GLOBAL GRAIN MODEL

AND

SCENARIO DEVELOPMENT

JULY 2007

US ARMY CORPS
OF ENGINEERS
Rock Island District

Global Grain Model and Scenario Development

Background

The Corps of Engineers was charged with developing new models, gathering additional data, and re-evaluating the economics underpinning the recommendations to improve and expand the Lock and Dam system on the Upper Mississippi River system (UMRS). The Global Grain Forecasting Model (GGM) and its applications to the UMRS is one component of the re-evaluation effort.

The Global Grain Model was developed as part of the Corps' Navigation Economic Technologies (NETS) research.[1] The focus of this model is on world grain trade with emphasis on the competitive pressures and structural relationships that are important to the international grain market. The model is also specific with respect to the U.S. forecast grain shipments through the Mississippi River system. The methodology developed is generally applicable to a broad range of commodities and was applied to the grain sector for the study. This model was used to forecast unconstrained UMR/IL Basin traffic.

The GGM was calibrated to the period 2000-2004 using a set of "base case" assumptions applicable to that period of time. Table 1 summarizes the key assumptions of the Base Case.

Table 1
Summary of Base Case Assumptions

Barge System Capacity	Existing
U.S. Rail Capacity	Restricted to base period maximum loadings
Modal Rates	Rail from 2000-2004 average Barge rates from estimates supply functions Ocean rates from regression analysis (PNW vs. Gulf to Asia approximately $5/metric ton)
U.S. Area	Minimum area=100% of recent 3-yr average Maximum area=100% of 2000-2004 base Maximum area switched between crops=7% of 2000-2004 base
Rest of World Area	Minimum area=100% of recent 3-yr average Minimum area for any one crop=88% of base Maximum area=107% of 2000-2004 base Maximum area switched between crops=7% of 2000-2004 base
Ethanol Production	Energy Information Agency (EIA) 2005 projections
China Corn Trade	Exports subsidized to 8 mmt
U.S. Corn Yields	1.6 bushel/acre/year increase – average of the 24 U.S. producing regions

The timeframe for forecasting is long-term covering a 50-year period. To accomplish these forecasts, a spatial framework of world grain trade was developed. The model, which is a large scale nonlinear programming model, has the objective of minimizing costs of world grain trade,

[1] "Longer-Term Forecasting of Commodity Flows on the Mississippi River: Application to Grains and World Trade." 2006. Wilson et. al.

subject to meeting the demands at importing countries and regions, and available supplies and production potential in each of the exporting countries and regions. The model is solved jointly for corn, soybeans, and wheat. Relevant parameters generally fall into the categories of consumption and import demand, export supply, and costs.

For projection of the base case to cover a 50-year period, the following changes to the base case assumptions were made.

U.S. Area Restrictions	Maximum area=107% in 2010 forward
Rest of World Area	Maximum area=107% in 2010 and 2020, 115% in 2030 and 2040, and 121% in 2060
China Corn Trade	Exports = 0

Additional information about the GGM can be found at http://www.nets.iwr.usace.army.mil/inlandnav.cfm.

GGM Workshop (February 2007)[2]

To assist the Corps of Engineers with the economic re-evaluation effort, a workshop was conducted on 14-15 February 2007 in St. Louis, Missouri. Dr. Bill Wilson, principal architect of the Global Grain Model, presented the important attributes, assumptions and outcomes of the model to the 29 participants including state and federal agricultural and transportation agency personnel, NGO representatives for agriculture and the environment, academics from the Peer Review groups, and Corps of Engineers Economic Re-evaluation Project Delivery Team members.

In his presentation, Dr. Wilson highlighted four variables (#1 - #4) that he felt would have a high potential for affecting the output of the GGM. Discussions during the plenary session on the first day of the workshop added seven additional high-impact variables (#5 - #11).

1. Ethanol
2. Yield growth rates
3. CRP lands
4. Rail capacity
5. Rail-barge substitution
6. Non-grain growth
7. Non-grain traffic
8. Barge capacity constraint
9. Panama Canal expansion
10. Delay cost impacts and expansion
11. China yields

On day two of the workshop, two working groups were formed to capture information from the participants on the assumptions and parameter ranges to be used in the GGM, and to identify key concerns. The 11 parameters developed on day one served as starter material for the working group brainstorming of issues. Each group identified their top priority concerns and offered a

[2] "UMRS NESP Navigation Economic Re-evaluation, Navigation Economic Technologies (NETS) Grain Forecasting Modeling and Scenarios Workshop, Final Report," 2007.

descriptive statement of why it was an issue of concern. The five top priority issues and concerns are shown in table 2.

Table 2
Top Five Issues and Concerns

Issue	Concern
Rail capacity	If rail already at capacity, additional grain demand will divert to barge and truck; future expansion of rail capacity is questionable due to limitations
China	Population and corn product consumption will increase; who can supply increased demand
Available acreage	Must consider loss of prime farmland (corn & soybean acreage) to urban development
Ethanol / corn	Ethanol future use is unknown; current ethanol estimates too low; increase in ethanol production capacity will impact corn export needs
Yield growth	Yield is basic variable needed for GGM production and use calculations; factors affecting yield could impact estimated model results

The working groups put considerable effort into the discussion of the ranges of inputs for their high priority variables. It was agreed that the base rates chosen so far for the GGM were reasonable but raised issues that would impact the future high and low projections. The groups' list of parameter value ranges for the high traffic and low traffic scenario development is presented in table 3.

Table 3
Summary of Working Group Estimates of Parameter Value Ranges

Variable	Low	High	Mid or current	Notes
Rail Capacity (million metric tons)	141 low base	170	155 mid	20% increase possible (Corn Growers Assn)
China (million metric tons)	0 imports	market solution	3-5 (USDA)	largest capacity in world but totally dependent on China's import/ export policies
Available Acres (millions of acres)	83 (affected by loss due to urban sprawl)		4 of total CRP available +79 current	current loss rate 0.5 m ac/yr to urban sprawl; consider competition between crops and other land uses
Ethanol/Corn (billion gallons/ year)	14.5 **or** ethanol decreases corn exports but not to zero	need to export ethanol or develop markets for E85; increase ethanol and still meet export needs of corn	current estimates are too low and the model maximums may be too low	peak in the next decade; production efficiencies will grow at a slower rate
Yield (bushels/acre/ year)	1.6	2.0 to blue sky limits	1.6 is current annual increase	past performance may not be indicative of future projections-both positive & negative

The entire proceedings from this workshop can be viewed in Attachment A, "Upper Mississippi River System Navigation and Ecosystem Sustainability Program, Navigation Economic Re-evaluation, Navigation Economic Technologies (NETS) Grain Forecast Modeling and Scenarios Workshop, Final Report."

Grain Model Input Specifications (9 March 07)

Grain model input specifications for the base, low and high traffic scenarios, shown in table 4, were developed based on the February workshop discussions. The parameters and values would become the topic for discussions at the 13 March PDT scenarios meeting.

Table 4
Grain Model Input Specifications

	Scenario		
Input Parameter	Low Traffic	Base Case	High Traffic
U.S. Ethanol Demand	FAPRI (10 billion gal by 2010, 12 billion gal by 2016)	EIA 2006 (9 billion gal by 2015, leveling off at 11 billion gal)	EIA 2005 (4 billion gal by 2015, leveling off at 4 billion gal)
U.S. Corn Yields	1.6 bu/yr increase	1.8 bu/yr increase	2.0 bu/yr increase
Rest of World Corn Yields	—	—	—
U.S. Area	107% of 2002-2004 avg	107% of 2002-2004 avg	102.5% of 2002-2004 avg
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 max car loadings	155 mmt (15% increase in 2000-2004 car loadings)	141 mmt (10% increase in 2000-2004 max car loadings)
China Corn	exports = 8 mmt	imports = 0	unconstrained model solution
Panama Canal	no expansion	expanded by 2020 ($5/mt ocean shipping cost reduction)	expanded by 2020 ($5/mt ocean shipping cost reduction)
UMR-IWW Navigation Infrastructure	expanded	expanded	expanded

Assumptions/Notes:

- All other model inputs are assumed to be equal to the base case described in the December 2006 Global Grain Model Report.
- ProExporter estimate of ethanol production: 9 billion gal by 2010, 11.5 billion gal by 2015.
- NCGA estimate of corn-based ethanol: 12.8 low, 1.59 mid, 17.9 high (billion gal in 2015).
- U.S. corn yields for GGM report base case average roughly 1.6 bu/yr annual increase.

Scenarios Meeting (13 March 07)

The re-evaluation PDT met to discuss the grain model input specifications that were developed following the February workshop. The purpose of this meeting was to reach agreement on the base, low and high traffic scenarios and on the parameter values for each scenario. Since no

probabilities had been assigned to any scenarios, it was decided that there was no value to having an intermediate scenario and it would be reasonable to select the two scenarios that represent the upper and lower bounds. Thus, the base case scenario was eliminated. The values identified by the study team during this meeting will be run as scenarios through the GGM. Table 5 presents the input specifications for low and high traffic. Parameters that changed from the initial list in table 2 are highlighted in bold print.

Table 5
Grain Model Input Specifications
(revisions based on Scenarios Meeting)

	Scenarios	
Input Parameter	Low Traffic	High Traffic
U.S. Corn-Based Ethanol Demand	**EIA 2007** (**11.2** billion gal by **2012**; **13.4** billion gal by **2025**)	**Current production level held constant (5 billion gal)**
U.S. Corn Yields	1.6 bu/yr increase (nat'l avg)1	2.0 bu/yr increase (nat'l avg)2
Rest of World Corn Yields	**GGM base case**	25% increase in GGM base case(3)
U.S. Area	107% of 2002-2004 avg	**107%** of 2002-2004 avg
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 max car loadings)	141 mmt (no change) or 155 mmt (10% increase in 2000-2004 max car loadings)
China Corn	exports = 8 mmt	unconstrained model solution
Panama Canal	no expansion	expanded by 2020
UMR-IWW Navigation Infrastructure	expanded	expanded

Assumptions/Notes:

- All other model inputs are assumed to be equal to the base case described in the December 2006 Global Grain Model Report
- (1) For US corn yields in the Low Traffic scenario, the base case in the December 2006 Global Grain Model Report incorporates production-region-specific yields and yield growth. In aggregate for the US, the base case reflects yield growth of 1.6 bushels per year. Therefore, the base case yields of the report are used to represent the yields for this scenario.
- (2) For US corn yields in the High Traffic scenario, US average yield growth of 2.0 bushels per year represents a 25 percent increase over the base case of the December 2006 Global Grain Model Report. In order to retain production-region-specific yields, base case yields are increased by 25 percent to represent this scenario.
- (3) In the High Traffic scenario, Rest of World Corn Yields are increased over the December 2006 Global Grain Model Report base case yields to reflect the same percentage increase assumed for the US with this scenario. Future genetic modification technology is the basis for assumed increases in the US yields, and this same technology is assumed to be exported to the Rest of World as has been the case with past genetic modification technology.

Traffic Scenarios – Grain (16 March 07)

Following the 13 March team meeting, the revised set of input parameters was modified slightly. Two versions of the traffic scenarios for grain were developed based on the inputs identified as significant with respect to model results. These inputs have been identified as key parameters in developing the traffic scenarios. The scenarios are intended to represent the reasonable upper and lower bound limits of future traffic in the UMR-IWW navigation system. The scenarios will be translated into future unconstrained traffic flows by executing the GGM.

Traffic Scenario 1 assumes no rail capacity increase for the High Traffic Scenario. Changes are highlighted in bold print.

Table 6
Traffic Scenario 1
(no rail capacity-high traffic)

Input Parameter	Low Traffic	High Traffic
U.S. Corn-Based Ethanol Demand	EIA 2007 (11.2 billion gal by 2012; 13.4 billion gal by 2025)	Current production level held constant (5 billion gal)
U.S. Corn Yields	1.6 bu/yr increase (nat'l avg)	2.0 bu/yr increase (nat'l avg)
Rest of World Corn Yields	GGM base case	--
U.S. Area	107% of 2002-2004 avg	107% of 2002-2004 avg
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 max car loadings)	**141 mmt (no change** in 2000-2004 max car loadings)
China Corn	exports = 8 mmt	unconstrained model solution
Panama Canal	no expansion	expanded by 2020 ($5/mt ocean shipping cost reduction)
UMR-IWW Navigation Infrastructure	expanded	expanded

Traffic Scenario 2 assumes a 10 percent increase in capacity for the High Traffic Scenario.

Table 7
Traffic Scenario 2
(10% capacity increase)

Input Parameter	Low Traffic	High Traffic
U.S. Corn-Based Ethanol Demand	EIA 2007 (11.2 billion gal by 2012; 13.4 billion gal by 2025)	Current production level held constant (5 billion gal)
U.S. Corn Yields	1.6 bu/yr increase (nat'l avg)	2.0 bu/yr increase (nat'l avg)
Rest of World Corn Yields	GGM base case	--
U.S. Area	107% of 2002-2004 avg	107% of 2002-2004 avg
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 max car loadings)	155 mmt (**10% increase** in 2000-2004 max car loadings)
China Corn	exports = 8 mmt	unconstrained model solution
Panama Canal	no expansion	expanded by 2020 ($5/mt ocean shipping cost reduction)
UMR-IWW Navigation Infrastructure	expanded	expanded

Regional Principals Teleconference (20 March 07)

A teleconference was conducted on 20 March 2007 to review the parameter inputs for Low and High Traffic Scenarios developed for use in the GGM. Participants included: Nick Marathon (DA), Rick Nelson (FWS), Al Fenedick (EPA), Bob Goodwin (MARAD), Terry Smith (ACE), Ken Barr (ACE), Scott Whitney (ACE), Mark Haab (ACE for Rich Manguno), Chuck Spitzack (ACE).

The meeting presentation focused on the background of inputs, assumptions and decisions made leading to the traffic scenarios for grain that would be considered for inclusion in the Interim Report. Discussion resulted in revisions to the input specifications that are highlighted in bold print in table 8 below.

NESP Draft Scenarios of GGM (23 Mar 07)

Following the 20 March Regional Principals teleconference, all NECC/ECC and UMRBA members were informed of the developments to date regarding the scenarios. The current proposal was to develop and use only two scenarios in the GGM, a reasonable lower bound (Low Traffic Scenario) and a reasonable upper bound (High Traffic Scenario), to bracket expectations. Values for two of the parameters are not yet fully resolved: 1) Rest of World Corn Yields for the High Traffic Scenario; and 2) U.S. Rail Capacity available for grain for the High Traffic Scenario.

A third scenario is being formulated to investigate the potential constraints and changes in the national transportation network during the period of analysis that might impact on utilization of the UMR-IWW. This won't be analyzed using NETS models and won't be done to the same level of rigor, but the results will be considered in reaching conclusions and making a recommendation.

This revised Grain Model Input Specification table was sent to the NECC/ECC and UMRBA members.

Table 8
Grain Model Input Specification

Input Parameter	Low Traffic	High Traffic
U.S. Corn-Based Ethanol Demand	EIA 2007 (11.2 billion gal by 2012; 13.4 billion gal by 2025)	current production level held constant (5 billion gallons)
U.S. Corn Yields	1.6 bu/yr increase (nat'l avg)	2.0 bu/yr increase (nat'l avg)
Rest of World Corn Yields	GGM base case	**---**
U.S. Area	107% of 2002-2004 average	107% of 2002-2004 average
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 maximum car loadings)	**TBD (141** mmt**-155 mmt**; **0%-**10% increase in **2004** maximum car loadings)
China Corn	exports = 8 mmt	unconstrained model solution
Panama Canal	no expansion	expanded by 2020 ($5/mt ocean shipping cost reduction)
UMR-IWW Navigation Infrastructure	expanded	expanded

Notes:
1. All other model inputs are assumed to be equal to the base case described in the December 2006 Global Grain Model report.

2. TBD = To Be Determined. Values for these items are still being explored.
3. All values subject to change based on additional information and consultation.

Assumptions, by input parameter, used for Low and High Traffic Scenarios:

- US Corn-Based Ethanol:
  - High Traffic scenario does not assume that total ethanol production is limited to corn-based production.
  - Total ethanol production is assumed to include rapid implementation of non-corn sources.
- US Corn Yields:
  - Long-term national average for growth in corn yield of 1.6 bushels per acre is assumed to represent the Low Traffic Scenario.
  - High Traffic Scenario assumed to be 2.0 bushels per acre, a 25% increase over the long-term national average.
- Rest of World Corn Yields:
  - Acceleration in recent US yield growth is driven primarily by bio-technology and the availability of this technology is not restricted to the US.
- US Area:
  - Assumptions of December 2006 GGM report for the base case retained for both the Low and High Traffic Scenarios.
  - Potential restriction in expansion of allowable acreages as a result of urbanization is being investigated.
- US Rail Capacity:
  - Potential increases in capacity are with respect to capacity available for the transport of grain.
- China Corn
  - Low Traffic Scenario model constraint of export = eight million metric tons is a continuation of recent China trade policy.
  - High Traffic Scenario does not force an outcome by means of a model constraint; trade determined by China's relative competitiveness with the rest of the world.
- Panama Canal
  - Lower ocean shipping costs resulting from an expanded canal are assumed to generate a savings of approximately $5 per metric ton.
- UMR-IWW Navigation Infrastructure:
  - Assume twelve 1200-foot locks on the UMR-IWW navigation system.

Follow-on discussions between the PDT and the model developers resulted in the finalization of two pieces of data in table 6 that were listed as uncertain: Rest of World Corn Yields-High Traffic assumed a 25 percent increase; and U.S. Rail Capacity-High Traffic assumed the 155mmt value. These changes were documented in the memo titled "NESP Interim Report Traffic Scenarios-Grain" dated 25 April 2007 which was disseminated to the NECC, ECC and UMRBA members. The final grain model input specifications are shown in table 9.

Table 9
Final Grain Model Input Specifications

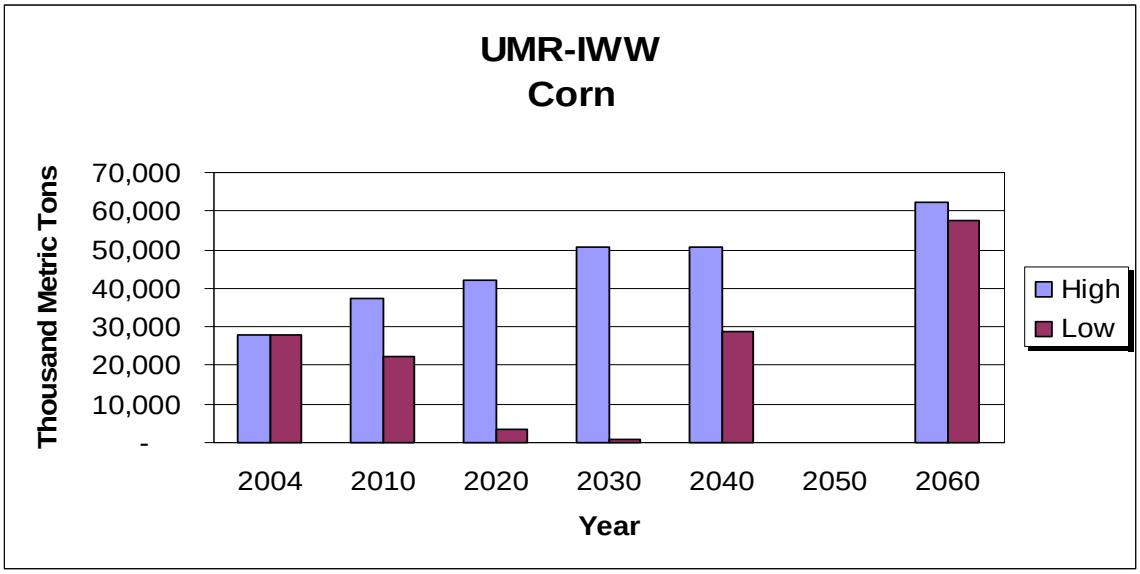
	Low Traffic	High Traffic
U.S. Corn-Based Ethanol Demand	EIA 2007 (11.2 billion gallons by 2012 and 13.4 by 2025)	Current product level held constant (5 billion gallons)
U.S. Corn Yields	1.6 bushels/year Increase (National Average)	2.0 bushels/year Increase (National Average)
Rest of World Corn Yields	GGM Base Case	25% increase in GGM base case
U.S. Area	107% of 2002-2004 average	107% of 2002-2004 average
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 maximum car loadings)	155 mmt (10% increase in 2004 maximum car loadings)
China Corn	Exports = 8 mmt	Unconstrained model solution
Panama Canal	No expansion	Expanded by 2020
UMR-IWW Navigation Infrastructure	Expanded	Expanded

Note: All other model inputs are assumed to be equal to the base case described in the December 2006 Grain Model report.

