FINAL MINUTES

31st Meeting of the NECC
November 28 & 29, 2000
Holiday Inn – Bettendorf, IA

CEMVR-PM-A

Navigation Environmental Coordination Committee (NECC)

November 28 & 29, 2000
Holiday Inn, Bettendorf, Iowa

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1. WELCOME

The 31st meeting of the Upper Mississippi River-Illinois Waterway System Navigation Study Navigation Environmental Coordination Committee (NECC) was called to order by Ken Barr, Chairman. No additions or changes were made to the Agenda. An attendance list is provided at **Attachment 1**.

2. STUDY STATUS - KEN BARR AND DENNY LUNDBERG

Ken Barr introduced Denny Lundberg as the new Project Manager of the UMRS Navigation Study. Lundberg gave a brief presentation on status and time frames for the study. Presentation is provided at **Attachment 2**.

Moore: Is it conceivable to have a 90-day comment period?
Barr: At this point we are planning for about a 60-day review period. We foresee about 60 days to review and submit comments.
Beorkrem: If the study allows, we would like a 90-day period for review and comment.
Lundberg: This is a comment we have received before?
Barr: Yes. The review period was previously planned for 45 days, but we extended it (in project schedules) to 60 days.

3. REVISED TRAFFIC FORECASTS - KEN BARR (PowerPoint presentation at Attachment 3)

Johnson: I know this was a detailed analysis, but I'm wondering whether or not ethanol production and increased use of set aside land was taken into account within this analysis?
Barr: There were some assumptions made about the Freedom to Farm Act and set aside land. They also made assumptions and anticipated on production of ethanol. Chris (Holleyman – Faucett Associates) would need to speak to this specifically.
Moore: What were the numbers at 2050, the original and revised?
Barr: The estimates were about 155M tons in the original forecast, and it looks like about 135M tons at 2050.
Bertrand: These estimates still seem to be contrary to recent trends.
Barr: Again, we are making predictions on long-term trends. Also, we did go to the USDA and obtained some information on their predictions for transportation needs. However, these estimates only go out 10 years. For planning purposes, we need to go out 50 years into the future, which becomes even more difficult to predict.
Bertand: What is the quality of the USDA data?
Barr: We did some QA of the USDA 10-year forecasts with Faucett and ourselves. It appears that this data can be utilized within our analysis.
Schonhoff: How did the extrapolation take place from 10 years out to 50 years?
Barr: I can't speak to this real well. Faucett revised the forecast based on a number of reasons. Most of the increase in traffic is attributed to increased crop production, not increased acreage.
Wilcox: Do you anticipate any adjustments of the traffic numbers based on ASA?
Barr: I don't believe so. ASA doesn't want us to use them as a technical review, but a parallel external review.
Duyvejonck: Didn't USDA say that these weren't really forecasts because of uncertainty?
Barr: USDA did have a disclaimer about this. However, after further discussion between USDA and their lawyers, they determined that they would stand by their 10-year forecasts.
Lundberg: FYI, this entire report is available on the web-site.
Brummett: How do the number of tows go up if projections go down?
Barr: The number of tows go down relative to previous projections. There is still an increase in tows on the river compared to the Base Condition.
Johnson: These projections again assume China imports 70% of its corn, as well as the existing methods of transportation and other destinations for goods, West Coast shipment, ethanol plants, etc.?
Lundberg: I think for the next meeting we should have Chris here so we can better address these details about the economics analysis.

Barr: I agree. To address Steve's question, I know these were all considerations within the analysis, but I can't specifically address them. We'll make sure Chris comes to the next meeting and does his homework.
Schonhoff: What was the assumed number of counties over which that corn would be shipped by rail vs. barge?
Barr: The analysis broke IA into three areas and identified by area what percentage of corn was shipped by water vs. rail.

4. REVISED MODELING RESULTS – STEVE BARTELL (PowerPoint presentation at Attachment 4)

Benjamin: Was horsepower class taken into consideration for future projections? In the future, will tows use higher horsepower engines and was this taken into account?
Knight: I don't believe this would be expected to change. Designs may change, but I doubt the horsepower will go up substantially.
Moore: So the model doesn't take into account the changes that may occur?
Bartell: Correct, we do take into account nozzle configuration. But we do make the assumption that certain general designs will be the same across the study period.
Barr: After discussion, it seemed an appropriate assumption.
Moore: Was this checked since 1992.
Barr: No, we haven't checked this.

Schonhoff: When will a preferred alternative be selected.
Lundberg: I believe it will be selected around February.
Schonhoff: Will it be public at that time?
Lundberg: Headquarters has said we will release the report in September. That is all I can really tell you about when the preferred alternative will be made public.
Duyvejonck: When will we have the revised modeling results package in hand?
Barr: When Steve feels comfortable to release as a final product.
Beorkrem: The Corps has 6 months to review the EIS. Who decided to take the GLC out of the process?
Lundberg: We're not happy with this, but it's a decision made by Headquarters. We are trying to rework this.
Beorkrem: What can MVD do to include the GLC?
Pullen: Ultimately, its not a Division issue, but a Headquarters issue. We can address our concerns with Headquarters, but ultimately they will make the decision.
Beorkrem: This is an issue because we have not been included as a part of the open process. Our people want to look at the full discussion about alternatives to identify how we got to the final preferred alternatives.

