upper Mississippi River																														Illinois Waterway									
Year	USA	LSA	P1	P2	P3	P4	P5	P5A	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P24	P25	P26	P27	OR*	ALT*	LGR	PEO	STR	MAR	DRS	BRD	LPT	OBN	UMRS
2010	2	2	3	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	249
2020	20	20	21	33	33	42	42	42	70	70	72	73	98	98	114	119	154	154	173	183	193	213	219	241	258	272	272	272	265	265	0	26	885	24	24	23	22	23	0	5,127
2030	169	169	173	704	704	760	726	726	803	803	835	837	1033	1037	1145	1184	1462	1455	1548	1595	1648	1764	1792	1862	1920	1972	1973	1995	1966	1965	23	402	351	222	199	174	121	119	30	38,365
2040	289	289	297	738	738	878	861	861	994	994	1048	1002	1400	1394	1600	1668	2122	2121	2280	2353	2438	2629	2672	2780	2862	2951	2951	4014	3907	3907	1063	1245	1096	709	634	550	403	400	106	61,240
2050	262	262	269	758	758	864	845	845	956	956	994	940	1278	1276	1459	1521	1953	1951	2084	2152	2223	2392	2429	2520	2601	2679	2680	3231	3155	3155	551	666	587	387	350	315	237	236	66	52,845

Total 157,826

* Alton Pool traffic was calculated using the formula (Pool 26 traffic - Pool 25 traffic)

Table 2. Comparison of total traffic forecasts for the years 2010-2050.

	Low Traffic	High Traffic	PEIS
Total Traffic	549,842 tows	868,515 tows	916,804 tows
W/O Project Traffic	522,534 tows	790,690 tows	758,968 tows
Incremental Increase	27,308 tows	77,825 tows	157,826 tows



Overall Sytemic Mitigation Summary			Initial 2003 and Updated 2006 Cost Estimates
Mitigation Items	**Initial Cost Estimates, 2003 ($1000)**	**CWCCIS Factor**	**Updated Cost Estimates, 2006 ($1000)**
B1. Bank Erosion	$17,564	1.178	$20,690
B2. Backwater & Secondary Channel	$29,391	1.212	$35,622
B3. Plants	$16,530	1.212	$20,034
B4. Fish	$60,802	1.212	$73,692
B5. Environmental Monitoring	$14,293	1.199	$17,137
B6. Historic Properties	$10,590	1.261	$13,354
B7. Site Specific Mitigation	Site Specific Costs shown on Lock Projects' Estimates		
B8. Administration	$18,647	1.199	$22,358
B9. Total Mitigation Cost	**$167,817**		**$202,887**

Dual Purpose Plan …

To seek long-term sustainability of the economic uses and ecological integrity of the Upper Mississippi River System

Draft Interim Report

Re-evaluation of the Recommended Plan:

UMR-IWW System Navigation Study

Presentation To

EPR/ITR Workshop

Scott D. Whitney

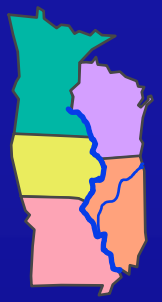
Asst. Regional Project Manager

One Team: Relevant, Ready, Responsive, Reliable

DRAFT INTERIM REPORT

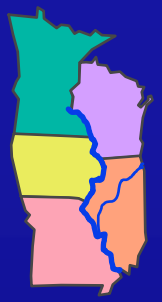
- Executive Summary
- Introduction
- Chapt 1: Natl Freight Transp
- Chapt 2: Inland Waterway Sys
- Chapt 3: Traff Forecast & Eval
- Chapt 4: Conclusions & Recommendations

CHAPT 1 KEY FINDINGS



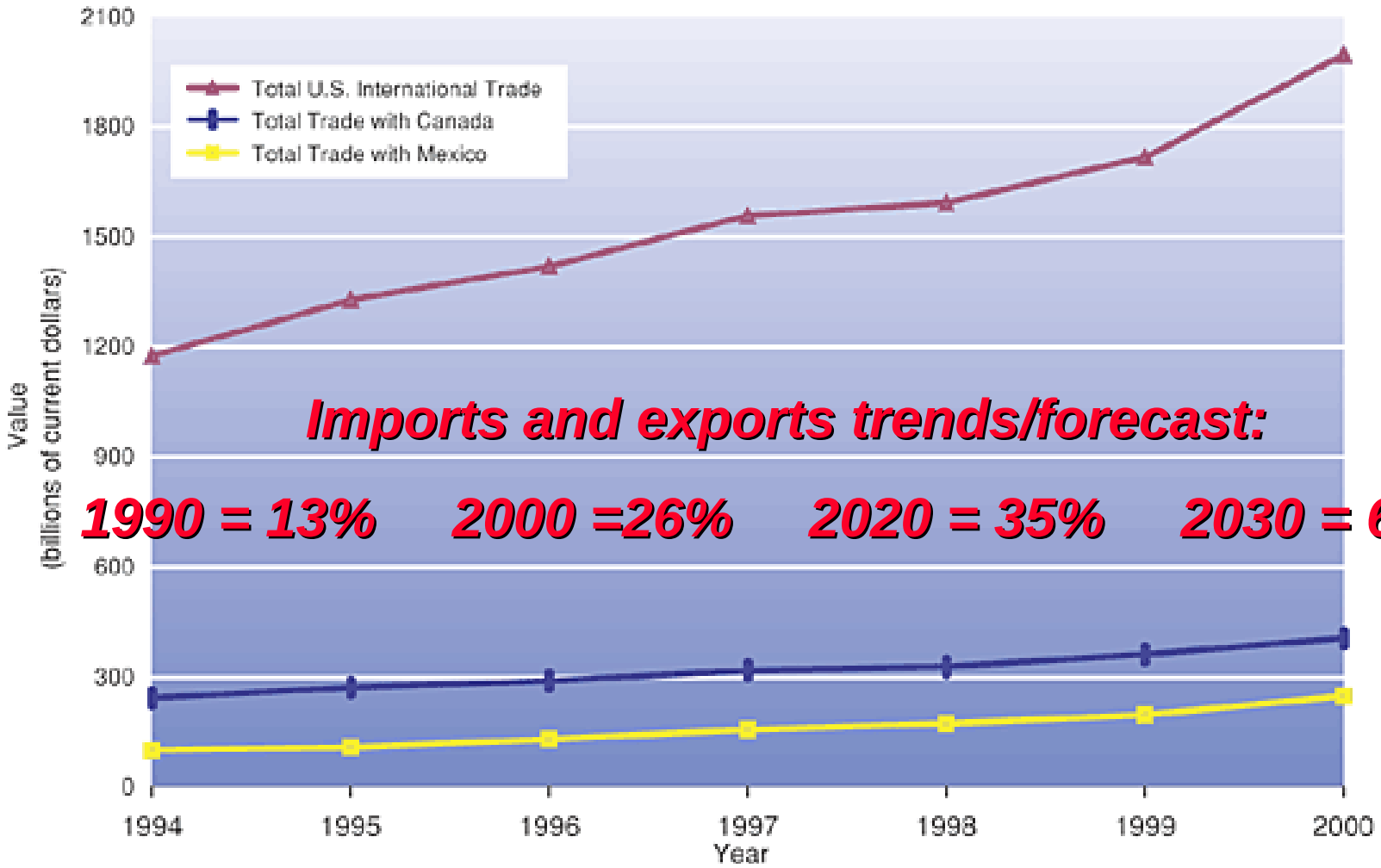
- Multimodal Approach
- Economic well being, security, and standard of living
- Congestion is significant & costly
- Inventive, flexible, and collaborative
- Most transp modes at or beyond design capacity (Aging infrastructure)
- Goal: Efficient, Safe, Reliable & Secure

THE CONGESTION TAX



- Congestion increases travel times, disrupts supply chains, and raises the cost of doing business at home and abroad.
- Congestion is costing America $200 billion each year
- Americans Lose 3.7 million hours and 2.3 billion gallons of fuel each year sitting in traffic jams!
- Airline delays contribute to $9.4 billion of wasted

U.S. Trade Trends



Imports and exports trends/forecast:

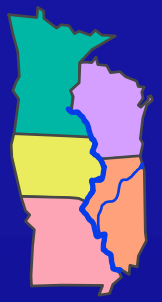
1990 = 13% 2000 =26% 2020 = 35% 2030 = 60%.

Source: U.S. Department of Transportation, Bureau of Transportation Statistics, *North American Trade and Travel Trends*, BTS-01-97 (Washington, DC: 2001).

TRANSPORTATION MODES

- Interstate Highway System was the envy of the world …..in 1967!
- Rail Network is struggling to satisfy current demands.
- Inland Waterways aging infrastructure plagued by delays and shutdowns
- Water ports face a tsunami of foreign trade that has overwhelmed their capacity
- Air Transport is in financial upheaval and delays/cancellations unprecedented highs.