Traffic Output From the Global Grain Model (GGM)

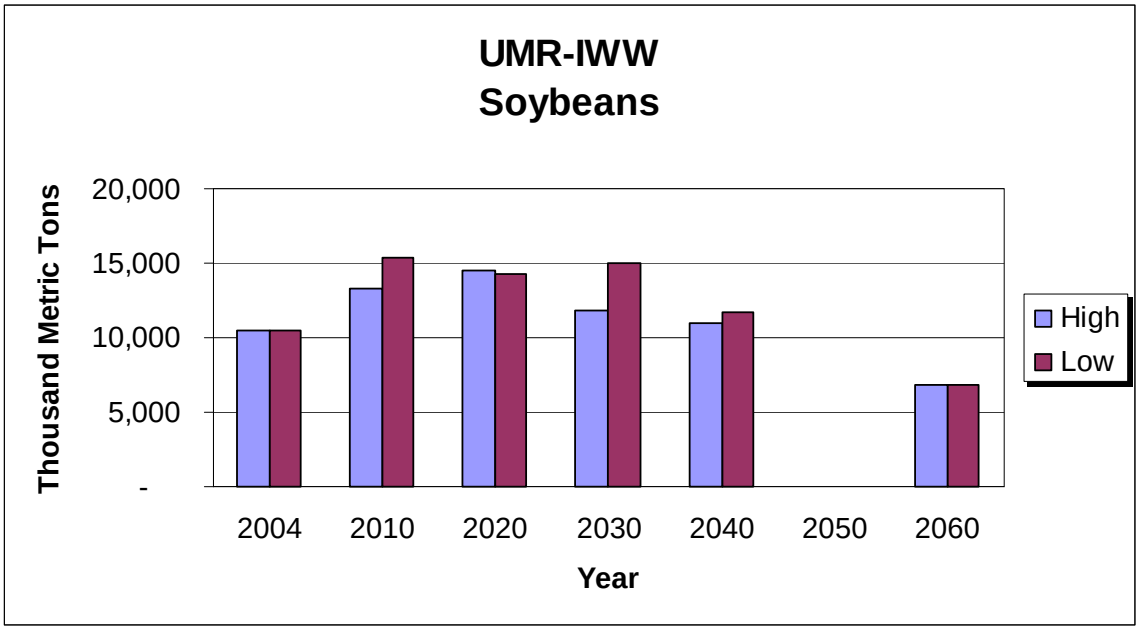
The following tables present output from the GGM for low and high scenarios, by commodity, for the years that the model was run. Tonnages were aggregated for all reaches. These outputs represent unconstrained corn, soybean and wheat traffic. Unconstrained non-grain traffic is presented in "NESP Economic Evaluation Waterway Traffic Forecast for Non-Grain Commodities", May 2007. Total unconstrained traffic is input to the survey model for each year that the survey model is run.

Table 10
Unconstrained Corn Traffic



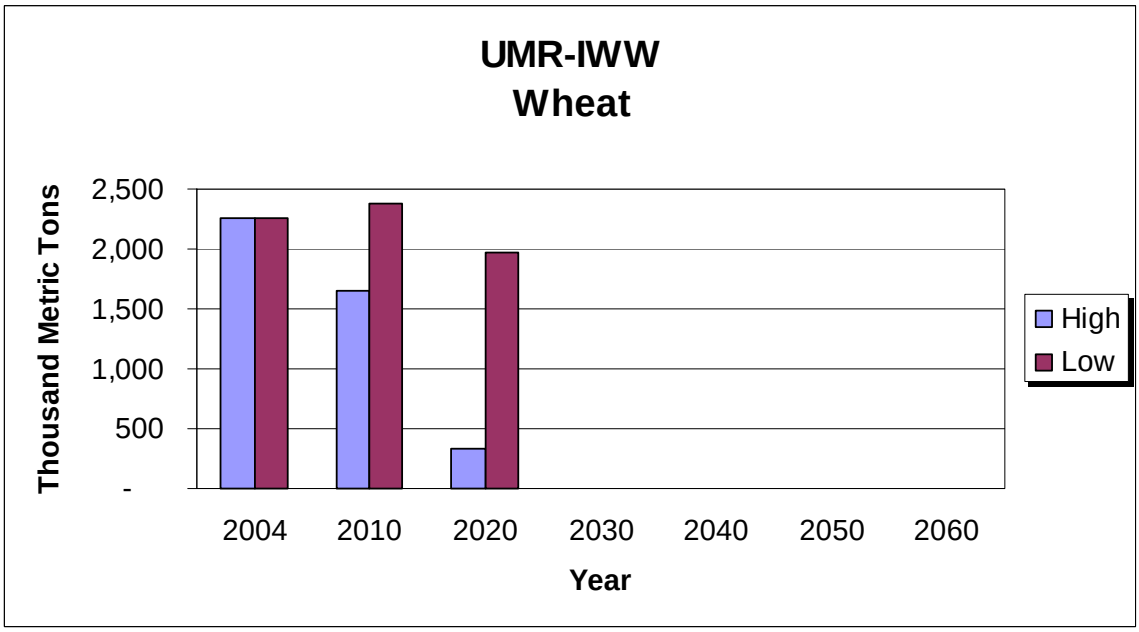
Note: Model not run for year 2050.

Table 11
Unconstrained Soybeans Traffic



Note: Model not run for year 2050.

Table 12
Unconstrained Wheat Traffic



Note: model not run for year 2050.

References:

1. Dr. William Wilson, Eric DeVuyst, Richard Taylor, Bruce Dahl and Won Koo. Longer-Term Forecasting of Commodity Flows on the Mississippi River: Application to Grains and World Trade. December 2006. IWR Report 06-NETS-R-12.

2. Upper Mississippi River System Navigation and Ecosystem Sustainability Program, Navigation Economic Re-evaluation, Navigation Economic Technologies (NETS) Grain Forecast Modeling and Scenarios Workshop, Final Report. February 2007.

PDT Conference Call (10 Jul 07):

The PDT reviewed the draft Global Grain Model and Scenario Development Report during the 10 July phone conference. The following meeting minutes capture that discussion.

Navigation and Ecosystem Sustainability Program
ECC Conference Call
July 10, 2007
8:30-9:30am

Call-in Attendees:

Chuck Spitzack, MVR	Rich Astrack, MVS	Ken Barr, MVR
Rich Worthington, HQ	Mark Beorkrem, NIC	Dick Lambert, MN DOT
Barb Naramore, UMRBA	Brad Walker, PRN	Rich Manguno, MVN
Jeff McGrath, MVP	Rebecca Soileau, MVP	David Kelly, MVS
Susan Wilson, MVS	Jack Carr, MVR	Scott Whitney, MVR
Sharryn Jackson, MVR	Katie Nelson, MVR	

Minutes:

1. Global Grain Model and Scenario Report
    - Jack Carr gave purpose of call: to discuss global grain model and scenario report. Also, to give progress of Economics products.
    - Chuck Spitzack will be sending out the schedule for preparation of interim report and schedule for review and comments.
    - Distribution date of the Draft Economic Re-evaluation report is 15 AUG 07.
    - Comments need to be received by 7 SEPT 07 to be included in report. All comments due 15 SEPT 07, (30 days after distribution of the draft report). Your comments will be characterized in a letter report.
    - If there are comments made earlier that weren't adequately addressed please repeat those comments so they become part of formal comment process.

GGM and Scenario Report:

Spitzack: Please submit comments in writing on scenario report to Jack Carr.

Brad Walker: We were looking for specific references to studies and specific names in organizations that had input into table 9 (Scenario Report, Final Grain Model Input Specifications). They were not included in the report. Are they going to be included in the report? Two areas of concern: corn yields and US area of crop land: where did those variables come from?

Manguno: Yields (low traffic scenario corn) are a result of historical trend of yields for US and for other producing regions in world. Number you see for US, 1.6 bushel per year increase, is not actual value used. It's a way to describe what is captured in model. It's a national average. Country is broken up into a number of producing regions in model. Aggregate= 1.6 bushels per acre per year increase. High traffic scenario corn of 2.0 bushels per acre per year increase is based on a shorter term period of record that is reflective of some higher growth. Also, a higher number was suggested by National Corn Growers. That's the source of those two values. Just like in the low, 2.0 isn't a particular value used. Model is run on particular values for each region.

Walker: My concern is these are optimistic and short term. They are heavily dependent on usual conditions and don't take into account water and nitrogen availability, and erosion. They are really just forecasts of business as usual for 50 years. Low traffic is essentially the

same. None of these negative possibilities are considered in model and they are highly likely.
Walker: We have reached a tipping point. Nitrogen up to $500/ton. Issue of oil shortages over 50 years not considered in model.
Lambert: We don't have wind power in model either do we?
Walker: How do you produce nitrogen fertilizer from wind?
Lambert: It takes place of generating power from electricity.
Barr: I don't believe Wilson considered oil constraints as part of his forecasts.
Walker: Did he include soil fertility problems, water issues, loss of soil from erosion, and fact that a lot of prime farm land is being lost and will bring down yield averages.
Carr: That is one opinion. Dr. Wilson used the idea that the future is continuation of past.
Walker: As for acres that's not true. A couple hundred million acres of farmland lost in 50 years. (This was actually 55 years from 1950 when there were 1,159 million acres of land in farms, approximately the peak. By 2005 this had dropped to 933 million acres (226 million acre change). This is from USDA information. The last 25 years is confirmed by the graph added in the addendum to these meeting notes. Land in farms includes Cropland, Pastureland and Rangeland. Cropland is what we should really be concerned about.) You are predicting 0 land lost in next 50 years- that's unrealistic.
Barr: In terms of yield – base case-does summary document state 1.6 is what Wilson used as historic trend?
Carr: Participants in workshop suggested 4% high traffic.
Manguno: I don't remember 4 % number.
Barr: National Corn Growers talked about increase in corn yields 2% for low and 4% for high traffic scenarios. This refers to growth in corn yields. See National Corn Growers comments attached to Scenario Report.
Walker: If you use 2% or 4% annual growth compounding results in very large yields. 150 bu/acre compounded for 50 years at 4% results in yield of 1100 bu/acre. Corn grower representative tells us we should expect 1100 bushels per acre. Is that a reliable source? I know you didn't use that in the model but that is what they are saying.
???: Do you have that in published literature?
Walker: That is what the Corn Growers said in the scenario development report.
Beorkrem: Jack, what kind of comments did you get on this from EPR?
Carr: None.
Beorkrem: What about comments they made on GGM itself?
Spitzack: We will characterize comments to date as part of the interim report. The EPR Panel is sending a final report on their review in October 2007.
Beorkrem: You won't use their comments in the re-evaluation study?
Spitzack: We have used their comments through workshops and meetings. The draft report is the first document for formal review. We have gotten pieces out to people but comments need to be done in context of the review in whole.
Beorkrem: We won't see comments until 15 August draft review or October?
Beorkrem: So you have their comments but we don't.
Spitzack: We have comments on products but not whole report.
Barr: We have no final panel comments.
Beorkrem: Other than participation in February and June workshops, they have not formally reviewed scenarios?
Carr: No, our intent was to send them what we have distributed to you (Scenario Report) along with notes summarizing discussions today. We will include your input in the Scenario Report that we send to the Peer Review Panel.
Barr: Can we move on to US area and production? 107% low and high traffic.
Manguno: Yes, that was the base case assumption.

Walker: Is this 107% of 2004 corn crop land or all crop land, or all farmland?
Barr: Grain Forecast is all grains including corn and soybeans. Cropland is all tillable acreage.
Manguno: This would be an increase in acreage devoted to corn, soybeans, and wheat in total. Doesn't include pasture.
Walker: Then that means you have all this crop land for 50 years remaining constant that is literally impossible; you disregard any farmland loss due to conversion to other uses. I find that hard to believe considering history.
Manguno: This number is not based on history. The increase of whatever the stated percentage is doesn't happen automatically. That 7% value is an allowable increase as the model tries to solve. It will allow it to go up by 7% in attempt to find equilibrium. In case of these two scenarios I think it's the case that you wind up using the 7%. You probably do it fairly early in the time sequence. It's amount allowable for an increase. The model doesn't automatically put it into production.
Walker: Assuming most coming from CRP program. You have an upper number of 107%, but your base is constantly decreasing.
Barr and Jackson: You're talking about urban expansion. We have been working with this. In Illinois we were able to come up with a figure of 0.1% crop land affected by construction in 2004. The amount of Illinois land in farming has declined at an average rate of approximately 10,000 acres per year since WW2. Land in farms for Iowa has decreased about 10% from 1950-2005.
Walker: 19 year period 70 million acres lost national cropland acres. Vast majority of crop land acres are in Midwest land that grows grain. Then you can look at prime farmland. Generally losing at least same percentage- it's located in best areas for development.
Beorkrem: High traffic scenario and ethanol: the high traffic level held constant US corn-based ethanol demand at 5 billion gallons. I assume high traffic scenario held constant means ethanol produced from other crops. Wouldn't appear US area any allowance made for other crops taking land away to produce 25-30 billion gal of ethanol that would come from cellulose. That crop land would come from same area of crop land.
Whitney: Not necessary- one of greatest sources for cellulose is biomass left in field.
Walker: When you take that off the ground you decrease yields- more fertilizers needed.
Barr: What Mark said is we keep corn-based ethanol at 5 billion gallons- and there is nothing happening that would take corn area and turn to switchgrass. Crop area is not being expanded within study area.
Manguno: It's not saying anything about ethanol that's not corn based. It's produced or isn't. If it is produced, than it isn't being produced as an expense of acres devoted to grain.
Beorkrem: Some kind of allowance needs to be made for land use for ethanol production (other than corn based). If we are using field fodder, that is model-able also.
Spitzack: For high scenario, 5 billion gal ethanol production and not assuming increases from other sources.
Beorkrem: On face of it model is false.
Worthington: We are not necessary limiting replacement of corn ethanol to cellulose ethanol. There are other possibilities: policy shifts, food vs fuel debate, reducing tariffs on foreign sources of ethanol, and sugar cane ethanol, variety of possibilities that are not all in cellulose ethanol replacement category.
Beorkrem: That's a possibly Rich, but it goes a long distance away from past practice of Corps of Engineer's in not trying to anticipate policy shifts. We can guest-imate large amounts of cotton acres shifting but we need to work with some realities. Taking current production level of corn based ethanol and not allowing for any decrease in acreage because of shift in crops- you leave yourself open.
That implies we will be exporting corn and importing ethanol.

Beorkrem: Rest of world shifting from soybeans to corn also. World reacts and that will have an impact on acreage worldwide. When you set yourself up to develop model like this and have scenarios that are little strange. That is why I want to see peer review comments from experts.
Carr: If you'd like to submit additional written comments that we can include in this report they need to be in by 7 SEPT for inclusion in letter report.
Barr: Workshops and dialogue have been for benefit of everyone understanding what we are doing.
Beorkrem: So at this point scenarios are fixed?
Spitzack: Yes, we had to proceed with analysis using scenarios as developed to date based on input from contractors and workshops.
At this point Beorkrem left the conference call.
Spitzack: The report coming out 15 Aug 07 is for internal review. Stakeholders, NECC/ECC, and EPR will be receiving this document for formal review at the same time.

2. Progress on Economic Products (Carr)
   - Products that have been sent to ECC: Global Grain Model, Demand curves for Ag commodities and Non-Ag, Non-grain Traffic Forecast from Louis Berger, Rail Capacity and Water Compelled rates by Mark Burton.
   - Remaining products for external peer review group are scenario report with summary of today's discussion, and draft interim report.

Barr: Sharryn Jackson has been looking at prime farmland data, will let us know about other sources, Brad?
Walker: Suggest you contact American Farmland Trust Office in DC. Check their website. USDA, NRCS, & NASS (they are an agency of Department of AG). Last US Agriculture census done in 2002. Latest one will be done this year. Won't have data for a year or two. Trend lines show an increasing rate of farmland loss since the 1980's.
Carr: We will research and make EPR aware.
McGrath: Are there any land use experts on that panel? Darryl Ray from University of Tennessee -Ag Economics. Steve Fuller has a background in modeling of transportation of Ag commodities. He's familiar with producing and consuming regions.
Walker: I would suggest getting a geographer.
Carr: Our contact from USDA is Nick Marathon. He would be our starting point.
Lambert: That's a good point Brad made: decrease in farmland- how does that impact our exports of grain?
Walker: There's really no supply side analysis in model. It's demand and distribution. If you are going to model AG in US you need to model all of it. A lot of considerations that need to be made that aren't.
Carr: The model does have producing regions (supply-side). Appreciate your well stated comments.

3. What's Next: (Soileau)
   - Stakeholder and EPR meeting in Aug or Sept 2007 on Draft report.
   - Meeting will be similar to last meeting where we had presentations and you get a chance to ask questions. This meeting will focus on draft report. Tentative: St. Paul Tues and Wed, Aug 29-30 noon to noon. It may be in Bloomington. Not finalized yet. Rebecca Soileau will get logistics out next week.

Lambert: On Aug 28-29 the St. Paul District has a River Resources Forum. Could they shift it so we don't have conflicts? There are others in WI and IA that want to attend both.

Barr: NECC/ECC Meeting August 22, 2007 LaCrosse, Wisconsin
Radisson Hotel
200 Harborview Plaza
LaCrosse, WI
608-784-6680

- Proposed agenda: combined environmental and economics meeting and go through results from interim report. If you have comments or additional items we need to address let Jack and Ken know.
- UMRBA August 21, NECC/ECC August 22, EMPCC August 23.

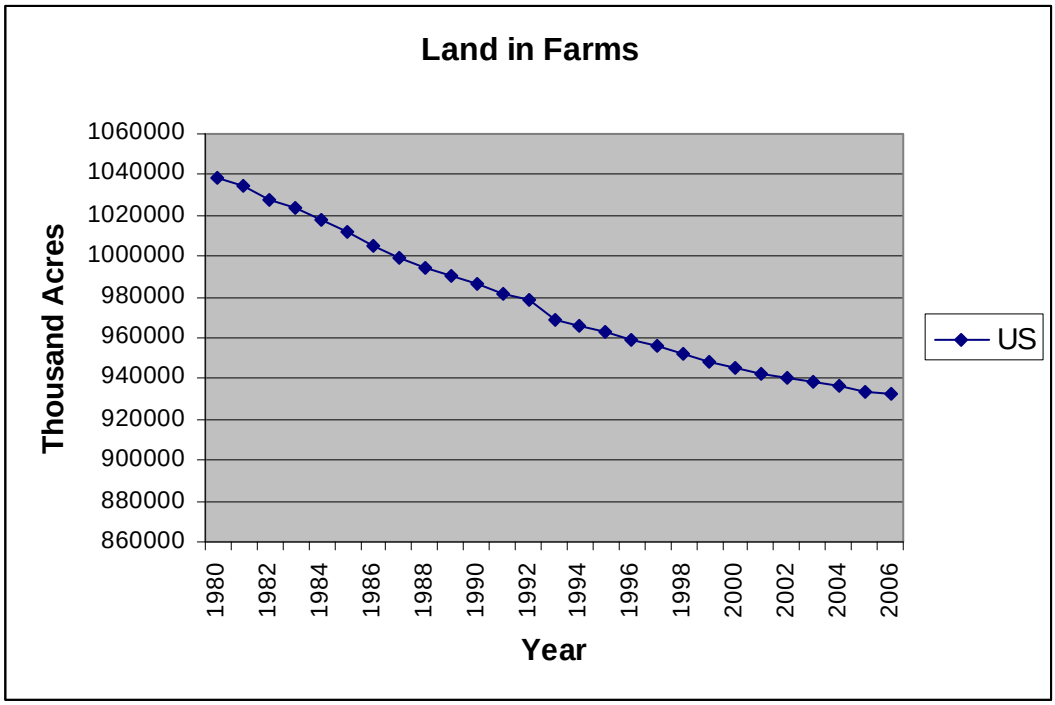
4. Around-table closing comments:

Jeff McGrath: Question- regarding concerns from stakeholders- is there any value in making additional model runs to address their questions on input variables? Directed to Spitzack or Manguno.
Spitzack: That needs to be part of formal comments to recommend additional runs and see if it's important. These comments will be considered in recommendations for the final report in December.
Manguno: At this point we are challenged to wrap up what we have done so far. There is no chance to re-run new scenarios and include them in ASA report.

No other comments.
9:30 end conference call.

Addendum:

As a follow-up to the discussion on farmland loss due to conversion to other uses, the American Farmland Trust (www.farmlandinfo.org) and US Department of Agriculture (www.nass.usda.gov) websites were searched for additional information. Historical data (1980-2006) for land in farms for the United States and for the states of Illinois and Iowa was obtained from the USDA site. Similar information was found on the American Farmland Trust site. Data shows an 11.4% decline in acres for the US, and 5.5 % and 7.3 % for Illinois and Iowa, respectively, as shown in the graphs below.


Land in Farms
Thousand Acres
1060000
1040000
1020000
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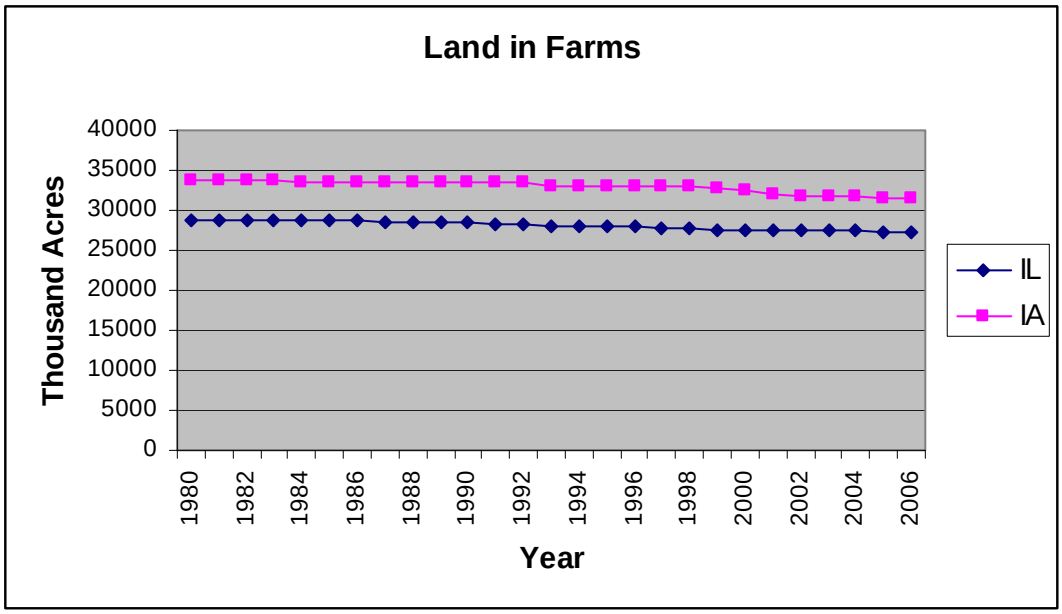
US


Land in Farms
Thousand Acres
40000
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1980
1982
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1988
1990
1992
1994
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1998
2000
2002
2004
2006
Year
IL
IA

Comments Received to Date:

1. From: bwalker@prairierivers.org [mailto:bwalker@prairierivers.org]
Sent: Monday, June 04, 2007 8:34 AM
To: Astrack, Richard F MVS; Carr, John P MVR
Cc: Barr, Kenneth A MVR; Spitzack, Charles P MVR; Beorkrem,Mark

Subject: UMR-IWW System Navigation Study, Traffic Scenarios Grain

In the May 2007 NECC-ECC meeting we were advised that assumptions used to establish the values for the LTS and HTS Grain Model Input Specifications would be made available for review. We have not as yet received this information. Please provide the information as soon as possible so that we will have adequate time to review it.

Also, it would be very helpful if you will include references to all studies or data, as well as direct input from organizations, that were utilized in establishing these values.

Your prompt attention to this request will be appreciated.

Thank you,

Brad Walker
Prairie Rivers Network
Upper Mississippi River Restoration Coordinator
(618) 541-0778

2. From: Max Starbuck [mailto:starbuck@ncga.com]
Sent: Tuesday, May 22, 2007 4:40 PM
To: Spitzack, Charles P MVR
Cc: Lisa Kelley

Subject: NESP Study

Chuck here is the thoughts regarding the NESP Response. The yield expressed as a percent rather than a set bushel is probably the one item to stress but all have a direct effect on corn on the river. Our thinking is included in the paragraph to which it pertains [see attachment 1 below].

Thanks and see you tomorrow.

Max Starbuck
Director Production, Stewardship and Livestock
National Corn Growers Association
632 Cepi Drive
Chesterfield, MO 63005

Attachment 1:

NESP Interim Report
Traffic Scenarios – Grain
25 April 2007

Two traffic scenarios are currently being considered for inclusion in the Interim Report. These scenarios are intended to represent the reasonable upper and lower bound limits of future traffic on the UMR-IWW navigation system. The scenarios will be translated into future traffic flows by executing the Global Grain Model (GGM.)

A number of GGM inputs have been identified as significant with respect to model results, as well as possessing a meaningful degree of uncertainty regarding their specification. These inputs have been identified as key parameters in developing the traffic scenarios. The following table identifies key input parameters, and values, for each scenario. (Note: A summary of the GGM is provided in a separate document.)

Grain Model Input Specification		
	Low Traffic	**High Traffic**
U.S. Corn-Based Ethanol Demand	EIA 2007 (11.2 billion gallons by 2012 and 13.4 by 2025)	Current Product Level Held Constant (5 billion gallons)
U.S. Corn Yields	1.6 bushels/year Increase (National Average)[1]	2.0 bushels/year Increase (National Average)[2]
Rest of the World Corn Yields	GGM Base Case	25% increase in GGM base case[3]
U.S. Area	107% of 2002-2004 average	107% of 2002-2004 average
U.S. Rail Capacity	169mmt (20% Increase in 2000-2004 Maximum Car Loadings)	155mmt (10% Increase in 2004 Maximum Car Loadings))
China Corn	Exports = 8mmt	Unconstrained Model Solution
Panama Canal	No Expansion	Expanded by 2020
UMR-IWW Navigation Infrastructure	Expanded	Expanded
Note: All other model inputs are assumed to be equal to the base case described in the December 2006 Global Grain Model report.		

U.S. Corn-Based Ethanol The Low Traffic Scenario assumes the 2007 Energy Information Administration, U.S. Department of Energy ethanol forecasts. Corn-based ethanol production is assumed in this scenario. The High Traffic Scenario assumes that corn-based ethanol production will not exceed current levels. However, the High Traffic Scenario does not assume that total ethanol production is limited to corn-based production. In addition to corn-based production, total ethanol production is assumed to include rapid implementation of non-corn sources.

NCGA has concerns with the High Traffic Scenario assumption that corn-based ethanol production will not exceed current levels to be flawed. Current production is at 6 billion gallons per year. Another 6.1 billion gallons of capacity are under construction, meaning ethanol production levels will top 12 billion gallons by 2010. We further expect ethanol production to grow to approximately 14.5 billion gallons in subsequent years. While we expect continued rapid growth in the amount of corn used for ethanol in the next 5-7 years, we do not expect significant decreases in corn export volumes. A number of public long-term projections (including USDA and FAPRI baselines) project export volumes receding only slightly in the next 2-3 years, but rebounding to the 2 billion bushel-

plus level by 2010/11. Increased corn production, through higher yields and expanding acreage, is likely to satisfy growing demand from ethanol production while still satisfying traditional demand commitments.

U.S. Corn Yields The base case in the December 2006 Global Grain Model report incorporates production region specific yields and yield growth. In aggregate the long-term national average for growth in corn yields has been approximately 1.6 bushels per year. Over a more recent historical period, corn yield growth has been higher. Consequently, the longer term historical national average is assumed to represent the Low Traffic Scenario while the High Traffic Scenario is assumed to be 2.0 bushels per acre, a 25% increase over the long-term national average.

I am not sure that corn yields should be expressed as a set bushel for a given year. This does not allow yields to reflect compounding effects over the prior year. NCGA has looked at trend yield in different periods and feels a shorter trend line time is more accurate due to several production and genetic factors as reflected:

35 year trend line – corn production 164 bu/ac by 2015

15 year tend line - corn production 174 bu/ac by 2015 (USDA abandoned 30 year trends in favor of starting with 1990)

10 year trend line – corn production 177 bu/ac by 2015

5 year trend line – corn production 200 bu/ac by 2015 (seed industry favors as they see their research)

NCGA feels the 10 year trend is relevant as the first biotech harvested seeds was 1995.

Suggestion (from base year national average yield 149 in 2006 crop year):

Low Scenario annual increase ~~2%~~ ***- Corrected to 1.7% (352 bu in 50 yrs)***

High Scenario annual increase ~~4%~~ ***- Corrected to 2.2% (452 bu in 50 yrs)***

Rest-of-World Corn Yields The Low Traffic Scenario assumes the base case values contained in the December 2006 GGM report for each non-U.S. production region. These values are based on trend analysis. For the High Traffic Scenario yields are increased over the December 2006 Global Grain Model report base case yields to reflect the same 25 percent increase assumed for the U.S. Acceleration in recent U.S. yield growth is driven primarily by bio-technology and the availability of this technology is not restricted to the U.S.

U.S. Area The assumptions of the December 2006 GGM report for the base case have been retained for both the Low and High Traffic Scenarios. Note that potential restriction in expansion of allowable acreages as a result of urbanization is being investigated.

Since the General Meeting in December, US corn acreage has gone well past the 107% annual increase. Up from 78.3 million planted acres in 2006 to projected plantings by USDA of 90.5 million acres in 2007, the annual increase percentage exceeded set levels. USDA and others anticipate continued growth in corn acres to steadily climb to meet increasing demand. When we start projecting the annual increases over the timeframe, the 107% is probably low but not enough to take issue with.

U.S. Rail Capacity The base case contained in the December 2006 GGM report restricts total U.S. rail capacity to the single-year maximum rail car loadings observed during the period 2000-2004. To account for the fact that this value is not strictly a capacity, but rather an observed flow, and to allow for the fact that rail capacity is not likely to be permanently restricted to existing levels, some

increase in the GGM base case assumption was assumed for the Low Traffic Scenario (20% increase) and is also being considered for the High Traffic Scenario (10%). Note that potential increases in capacity are with respect to capacity available for the transport of grain.

China Corn The Low Traffic Scenario includes a model constraint that requires China to export corn in the amount of eight million metric tons. This would be a continuation of recent China trade policy. Alternatively, the High Traffic Scenario does not force an outcome by means of a model constraint. Rather, China trade with this scenario will be determined by the model based on China's relative competitiveness with the rest of the world.

Panama Canal In 2006 a Panamanian referendum was passed that endorsed expansion of the canal. Once begun, construction is expected to take 10 years. The effect of an expanded canal would be to lower ocean shipping costs, primarily by allowing vessels that currently must light-load to increase their loads. A savings of approximately $5 per metric ton is assumed. Note that this savings is not reduced to account for an expected toll increase to finance the canal because the toll is assumed to be in place only for the duration of the construction period. The High Traffic scenario assumes that canal expansion will be accomplished by 2020. The Low Traffic scenario assumes that expansion will not occur.

UMR-IWW Navigation Infrastructure The intended use of the GGM for purposes of the Interim Report is to develop a set of unconstrained traffic flows. Unconstrained in this context means unconstrained by increases in future water congestion associated with increased levels of waterway traffic. Consequently, both the Low and High traffic scenarios assume expansion (twelve 1200' locks) of the UMR-IWW navigation system.

3. From: bwalker@prairierivers.org [mailto:bwalker@prairierivers.org]
Sent: Thursday, July 12, 2007 10:18 AM
To: Manguno, Richard J MVN; Astrack, Richard F MVS
Cc: mbeorkrem@hotmail.com
Subject: GGM Data

Thank you for holding the NECC/ECC telecon on Tuesday July 10, 2007. Upon reflection of the discussion held regarding two of the scenarios variables, specifically U.S. Corn Yields and U.S. Area we are requesting some specific model run information to assist in our evaluation of the GGM. These include:

1. The total cropland calculated for all grains per year for both LT & HT scenarios
2. The total production calculated for all grains per year for both LT & HT scenarios
3. The average yield calculated for all grains per year for both LT & HT scenarios
4. The export volume on the UMR for all grains per year for both LT & HT scenarios

We would prefer this information in a summary format but if you have the regional information available this would be helpful as well. This information is essential for us to provide comprehensive comments to you by the September 7, 2007 deadline and we will need about a month to analyze it. Your prompt attention is requested.

If we have additional informational requests we will provide them as soon as possible.

Thank you,

Brad Walker
Prairie Rivers Network
Upper Mississippi River Restoration Coordinator
(618) 541-0778

Response:

From: Manguno, Richard J MVN
Sent: Monday, July 16, 2007 7:56 AM
To: bwalker@prairierivers.org; Astrack, Richard F MVS
Cc: mbeorkrem@hotmail.com; Carr, John P MVR; Spitzack, Charles P MVR; Barr, Kenneth A MVR
Subject: RE: GGM Data

Brad,
Requested info is attached. [Excel workbook]

Rich Manguno

Corn (units in hectares)

Sum of Harv Area	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	2,396	2,463	2,530	2,596	2,245	2,397	2,464	2,530	2,597	2,730
USCPR	1,947	2,001	2,056	1,735	1,824	1,947	2,002	2,056	2,110	2,219
USD	552	568	583	598	629	552	568	583	599	629
USIAR	1,701	1,748	1,796	1,843	1,594	1,701	1,749	1,796	1,844	1,938
USIAW	4,165	4,281	4,397	4,513	3,903	4,166	4,282	4,398	4,514	4,746
USILN	3,484	3,581	3,679	3,776	3,934	3,485	3,582	3,679	3,777	3,971
USILS	2,038	2,095	2,152	2,209	1,910	2,039	2,096	2,152	2,209	2,323
USINN	2,135	2,195	2,254	2,314	2,433	2,136	2,195	2,255	2,315	2,433
USINR	525	540	555	569	599	526	540	555	570	599
USMI	953	979	1,006	1,033	893	953	980	1,006	1,033	1,086
USMN	941	968	994	839	882	941	968	994	1,020	1,073
USMNR	1,245	1,280	1,315	1,110	1,167	1,246	1,280	1,315	1,350	1,419
USMOR	336	345	354	299	315	336	345	354	364	383
USMOW	1,045	1,074	1,103	1,132	979	1,045	1,074	1,103	1,133	1,191
USNE	992	1,019	1,047	1,075	1,130	992	1,020	1,047	1,075	1,130
USNP	2,469	2,538	2,607	2,200	2,314	2,470	2,539	2,607	2,676	2,814
USOH	1,505	1,547	1,589	1,341	1,410	1,505	1,548	1,589	1,631	1,715
USPNW	83	86	88	90	95	83	86	88	90	95
USSE	1,705	1,752	1,800	1,847	1,942	1,705	1,753	1,800	1,848	1,942
USSP	955	981	1,008	1,034	1,088	955	982	1,008	1,035	1,088
USW	81	83	86	88	92	81	83	86	88	92
USWIS	615	632	650	548	577	615	633	650	667	701
USWIW	255	262	269	227	239	255	262	269	276	290
USWNP	32	32	33	28	30	32	32	33	34	36
Total:	32,156	33,052	33,949	33,046	32,221	32,162	33,061	33,953	34,855	36,643

Soybean (units in hectares)

Sum of Harv Area	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	951	1,008	1,064	1,120	1,233	951	1,008	1,064	1,120	1,233
USCPR	2,580	2,733	2,885	2,498	2,750	2,580	2,247	2,692	2,498	2,750
USD	2,655	2,313	2,442	2,572	2,830	2,184	2,313	2,442	2,572	2,830
USIAR	1,223	1,295	1,367	1,440	1,303	1,223	1,295	1,368	1,184	1,303
USIAW	3,558	3,769	3,979	4,190	3,792	3,559	3,770	3,980	3,446	3,792
USILN	2,499	2,646	2,794	2,942	3,238	2,499	2,647	2,795	2,420	2,663
USILS	2,081	2,204	2,327	2,451	2,218	2,081	2,143	2,328	2,015	2,218
USINN	2,061	2,183	2,305	2,427	2,671	2,062	2,184	2,305	2,138	2,672
USINR	516	547	577	608	669	516	547	577	500	550
USMI	940	995	1,051	910	1,001	940	818	911	910	1,001
USMN	924	979	850	895	985	924	805	850	895	985
USMNR	744	788	832	721	793	744	703	833	721	793
USMOR	541	573	605	524	576	541	471	605	524	576
USMOW	1,807	1,914	1,679	1,750	1,926	1,785	1,574	1,662	1,750	1,926
USNE	660	699	738	639	704	660	575	607	639	704
USNP	3,418	2,977	3,143	3,310	3,642	2,811	2,977	3,143	3,310	3,642
USOH	2,106	2,231	2,356	2,040	2,245	2,107	1,835	1,937	2,040	2,245
USPNW										
USSE	2,505	2,653	2,802	2,426	3,246	2,060	2,182	2,304	2,426	2,670
USSP	259	226	238	251	276	213	226	238	251	276
USW										
USWIS	268	284	300	316	286	268	284	300	260	286
USWIW	99	105	111	96	105	99	86	91	96	105
USWNP										
Total:	32,395	33,121	34,447	34,124	36,490	30,807	30,690	33,032	31,714	35,220

Wheat (units in hectares)

Sum of Harv Area	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	5,138.3	4,124.3	4,022.6	3,920.9	3,744.8	4,225.9	4,124.3	4,022.6	3,920.9	3,743.2
USCPR	480.7	469.1	457.6	446.0	422.9	480.8	469.2	457.6	366.8	422.9
USD	296.7	289.6	282.4	275.3	261.0	296.8	289.6	282.5	275.4	261.1
USIAR	4.3	4.2	4.1	4.0	3.8	4.3	4.2	4.1	4.0	3.8
USIAW	3.8	3.7	3.6	3.5	3.3	3.8	3.7	3.6	2.9	3.3
USILN	72.3	70.5	68.8	67.1	63.6	72.3	70.6	68.8	67.1	63.6
USILS	257.2	251.0	244.9	238.7	226.3	257.3	206.5	244.9	196.3	226.3
USINN	106.4	103.9	101.3	98.7	93.6	106.4	103.9	101.3	98.8	93.6
USINR	66.2	64.6	63.0	61.4	58.2	66.2	64.6	63.0	61.4	58.2
USMI	269.6	263.1	256.6	250.1	237.2	269.7	263.2	256.7	250.2	237.2
USMN	714.6	697.4	680.3	663.1	628.7	714.8	658.2	680.4	545.3	628.8
USMNR	25.8	20.7	24.6	19.7	22.7	21.3	20.7	20.2	19.7	22.7
USMOR	60.0	58.5	57.1	55.7	52.8	60.0	48.1	57.1	45.8	52.8
USMOW	273.8	267.2	260.6	254.0	240.9	273.9	219.8	260.7	208.9	240.9
USNE	203.3	198.4	193.5	188.6	178.8	203.3	198.4	193.5	188.7	178.9
USNP	3,976.7	3,881.0	3,785.4	3,689.7	3,498.4	3,976.7	3,881.0	3,785.4	3,689.7	3,498.4
USOH	388.0	378.7	369.3	360.0	341.3	388.1	378.8	369.4	360.1	341.4
USPNW	1,559.7	1,522.2	1,484.7	1,447.1	1,372.1	1,559.7	1,522.2	1,484.7	1,447.1	1,372.1
USSE	690.4	673.8	657.2	640.6	607.4	690.5	554.1	657.3	526.8	607.5
USSP	3,417.7	2,743.2	2,675.6	2,792.9	3,006.6	2,810.8	2,743.2	2,675.6	2,608.0	3,007.2
USW	293.6	286.5	279.4	224.6	258.3	293.6	235.6	248.1	224.0	258.3
USWIS	79.8	77.8	75.9	74.0	70.2	79.8	77.9	75.9	74.0	70.2
USWIW	4.6	4.5	4.4	4.3	4.1	4.6	4.5	4.4	4.3	4.1
USWNP	1,865.8	1,820.9	1,776.0	1,731.1	1,641.3	1,865.8	1,820.9	1,776.0	1,731.1	1,641.3
Total:	20,249	18,275	17,829	17,511	17,038	18,726	17,963	17,794	16,917	17,038
Grand Total:	**84,800**	**84,448**	**86,225**	**84,680**	**85,749**	**81,696**	**81,715**	**84,779**	**83,486**	**88,901**