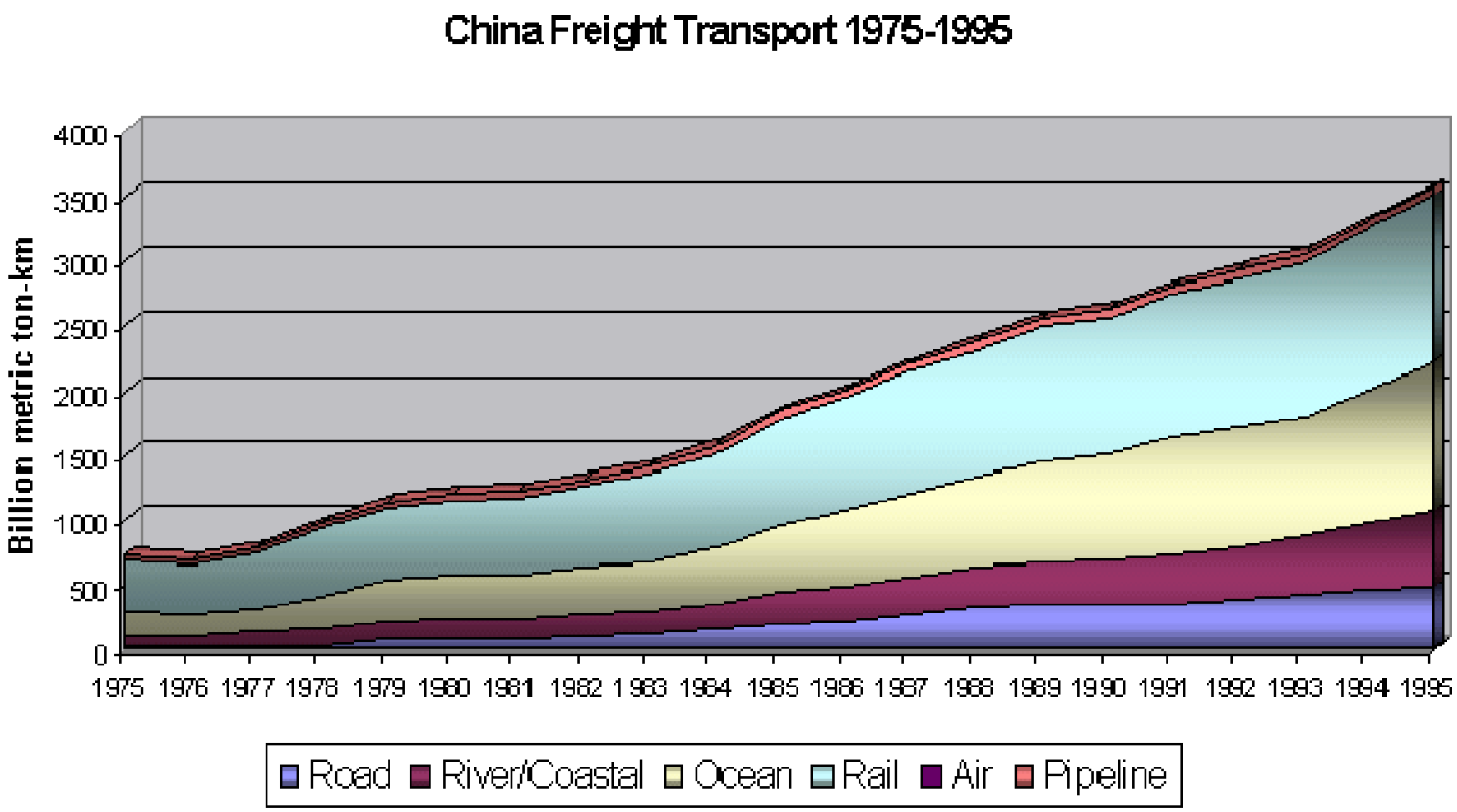
Rank of Nations GDP in inflation adjusted dollars



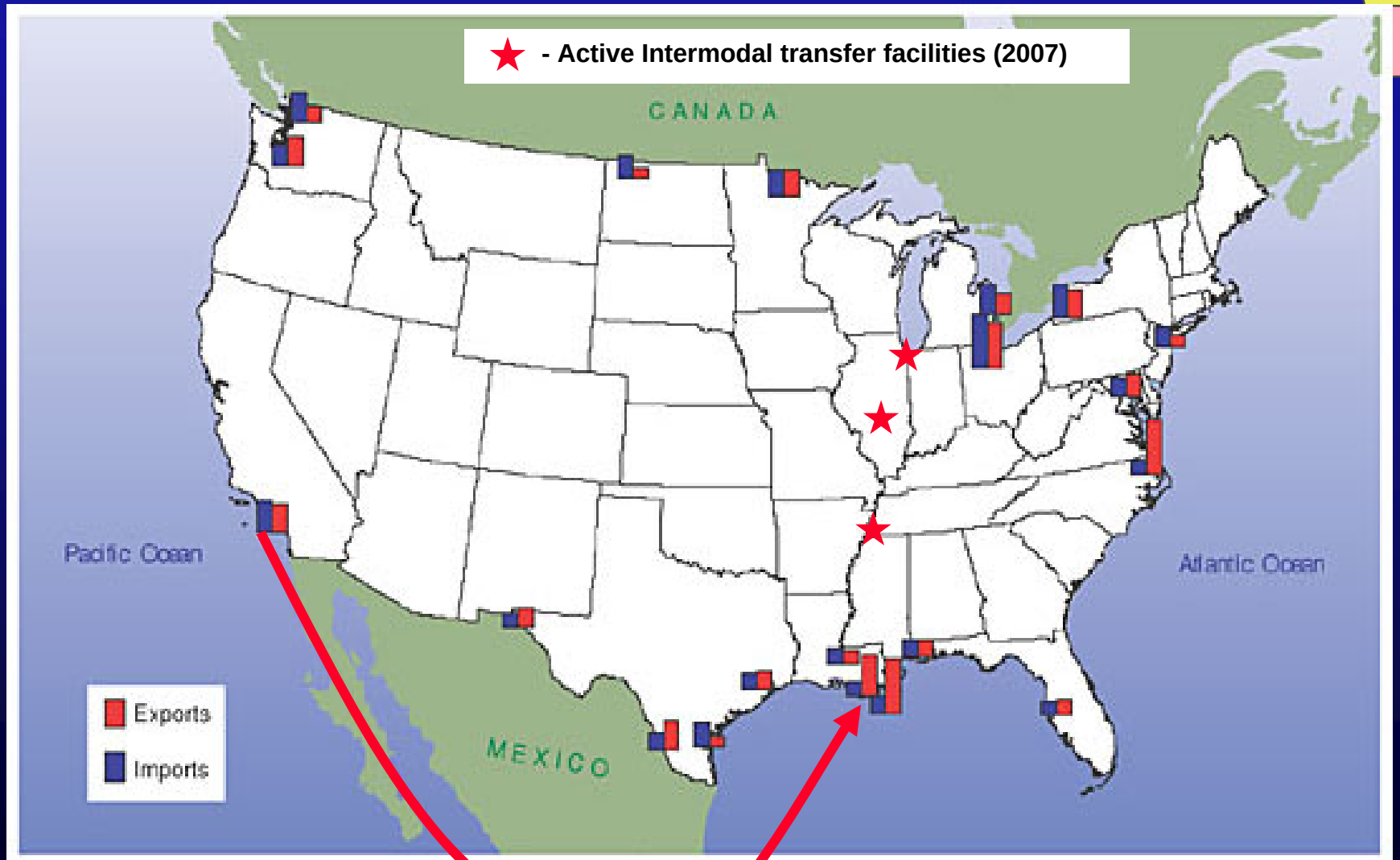
	2000	2010	2020	2030	2040	2050
1	US	US	US	US	US	China
2	Japan	Japan	China	China	China	US
3	Germany	Germany	Japan	Japan	India	India
4	U.K.	U.K.	Germany	India	Japan	Japan
5	France	China	U.K.	Russia	Russia	Brazil
6	Italy	France	India	U.K.	Brazil	Russia
7	China	Italy	France	Germany	U.K.	U.K.
8	Brazil	India	Russia	France	Germany	Germany
9	India	Russia	Italy	Brazil	France	France
10	Russia	Brazil	Brazil	Italy	Italy	Italy

US Economy predicted to grow at a compound annual rate of 2.8% over next 30yrs. US GDP = 130% and double freight shipped