Corn (units in metric tons)

Sum of Production	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	24,848	29,160	34,202	36,739	37,472	24,469	27,962	31,929	36,465	47,373
USCPR	18,184	21,353	25,036	22,903	28,714	17,915	20,478	23,374	26,675	34,677
USD	4,777	5,608	6,571	7,516	9,501	4,706	5,377	6,140	7,010	9,106
USILN	37,700	44,231	51,869	54,973	67,274	37,115	42,416	48,416	55,292	71,866
USILS	20,342	23,883	27,996	30,457	31,188	20,040	22,905	26,149	29,848	38,788
USINN	21,545	25,284	29,645	32,139	39,971	21,208	24,238	27,687	31,617	41,074
USINR	4,970	5,833	6,840	7,578	9,488	4,892	5,597	6,391	7,295	9,478
USIAR	17,638	20,699	24,278	26,078	26,599	17,369	19,848	22,664	25,884	33,627
USIAW	43,690	51,286	60,109	64,356	65,563	43,032	49,160	56,159	64,106	83,294
USMI	7,966	9,344	10,956	12,690	13,241	7,844	8,964	10,232	11,682	15,191
USMN	8,999	10,556	12,383	11,241	14,059	8,859	10,123	11,569	13,203	17,163
USMNR	12,765	14,990	17,566	15,582	19,348	12,568	14,367	16,411	18,737	24,353
USMOR	2,901	3,402	3,991	3,755	4,747	2,854	3,265	3,729	4,254	5,532
USMOW	9,634	11,310	13,260	14,822	15,303	9,490	10,851	12,390	14,135	18,373
USNE	7,606	8,919	10,459	12,519	16,032	7,489	8,554	9,769	11,147	14,498
USNP	18,420	21,624	25,339	25,218	32,391	18,127	20,716	23,673	27,005	35,115
USOH	14,028	16,461	19,307	17,679	22,170	13,820	15,785	18,038	20,589	26,756
USPNW	1,059	1,243	1,458	1,473	1,791	1,043	1,192	1,361	1,554	2,020
USSE	13,789	16,171	18,967	22,238	28,314	13,570	15,510	17,710	20,212	26,280
USSP	8,324	9,763	11,450	13,055	16,489	8,192	9,364	10,695	12,200	15,861
USW	980	1,151	1,349	1,383	1,689	965	1,104	1,260	1,439	1,869
USWIS	5,655	6,634	7,782	7,161	8,994	5,570	6,364	7,270	8,297	10,784
USWIW	2,212	2,598	3,045	2,859	3,611	2,180	2,492	2,844	3,248	4,221
USWNP	280	328	385	359	452	275	315	359	410	533
Total:	303,593	361,832	424,243	444,771	514,402	303,593	346,947	396,221	452,301	587,831

Soybean (units in metric tons)

Sum of Production	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	2,958	3,405	3,862	4,324	5,264	2,959	3,406	3,862	4,325	5,265
USCPR	6,914	7,979	9,060	8,345	10,173	6,915	6,562	8,452	8,345	10,173
USD	6,320	6,199	7,254	8,332	10,585	5,198	6,199	7,254	8,332	10,585
USILN	8,195	9,183	10,199	11,180	13,210	8,197	9,186	10,201	9,195	10,865
USILS	6,139	7,009	7,890	8,797	8,739	6,140	6,814	7,891	7,235	8,739
USINN	6,658	7,554	8,460	9,369	11,218	6,659	7,556	8,461	8,254	11,221
USINR	1,543	1,771	2,009	2,243	2,729	1,544	1,772	2,009	1,845	2,245
USIAR	3,937	4,416	4,895	5,384	5,225	3,938	4,417	4,896	4,428	5,225
USIAW	11,030	12,324	13,570	14,874	14,334	11,032	12,327	13,571	12,233	14,334
USMI	2,368	2,607	2,837	2,530	2,914	2,368	2,144	2,460	2,530	2,914
USMN	2,283	2,506	2,253	2,434	2,817	2,283	2,061	2,253	2,434	2,817
USMNR	2,159	2,405	2,664	2,393	2,816	2,159	2,144	2,664	2,393	2,816
USMOR	1,536	1,821	2,110	1,979	2,495	1,536	1,498	2,111	1,979	2,495
USMOW	4,644	5,321	5,003	5,548	6,741	4,586	4,376	4,953	5,548	6,741
USNE	1,716	1,972	2,237	2,058	2,504	1,717	1,621	1,840	2,058	2,504
USNP	7,724	7,115	7,890	8,671	10,235	6,352	7,115	7,890	8,671	10,235
USOH	5,982	6,648	7,303	6,548	7,655	5,983	5,468	6,006	6,548	7,655
USSE	5,987	7,058	8,181	7,691	11,752	4,924	5,805	6,728	7,691	9,665
USSP	472	427	467	507	586	388	427	467	507	586
USWIS	772	860	947	1,035	997	772	860	947	851	997
USWIW	256	290	324	294	351	256	238	266	294	351
Total:	89,592	98,870	109,415	114,536	133,342	85,906	91,997	105,182	105,696	128,427

Wheat (units in metric tons)

Sum of Production	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	13,308	11,012	11,022	10,979	10,897	10,945	11,012	11,022	10,979	10,893
USCPR	1,379	1,440	1,492	1,525	1,573	1,380	1,441	1,492	1,254	1,573
USD	1,050	1,118	1,175	1,222	1,292	1,051	1,118	1,175	1,223	1,292
USILN	322	337	350	359	371	322	337	350	359	371
USILS	949	967	979	986	984	949	795	980	811	985
USINN	493	523	548	569	598	493	524	548	569	598
USINR	262	276	287	295	307	262	276	287	295	307
USIAR	16	17	17	18	19	16	17	17	18	19
USIAW	12	12	13	13	14	12	12	13	11	14
USMI	1,202	1,276	1,340	1,388	1,463	1,203	1,276	1,340	1,389	1,464
USMN	2,058	2,078	2,088	2,089	2,068	2,059	1,961	2,089	1,718	2,069
USMNR	72	59	72	59	70	60	59	59	59	70
USMOR	209	216	220	224	227	209	178	220	184	227
USMOW	967	1,018	1,061	1,095	1,142	967	837	1,061	900	1,142
USNE	835	887	929	964	1,014	836	887	929	964	1,014
USNP	9,624	10,091	10,448	10,737	11,125	9,624	10,091	10,448	10,737	11,125
USOH	1,812	1,935	2,039	2,124	2,249	1,812	1,936	2,039	2,125	2,250
USPNW	6,941	7,002	7,022	7,019	6,929	6,941	7,002	7,022	7,019	6,929
USSE	2,541	2,736	2,905	3,043	3,261	2,541	2,250	2,905	2,502	3,262
USSP	7,211	5,925	5,886	6,228	6,885	5,931	5,925	5,886	5,816	6,887
USW	1,471	1,461	1,445	1,174	1,379	1,471	1,202	1,283	1,172	1,379
USWIS	332	346	357	366	377	332	346	357	366	377
USWIW	16	17	19	20	22	16	17	19	20	22
USWNP	3,825	3,860	3,889	3,895	3,857	3,825	3,860	3,889	3,895	3,857
Total:	56,907	54,609	55,602	56,389	58,125	53,254	53,359	55,429	54,382	58,125
Grand Total:	**450,092**	**515,311**	**589,260**	**615,696**	**705,868**	**442,752**	**492,303**	**556,832**	**612,380**	**774,384**

Corn (units in metric tons per hectare)

Sum of Yield	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	10.37	11.84	13.52	14.15	16.69	10.21	11.35	12.62	14.04	17.35
USCPR	9.34	10.67	12.18	13.20	15.74	9.20	10.23	11.37	12.64	15.63
USD	8.65	9.88	11.27	12.56	15.10	8.52	9.47	10.53	11.71	14.47
USILN	10.82	12.35	14.10	14.56	17.10	10.65	11.84	13.16	14.64	18.10
USILS	9.98	11.40	13.01	13.79	16.33	9.83	10.93	12.15	13.51	16.70
USINN	10.09	11.52	13.15	13.89	16.43	9.93	11.04	12.28	13.66	16.88
USINR	9.46	10.80	12.33	13.31	15.85	9.31	10.36	11.52	12.81	15.83
USIAR	10.37	11.84	13.52	14.15	16.69	10.21	11.35	12.62	14.04	17.35
USIAW	10.49	11.98	13.67	14.26	16.80	10.33	11.48	12.77	14.20	17.55
USMI	8.36	9.54	10.89	12.29	14.83	8.23	9.15	10.17	11.31	13.99
USMN	9.56	10.91	12.46	13.40	15.94	9.41	10.46	11.64	12.94	16.00
USMNR	10.25	11.71	13.36	14.04	16.58	10.09	11.22	12.48	13.88	17.16
USMOR	8.64	9.86	11.26	12.55	15.09	8.50	9.46	10.52	11.69	14.46
USMOW	9.22	10.53	12.02	13.09	15.63	9.08	10.10	11.23	12.48	15.43
USNE	7.67	8.75	9.99	11.65	14.19	7.55	8.39	9.33	10.37	12.83
USNP	7.46	8.52	9.72	11.46	14.00	7.34	8.16	9.08	10.09	12.48
USOH	9.32	10.64	12.15	13.18	15.72	9.18	10.20	11.35	12.62	15.60
USPNW	12.69	14.49	16.54	16.29	18.83	12.49	13.89	15.44	17.17	21.23
USSE	8.09	9.23	10.54	12.04	14.58	7.96	8.85	9.84	10.94	13.53
USSP	8.72	9.95	11.36	12.62	15.16	8.58	9.54	10.61	11.79	14.58
USW	12.09	13.81	15.76	15.74	18.28	11.90	13.24	14.72	16.37	20.23
USWIS	9.19	10.49	11.98	13.06	15.60	9.05	10.06	11.19	12.44	15.38
USWIW	8.69	9.93	11.33	12.60	15.14	8.56	9.52	10.58	11.77	14.55
USWNP	8.85	10.10	11.53	12.74	15.28	8.71	9.68	10.77	11.97	14.80
Total:	224.82	260.74	297.64	320.62	381.58	224.82	249.97	277.97	309.08	382.11

Soybean (units in metric tons per hectare)

Sum of Yield	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	3.11	3.38	3.63	3.86	4.27	3.11	3.38	3.63	3.86	4.27
USCPR	2.68	2.92	3.14	3.34	3.70	2.68	2.92	3.14	3.34	3.70
USD	2.38	2.68	2.97	3.24	3.74	2.38	2.68	2.97	3.24	3.74
USILN	3.28	3.47	3.65	3.80	4.08	3.28	3.47	3.65	3.80	4.08
USILS	2.95	3.18	3.39	3.59	3.94	2.95	3.18	3.39	3.59	3.94
USINN	3.23	3.46	3.67	3.86	4.20	3.23	3.46	3.67	3.86	4.20
USINR	2.99	3.24	3.48	3.69	4.08	2.99	3.24	3.48	3.69	4.08
USIAR	3.22	3.41	3.58	3.74	4.01	3.22	3.41	3.58	3.74	4.01
USIAW	3.10	3.27	3.41	3.55	3.78	3.10	3.27	3.41	3.55	3.78
USMI	2.52	2.62	2.70	2.78	2.91	2.52	2.62	2.70	2.78	2.91
USMN	2.47	2.56	2.65	2.72	2.86	2.47	2.56	2.65	2.72	2.86
USMNR	2.90	3.05	3.20	3.32	3.55	2.90	3.05	3.20	3.32	3.55
USMOR	2.84	3.18	3.49	3.78	4.33	2.84	3.18	3.49	3.78	4.33
USMOW	2.57	2.78	2.98	3.17	3.50	2.57	2.78	2.98	3.17	3.50
USNE	2.60	2.82	3.03	3.22	3.56	2.60	2.82	3.03	3.22	3.56
USNP	2.26	2.39	2.51	2.62	2.81	2.26	2.39	2.51	2.62	2.81
USOH	2.84	2.98	3.10	3.21	3.41	2.84	2.98	3.10	3.21	3.41
USSE	2.39	2.66	2.92	3.17	3.62	2.39	2.66	2.92	3.17	3.62
USSP	1.82	1.89	1.96	2.02	2.12	1.82	1.89	1.96	2.02	2.12
USWIS	2.88	3.03	3.16	3.28	3.49	2.88	3.03	3.16	3.28	3.49
USWIW	2.59	2.77	2.93	3.07	3.33	2.59	2.77	2.93	3.07	3.33
Total:	57.62	61.74	65.55	69.03	75.29	57.62	61.74	65.55	69.03	75.29

Wheat (units in metric tons per hectare)

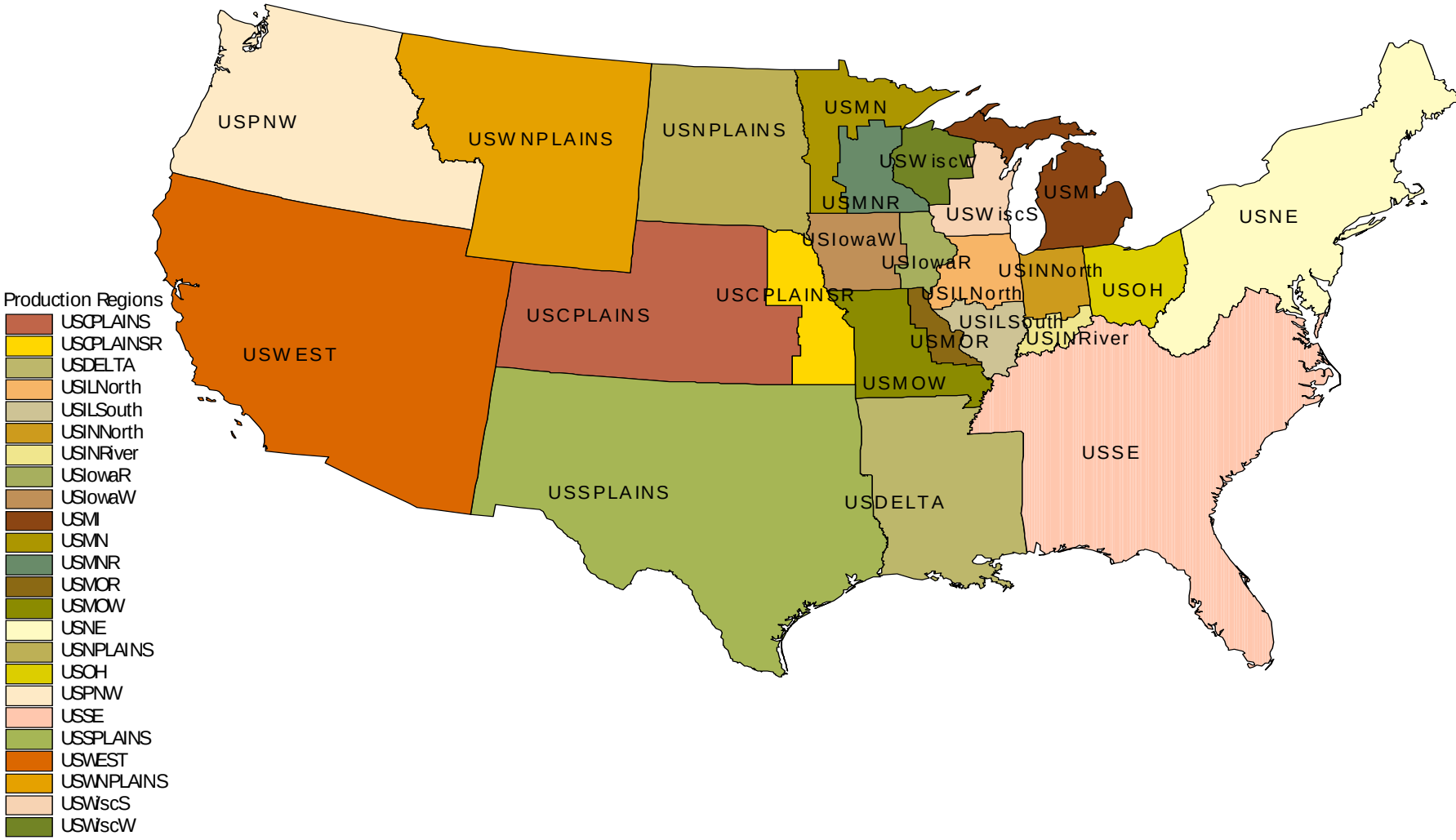
Sum of Yield	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	2.59	2.67	2.74	2.80	2.91	2.59	2.67	2.74	2.80	2.91
USCPR	2.87	3.07	3.26	3.42	3.72	2.87	3.07	3.26	3.42	3.72
USD	3.54	3.86	4.16	4.44	4.95	3.54	3.86	4.16	4.44	4.95
USILN	4.46	4.78	5.08	5.35	5.83	4.46	4.78	5.08	5.35	5.83
USILS	3.69	3.85	4.00	4.13	4.35	3.69	3.85	4.00	4.13	4.35
USINN	4.63	5.04	5.41	5.76	6.39	4.63	5.04	5.41	5.76	6.39
USINR	3.96	4.27	4.55	4.80	5.27	3.96	4.27	4.55	4.80	5.27
USIAR	3.60	3.92	4.20	4.47	4.95	3.60	3.92	4.20	4.47	4.95
USIAW	3.12	3.39	3.63	3.86	4.28	3.12	3.39	3.63	3.86	4.28
USMI	4.46	4.85	5.22	5.55	6.17	4.46	4.85	5.22	5.55	6.17
USMN	2.88	2.98	3.07	3.15	3.29	2.88	2.98	3.07	3.15	3.29
USMNR	2.80	2.87	2.94	2.99	3.09	2.80	2.87	2.94	2.99	3.09
USMOR	3.49	3.69	3.86	4.02	4.31	3.49	3.69	3.86	4.02	4.31
USMOW	3.53	3.81	4.07	4.31	4.74	3.53	3.81	4.07	4.31	4.74
USNE	4.11	4.47	4.80	5.11	5.67	4.11	4.47	4.80	5.11	5.67
USNP	2.42	2.60	2.76	2.91	3.18	2.42	2.60	2.76	2.91	3.18
USOH	4.67	5.11	5.52	5.90	6.59	4.67	5.11	5.52	5.90	6.59
USPNW	4.45	4.60	4.73	4.85	5.05	4.45	4.60	4.73	4.85	5.05
USSE	3.68	4.06	4.42	4.75	5.37	3.68	4.06	4.42	4.75	5.37
USSP	2.11	2.16	2.20	2.23	2.29	2.11	2.16	2.20	2.23	2.29
USW	5.01	5.10	5.17	5.23	5.34	5.01	5.10	5.17	5.23	5.34
USWIS	4.16	4.44	4.70	4.94	5.37	4.16	4.44	4.70	4.94	5.37
USWIW	3.46	3.88	4.28	4.66	5.36	3.46	3.88	4.28	4.66	5.36
USWNP	2.05	2.12	2.19	2.25	2.35	2.05	2.12	2.19	2.25	2.35
Total:	85.74	91.59	96.96	101.88	110.82	85.74	91.59	96.96	101.88	110.82

Exports:

Units in metric tons

	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
Corn	37,248	41,927	50,652	50,853	62,432	22,482	3,446	721	28,637	57,753
Soybean	13,299	14,484	11,873	11,010	6,881	15,377	14,314	14,975	11,663	6,818
Wheat	1,659	337	0	0	0	2,376	1,970	0	0	0
Total:	**52,206**	**56,748**	**62,525**	**61,864**	**69,313**	**40,236**	**19,730**	**15,696**	**40,300**	**64,570**

US Production Regions



Global Grain Model and Scenario Development

Background

The Corps of Engineers was charged with developing new models, gathering additional data, and re-evaluating the economics underpinning the recommendations to improve and expand the Lock and Dam system on the Upper Mississippi River system (UMRS). The Global Grain Forecasting Model (GGM) and its applications to the UMRS is one component of the re-evaluation effort.

The Global Grain Model was developed as part of the Corps' Navigation Economic Technologies (NETS) research.[1] The focus of this model is on world grain trade with emphasis on the competitive pressures and structural relationships that are important to the international grain market. The model is also specific with respect to the U.S. forecast grain shipments through the Mississippi River system. The methodology developed is generally applicable to a broad range of commodities and was applied to the grain sector for the study. This model was used to forecast unconstrained UMR/IL Basin traffic.

The GGM was calibrated to the period 2000-2004 using a set of "base case" assumptions applicable to that period of time. Table 1 summarizes the key assumptions of the Base Case.

Table 1
Summary of Base Case Assumptions

Barge System Capacity	Existing
U.S. Rail Capacity	Restricted to base period maximum loadings
Modal Rates	Rail from 2000-2004 average Barge rates from estimates supply functions Ocean rates from regression analysis (PNW vs. Gulf to Asia approximately $5/metric ton)
U.S. Area	Minimum area=100% of recent 3-yr average Maximum area=100% of 2000-2004 base Maximum area switched between crops=7% of 2000-2004 base
Rest of World Area	Minimum area=100% of recent 3-yr average Minimum area for any one crop=88% of base Maximum area=107% of 2000-2004 base Maximum area switched between crops=7% of 2000-2004 base
Ethanol Production	Energy Information Agency (EIA) 2005 projections
China Corn Trade	Exports subsidized to 8 mmt
U.S. Corn Yields	1.6 bushel/acre/year increase – average of the 24 U.S. producing regions

The timeframe for forecasting is long-term covering a 50-year period. To accomplish these forecasts, a spatial framework of world grain trade was developed. The model, which is a large scale nonlinear programming model, has the objective of minimizing costs of world grain trade,

[1] "Longer-Term Forecasting of Commodity Flows on the Mississippi River: Application to Grains and World Trade." 2006. Wilson et. al.

subject to meeting the demands at importing countries and regions, and available supplies and production potential in each of the exporting countries and regions. The model is solved jointly for corn, soybeans, and wheat. Relevant parameters generally fall into the categories of consumption and import demand, export supply, and costs.

For projection of the base case to cover a 50-year period, the following changes to the base case assumptions were made.

U.S. Area Restrictions	Maximum area=107% in 2010 forward
Rest of World Area	Maximum area=107% in 2010 and 2020, 115% in 2030 and 2040, and 121% in 2060
China Corn Trade	Exports = 0

Additional information about the GGM can be found at http://www.nets.iwr.usace.army.mil/inlandnav.cfm.

GGM Workshop (February 2007)[2]

To assist the Corps of Engineers with the economic re-evaluation effort, a workshop was conducted on 14-15 February 2007 in St. Louis, Missouri. Dr. Bill Wilson, principal architect of the Global Grain Model, presented the important attributes, assumptions and outcomes of the model to the 29 participants including state and federal agricultural and transportation agency personnel, NGO representatives for agriculture and the environment, academics from the Peer Review groups, and Corps of Engineers Economic Re-evaluation Project Delivery Team members.

In his presentation, Dr. Wilson highlighted four variables (#1 - #4) that he felt would have a high potential for affecting the output of the GGM. Discussions during the plenary session on the first day of the workshop added seven additional high-impact variables (#5 - #11).

1. Ethanol
2. Yield growth rates
3. CRP lands
4. Rail capacity
5. Rail-barge substitution
6. Non-grain growth
7. Non-grain traffic
8. Barge capacity constraint
9. Panama Canal expansion
10. Delay cost impacts and expansion
11. China yields

On day two of the workshop, two working groups were formed to capture information from the participants on the assumptions and parameter ranges to be used in the GGM, and to identify key concerns. The 11 parameters developed on day one served as starter material for the working group brainstorming of issues. Each group identified their top priority concerns and offered a

[2] "UMRS NESP Navigation Economic Re-evaluation, Navigation Economic Technologies (NETS) Grain Forecasting Modeling and Scenarios Workshop, Final Report," 2007.

descriptive statement of why it was an issue of concern. The five top priority issues and concerns are shown in table 2.

Table 2
Top Five Issues and Concerns

Issue	Concern
Rail capacity	If rail already at capacity, additional grain demand will divert to barge and truck; future expansion of rail capacity is questionable due to limitations
China	Population and corn product consumption will increase; who can supply increased demand
Available acreage	Must consider loss of prime farmland (corn & soybean acreage) to urban development
Ethanol / corn	Ethanol future use is unknown; current ethanol estimates too low; increase in ethanol production capacity will impact corn export needs
Yield growth	Yield is basic variable needed for GGM production and use calculations; factors affecting yield could impact estimated model results

The working groups put considerable effort into the discussion of the ranges of inputs for their high priority variables. It was agreed that the base rates chosen so far for the GGM were reasonable but raised issues that would impact the future high and low projections. The groups' list of parameter value ranges for the high traffic and low traffic scenario development is presented in table 3.

Table 3
Summary of Working Group Estimates of Parameter Value Ranges

Variable	Low	High	Mid or current	Notes
Rail Capacity (million metric tons)	141 low base	170	155 mid	20% increase possible (Corn Growers Assn)
China (million metric tons)	0 imports	market solution	3-5 (USDA)	largest capacity in world but totally dependent on China's import/ export policies
Available Acres (millions of acres)	83 (affected by loss due to urban sprawl)		4 of total CRP available +79 current	current loss rate 0.5 m ac/yr to urban sprawl; consider competition between crops and other land uses
Ethanol/Corn (billion gallons/ year)	14.5 **or** ethanol decreases corn exports but not to zero	need to export ethanol or develop markets for E85; increase ethanol and still meet export needs of corn	current estimates are too low and the model maximums may be too low	peak in the next decade; production efficiencies will grow at a slower rate
Yield (bushels/acre/ year)	1.6	2.0 to blue sky limits	1.6 is current annual increase	past performance may not be indicative of future projections-both positive & negative

The entire proceedings from this workshop can be viewed in Attachment A, "Upper Mississippi River System Navigation and Ecosystem Sustainability Program, Navigation Economic Re-evaluation, Navigation Economic Technologies (NETS) Grain Forecast Modeling and Scenarios Workshop, Final Report."

Grain Model Input Specifications (9 March 07)

Grain model input specifications for the base, low and high traffic scenarios, shown in table 4, were developed based on the February workshop discussions. The parameters and values would become the topic for discussions at the 13 March PDT scenarios meeting.

Table 4
Grain Model Input Specifications

	Scenario		
Input Parameter	Low Traffic	Base Case	High Traffic
U.S. Ethanol Demand	FAPRI (10 billion gal by 2010, 12 billion gal by 2016)	EIA 2006 (9 billion gal by 2015, leveling off at 11 billion gal)	EIA 2005 (4 billion gal by 2015, leveling off at 4 billion gal)
U.S. Corn Yields	1.6 bu/yr increase	1.8 bu/yr increase	2.0 bu/yr increase
Rest of World Corn Yields	—	—	—
U.S. Area	107% of 2002-2004 avg	107% of 2002-2004 avg	102.5% of 2002-2004 avg
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 max car loadings	155 mmt (15% increase in 2000-2004 car loadings)	141 mmt (10% increase in 2000-2004 max car loadings)
China Corn	exports = 8 mmt	imports = 0	unconstrained model solution
Panama Canal	no expansion	expanded by 2020 ($5/mt ocean shipping cost reduction)	expanded by 2020 ($5/mt ocean shipping cost reduction)
UMR-IWW Navigation Infrastructure	expanded	expanded	expanded

Assumptions/Notes:

- All other model inputs are assumed to be equal to the base case described in the December 2006 Global Grain Model Report.
- ProExporter estimate of ethanol production: 9 billion gal by 2010, 11.5 billion gal by 2015.
- NCGA estimate of corn-based ethanol: 12.8 low, 1.59 mid, 17.9 high (billion gal in 2015).
- U.S. corn yields for GGM report base case average roughly 1.6 bu/yr annual increase.

Scenarios Meeting (13 March 07)

The re-evaluation PDT met to discuss the grain model input specifications that were developed following the February workshop. The purpose of this meeting was to reach agreement on the base, low and high traffic scenarios and on the parameter values for each scenario. Since no

probabilities had been assigned to any scenarios, it was decided that there was no value to having an intermediate scenario and it would be reasonable to select the two scenarios that represent the upper and lower bounds. Thus, the base case scenario was eliminated. The values identified by the study team during this meeting will be run as scenarios through the GGM. Table 5 presents the input specifications for low and high traffic. Parameters that changed from the initial list in table 2 are highlighted in bold print.

Table 5
Grain Model Input Specifications
(revisions based on Scenarios Meeting)

	Scenarios	
Input Parameter	Low Traffic	High Traffic
U.S. Corn-Based Ethanol Demand	**EIA 2007** (**11.2** billion gal by **2012**; **13.4** billion gal by **2025**)	**Current production level held constant (5 billion gal)**
U.S. Corn Yields	1.6 bu/yr increase (nat'l avg)1	2.0 bu/yr increase (nat'l avg)2
Rest of World Corn Yields	**GGM base case**	25% increase in GGM base case(3)
U.S. Area	107% of 2002-2004 avg	**107%** of 2002-2004 avg
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 max car loadings)	141 mmt (no change) or 155 mmt (10% increase in 2000-2004 max car loadings)
China Corn	exports = 8 mmt	unconstrained model solution
Panama Canal	no expansion	expanded by 2020
UMR-IWW Navigation Infrastructure	expanded	expanded

Assumptions/Notes:

- All other model inputs are assumed to be equal to the base case described in the December 2006 Global Grain Model Report
- (1) For US corn yields in the Low Traffic scenario, the base case in the December 2006 Global Grain Model Report incorporates production-region-specific yields and yield growth. In aggregate for the US, the base case reflects yield growth of 1.6 bushels per year. Therefore, the base case yields of the report are used to represent the yields for this scenario.
- (2) For US corn yields in the High Traffic scenario, US average yield growth of 2.0 bushels per year represents a 25 percent increase over the base case of the December 2006 Global Grain Model Report. In order to retain production-region-specific yields, base case yields are increased by 25 percent to represent this scenario.
- (3) In the High Traffic scenario, Rest of World Corn Yields are increased over the December 2006 Global Grain Model Report base case yields to reflect the same percentage increase assumed for the US with this scenario. Future genetic modification technology is the basis for assumed increases in the US yields, and this same technology is assumed to be exported to the Rest of World as has been the case with past genetic modification technology.

Traffic Scenarios – Grain (16 March 07)

Following the 13 March team meeting, the revised set of input parameters was modified slightly. Two versions of the traffic scenarios for grain were developed based on the inputs identified as significant with respect to model results. These inputs have been identified as key parameters in developing the traffic scenarios. The scenarios are intended to represent the reasonable upper and lower bound limits of future traffic in the UMR-IWW navigation system. The scenarios will be translated into future unconstrained traffic flows by executing the GGM.

Traffic Scenario 1 assumes no rail capacity increase for the High Traffic Scenario. Changes are highlighted in bold print.

Table 6
Traffic Scenario 1
(no rail capacity-high traffic)

Input Parameter	Low Traffic	High Traffic
U.S. Corn-Based Ethanol Demand	EIA 2007 (11.2 billion gal by 2012; 13.4 billion gal by 2025)	Current production level held constant (5 billion gal)
U.S. Corn Yields	1.6 bu/yr increase (nat'l avg)	2.0 bu/yr increase (nat'l avg)
Rest of World Corn Yields	GGM base case	--
U.S. Area	107% of 2002-2004 avg	107% of 2002-2004 avg
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 max car loadings)	**141 mmt (no change** in 2000-2004 max car loadings)
China Corn	exports = 8 mmt	unconstrained model solution
Panama Canal	no expansion	expanded by 2020 ($5/mt ocean shipping cost reduction)
UMR-IWW Navigation Infrastructure	expanded	expanded

Traffic Scenario 2 assumes a 10 percent increase in capacity for the High Traffic Scenario.

Table 7
Traffic Scenario 2
(10% capacity increase)

Input Parameter	Low Traffic	High Traffic
U.S. Corn-Based Ethanol Demand	EIA 2007 (11.2 billion gal by 2012; 13.4 billion gal by 2025)	Current production level held constant (5 billion gal)
U.S. Corn Yields	1.6 bu/yr increase (nat'l avg)	2.0 bu/yr increase (nat'l avg)
Rest of World Corn Yields	GGM base case	--
U.S. Area	107% of 2002-2004 avg	107% of 2002-2004 avg
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 max car loadings)	155 mmt (**10% increase** in 2000-2004 max car loadings)
China Corn	exports = 8 mmt	unconstrained model solution
Panama Canal	no expansion	expanded by 2020 ($5/mt ocean shipping cost reduction)
UMR-IWW Navigation Infrastructure	expanded	expanded

Regional Principals Teleconference (20 March 07)

A teleconference was conducted on 20 March 2007 to review the parameter inputs for Low and High Traffic Scenarios developed for use in the GGM. Participants included: Nick Marathon (DA), Rick Nelson (FWS), Al Fenedick (EPA), Bob Goodwin (MARAD), Terry Smith (ACE), Ken Barr (ACE), Scott Whitney (ACE), Mark Haab (ACE for Rich Manguno), Chuck Spitzack (ACE).

The meeting presentation focused on the background of inputs, assumptions and decisions made leading to the traffic scenarios for grain that would be considered for inclusion in the Interim Report. Discussion resulted in revisions to the input specifications that are highlighted in bold print in table 8 below.

NESP Draft Scenarios of GGM (23 Mar 07)

Following the 20 March Regional Principals teleconference, all NECC/ECC and UMRBA members were informed of the developments to date regarding the scenarios. The current proposal was to develop and use only two scenarios in the GGM, a reasonable lower bound (Low Traffic Scenario) and a reasonable upper bound (High Traffic Scenario), to bracket expectations. Values for two of the parameters are not yet fully resolved: 1) Rest of World Corn Yields for the High Traffic Scenario; and 2) U.S. Rail Capacity available for grain for the High Traffic Scenario.

A third scenario is being formulated to investigate the potential constraints and changes in the national transportation network during the period of analysis that might impact on utilization of the UMR-IWW. This won't be analyzed using NETS models and won't be done to the same level of rigor, but the results will be considered in reaching conclusions and making a recommendation.

This revised Grain Model Input Specification table was sent to the NECC/ECC and UMRBA members.

Table 8
Grain Model Input Specification

Input Parameter	Low Traffic	High Traffic
U.S. Corn-Based Ethanol Demand	EIA 2007 (11.2 billion gal by 2012; 13.4 billion gal by 2025)	current production level held constant (5 billion gallons)
U.S. Corn Yields	1.6 bu/yr increase (nat'l avg)	2.0 bu/yr increase (nat'l avg)
Rest of World Corn Yields	GGM base case	**---**
U.S. Area	107% of 2002-2004 average	107% of 2002-2004 average
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 maximum car loadings)	**TBD (141** mmt**-155 mmt**; **0%-**10% increase in **2004** maximum car loadings)
China Corn	exports = 8 mmt	unconstrained model solution
Panama Canal	no expansion	expanded by 2020 ($5/mt ocean shipping cost reduction)
UMR-IWW Navigation Infrastructure	expanded	expanded

Notes:
1. All other model inputs are assumed to be equal to the base case described in the December 2006 Global Grain Model report.

2. TBD = To Be Determined. Values for these items are still being explored.
3. All values subject to change based on additional information and consultation.

Assumptions, by input parameter, used for Low and High Traffic Scenarios:

- US Corn-Based Ethanol:
  - High Traffic scenario does not assume that total ethanol production is limited to corn-based production.
  - Total ethanol production is assumed to include rapid implementation of non-corn sources.
- US Corn Yields:
  - Long-term national average for growth in corn yield of 1.6 bushels per acre is assumed to represent the Low Traffic Scenario.
  - High Traffic Scenario assumed to be 2.0 bushels per acre, a 25% increase over the long-term national average.
- Rest of World Corn Yields:
  - Acceleration in recent US yield growth is driven primarily by bio-technology and the availability of this technology is not restricted to the US.
- US Area:
  - Assumptions of December 2006 GGM report for the base case retained for both the Low and High Traffic Scenarios.
  - Potential restriction in expansion of allowable acreages as a result of urbanization is being investigated.
- US Rail Capacity:
  - Potential increases in capacity are with respect to capacity available for the transport of grain.
- China Corn
  - Low Traffic Scenario model constraint of export = eight million metric tons is a continuation of recent China trade policy.
  - High Traffic Scenario does not force an outcome by means of a model constraint; trade determined by China's relative competitiveness with the rest of the world.
- Panama Canal
  - Lower ocean shipping costs resulting from an expanded canal are assumed to generate a savings of approximately $5 per metric ton.
- UMR-IWW Navigation Infrastructure:
  - Assume twelve 1200-foot locks on the UMR-IWW navigation system.

Follow-on discussions between the PDT and the model developers resulted in the finalization of two pieces of data in table 6 that were listed as uncertain: Rest of World Corn Yields-High Traffic assumed a 25 percent increase; and U.S. Rail Capacity-High Traffic assumed the 155mmt value. These changes were documented in the memo titled "NESP Interim Report Traffic Scenarios-Grain" dated 25 April 2007 which was disseminated to the NECC, ECC and UMRBA members. The final grain model input specifications are shown in table 9.

Table 9
Final Grain Model Input Specifications

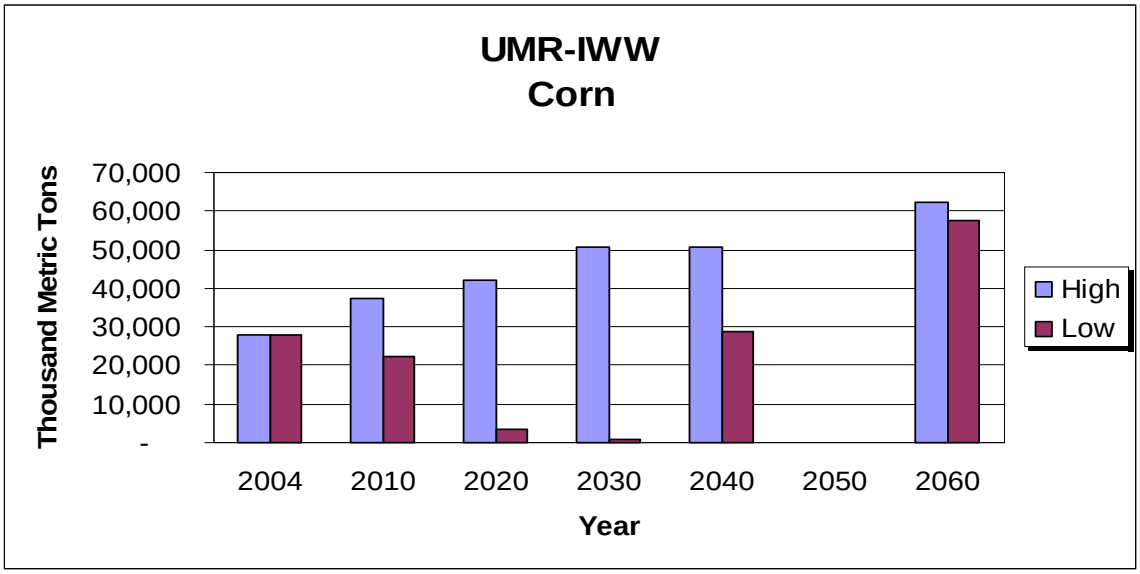
	Low Traffic	High Traffic
U.S. Corn-Based Ethanol Demand	EIA 2007 (11.2 billion gallons by 2012 and 13.4 by 2025)	Current product level held constant (5 billion gallons)
U.S. Corn Yields	1.6 bushels/year Increase (National Average)	2.0 bushels/year Increase (National Average)
Rest of World Corn Yields	GGM Base Case	25% increase in GGM base case
U.S. Area	107% of 2002-2004 average	107% of 2002-2004 average
U.S. Rail Capacity	169 mmt (20% increase in 2000-2004 maximum car loadings)	155 mmt (10% increase in 2004 maximum car loadings)
China Corn	Exports = 8 mmt	Unconstrained model solution
Panama Canal	No expansion	Expanded by 2020
UMR-IWW Navigation Infrastructure	Expanded	Expanded

Note: All other model inputs are assumed to be equal to the base case described in the December 2006 Grain Model report.