CHINA FREIGTH TRENDS



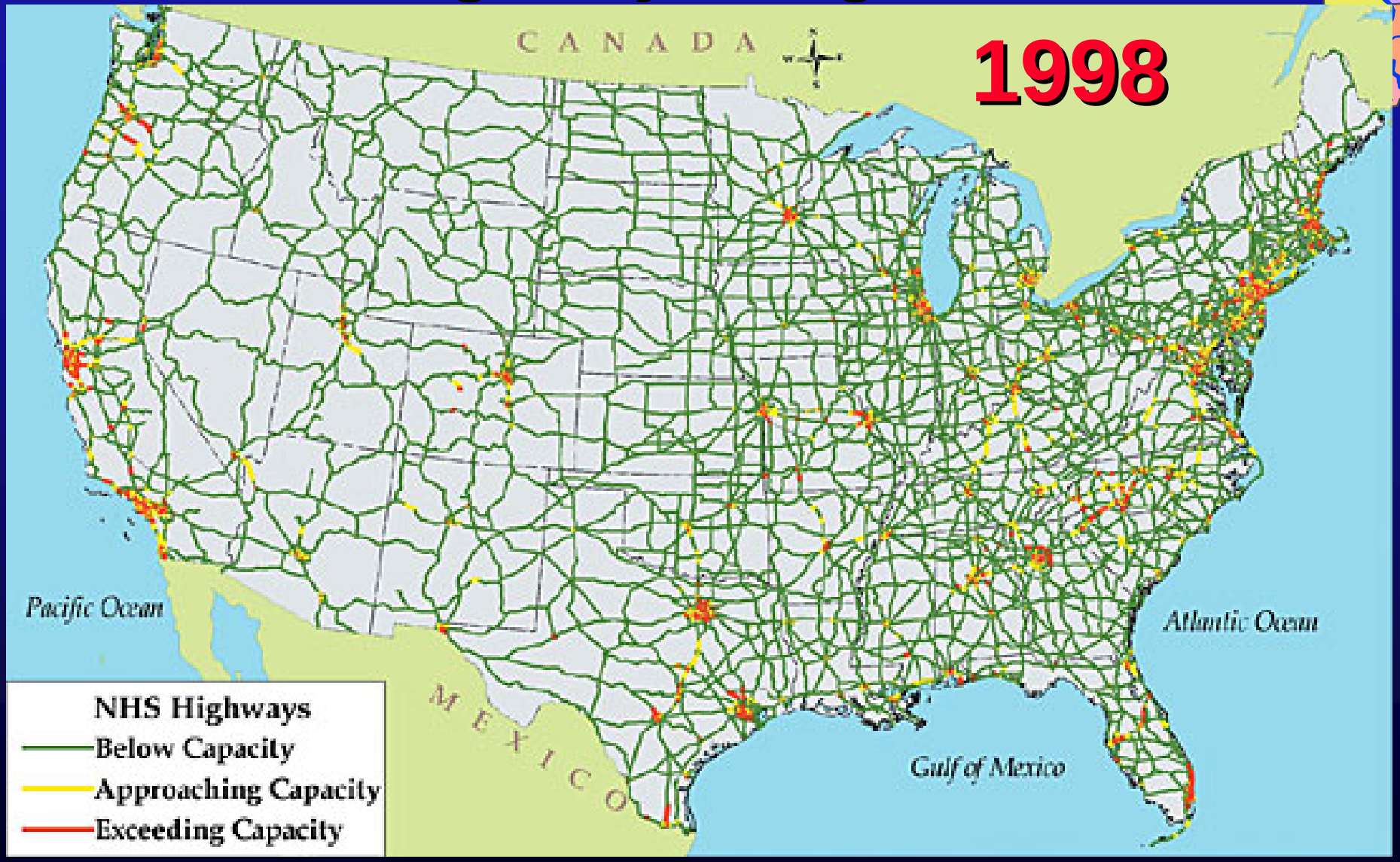
IMPORTS & EXPORTS



Panama Canal Expansion 2015?

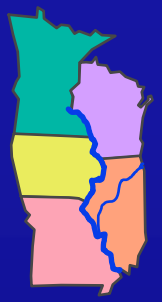
Source: U.S. Department of Transportation, Federal Highway Administration, Freight Analysis Framework, 2002.

Highway Congestion



Highway Congestion

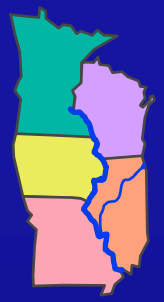
CHAPT 2 KEY FINDINGS



Inland Waterway System

- ***Invisible Transportation Infrastructure***
- **12,000 mi, 15% of freight, 624 mil tons**
- **USACE operates and maintains**
- **11,000 mi "fuel-tax" to IWWTF**
- **Variety of high volume commodities**
- **Most energy efficient transp. mode**

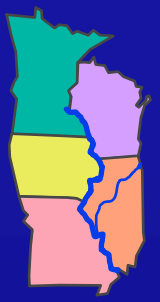
CHAPT 2 KEY FINDINGS



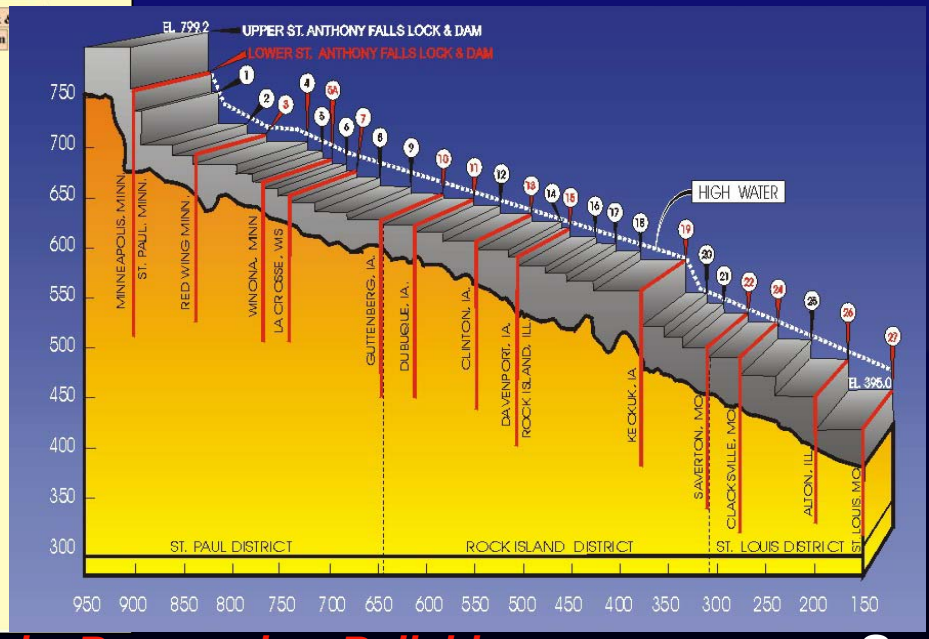
UMR-IWW Navigation System

- 1200 mi, 9’ deep, 38 L&D sites, 600’ length
- Aging infrastructure, 70+ yrs old
- Some of the most delayed locks in USA
- Vital part of national economy - $30 billion
- UMR-IWW System Nav Feas. Study 1993-2004.
- Recommended Plan – Vision, Goals, Obj
- “Three-legged” stool analogy

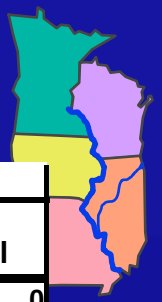
Upper Mississippi River System



- 37 Lock Sites
- 1,200 Miles of River
- Significant Ecosystem (2.7 million acres)
- Constructed 1930-45