Traffic Output From the Global Grain Model (GGM)

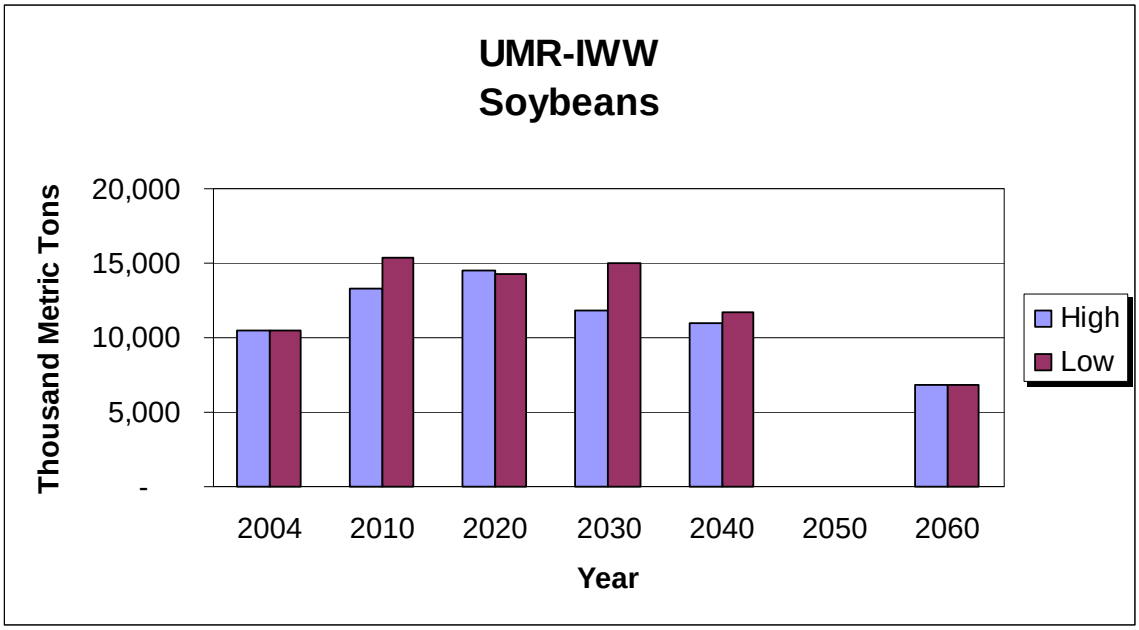
The following tables present output from the GGM for low and high scenarios, by commodity, for the years that the model was run. Tonnages were aggregated for all reaches. These outputs represent unconstrained corn, soybean and wheat traffic. Unconstrained non-grain traffic is presented in "NESP Economic Evaluation Waterway Traffic Forecast for Non-Grain Commodities", May 2007. Total unconstrained traffic is input to the survey model for each year that the survey model is run.

Table 10
Unconstrained Corn Traffic



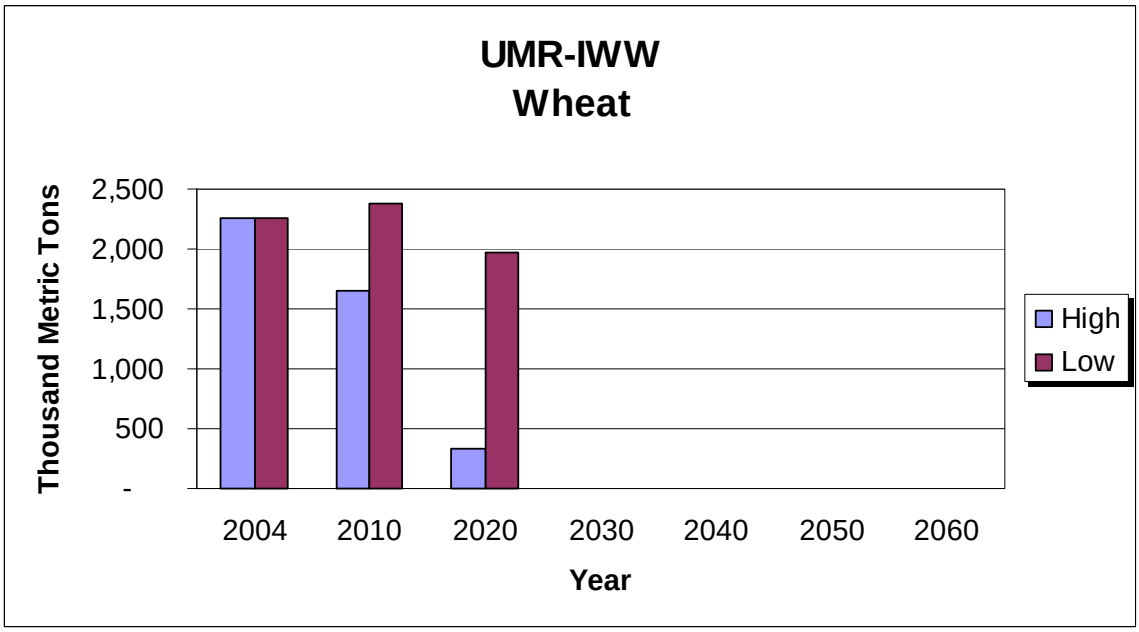
Note: Model not run for year 2050.

Table 11
Unconstrained Soybeans Traffic



Note: Model not run for year 2050.

Table 12
Unconstrained Wheat Traffic



Note: model not run for year 2050.

References:

1. Dr. William Wilson, Eric DeVuyst, Richard Taylor, Bruce Dahl and Won Koo. Longer-Term Forecasting of Commodity Flows on the Mississippi River: Application to Grains and World Trade. December 2006. IWR Report 06-NETS-R-12.

2. Upper Mississippi River System Navigation and Ecosystem Sustainability Program, Navigation Economic Re-evaluation, Navigation Economic Technologies (NETS) Grain Forecast Modeling and Scenarios Workshop, Final Report. February 2007.

PDT Conference Call (10 Jul 07):

The PDT reviewed the draft Global Grain Model and Scenario Development Report during the 10 July phone conference. The following meeting minutes capture that discussion.

Navigation and Ecosystem Sustainability Program
ECC Conference Call
July 10, 2007
8:30-9:30am

Call-in Attendees:

Chuck Spitzack, MVR	Rich Astrack, MVS	Ken Barr, MVR
Rich Worthington, HQ	Mark Beorkrem, NIC	Dick Lambert, MN DOT
Barb Naramore, UMRBA	Brad Walker, PRN	Rich Manguno, MVN
Jeff McGrath, MVP	Rebecca Soileau, MVP	David Kelly, MVS
Susan Wilson, MVS	Jack Carr, MVR	Scott Whitney, MVR
Sharryn Jackson, MVR	Katie Nelson, MVR	

Minutes:

1. Global Grain Model and Scenario Report
    - Jack Carr gave purpose of call: to discuss global grain model and scenario report. Also, to give progress of Economics products.
    - Chuck Spitzack will be sending out the schedule for preparation of interim report and schedule for review and comments.
    - Distribution date of the Draft Economic Re-evaluation report is 15 AUG 07.
    - Comments need to be received by 7 SEPT 07 to be included in report. All comments due 15 SEPT 07, (30 days after distribution of the draft report). Your comments will be characterized in a letter report.
    - If there are comments made earlier that weren't adequately addressed please repeat those comments so they become part of formal comment process.

GGM and Scenario Report:

Spitzack: Please submit comments in writing on scenario report to Jack Carr.

Brad Walker: We were looking for specific references to studies and specific names in organizations that had input into table 9 (Scenario Report, Final Grain Model Input Specifications). They were not included in the report. Are they going to be included in the report? Two areas of concern: corn yields and US area of crop land: where did those variables come from?

Manguno: Yields (low traffic scenario corn) are a result of historical trend of yields for US and for other producing regions in world. Number you see for US, 1.6 bushel per year increase, is not actual value used. It's a way to describe what is captured in model. It's a national average. Country is broken up into a number of producing regions in model. Aggregate= 1.6 bushels per acre per year increase. High traffic scenario corn of 2.0 bushels per acre per year increase is based on a shorter term period of record that is reflective of some higher growth. Also, a higher number was suggested by National Corn Growers. That's the source of those two values. Just like in the low, 2.0 isn't a particular value used. Model is run on particular values for each region.

Walker: My concern is these are optimistic and short term. They are heavily dependent on usual conditions and don't take into account water and nitrogen availability, and erosion. They are really just forecasts of business as usual for 50 years. Low traffic is essentially the

same. None of these negative possibilities are considered in model and they are highly likely.
Walker: We have reached a tipping point. Nitrogen up to $500/ton. Issue of oil shortages over 50 years not considered in model.
Lambert: We don't have wind power in model either do we?
Walker: How do you produce nitrogen fertilizer from wind?
Lambert: It takes place of generating power from electricity.
Barr: I don't believe Wilson considered oil constraints as part of his forecasts.
Walker: Did he include soil fertility problems, water issues, loss of soil from erosion, and fact that a lot of prime farm land is being lost and will bring down yield averages.
Carr: That is one opinion. Dr. Wilson used the idea that the future is continuation of past.
Walker: As for acres that's not true. A couple hundred million acres of farmland lost in 50 years. (This was actually 55 years from 1950 when there were 1,159 million acres of land in farms, approximately the peak. By 2005 this had dropped to 933 million acres (226 million acre change). This is from USDA information. The last 25 years is confirmed by the graph added in the addendum to these meeting notes. Land in farms includes Cropland, Pastureland and Rangeland. Cropland is what we should really be concerned about.) You are predicting 0 land lost in next 50 years- that's unrealistic.
Barr: In terms of yield – base case-does summary document state 1.6 is what Wilson used as historic trend?
Carr: Participants in workshop suggested 4% high traffic.
Manguno: I don't remember 4 % number.
Barr: National Corn Growers talked about increase in corn yields 2% for low and 4% for high traffic scenarios. This refers to growth in corn yields. See National Corn Growers comments attached to Scenario Report.
Walker: If you use 2% or 4% annual growth compounding results in very large yields. 150 bu/acre compounded for 50 years at 4% results in yield of 1100 bu/acre. Corn grower representative tells us we should expect 1100 bushels per acre. Is that a reliable source? I know you didn't use that in the model but that is what they are saying.
???: Do you have that in published literature?
Walker: That is what the Corn Growers said in the scenario development report.
Beorkrem: Jack, what kind of comments did you get on this from EPR?
Carr: None.
Beorkrem: What about comments they made on GGM itself?
Spitzack: We will characterize comments to date as part of the interim report. The EPR Panel is sending a final report on their review in October 2007.
Beorkrem: You won't use their comments in the re-evaluation study?
Spitzack: We have used their comments through workshops and meetings. The draft report is the first document for formal review. We have gotten pieces out to people but comments need to be done in context of the review in whole.
Beorkrem: We won't see comments until 15 August draft review or October?
Beorkrem: So you have their comments but we don't.
Spitzack: We have comments on products but not whole report.
Barr: We have no final panel comments.
Beorkrem: Other than participation in February and June workshops, they have not formally reviewed scenarios?
Carr: No, our intent was to send them what we have distributed to you (Scenario Report) along with notes summarizing discussions today. We will include your input in the Scenario Report that we send to the Peer Review Panel.
Barr: Can we move on to US area and production? 107% low and high traffic.
Manguno: Yes, that was the base case assumption.

Walker: Is this 107% of 2004 corn crop land or all crop land, or all farmland?
Barr: Grain Forecast is all grains including corn and soybeans. Cropland is all tillable acreage.
Manguno: This would be an increase in acreage devoted to corn, soybeans, and wheat in total. Doesn't include pasture.
Walker: Then that means you have all this crop land for 50 years remaining constant that is literally impossible; you disregard any farmland loss due to conversion to other uses. I find that hard to believe considering history.
Manguno: This number is not based on history. The increase of whatever the stated percentage is doesn't happen automatically. That 7% value is an allowable increase as the model tries to solve. It will allow it to go up by 7% in attempt to find equilibrium. In case of these two scenarios I think it's the case that you wind up using the 7%. You probably do it fairly early in the time sequence. It's amount allowable for an increase. The model doesn't automatically put it into production.
Walker: Assuming most coming from CRP program. You have an upper number of 107%, but your base is constantly decreasing.
Barr and Jackson: You're talking about urban expansion. We have been working with this. In Illinois we were able to come up with a figure of 0.1% crop land affected by construction in 2004. The amount of Illinois land in farming has declined at an average rate of approximately 10,000 acres per year since WW2. Land in farms for Iowa has decreased about 10% from 1950-2005.
Walker: 19 year period 70 million acres lost national cropland acres. Vast majority of crop land acres are in Midwest land that grows grain. Then you can look at prime farmland. Generally losing at least same percentage- it's located in best areas for development.
Beorkrem: High traffic scenario and ethanol: the high traffic level held constant US corn-based ethanol demand at 5 billion gallons. I assume high traffic scenario held constant means ethanol produced from other crops. Wouldn't appear US area any allowance made for other crops taking land away to produce 25-30 billion gal of ethanol that would come from cellulose. That crop land would come from same area of crop land.
Whitney: Not necessary- one of greatest sources for cellulose is biomass left in field.
Walker: When you take that off the ground you decrease yields- more fertilizers needed.
Barr: What Mark said is we keep corn-based ethanol at 5 billion gallons- and there is nothing happening that would take corn area and turn to switchgrass. Crop area is not being expanded within study area.
Manguno: It's not saying anything about ethanol that's not corn based. It's produced or isn't. If it is produced, than it isn't being produced as an expense of acres devoted to grain.
Beorkrem: Some kind of allowance needs to be made for land use for ethanol production (other than corn based). If we are using field fodder, that is model-able also.
Spitzack: For high scenario, 5 billion gal ethanol production and not assuming increases from other sources.
Beorkrem: On face of it model is false.
Worthington: We are not necessary limiting replacement of corn ethanol to cellulose ethanol. There are other possibilities: policy shifts, food vs fuel debate, reducing tariffs on foreign sources of ethanol, and sugar cane ethanol, variety of possibilities that are not all in cellulose ethanol replacement category.
Beorkrem: That's a possibly Rich, but it goes a long distance away from past practice of Corps of Engineer's in not trying to anticipate policy shifts. We can guest-imate large amounts of cotton acres shifting but we need to work with some realities. Taking current production level of corn based ethanol and not allowing for any decrease in acreage because of shift in crops- you leave yourself open.
That implies we will be exporting corn and importing ethanol.

Beorkrem: Rest of world shifting from soybeans to corn also. World reacts and that will have an impact on acreage worldwide. When you set yourself up to develop model like this and have scenarios that are little strange. That is why I want to see peer review comments from experts.
Carr: If you'd like to submit additional written comments that we can include in this report they need to be in by 7 SEPT for inclusion in letter report.
Barr: Workshops and dialogue have been for benefit of everyone understanding what we are doing.
Beorkrem: So at this point scenarios are fixed?
Spitzack: Yes, we had to proceed with analysis using scenarios as developed to date based on input from contractors and workshops.
At this point Beorkrem left the conference call.
Spitzack: The report coming out 15 Aug 07 is for internal review. Stakeholders, NECC/ECC, and EPR will be receiving this document for formal review at the same time.

2. Progress on Economic Products (Carr)
   - Products that have been sent to ECC: Global Grain Model, Demand curves for Ag commodities and Non-Ag, Non-grain Traffic Forecast from Louis Berger, Rail Capacity and Water Compelled rates by Mark Burton.
   - Remaining products for external peer review group are scenario report with summary of today's discussion, and draft interim report.

Barr: Sharryn Jackson has been looking at prime farmland data, will let us know about other sources, Brad?
Walker: Suggest you contact American Farmland Trust Office in DC. Check their website. USDA, NRCS, & NASS (they are an agency of Department of AG). Last US Agriculture census done in 2002. Latest one will be done this year. Won't have data for a year or two. Trend lines show an increasing rate of farmland loss since the 1980's.
Carr: We will research and make EPR aware.
McGrath: Are there any land use experts on that panel? Darryl Ray from University of Tennessee -Ag Economics. Steve Fuller has a background in modeling of transportation of Ag commodities. He's familiar with producing and consuming regions.
Walker: I would suggest getting a geographer.
Carr: Our contact from USDA is Nick Marathon. He would be our starting point.
Lambert: That's a good point Brad made: decrease in farmland- how does that impact our exports of grain?
Walker: There's really no supply side analysis in model. It's demand and distribution. If you are going to model AG in US you need to model all of it. A lot of considerations that need to be made that aren't.
Carr: The model does have producing regions (supply-side). Appreciate your well stated comments.

3. What's Next: (Soileau)
   - Stakeholder and EPR meeting in Aug or Sept 2007 on Draft report.
   - Meeting will be similar to last meeting where we had presentations and you get a chance to ask questions. This meeting will focus on draft report. Tentative: St. Paul Tues and Wed, Aug 29-30 noon to noon. It may be in Bloomington. Not finalized yet. Rebecca Soileau will get logistics out next week.

Lambert: On Aug 28-29 the St. Paul District has a River Resources Forum. Could they shift it so we don't have conflicts? There are others in WI and IA that want to attend both.

Barr: NECC/ECC Meeting August 22, 2007 LaCrosse, Wisconsin
Radisson Hotel
200 Harborview Plaza
LaCrosse, WI
608-784-6680

- Proposed agenda: combined environmental and economics meeting and go through results from interim report. If you have comments or additional items we need to address let Jack and Ken know.
- UMRBA August 21, NECC/ECC August 22, EMPCC August 23.

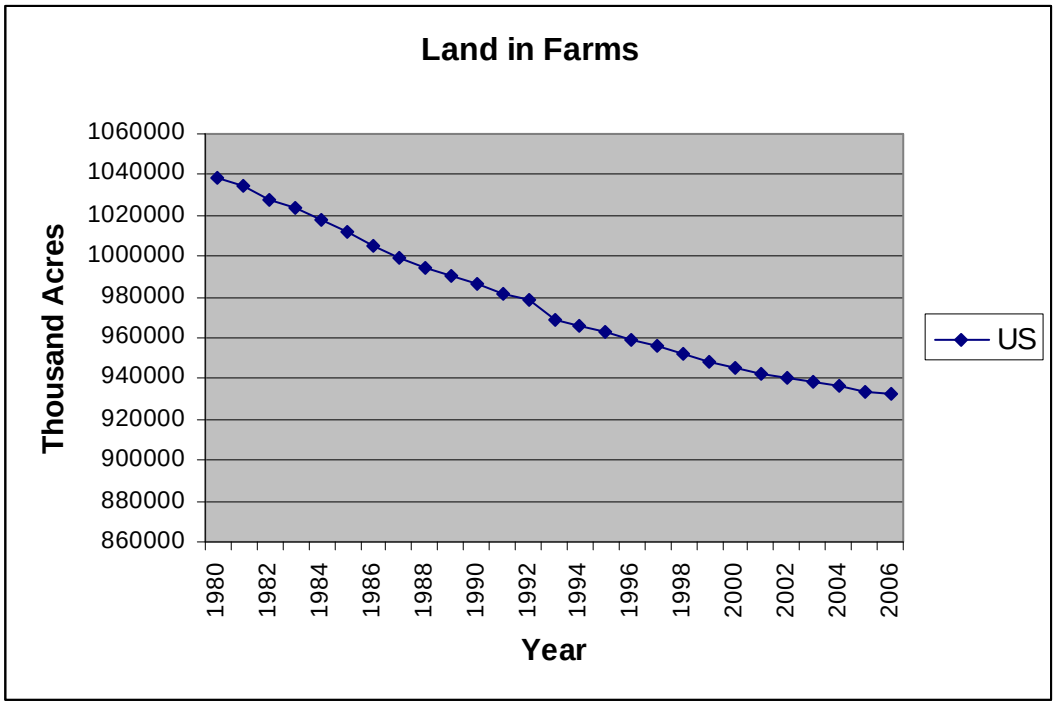
4. Around-table closing comments:

Jeff McGrath: Question- regarding concerns from stakeholders- is there any value in making additional model runs to address their questions on input variables? Directed to Spitzack or Manguno.
Spitzack: That needs to be part of formal comments to recommend additional runs and see if it's important. These comments will be considered in recommendations for the final report in December.
Manguno: At this point we are challenged to wrap up what we have done so far. There is no chance to re-run new scenarios and include them in ASA report.