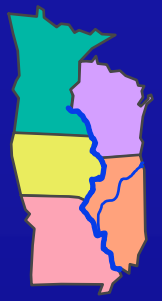


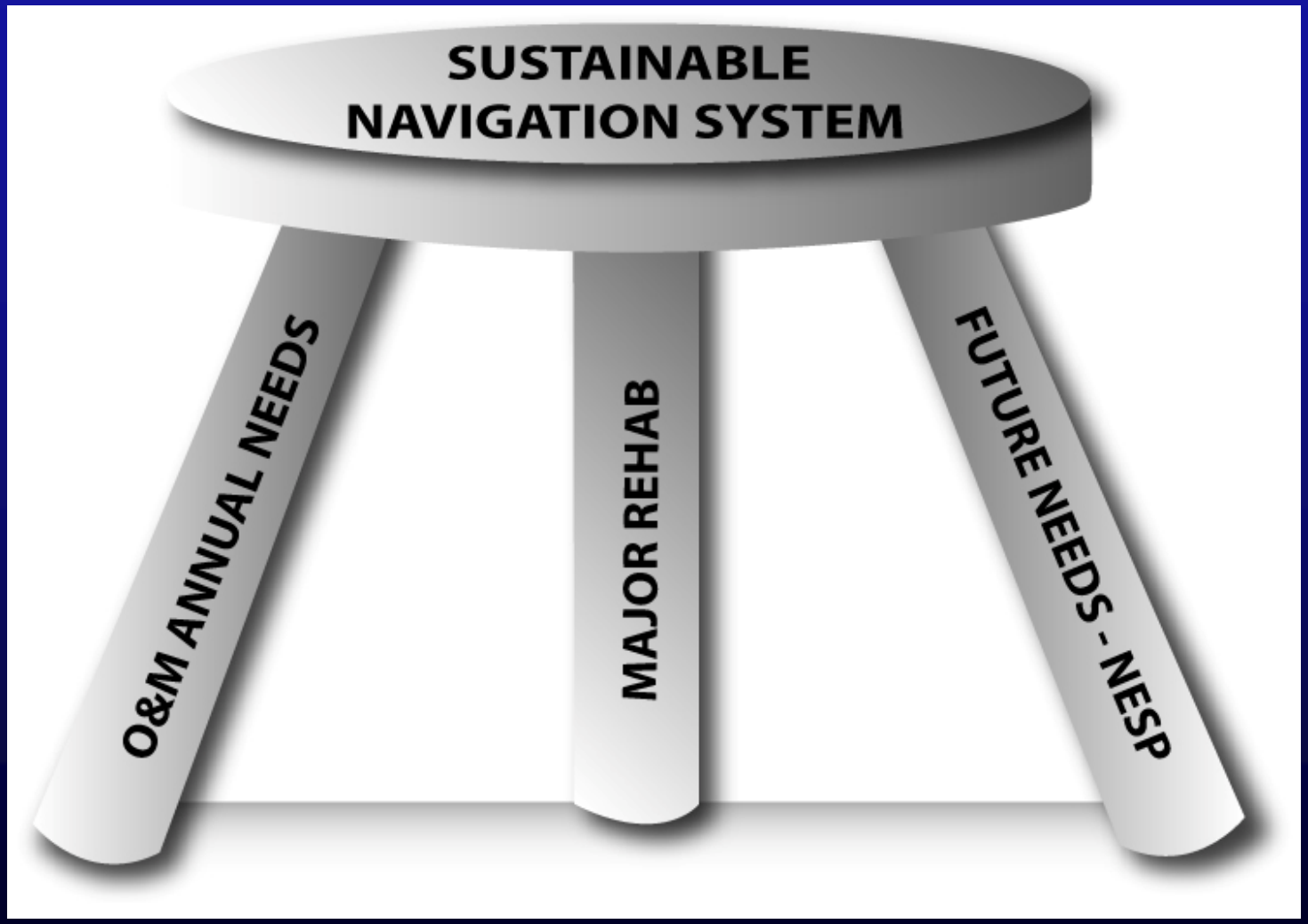
UMR LOCKS & DAMS



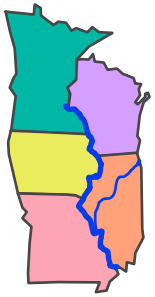
Lock	Mile	Main Chamber		Auxiliary Chamber		2005 Tonnage (ktons)		
		Year Open	Size	Year Open	Size	Up-bound	Down-bound	Total
St. Anthony Falls	853.3	1959	400 x 56	-	-	876	51	0
Locks & Dam 1	847.6	1930	400 x 56	1932	400 x 56	876	51	927
Locks & Dam 2	815.0	1930	500 x 110	1948	600 x 110	2,709	3,622	6,331
Lock & Dam 3	796.9	1938	600 x 110	-	-	2,709	3,622	6,331
Lock & Dam 4	752.8	1935	600 x 110	-	-	2,829	4,284	7,113
Lock & Dam 5	738.1	1935	600 x 110	-	-	3,267	4,284	7,551
Lock & Dam 5A	728.5	1936	600 x 110	-	-	3,237	4,284	7,521
Lock & Dam 6	714.0	1936	600 x 110	-	-	3,819	5,485	9,304
Lock & Dam 7	702.0	1937	600 x 110	-	-	3,819	5,485	9,304
Lock & Dam 8	679.0	1937	600 x 110	-	-	4,306	5,699	10,005
Lock & Dam 9	647.0	1938	600 x 110	-	-	6,473	5,699	12,172
Lock & Dam 10	615.0	1936	600 x 110	-	-	6,722	8,499	15,221
Lock & Dam 11	583.0	1937	600 x 110	-	-	6,804	8,375	15,179
Lock & Dam 12	556.0	1938	600 x 110	-	-	7,430	9,495	16,925
Lock & Dam 13	523.0	1938	600 x 110	-	-	7,430	9,706	17,136
Locks & Dam 14	493.0	1939	600 x 110	1922	320 x 80	8,309	11,098	19,407
Locks & Dam 15	482.9	1934	600 x 110	1934	360 x 110	8,473	10,737	19,210
Lock & Dam 16	457.2	1934	600 x 110	-	-	8,997	11,444	20,441
Lock & Dam 17	437.1	1939	600 x 110	-	-	9,817	11,979	21,796
Lock & Dam 18	410.5	1937	600 x 110	-	-	9,816	12,811	22,627
Lock & Dam 19	364.2	1957	1200 x 110	-	-	9,095	14,324	23,419
Lock & Dam 20	343.2	1936	600 x 110	-	-	9,291	15,093	24,384
Lock & Dam 21	324.9	1938	600 x 110	-	-	9,834	15,928	25,762
Lock & Dam 22	301.2	1938	600 x 110	-	-	6,768	16,324	23,092
Lock & Dam 24	273.4	1940	600 x 110	-	-	10,302	17,298	27,600
Lock & Dam 25	241.4	1939	600 x 110	-	-	10,302	17,297	27,599
Melvin Price	200.8	1990	1200 x 110	1994	600 x 110	24,931	34,809	59,740
Locks and Dam 27	185.5	1953	1200 x 110	1953	600 x 110	26,652	36,991	63,643

1200 Mile Nav System



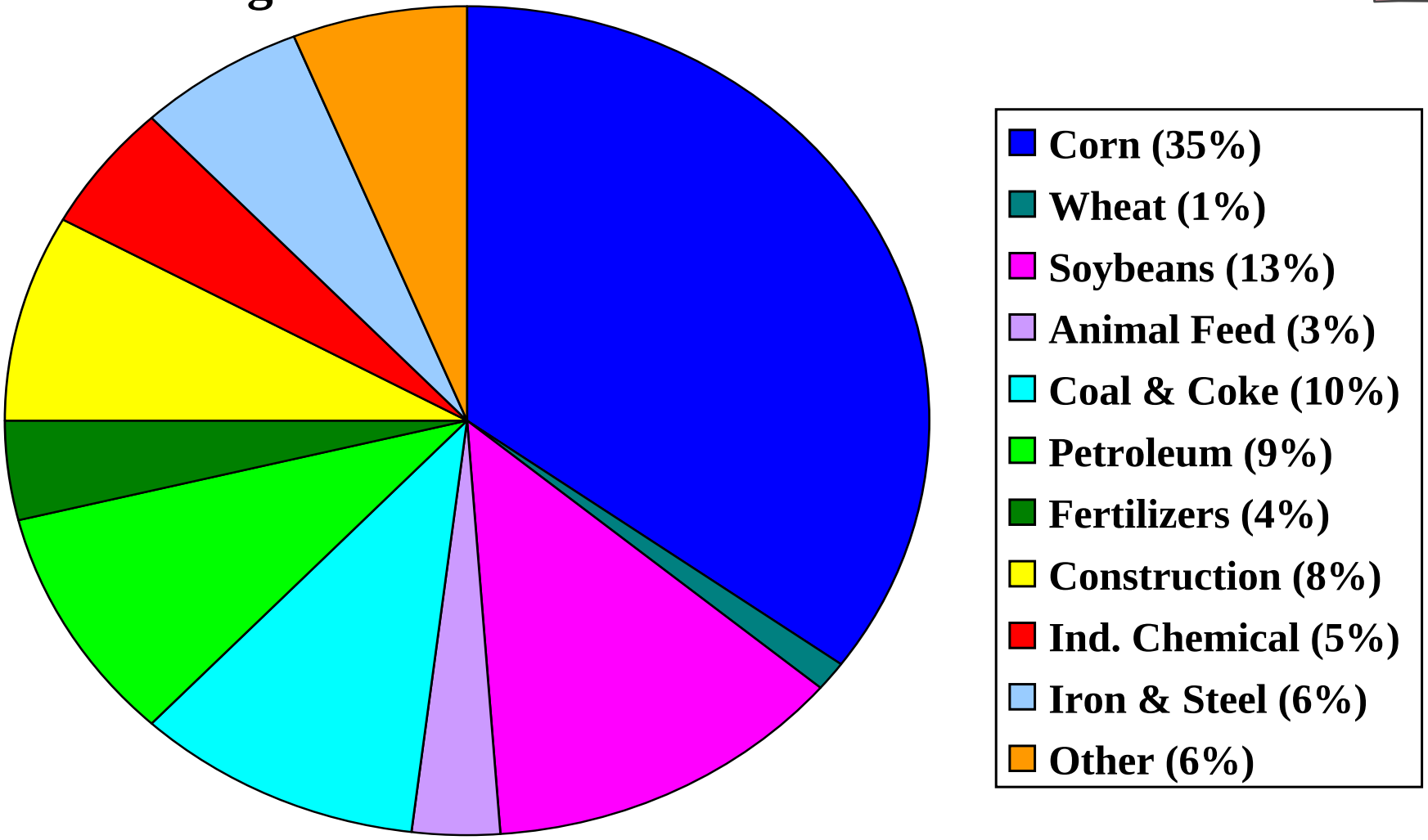


COMMODITIES SHIPPED BY BARGE



UMR-IWW System, 1995-2000

Average Annual Movements: 81.9 million short tons



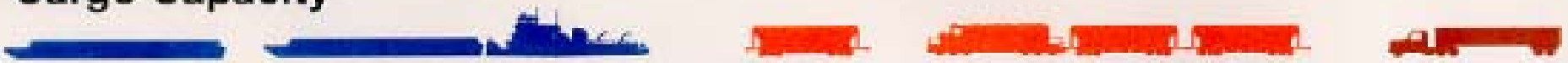
Source: US Army Corps of Engineers, *Lock Performance Monitoring System* (LPMS)

Compare...

Iowa Department of Transportation

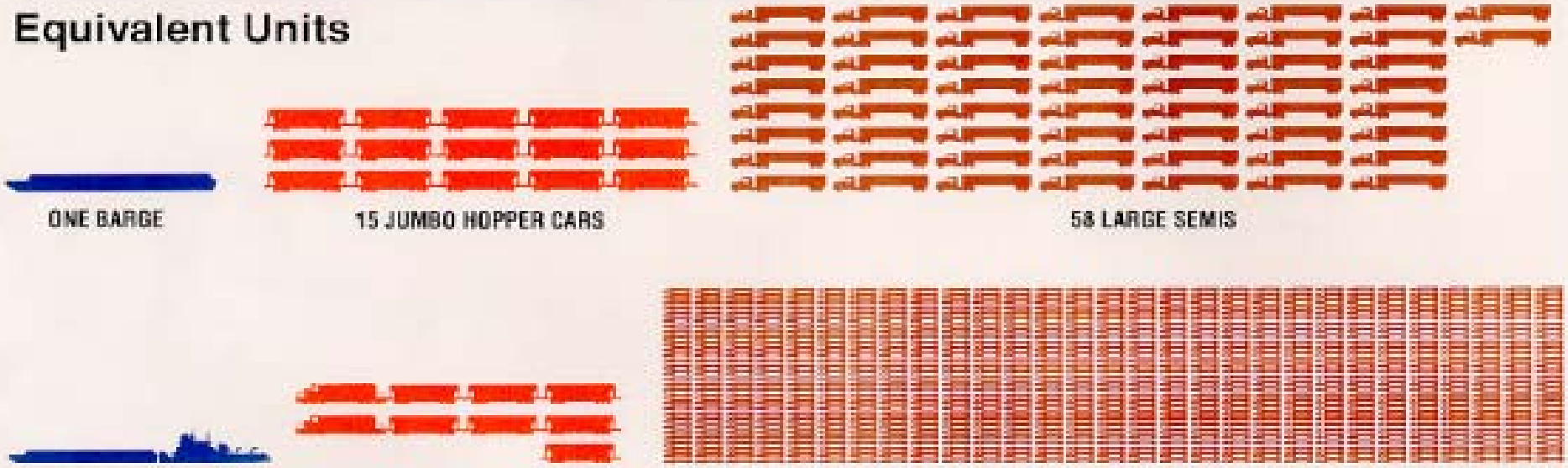
Source: Iowa Department of Transportation - 800 Lincoln Way - Ames, IA 50010 - 515-239-1332