No other comments.
9:30 end conference call.

Addendum:

As a follow-up to the discussion on farmland loss due to conversion to other uses, the American Farmland Trust (www.farmlandinfo.org) and US Department of Agriculture (www.nass.usda.gov) websites were searched for additional information. Historical data (1980-2006) for land in farms for the United States and for the states of Illinois and Iowa was obtained from the USDA site. Similar information was found on the American Farmland Trust site. Data shows an 11.4% decline in acres for the US, and 5.5 % and 7.3 % for Illinois and Iowa, respectively, as shown in the graphs below.


Land in Farms
Thousand Acres
1060000
1040000
1020000
1000000
980000
960000
940000
920000
900000
880000
860000
1980
1982
1984
1986
1988
1990
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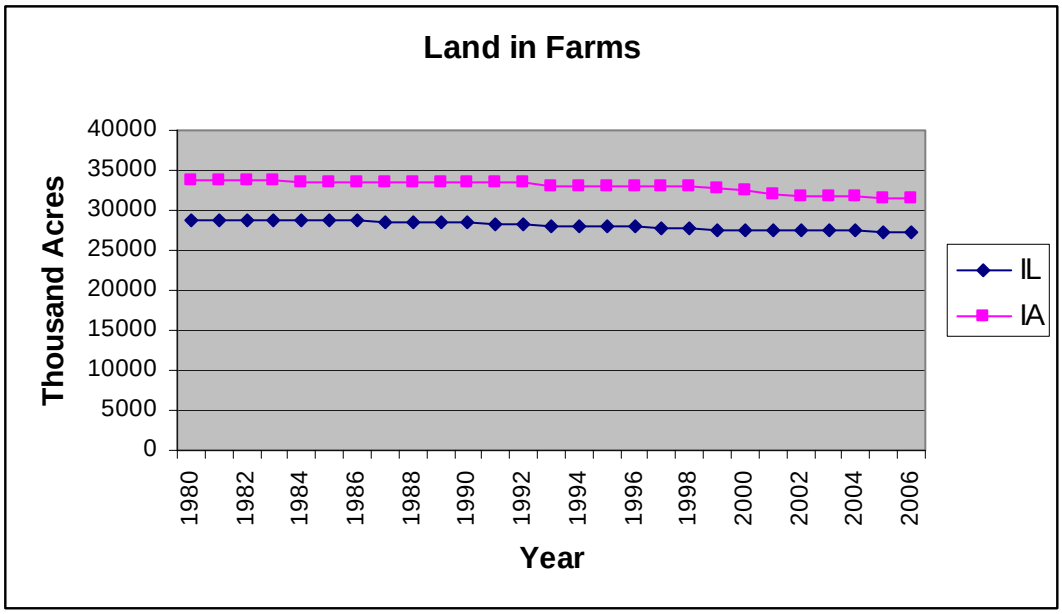
Land in Farms
Thousand Acres
40000
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Comments Received to Date:

1. From: bwalker@prairierivers.org [mailto:bwalker@prairierivers.org]
Sent: Monday, June 04, 2007 8:34 AM
To: Astrack, Richard F MVS; Carr, John P MVR
Cc: Barr, Kenneth A MVR; Spitzack, Charles P MVR; Beorkrem,Mark

Subject: UMR-IWW System Navigation Study, Traffic Scenarios Grain

In the May 2007 NECC-ECC meeting we were advised that assumptions used to establish the values for the LTS and HTS Grain Model Input Specifications would be made available for review. We have not as yet received this information. Please provide the information as soon as possible so that we will have adequate time to review it.

Also, it would be very helpful if you will include references to all studies or data, as well as direct input from organizations, that were utilized in establishing these values.

Your prompt attention to this request will be appreciated.

Thank you,

Brad Walker
Prairie Rivers Network
Upper Mississippi River Restoration Coordinator
(618) 541-0778

2. From: Max Starbuck [mailto:starbuck@ncga.com]
Sent: Tuesday, May 22, 2007 4:40 PM
To: Spitzack, Charles P MVR
Cc: Lisa Kelley

Subject: NESP Study

Chuck here is the thoughts regarding the NESP Response. The yield expressed as a percent rather than a set bushel is probably the one item to stress but all have a direct effect on corn on the river. Our thinking is included in the paragraph to which it pertains [see attachment 1 below].

Thanks and see you tomorrow.

Max Starbuck
Director Production, Stewardship and Livestock
National Corn Growers Association
632 Cepi Drive
Chesterfield, MO 63005

Attachment 1:

NESP Interim Report
Traffic Scenarios – Grain
25 April 2007

Two traffic scenarios are currently being considered for inclusion in the Interim Report. These scenarios are intended to represent the reasonable upper and lower bound limits of future traffic on the UMR-IWW navigation system. The scenarios will be translated into future traffic flows by executing the Global Grain Model (GGM.)

A number of GGM inputs have been identified as significant with respect to model results, as well as possessing a meaningful degree of uncertainty regarding their specification. These inputs have been identified as key parameters in developing the traffic scenarios. The following table identifies key input parameters, and values, for each scenario. (Note: A summary of the GGM is provided in a separate document.)

Grain Model Input Specification		
	Low Traffic	**High Traffic**
U.S. Corn-Based Ethanol Demand	EIA 2007 (11.2 billion gallons by 2012 and 13.4 by 2025)	Current Product Level Held Constant (5 billion gallons)
U.S. Corn Yields	1.6 bushels/year Increase (National Average)[1]	2.0 bushels/year Increase (National Average)[2]
Rest of the World Corn Yields	GGM Base Case	25% increase in GGM base case[3]
U.S. Area	107% of 2002-2004 average	107% of 2002-2004 average
U.S. Rail Capacity	169mmt (20% Increase in 2000-2004 Maximum Car Loadings)	155mmt (10% Increase in 2004 Maximum Car Loadings))
China Corn	Exports = 8mmt	Unconstrained Model Solution
Panama Canal	No Expansion	Expanded by 2020
UMR-IWW Navigation Infrastructure	Expanded	Expanded
Note: All other model inputs are assumed to be equal to the base case described in the December 2006 Global Grain Model report.		

U.S. Corn-Based Ethanol The Low Traffic Scenario assumes the 2007 Energy Information Administration, U.S. Department of Energy ethanol forecasts. Corn-based ethanol production is assumed in this scenario. The High Traffic Scenario assumes that corn-based ethanol production will not exceed current levels. However, the High Traffic Scenario does not assume that total ethanol production is limited to corn-based production. In addition to corn-based production, total ethanol production is assumed to include rapid implementation of non-corn sources.

NCGA has concerns with the High Traffic Scenario assumption that corn-based ethanol production will not exceed current levels to be flawed. Current production is at 6 billion gallons per year. Another 6.1 billion gallons of capacity are under construction, meaning ethanol production levels will top 12 billion gallons by 2010. We further expect ethanol production to grow to approximately 14.5 billion gallons in subsequent years. While we expect continued rapid growth in the amount of corn used for ethanol in the next 5-7 years, we do not expect significant decreases in corn export volumes. A number of public long-term projections (including USDA and FAPRI baselines) project export volumes receding only slightly in the next 2-3 years, but rebounding to the 2 billion bushel-

plus level by 2010/11. Increased corn production, through higher yields and expanding acreage, is likely to satisfy growing demand from ethanol production while still satisfying traditional demand commitments.

U.S. Corn Yields The base case in the December 2006 Global Grain Model report incorporates production region specific yields and yield growth. In aggregate the long-term national average for growth in corn yields has been approximately 1.6 bushels per year. Over a more recent historical period, corn yield growth has been higher. Consequently, the longer term historical national average is assumed to represent the Low Traffic Scenario while the High Traffic Scenario is assumed to be 2.0 bushels per acre, a 25% increase over the long-term national average.

I am not sure that corn yields should be expressed as a set bushel for a given year. This does not allow yields to reflect compounding effects over the prior year. NCGA has looked at trend yield in different periods and feels a shorter trend line time is more accurate due to several production and genetic factors as reflected:

35 year trend line – corn production 164 bu/ac by 2015

15 year tend line - corn production 174 bu/ac by 2015 (USDA abandoned 30 year trends in favor of starting with 1990)

10 year trend line – corn production 177 bu/ac by 2015

5 year trend line – corn production 200 bu/ac by 2015 (seed industry favors as they see their research)

NCGA feels the 10 year trend is relevant as the first biotech harvested seeds was 1995.

Suggestion (from base year national average yield 149 in 2006 crop year):

Low Scenario annual increase ~~2%~~ ***- Corrected to 1.7% (352 bu in 50 yrs)***

High Scenario annual increase ~~4%~~ ***- Corrected to 2.2% (452 bu in 50 yrs)***

Rest-of-World Corn Yields The Low Traffic Scenario assumes the base case values contained in the December 2006 GGM report for each non-U.S. production region. These values are based on trend analysis. For the High Traffic Scenario yields are increased over the December 2006 Global Grain Model report base case yields to reflect the same 25 percent increase assumed for the U.S. Acceleration in recent U.S. yield growth is driven primarily by bio-technology and the availability of this technology is not restricted to the U.S.

U.S. Area The assumptions of the December 2006 GGM report for the base case have been retained for both the Low and High Traffic Scenarios. Note that potential restriction in expansion of allowable acreages as a result of urbanization is being investigated.

Since the General Meeting in December, US corn acreage has gone well past the 107% annual increase. Up from 78.3 million planted acres in 2006 to projected plantings by USDA of 90.5 million acres in 2007, the annual increase percentage exceeded set levels. USDA and others anticipate continued growth in corn acres to steadily climb to meet increasing demand. When we start projecting the annual increases over the timeframe, the 107% is probably low but not enough to take issue with.

U.S. Rail Capacity The base case contained in the December 2006 GGM report restricts total U.S. rail capacity to the single-year maximum rail car loadings observed during the period 2000-2004. To account for the fact that this value is not strictly a capacity, but rather an observed flow, and to allow for the fact that rail capacity is not likely to be permanently restricted to existing levels, some

increase in the GGM base case assumption was assumed for the Low Traffic Scenario (20% increase) and is also being considered for the High Traffic Scenario (10%). Note that potential increases in capacity are with respect to capacity available for the transport of grain.

China Corn The Low Traffic Scenario includes a model constraint that requires China to export corn in the amount of eight million metric tons. This would be a continuation of recent China trade policy. Alternatively, the High Traffic Scenario does not force an outcome by means of a model constraint. Rather, China trade with this scenario will be determined by the model based on China's relative competitiveness with the rest of the world.

Panama Canal In 2006 a Panamanian referendum was passed that endorsed expansion of the canal. Once begun, construction is expected to take 10 years. The effect of an expanded canal would be to lower ocean shipping costs, primarily by allowing vessels that currently must light-load to increase their loads. A savings of approximately $5 per metric ton is assumed. Note that this savings is not reduced to account for an expected toll increase to finance the canal because the toll is assumed to be in place only for the duration of the construction period. The High Traffic scenario assumes that canal expansion will be accomplished by 2020. The Low Traffic scenario assumes that expansion will not occur.

UMR-IWW Navigation Infrastructure The intended use of the GGM for purposes of the Interim Report is to develop a set of unconstrained traffic flows. Unconstrained in this context means unconstrained by increases in future water congestion associated with increased levels of waterway traffic. Consequently, both the Low and High traffic scenarios assume expansion (twelve 1200' locks) of the UMR-IWW navigation system.

3. From: bwalker@prairierivers.org [mailto:bwalker@prairierivers.org]
Sent: Thursday, July 12, 2007 10:18 AM
To: Manguno, Richard J MVN; Astrack, Richard F MVS
Cc: mbeorkrem@hotmail.com
Subject: GGM Data

Thank you for holding the NECC/ECC telecon on Tuesday July 10, 2007. Upon reflection of the discussion held regarding two of the scenarios variables, specifically U.S. Corn Yields and U.S. Area we are requesting some specific model run information to assist in our evaluation of the GGM. These include:

1. The total cropland calculated for all grains per year for both LT & HT scenarios
2. The total production calculated for all grains per year for both LT & HT scenarios
3. The average yield calculated for all grains per year for both LT & HT scenarios
4. The export volume on the UMR for all grains per year for both LT & HT scenarios

We would prefer this information in a summary format but if you have the regional information available this would be helpful as well. This information is essential for us to provide comprehensive comments to you by the September 7, 2007 deadline and we will need about a month to analyze it. Your prompt attention is requested.

If we have additional informational requests we will provide them as soon as possible.

Thank you,

Brad Walker
Prairie Rivers Network
Upper Mississippi River Restoration Coordinator
(618) 541-0778

Response:

From: Manguno, Richard J MVN
Sent: Monday, July 16, 2007 7:56 AM
To: bwalker@prairierivers.org; Astrack, Richard F MVS
Cc: mbeorkrem@hotmail.com; Carr, John P MVR; Spitzack, Charles P MVR; Barr, Kenneth A MVR
Subject: RE: GGM Data

Brad,
Requested info is attached. [Excel workbook]

Rich Manguno

Corn (units in hectares)

Sum of Harv Area	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	2,396	2,463	2,530	2,596	2,245	2,397	2,464	2,530	2,597	2,730
USCPR	1,947	2,001	2,056	1,735	1,824	1,947	2,002	2,056	2,110	2,219
USD	552	568	583	598	629	552	568	583	599	629
USIAR	1,701	1,748	1,796	1,843	1,594	1,701	1,749	1,796	1,844	1,938
USIAW	4,165	4,281	4,397	4,513	3,903	4,166	4,282	4,398	4,514	4,746
USILN	3,484	3,581	3,679	3,776	3,934	3,485	3,582	3,679	3,777	3,971
USILS	2,038	2,095	2,152	2,209	1,910	2,039	2,096	2,152	2,209	2,323
USINN	2,135	2,195	2,254	2,314	2,433	2,136	2,195	2,255	2,315	2,433
USINR	525	540	555	569	599	526	540	555	570	599
USMI	953	979	1,006	1,033	893	953	980	1,006	1,033	1,086
USMN	941	968	994	839	882	941	968	994	1,020	1,073
USMNR	1,245	1,280	1,315	1,110	1,167	1,246	1,280	1,315	1,350	1,419
USMOR	336	345	354	299	315	336	345	354	364	383
USMOW	1,045	1,074	1,103	1,132	979	1,045	1,074	1,103	1,133	1,191
USNE	992	1,019	1,047	1,075	1,130	992	1,020	1,047	1,075	1,130
USNP	2,469	2,538	2,607	2,200	2,314	2,470	2,539	2,607	2,676	2,814
USOH	1,505	1,547	1,589	1,341	1,410	1,505	1,548	1,589	1,631	1,715
USPNW	83	86	88	90	95	83	86	88	90	95
USSE	1,705	1,752	1,800	1,847	1,942	1,705	1,753	1,800	1,848	1,942
USSP	955	981	1,008	1,034	1,088	955	982	1,008	1,035	1,088
USW	81	83	86	88	92	81	83	86	88	92
USWIS	615	632	650	548	577	615	633	650	667	701
USWIW	255	262	269	227	239	255	262	269	276	290
USWNP	32	32	33	28	30	32	32	33	34	36
Total:	32,156	33,052	33,949	33,046	32,221	32,162	33,061	33,953	34,855	36,643

Soybean (units in hectares)

Sum of Harv Area	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	951	1,008	1,064	1,120	1,233	951	1,008	1,064	1,120	1,233
USCPR	2,580	2,733	2,885	2,498	2,750	2,580	2,247	2,692	2,498	2,750
USD	2,655	2,313	2,442	2,572	2,830	2,184	2,313	2,442	2,572	2,830
USIAR	1,223	1,295	1,367	1,440	1,303	1,223	1,295	1,368	1,184	1,303
USIAW	3,558	3,769	3,979	4,190	3,792	3,559	3,770	3,980	3,446	3,792
USILN	2,499	2,646	2,794	2,942	3,238	2,499	2,647	2,795	2,420	2,663
USILS	2,081	2,204	2,327	2,451	2,218	2,081	2,143	2,328	2,015	2,218
USINN	2,061	2,183	2,305	2,427	2,671	2,062	2,184	2,305	2,138	2,672
USINR	516	547	577	608	669	516	547	577	500	550
USMI	940	995	1,051	910	1,001	940	818	911	910	1,001
USMN	924	979	850	895	985	924	805	850	895	985
USMNR	744	788	832	721	793	744	703	833	721	793
USMOR	541	573	605	524	576	541	471	605	524	576
USMOW	1,807	1,914	1,679	1,750	1,926	1,785	1,574	1,662	1,750	1,926
USNE	660	699	738	639	704	660	575	607	639	704
USNP	3,418	2,977	3,143	3,310	3,642	2,811	2,977	3,143	3,310	3,642
USOH	2,106	2,231	2,356	2,040	2,245	2,107	1,835	1,937	2,040	2,245
USPNW										
USSE	2,505	2,653	2,802	2,426	3,246	2,060	2,182	2,304	2,426	2,670
USSP	259	226	238	251	276	213	226	238	251	276
USW										
USWIS	268	284	300	316	286	268	284	300	260	286
USWIW	99	105	111	96	105	99	86	91	96	105
USWNP										
Total:	32,395	33,121	34,447	34,124	36,490	30,807	30,690	33,032	31,714	35,220

Wheat (units in hectares)

Sum of Harv Area	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	5,138.3	4,124.3	4,022.6	3,920.9	3,744.8	4,225.9	4,124.3	4,022.6	3,920.9	3,743.2
USCPR	480.7	469.1	457.6	446.0	422.9	480.8	469.2	457.6	366.8	422.9
USD	296.7	289.6	282.4	275.3	261.0	296.8	289.6	282.5	275.4	261.1
USIAR	4.3	4.2	4.1	4.0	3.8	4.3	4.2	4.1	4.0	3.8
USIAW	3.8	3.7	3.6	3.5	3.3	3.8	3.7	3.6	2.9	3.3
USILN	72.3	70.5	68.8	67.1	63.6	72.3	70.6	68.8	67.1	63.6
USILS	257.2	251.0	244.9	238.7	226.3	257.3	206.5	244.9	196.3	226.3
USINN	106.4	103.9	101.3	98.7	93.6	106.4	103.9	101.3	98.8	93.6
USINR	66.2	64.6	63.0	61.4	58.2	66.2	64.6	63.0	61.4	58.2
USMI	269.6	263.1	256.6	250.1	237.2	269.7	263.2	256.7	250.2	237.2
USMN	714.6	697.4	680.3	663.1	628.7	714.8	658.2	680.4	545.3	628.8
USMNR	25.8	20.7	24.6	19.7	22.7	21.3	20.7	20.2	19.7	22.7
USMOR	60.0	58.5	57.1	55.7	52.8	60.0	48.1	57.1	45.8	52.8
USMOW	273.8	267.2	260.6	254.0	240.9	273.9	219.8	260.7	208.9	240.9
USNE	203.3	198.4	193.5	188.6	178.8	203.3	198.4	193.5	188.7	178.9
USNP	3,976.7	3,881.0	3,785.4	3,689.7	3,498.4	3,976.7	3,881.0	3,785.4	3,689.7	3,498.4
USOH	388.0	378.7	369.3	360.0	341.3	388.1	378.8	369.4	360.1	341.4
USPNW	1,559.7	1,522.2	1,484.7	1,447.1	1,372.1	1,559.7	1,522.2	1,484.7	1,447.1	1,372.1
USSE	690.4	673.8	657.2	640.6	607.4	690.5	554.1	657.3	526.8	607.5
USSP	3,417.7	2,743.2	2,675.6	2,792.9	3,006.6	2,810.8	2,743.2	2,675.6	2,608.0	3,007.2
USW	293.6	286.5	279.4	224.6	258.3	293.6	235.6	248.1	224.0	258.3
USWIS	79.8	77.8	75.9	74.0	70.2	79.8	77.9	75.9	74.0	70.2
USWIW	4.6	4.5	4.4	4.3	4.1	4.6	4.5	4.4	4.3	4.1
USWNP	1,865.8	1,820.9	1,776.0	1,731.1	1,641.3	1,865.8	1,820.9	1,776.0	1,731.1	1,641.3
Total:	20,249	18,275	17,829	17,511	17,038	18,726	17,963	17,794	16,917	17,038
Grand Total:	**84,800**	**84,448**	**86,225**	**84,680**	**85,749**	**81,696**	**81,715**	**84,779**	**83,486**	**88,901**