Cargo Capacity



ONE BARGE	ONE 15 BARGE TOW	JUMBO HOPPER CAR	100 CAR TRAIN UNIT	LARGE SEMI
1,500 TON	22,500 TON	100 TON	10,000 TON	26 TON
52,500 BUSHELS	787,500 BUSHELS	3,500 BUSHELS	350,000 BUSHELS	910 BUSHELS
453,600 GALLONS	6,804,000 GALLONS	30,240 GALLONS	3,024,000 GALLONS	7,865 GALLONS

Equivalent Units



ONE BARGE

15 JUMBO HOPPER CARS

58 LARGE SEMIS

ONE 15 BARGE TOW

2.25 100 CAR UNIT TRAINS

870 LARGE SEMIS

Equivalent Lengths

ONE 15 BARGE TOW

.25 MILES

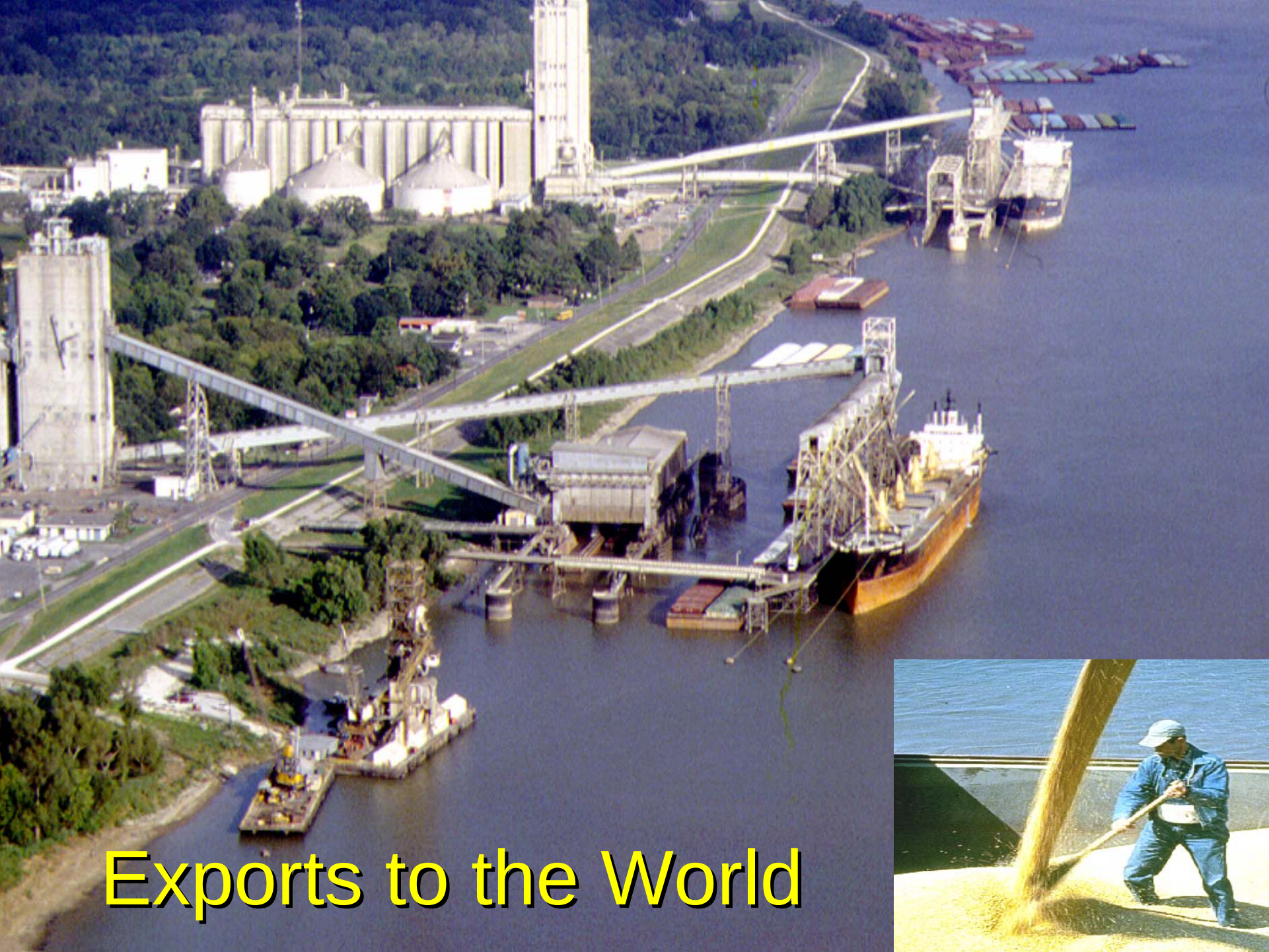
2.25 100 CAR TRAIN UNITS

2.75 MILES

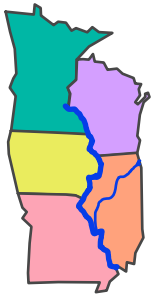
870 LARGE SEMIS

11.5 MILES
(BUMPER TO BUMPER)

PM 444 12-21-94


Exports to the World

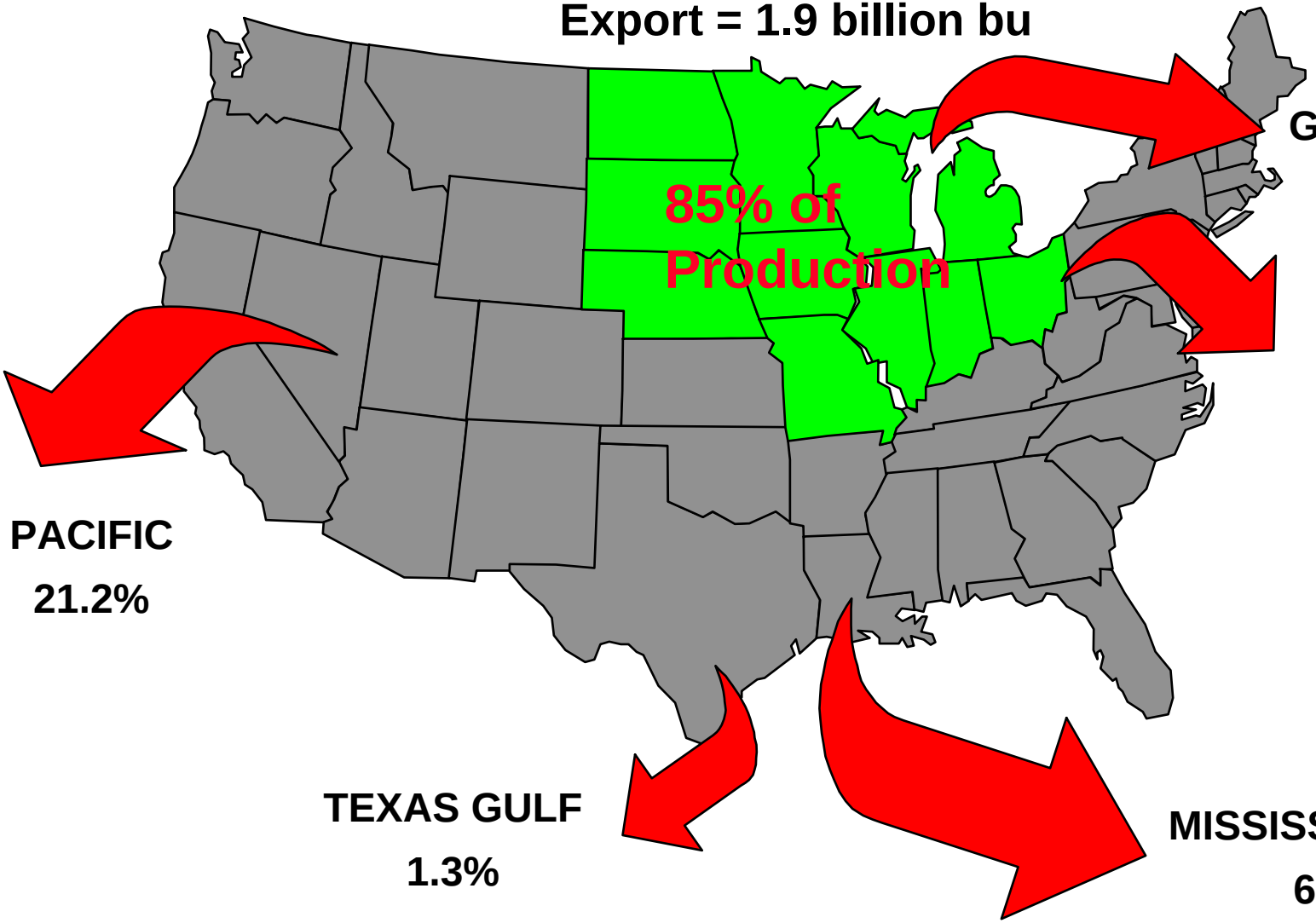
Corn Exports (15-17% of Harvest)



2005

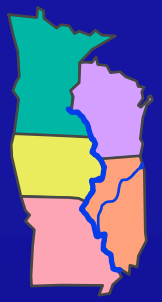
Harvest = 11.1 billion bu

Export = 1.9 billion bu



Double Lockage Process
2 hours Transit

UMRS Navigation & Ecosystem Sustainability Program (NESP)



Points of Contact

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UMRS NESP Website

http://www2.mvr.usace.army.mil/UMRS/NESP/

KEY FINDINGS

CHAPTER 1

- Meeting America's transportation needs for the future will require a multi-modal approach, which preserves what has been built to date, improves system performance, and adds substantial capacity in highways, railroads, airports, inland waterways, ports and border crossings. It must also go beyond transportation improvements and include policies addressing land use, energy, global climate change, the environment, and community quality of life.
- Nearly all aspects of our national economic well being, security and standard of living are directly dependent on the efficiency and effectiveness of a complex transportation network. Whether it is the bus, train, or auto we use for our daily commute to work or the food and commodities we use, all rely heavily on transportation of people, products or services across space and time.
- Congestion is one of the single largest threats to our economic prosperity and way of life. Whether it takes the form of trucks stalled in traffic, barges backed up at undersized locks, airplanes circling over crowded airports or cargo stuck in overwhelmed seaports, congestion is costing America an estimated $200 billion a year!
- Meeting the future transportation requirements necessary to maintain our economic standing in the world markets will require an inventive and flexible multimodal focus combined with unprecedented planning and collaboration across a wide range of public and private sector agencies, organizations and experts.
- With staggering growth looming on America's network, American shippers realize that the nations transportation system cannot handle today's freight, much less those forecast for the next three decades.
- Our countries wealth, security and productive capacity are directly and intimately linked to our ability to efficiently, reliably, safely and securely transport freight.

CHAPTER 2

- Because it operates largely out of sight and out of mind of a significant proportion of the US population, the Inland Waterway System has often been referred to as the "invisible transportation infrastructure."
- The Inland Waterway System is comprised of rivers, waterways, canals, and the locks and dams that provide some 25,000 miles of commercially-navigable waters. The Inland Waterway System moves approximately 15 percent of the Nation's cargo at a significantly lower transportation cost/ton than rail or truck. In 2005, this system carried 624 million tons of cargo—principally raw materials and liquid and bulk primary products, like coal, petroleum, chemicals, grain, processed metals, cement, sand and gravel.
- Shipping by barge is more energy efficient than shipping by truck or rail. Supporting this conclusion are the statistical data reflecting the relative distance each mode of transportation can carry one ton of cargo for every gallon of fuel burned. These figures show that shallow

draft water transportation is almost nine times more economical, thus more efficient, than trucks and over 2 ½ times more efficient than rail.

Truck	70 miles
Train	420 miles
Barge	530miles

- The commercially-navigable portions of the UMR extend from the confluence with the Ohio River, River Mile (RM) 0.0, to Upper St. Anthony Falls Lock in Minneapolis-St. Paul, Minnesota, RM 854.0. The IWW extends from its confluence with the Mississippi River at Grafton, Illinois, RM 0.0 to T. J. O'Brien Lock in Chicago, Illinois, RM 327.0. The UMR-IWW Navigation System contains 1,200 miles of 9-foot deep channels, 38 lock and dam sites, and thousands of channel training structures.
- Most of the locks and dams within the UMR-IWW navigation system were built by the Corps in the 1930s, with an initial projected life span of about 50 years, and most were originally designed to accommodate 600-foot-long barge tows. Standard tows since then have grown from 600 feet to over 1,100 feet, nearly the length of four football fields. Twenty-three of the UMR's 29 lock locations have chambers that are 600 ft in length. The upper and lower St. Anthony Falls locks and Lock 1 are 400 ft. in length. Three locks—Lock 19, Lock 26 (renamed the Melvin Price Lock and Dam), and Lock 27—are 1,200 ft. in length. With a 1,200 ft. lock chamber, a 1,100-ft. barge tow can pass through in 45 minutes. In contrast, it generally takes between 90 and 120 minutes for a 1,100-ft. barge tow to pass through a 600-ft. lock due to the need to double-lock the barge tow.
- Since the 1980s, the UMR-IWW has experienced increasing traffic congestion and delays related to its aging infrastructure and limited lock capacity. Unplanned closures due to aging infrastructure have increased, thus reducing the number of days annually that locks are open to traffic.
- The Corps of Engineers reports that the UMR-IWW system has over half (19 of 36) of the most delayed lock sites in the country's system of inland waterways. Existing delays vary based on location in the system, but are generally greatest furthest downstream
- The system is a vital part of our national economy. The system is significant for certain key exports and the Nation's balance of trade. In 2005, the UMR moved just over 109 million tons of commercial cargo. This tonnage was worth almost $19 billion. Of the almost 84.2 million tons leaving the river, two-thirds was destined for the Lower Mississippi River. Another 10 percent moved to the Ohio River and its tributaries. Comparatively, in 2005 the IWW moved 51.6 million tons of commercial cargo worth $9.5 billion. The waterway's traffic is dominated by grain, corn and soybeans. Corn and soybeans are shipped via the waterway at roughly 60 to 70 percent of the cost of shipping over the same distance by rail.
- The UMR-IWW System Navigation Feasibility Study was initiated in April 1993 to address the potential economic losses to the Nation for significant traffic delays at locks on the commercial navigation system between 2000 and 2050. In 2001, the study was restructured to address the ongoing cumulative effects of navigation, and the ecosystem restoration needs, with a goal of attaining an environmentally sustainable navigation system, in addition to ensuring an efficient transportation system for the future.

- The Feasibility Study resulted in successful formulation of the Recommended Plan for navigation efficiency improvements, ecosystem restoration, and dual-purpose operation that, if implemented in accordance to plan, will go a long way towards satisfying the shared vision of long-term sustainability of the economic uses and ecological integrity of the Upper Mississippi River System. The Recommended Plan was developed collaboratively by stakeholders with diverse interests in the UMRS.
- The navigation component of the Recommended Plan is a well-balanced navigation project when evaluated across a broad range of planning objectives, which align with the vision, goals, and objectives for the national freight transportation system – efficiency and effectiveness, completeness, acceptability and sustainability, safety, reliability, and adaptability.
- The Recommended Plan, however, is only part of what is needed to optimize the waterways and prepare them for their role in moving the increase in freight projected over the planning horizon. Preserving and optimizing use of the Inland Waterway System, replacement of which is valued at over $125 billion in today's dollars, requires stepped-up investment in maintenance, rehabilitation, and efficiency improvements. It also will require collaboration among Federal, state, and private sector entities to make waterways an integral part of intermodal freight transportation in the future.

NED Analysis – Phase 2

- Need for Multimodal Analysis

- Multimodal Transportation Scenario

NED - Phase 2

- Need for multimodal analysis
  - driven by projected demand on freight transportation system (can waterways be part of the solution?)
  - expand scope of traditional analysis
    - other benefits (externalities)
    - congestion reduction benefits
  - **qualitative** analysis

Multimodal Transportation Scenario

Traditional transportation cost savings benefits (NED Phase 1 analysis)

+

Externalities (NED Phase 2 benefits)

=

Total Project Benefits (?)

Externalities Include

- Congestion reduction benefits
  - time value of drivers/passengers
  - vehicle operating cost savings
  - business operation cost savings
  - highway/rail expansion cost savings
- Reduced fuel consumption, emissions
- Reduced number of injuries/fatalities
- Reduced highway/railway repairs
- Reduced noise impacts
- Regional economic development benefits
- Enhanced national security
- Improved competitive position globally
- Others

Multimodal Transportation Scenario

- Externalities – Questions

  - how to monetize?

  - are they “NED”?

Multimodal Transportation Scenario

- Central element is “loosening” of traditional assumption regarding ability of alternate modes to accommodate traffic growth
- Assumption may be challenged because:

  - rail network is showing signs of congestion
  - railroads are investing heavily to upgrade infrastructure and operations to meet demand

Multimodal Transportation Scenario

- Increased rail congestion → Increases rail costs → increases rail/barge rate differential → freight diverted to waterway (crux of Anatoly's work)

Multimodal Transportation Scenario

- Other considerations (favoring waterway)
  - East/West coast port congestion, border congestion → more freight through Gulf ports?
  - Expansion of Panama Canal

Multimodal Transportation Scenario

- Other Considerations (obstacles to wtwy growth)
  - Aging infrastructure
  - Regulatory environment
  - Funding
  - Ethanol – domestic consumption vs. export
  - Shifting trade flows (ex. - grain to PNW)
  - Competition with rail

Multimodal Transportation Scenario

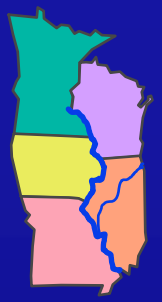
- Government promotion of inland waterways
  - Programs, policies intended to divert freight to reduce congestion and use more socially/ environmentally “friendly” waterways (a la EU)

  - The Recommended Plan is in congruence with national strategies addressing transportation issues (congestion, reliability, environment, etc.)

Multimodal Transportation Scenario

- Louis Berger contract in progress - performed by Anatoly Hochstein with assistance from Mark Burton

- Qualitative assessment of potential congestion-induced diversion of rail traffic to UMR-IWW backed by some quantitative analysis (first attempt at this type of an analysis)



UPPER MISSISSIPPI RIVER SYSTEM NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

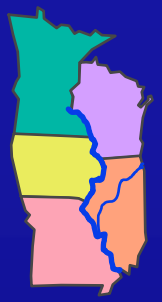
RE-EVALUATION REPORT

REGIONAL ECONOMIC DEVELOPMENT (RED) AND OTHER SOCIAL EFFECTS

BY

JACK CARR
ROCK ISLAND DISTRICT

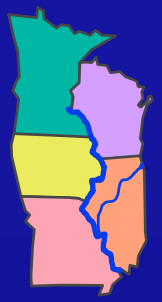
REGIONAL ECONOMIC DEVELOPMENT (RED) IMPACTS



TVA estimated RED impacts with an Economic model by Regional Economic Models Inc. (REMI) of Amherst, MA.

Direct impacts consist of: construction impacts which include spending for labor and for goods and services; and the savings to shippers from improved efficiency of the navigation system.

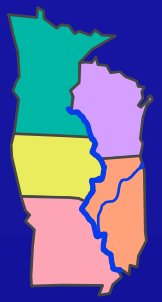
REGIONAL ECONOMIC DEVELOPMENT (RED) IMPACTS



Direct construction activity results in indirect impacts in the local economy; money spent on construction activity, labor, and the purchase of materials generates additional income and employment in a multiplier fashion.

Savings to shippers from improved efficiency of the navigation system is spent and generates additional income and employment in a multiplier fashion.