Corn (units in metric tons)

Sum of Production	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	24,848	29,160	34,202	36,739	37,472	24,469	27,962	31,929	36,465	47,373
USCPR	18,184	21,353	25,036	22,903	28,714	17,915	20,478	23,374	26,675	34,677
USD	4,777	5,608	6,571	7,516	9,501	4,706	5,377	6,140	7,010	9,106
USILN	37,700	44,231	51,869	54,973	67,274	37,115	42,416	48,416	55,292	71,866
USILS	20,342	23,883	27,996	30,457	31,188	20,040	22,905	26,149	29,848	38,788
USINN	21,545	25,284	29,645	32,139	39,971	21,208	24,238	27,687	31,617	41,074
USINR	4,970	5,833	6,840	7,578	9,488	4,892	5,597	6,391	7,295	9,478
USIAR	17,638	20,699	24,278	26,078	26,599	17,369	19,848	22,664	25,884	33,627
USIAW	43,690	51,286	60,109	64,356	65,563	43,032	49,160	56,159	64,106	83,294
USMI	7,966	9,344	10,956	12,690	13,241	7,844	8,964	10,232	11,682	15,191
USMN	8,999	10,556	12,383	11,241	14,059	8,859	10,123	11,569	13,203	17,163
USMNR	12,765	14,990	17,566	15,582	19,348	12,568	14,367	16,411	18,737	24,353
USMOR	2,901	3,402	3,991	3,755	4,747	2,854	3,265	3,729	4,254	5,532
USMOW	9,634	11,310	13,260	14,822	15,303	9,490	10,851	12,390	14,135	18,373
USNE	7,606	8,919	10,459	12,519	16,032	7,489	8,554	9,769	11,147	14,498
USNP	18,420	21,624	25,339	25,218	32,391	18,127	20,716	23,673	27,005	35,115
USOH	14,028	16,461	19,307	17,679	22,170	13,820	15,785	18,038	20,589	26,756
USPNW	1,059	1,243	1,458	1,473	1,791	1,043	1,192	1,361	1,554	2,020
USSE	13,789	16,171	18,967	22,238	28,314	13,570	15,510	17,710	20,212	26,280
USSP	8,324	9,763	11,450	13,055	16,489	8,192	9,364	10,695	12,200	15,861
USW	980	1,151	1,349	1,383	1,689	965	1,104	1,260	1,439	1,869
USWIS	5,655	6,634	7,782	7,161	8,994	5,570	6,364	7,270	8,297	10,784
USWIW	2,212	2,598	3,045	2,859	3,611	2,180	2,492	2,844	3,248	4,221
USWNP	280	328	385	359	452	275	315	359	410	533
Total:	303,593	361,832	424,243	444,771	514,402	303,593	346,947	396,221	452,301	587,831

Soybean (units in metric tons)

Sum of Production	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	2,958	3,405	3,862	4,324	5,264	2,959	3,406	3,862	4,325	5,265
USCPR	6,914	7,979	9,060	8,345	10,173	6,915	6,562	8,452	8,345	10,173
USD	6,320	6,199	7,254	8,332	10,585	5,198	6,199	7,254	8,332	10,585
USILN	8,195	9,183	10,199	11,180	13,210	8,197	9,186	10,201	9,195	10,865
USILS	6,139	7,009	7,890	8,797	8,739	6,140	6,814	7,891	7,235	8,739
USINN	6,658	7,554	8,460	9,369	11,218	6,659	7,556	8,461	8,254	11,221
USINR	1,543	1,771	2,009	2,243	2,729	1,544	1,772	2,009	1,845	2,245
USIAR	3,937	4,416	4,895	5,384	5,225	3,938	4,417	4,896	4,428	5,225
USIAW	11,030	12,324	13,570	14,874	14,334	11,032	12,327	13,571	12,233	14,334
USMI	2,368	2,607	2,837	2,530	2,914	2,368	2,144	2,460	2,530	2,914
USMN	2,283	2,506	2,253	2,434	2,817	2,283	2,061	2,253	2,434	2,817
USMNR	2,159	2,405	2,664	2,393	2,816	2,159	2,144	2,664	2,393	2,816
USMOR	1,536	1,821	2,110	1,979	2,495	1,536	1,498	2,111	1,979	2,495
USMOW	4,644	5,321	5,003	5,548	6,741	4,586	4,376	4,953	5,548	6,741
USNE	1,716	1,972	2,237	2,058	2,504	1,717	1,621	1,840	2,058	2,504
USNP	7,724	7,115	7,890	8,671	10,235	6,352	7,115	7,890	8,671	10,235
USOH	5,982	6,648	7,303	6,548	7,655	5,983	5,468	6,006	6,548	7,655
USSE	5,987	7,058	8,181	7,691	11,752	4,924	5,805	6,728	7,691	9,665
USSP	472	427	467	507	586	388	427	467	507	586
USWIS	772	860	947	1,035	997	772	860	947	851	997
USWIW	256	290	324	294	351	256	238	266	294	351
Total:	89,592	98,870	109,415	114,536	133,342	85,906	91,997	105,182	105,696	128,427

Wheat (units in metric tons)

Sum of Production	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	13,308	11,012	11,022	10,979	10,897	10,945	11,012	11,022	10,979	10,893
USCPR	1,379	1,440	1,492	1,525	1,573	1,380	1,441	1,492	1,254	1,573
USD	1,050	1,118	1,175	1,222	1,292	1,051	1,118	1,175	1,223	1,292
USILN	322	337	350	359	371	322	337	350	359	371
USILS	949	967	979	986	984	949	795	980	811	985
USINN	493	523	548	569	598	493	524	548	569	598
USINR	262	276	287	295	307	262	276	287	295	307
USIAR	16	17	17	18	19	16	17	17	18	19
USIAW	12	12	13	13	14	12	12	13	11	14
USMI	1,202	1,276	1,340	1,388	1,463	1,203	1,276	1,340	1,389	1,464
USMN	2,058	2,078	2,088	2,089	2,068	2,059	1,961	2,089	1,718	2,069
USMNR	72	59	72	59	70	60	59	59	59	70
USMOR	209	216	220	224	227	209	178	220	184	227
USMOW	967	1,018	1,061	1,095	1,142	967	837	1,061	900	1,142
USNE	835	887	929	964	1,014	836	887	929	964	1,014
USNP	9,624	10,091	10,448	10,737	11,125	9,624	10,091	10,448	10,737	11,125
USOH	1,812	1,935	2,039	2,124	2,249	1,812	1,936	2,039	2,125	2,250
USPNW	6,941	7,002	7,022	7,019	6,929	6,941	7,002	7,022	7,019	6,929
USSE	2,541	2,736	2,905	3,043	3,261	2,541	2,250	2,905	2,502	3,262
USSP	7,211	5,925	5,886	6,228	6,885	5,931	5,925	5,886	5,816	6,887
USW	1,471	1,461	1,445	1,174	1,379	1,471	1,202	1,283	1,172	1,379
USWIS	332	346	357	366	377	332	346	357	366	377
USWIW	16	17	19	20	22	16	17	19	20	22
USWNP	3,825	3,860	3,889	3,895	3,857	3,825	3,860	3,889	3,895	3,857
Total:	56,907	54,609	55,602	56,389	58,125	53,254	53,359	55,429	54,382	58,125
Grand Total:	**450,092**	**515,311**	**589,260**	**615,696**	**705,868**	**442,752**	**492,303**	**556,832**	**612,380**	**774,384**

Corn (units in metric tons per hectare)

Sum of Yield	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	10.37	11.84	13.52	14.15	16.69	10.21	11.35	12.62	14.04	17.35
USCPR	9.34	10.67	12.18	13.20	15.74	9.20	10.23	11.37	12.64	15.63
USD	8.65	9.88	11.27	12.56	15.10	8.52	9.47	10.53	11.71	14.47
USILN	10.82	12.35	14.10	14.56	17.10	10.65	11.84	13.16	14.64	18.10
USILS	9.98	11.40	13.01	13.79	16.33	9.83	10.93	12.15	13.51	16.70
USINN	10.09	11.52	13.15	13.89	16.43	9.93	11.04	12.28	13.66	16.88
USINR	9.46	10.80	12.33	13.31	15.85	9.31	10.36	11.52	12.81	15.83
USIAR	10.37	11.84	13.52	14.15	16.69	10.21	11.35	12.62	14.04	17.35
USIAW	10.49	11.98	13.67	14.26	16.80	10.33	11.48	12.77	14.20	17.55
USMI	8.36	9.54	10.89	12.29	14.83	8.23	9.15	10.17	11.31	13.99
USMN	9.56	10.91	12.46	13.40	15.94	9.41	10.46	11.64	12.94	16.00
USMNR	10.25	11.71	13.36	14.04	16.58	10.09	11.22	12.48	13.88	17.16
USMOR	8.64	9.86	11.26	12.55	15.09	8.50	9.46	10.52	11.69	14.46
USMOW	9.22	10.53	12.02	13.09	15.63	9.08	10.10	11.23	12.48	15.43
USNE	7.67	8.75	9.99	11.65	14.19	7.55	8.39	9.33	10.37	12.83
USNP	7.46	8.52	9.72	11.46	14.00	7.34	8.16	9.08	10.09	12.48
USOH	9.32	10.64	12.15	13.18	15.72	9.18	10.20	11.35	12.62	15.60
USPNW	12.69	14.49	16.54	16.29	18.83	12.49	13.89	15.44	17.17	21.23
USSE	8.09	9.23	10.54	12.04	14.58	7.96	8.85	9.84	10.94	13.53
USSP	8.72	9.95	11.36	12.62	15.16	8.58	9.54	10.61	11.79	14.58
USW	12.09	13.81	15.76	15.74	18.28	11.90	13.24	14.72	16.37	20.23
USWIS	9.19	10.49	11.98	13.06	15.60	9.05	10.06	11.19	12.44	15.38
USWIW	8.69	9.93	11.33	12.60	15.14	8.56	9.52	10.58	11.77	14.55
USWNP	8.85	10.10	11.53	12.74	15.28	8.71	9.68	10.77	11.97	14.80
Total:	224.82	260.74	297.64	320.62	381.58	224.82	249.97	277.97	309.08	382.11

Soybean (units in metric tons per hectare)

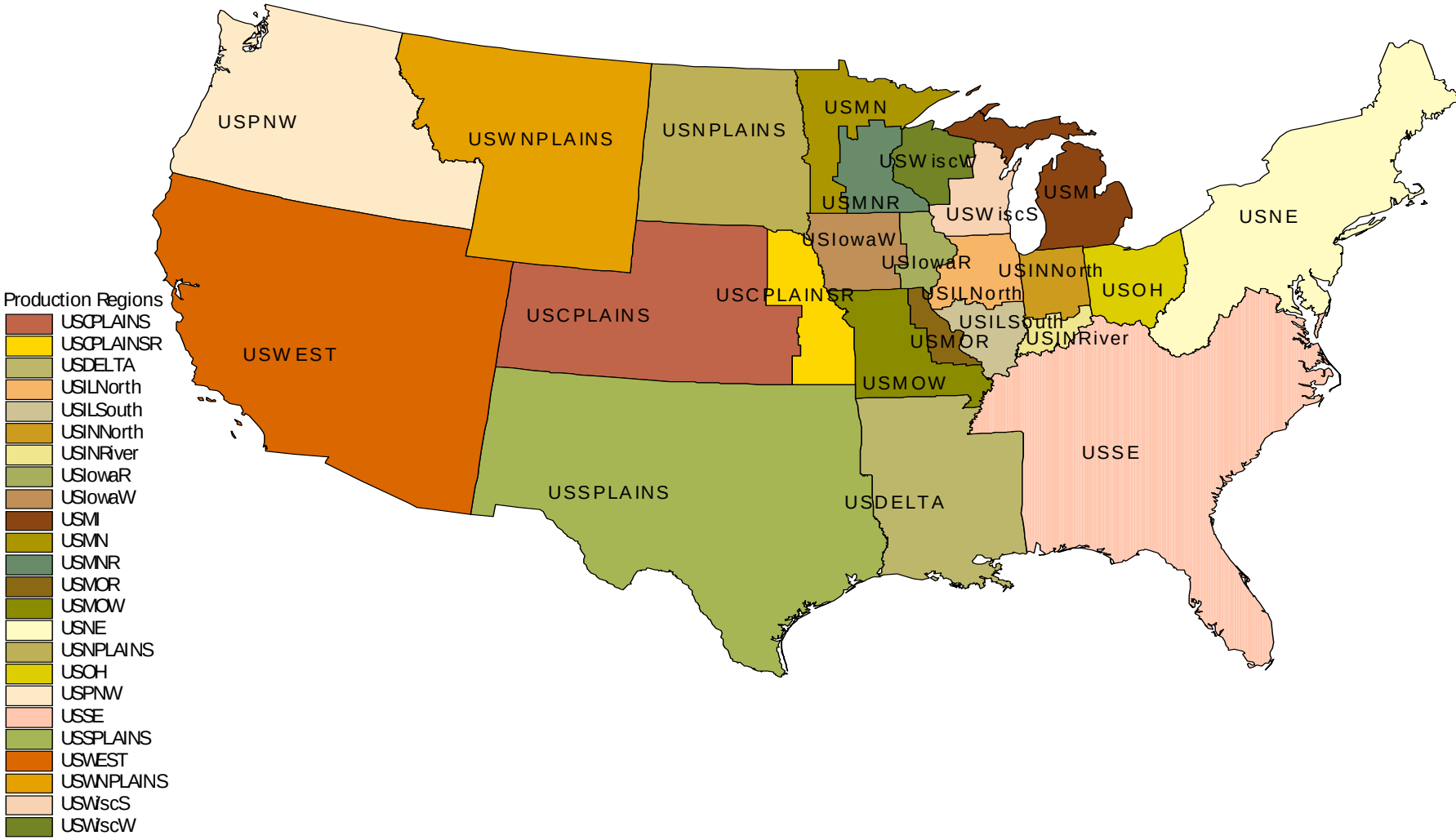
Sum of Yield	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	3.11	3.38	3.63	3.86	4.27	3.11	3.38	3.63	3.86	4.27
USCPR	2.68	2.92	3.14	3.34	3.70	2.68	2.92	3.14	3.34	3.70
USD	2.38	2.68	2.97	3.24	3.74	2.38	2.68	2.97	3.24	3.74
USILN	3.28	3.47	3.65	3.80	4.08	3.28	3.47	3.65	3.80	4.08
USILS	2.95	3.18	3.39	3.59	3.94	2.95	3.18	3.39	3.59	3.94
USINN	3.23	3.46	3.67	3.86	4.20	3.23	3.46	3.67	3.86	4.20
USINR	2.99	3.24	3.48	3.69	4.08	2.99	3.24	3.48	3.69	4.08
USIAR	3.22	3.41	3.58	3.74	4.01	3.22	3.41	3.58	3.74	4.01
USIAW	3.10	3.27	3.41	3.55	3.78	3.10	3.27	3.41	3.55	3.78
USMI	2.52	2.62	2.70	2.78	2.91	2.52	2.62	2.70	2.78	2.91
USMN	2.47	2.56	2.65	2.72	2.86	2.47	2.56	2.65	2.72	2.86
USMNR	2.90	3.05	3.20	3.32	3.55	2.90	3.05	3.20	3.32	3.55
USMOR	2.84	3.18	3.49	3.78	4.33	2.84	3.18	3.49	3.78	4.33
USMOW	2.57	2.78	2.98	3.17	3.50	2.57	2.78	2.98	3.17	3.50
USNE	2.60	2.82	3.03	3.22	3.56	2.60	2.82	3.03	3.22	3.56
USNP	2.26	2.39	2.51	2.62	2.81	2.26	2.39	2.51	2.62	2.81
USOH	2.84	2.98	3.10	3.21	3.41	2.84	2.98	3.10	3.21	3.41
USSE	2.39	2.66	2.92	3.17	3.62	2.39	2.66	2.92	3.17	3.62
USSP	1.82	1.89	1.96	2.02	2.12	1.82	1.89	1.96	2.02	2.12
USWIS	2.88	3.03	3.16	3.28	3.49	2.88	3.03	3.16	3.28	3.49
USWIW	2.59	2.77	2.93	3.07	3.33	2.59	2.77	2.93	3.07	3.33
Total:	57.62	61.74	65.55	69.03	75.29	57.62	61.74	65.55	69.03	75.29

Wheat (units in metric tons per hectare)

Sum of Yield	Scenario									
ProdReg	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
USCP	2.59	2.67	2.74	2.80	2.91	2.59	2.67	2.74	2.80	2.91
USCPR	2.87	3.07	3.26	3.42	3.72	2.87	3.07	3.26	3.42	3.72
USD	3.54	3.86	4.16	4.44	4.95	3.54	3.86	4.16	4.44	4.95
USILN	4.46	4.78	5.08	5.35	5.83	4.46	4.78	5.08	5.35	5.83
USILS	3.69	3.85	4.00	4.13	4.35	3.69	3.85	4.00	4.13	4.35
USINN	4.63	5.04	5.41	5.76	6.39	4.63	5.04	5.41	5.76	6.39
USINR	3.96	4.27	4.55	4.80	5.27	3.96	4.27	4.55	4.80	5.27
USIAR	3.60	3.92	4.20	4.47	4.95	3.60	3.92	4.20	4.47	4.95
USIAW	3.12	3.39	3.63	3.86	4.28	3.12	3.39	3.63	3.86	4.28
USMI	4.46	4.85	5.22	5.55	6.17	4.46	4.85	5.22	5.55	6.17
USMN	2.88	2.98	3.07	3.15	3.29	2.88	2.98	3.07	3.15	3.29
USMNR	2.80	2.87	2.94	2.99	3.09	2.80	2.87	2.94	2.99	3.09
USMOR	3.49	3.69	3.86	4.02	4.31	3.49	3.69	3.86	4.02	4.31
USMOW	3.53	3.81	4.07	4.31	4.74	3.53	3.81	4.07	4.31	4.74
USNE	4.11	4.47	4.80	5.11	5.67	4.11	4.47	4.80	5.11	5.67
USNP	2.42	2.60	2.76	2.91	3.18	2.42	2.60	2.76	2.91	3.18
USOH	4.67	5.11	5.52	5.90	6.59	4.67	5.11	5.52	5.90	6.59
USPNW	4.45	4.60	4.73	4.85	5.05	4.45	4.60	4.73	4.85	5.05
USSE	3.68	4.06	4.42	4.75	5.37	3.68	4.06	4.42	4.75	5.37
USSP	2.11	2.16	2.20	2.23	2.29	2.11	2.16	2.20	2.23	2.29
USW	5.01	5.10	5.17	5.23	5.34	5.01	5.10	5.17	5.23	5.34
USWIS	4.16	4.44	4.70	4.94	5.37	4.16	4.44	4.70	4.94	5.37
USWIW	3.46	3.88	4.28	4.66	5.36	3.46	3.88	4.28	4.66	5.36
USWNP	2.05	2.12	2.19	2.25	2.35	2.05	2.12	2.19	2.25	2.35
Total:	85.74	91.59	96.96	101.88	110.82	85.74	91.59	96.96	101.88	110.82

Exports:

Units in metric tons

	High10	High20	High30	High40	High60	Low10	Low20	Low30	Low40	Low60
Corn	37,248	41,927	50,652	50,853	62,432	22,482	3,446	721	28,637	57,753
Soybean	13,299	14,484	11,873	11,010	6,881	15,377	14,314	14,975	11,663	6,818
Wheat	1,659	337	0	0	0	2,376	1,970	0	0	0
Total:	**52,206**	**56,748**	**62,525**	**61,864**	**69,313**	**40,236**	**19,730**	**15,696**	**40,300**	**64,570**

US Production Regions