REGIONAL ECONOMIC DEVELOPMENT (RED) IMPACTS



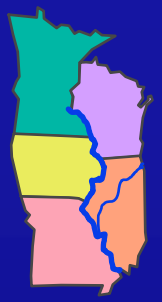
Summary of regional impacts – *generated from total project costs and shipper savings*

GRP	Real Personal Income	Output	Employment	Ratio GRP/Cost
$2,799.11	$2,032.95	$5,209.43	2555	3.38

Summary of regional impacts - *project costs only*

GRP	Real Personal Income	Output	Employment	Ratio GRP/Cost
$2,089.79	$1,469.25	$4,246.29	1954	2.53

ASSESSING THE CAPACITY OF CLASS I RAILROADS IN THE UPPER MISSISSIPPI AND ILLINOIS RIVER BASINS

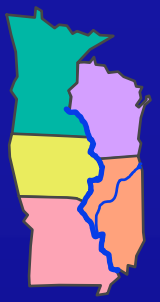


Mark Burton and David Clarke

Center for Transportation Research

June 2007

ASSESSING THE CAPACITY OF CLASS I RAILROADS IN THE UPPER MISSISSIPPI AND ILLINOIS RIVER BASINS



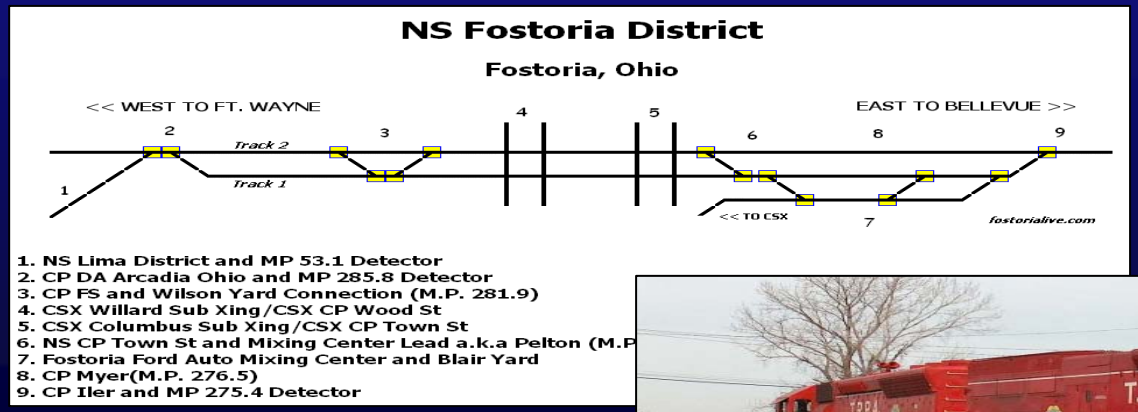
Corps assumed sufficient land-side freight capacity when evaluating potential navigation benefits.

Assuming future alternative modal capacity will be available may lead to substantial errors in public policy.

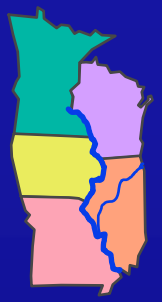
A closer look at corridor-specific railroad and motor carrier capacities was undertaken.

THE CURRENT ANALYSIS

- Union Pacific, Chicago – New Orleans
- BNSF, Eastern Iowa – St Louis
- Canadian National, Chicago – New Orleans
- Norfolk Southern, Chicago – St Louis
- St Louis Terminal (TRRA)

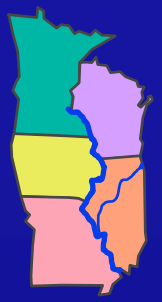


CAPACITY SUMMARY



- Four corridors examined are busy, but not at capacity (50-100 million tons reserve capacity)
- CN capacity most available, most easily expanded
- Study didn’t consider more westerly Gulf routings that reflect additional capacity
- Most easy fixes have been made; additional capacity expansions are likely to be more costly
- Should continue to monitor

WATER-COMPELLED RATES



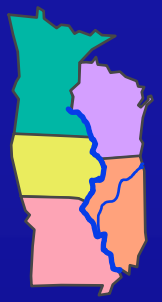
- Same methodology as 1995 WCR Study
- Same caveats and cautions
- Substantially different results from 1995 WCR Study

WATER COMPELLED RESULTS

Table 1.

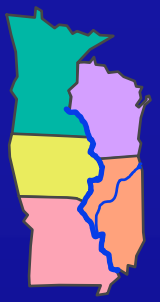
Commodity	*STCC*	*Observed Revenue per Ton-Mile*	*Rate Predicted Without Navigation*	*Per Ton-Mile Rate Difference*	*Affected Tonnage*	*Water-Compelled Rate Impact*
Wheat	1137	0.039471	0.042618	0.003146	21,967,189	54,216,873
Coal	11	0.022696	0.022147	0.000549	66,785,947	24,866,749
Non-Metallic Minerals	14	0.043795	0.043905	0.000110	29,828,671	1,420,497
Lumber and Wood	24	0.049427	0.050802	0.001375	26,823,696	31,431,352
Pulp Paper and Prod	26	0.059729	0.063669	0.003941	22,452,612	61,560,821
Coal and Petrol Prod	29	0.052048	0.053737	0.001689	80,071,679	99,968,392
Primary Metal	33	0.053556	0.057749	0.004193	19,922,160	53,565,649
Fabricated Metal	34	0.068262	0.071829	0.003567	549,148	2,973,260
Scrap Materials	40	0.061297	0.063445	0.002148	12,932,832	13,631,449
TOTAL						**343,635,043**

WATER COMPELLED RESULTS



- Results are about one-third as large as 1995 study
- Class I carriers don’t need the traffic
- More local processing of corn and soybeans
- Loss of short-line connections to the river

OTHER SOCIAL EFFECTS (OSE) ACCOUNT

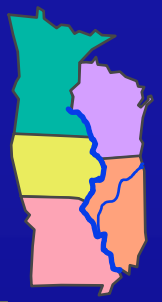


For the Interim Report, OSE examines the improved quality of life that a healthy and sustainable river system offers to the human community.

UMR system is the lifeblood of the Midwest region and central to quality of life.

A healthy, sustainable system provides the goods and services that add to quality of life.

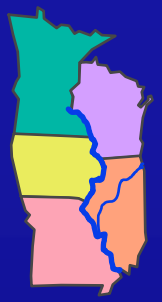
OTHER SOCIAL EFFECTS (OSE) ACCOUNT (Cont'd)



Quality of Life benefits from a healthy, attractive and sustainable river system:

- Recreational opportunities, scenic vistas, other amenities for consumers
- Amenities that generate jobs and income
- Amenities that contribute to community stability and social interaction
- Ecosystem goods and services
- Growth in eco-tourism
- Spiritual, historic, cultural, and artistic resources and values
- Preservation of the system for future generations

EMISSIONS, ACCIDENTS, NOISE, AND VEHICLE DELAY

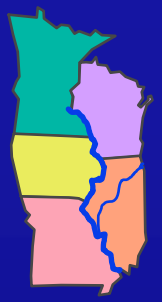


The following information was presented in the Feasibility Study.

This work (Tolliver, 2004) evaluated and quantified impacts of waterway traffic versus rail for the categories of emissions, accidents, noise and vehicle delay at railroad crossings.

The level of input detail and lack of standardized measurement techniques within the Corps preclude these impacts from being considered in the NED formulation process.

EMISSIONS



The change in rail and waterway traffic emissions impacts attributable to an alternative can be quantified by comparing the gallons of fuel consumed in waterway and rail transportation for each alternative.

Emission factors per gallon of fuel consumed can be used in developing the estimates.

The emission of air pollutants is directly linked to fuel consumption.

The general conclusion of the analysis is that there is no evidence to suggest that the potential waterway investments would have a significant beneficial effect on annual fuel consumption.

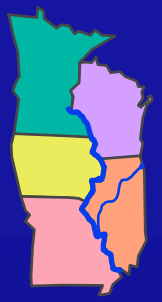
ACCIDENTS

Included in these data are estimates of the differential financial cost of accidents and fatalities resulting from waterway and rail transportation.

A two-step analysis process was followed for both modes: (1) estimate annual accidents, fatalities, and injuries for the incremental traffic; and (2) multiply the annual events by the applicable unit cost per property damage, fatality, or injury.

The projected change (REDUCTION) in accident costs for vehicular traffic is very large.

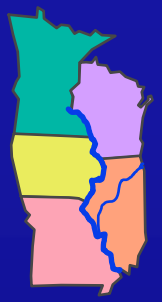
NOISE AND VEHICLE DELAY



The change in rail and waterway traffic noise and other community impacts attributable to each alternative have been evaluated and quantified. Incremental railroad traffic will result in changes in traveler delay at railroad/highway crossings.

A comprehensive analysis of grade crossing delay is beyond the scope of this study. However, several illustrations are presented based on probable routings.

NOISE AND VEHICLE DELAY (Cont'd)

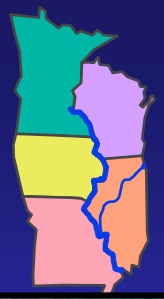


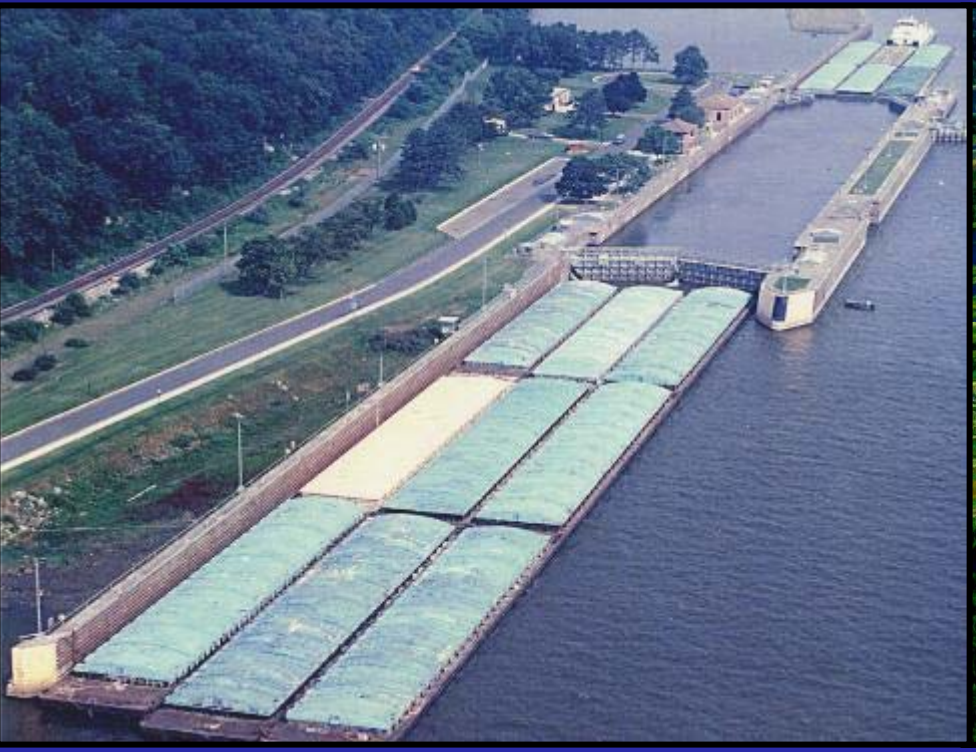
The grade crossing delay and noise analysis procedures use the same database.

Results show moderate reductions in noise levels and vehicle delays.

US Army Corps of Engineers®

Upper Mississippi River System





NESP Reevaluation
Risks, Conclusions, and Recommendations

One Team: Relevant, Ready, Responsive and Reliable

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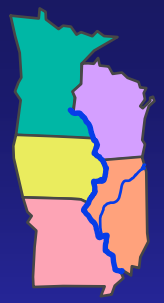
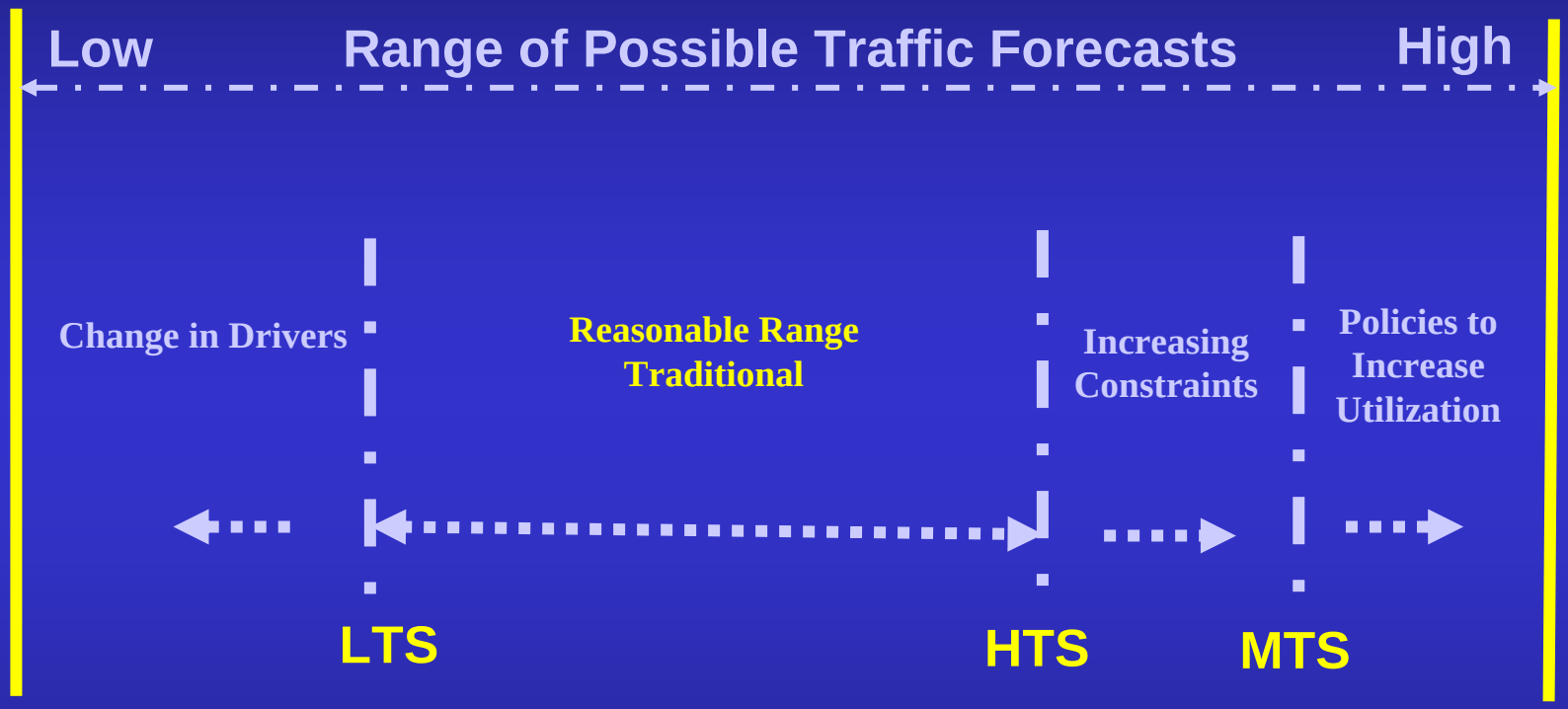
Reevaluation
Risk Framework





Flat or Falling Traffic (MIN)

hIGH System Utilization (MAX)

LTS = Low Traffic Scenario
HTS = High Traffic Scenario
MTS = Multimodal Transportation Scenario

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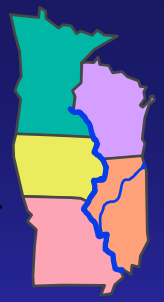
Reevaluation
Considering Risk & Uncertainty



- Seeing RP in greater context
- Evaluating NED under traditional assumptions
- Considering external NED and multimodal
- Considering redundancy benefits
- Considering RED, EQ, and OSE
- Comparing potential consequences with and without

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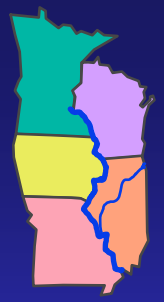
Reevaluation
Preliminary Conclusions



- UMRS is a national symbol
- Public expects sustainable balance
- Investment in transportation needs to increase
- RP meets planning objectives
- RP aligns with national objectives
- Potential gains from implementing RP > risks

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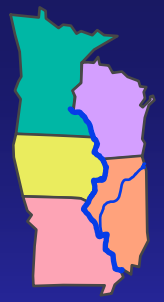
Reevaluation
Preliminary Recommendations



- Endorse dual-purpose RP
- Support additional provisions
- Support efficient funding
- Support coordination & collaboration
- Support innovations
- Support development of multimodal tools

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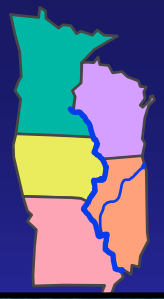
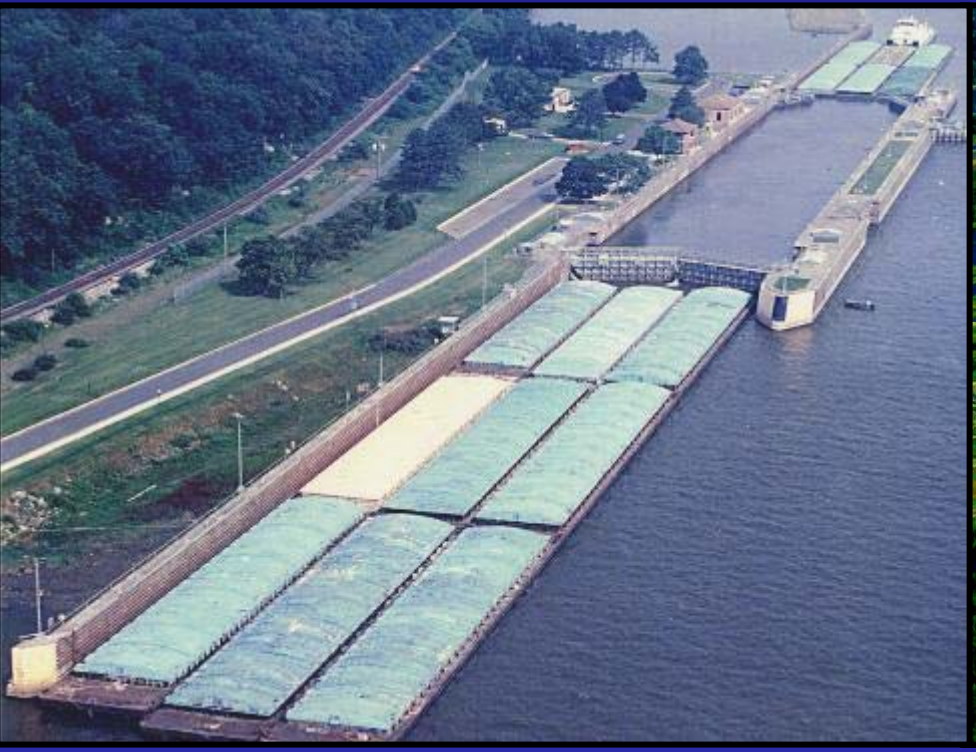
Upper Mississippi River System





To seek long-term sustainability of the economic uses and ecological integrity of the Upper Mississippi River System

One Team: Relevant, Ready, Responsive and Reliable