5. REVISED ENVIRONMENTAL MODELING: PLANTS – STEVE BARTELL (PowerPoint presentation at Attachment 5)

Sallee: Wouldn't channel border areas continue to fill in and serve as plant habitat?
Wilcox: Channel and channel border areas are generally fairly stable.
Bertrand: I think in Pool 19 and Pool 13 we will have sedimentation to lead to more plant habitat that you are not including.
Sallee: Pool 14 would have it, Pool 12 would have it. As those areas shallow up, they may become plant habitat. The river is aging, so how do you account this aging over the 50 year analysis period.
Barr: We have attempted to address this in the cumulative impacts report.
Bartell: We have focused on the incremental differences between with and without project. We may have biased by not including these areas, but it shouldn't greatly affect the incremental area.
Sallee: There is uncertainty there that you may be over-estimating or under-estimating appropriate mitigation to offset these impacts.
Wilcox: I think Dan's point would be quite different if we have 2050 bathymetry projection. But, because we are so conservative in our projections, I think we are still o.k. in our impact calls. In addition, we haven't done a site by site analysis to determine if all these areas are possible plant habitat. This would take a site by site evaluation.

Beorkrem: How do you assess probability of risks without knowing the thresholds for these plants?
Bartell: We would express affects in terms of biomass, and not "mortality." We could give the likelihood for a 100% die off, if you equate 100% loss of biomass to mortality.
Beorkrem: You have no baseline condition, so how can you assess impacts?

Barr: We have baseline turbidity data, and we have assumed where these plants are growing. We have assumed plants are growing in every place where water is less than 1.5 meter deep. Again, we are attempting to be overly conservative in our estimates.

Wilcox: We haven't seen substantial reductions in plant growth to suggest reduced reproductive potential. It probably isn't a difference great enough to measurably affect population levels.

Barr: We just aren't seeing the big effects to plants. The increased traffic may slightly affect growth, but not with large scale die offs. Still, we have identified hotspots and we will avoid, minimize and/or mitigate impacts to these areas.

6. REVISED ENVIRONMENTAL MODELING: LARVAL FISH ENTRAINMENT – STEVE BARTELL (PowerPoint presentation at Attachment 6)

Moore: What does larval distribution factor reflect?

Bartell: We have for different species, various estimates to develop densities for each pool. The factor W_i deals with relative distribution based on what we know about larval fish behavior for each species, i.e., where would each species likely be found (channel vs. channel border).

Moore: I reviewed the Corps larval fish data, and it showed tremendous variation. How did you select a representative value, given this variation?

Bartell: Our estimates are conservative. If anything, we have overestimated larva fish concentrations. We can discuss variability with different point estimates. We tried to keep the development of distribution data as close to the species as possible, but eventually we had to pool data to develop our analysis. In some cases we may have over-inflated the values.

Beorkrem: But you may have underestimated them as well.

Bartell: It's possible, but would seem unlikely.

Beorkrem: It may be conservative, but we just don't know.

Sallee: My understanding was that you were assuming a steady state, with tows moving upstream at a steady speed. We know this is not the case. Have any field studies been done to evaluate the estimated value from real world circumstances – how much water is actually passed through the turbines, compared to our modeled values?

Knight: We have done some evaluations of this. Much of the manuvering, accelerating and decelerating occurs around the locks. The amount of water drawn through depends on a variety of factors.

Wilcox: Steve Maynord made some careful calculations to take these factors into account.

Sallee: Have you ever done some field verification?

Knight: We have modeled this with the physical model.

Wilcox: There also is a consideration for a mixing of water. How much new water is coming in because you can only kill a fish once.

Schonhoff: Can't you mount flow meters behind the vessel to identify the amount of water entrained?

Knight: We evaluated this. But we also need to identify where the water exiting the prop came from.

Sallee: You just said you assumed the larval densities were constant throughout the river.

Wilcox: No, just constant throughout the main channel.

Knight: There is a report by Maynord that has been put out that may help out with this discussion.

Sallee: At Dubuque bridges, a downbound tow takes 45 minutes to back and make the bridge. My question was whether this was taken into consideration, and the answer you gave me is no.

Knight: Your right, this specific issue was not taken into consideration.

Barr: This is a site-specific consideration that was not taken into account.

Moore: In order to get to an EAL of 250K, how many juveniles would you need to kill?

Wilcox: It's about 10,000 times that number, it's in the millions.

Beorkrem: On the Open River, with juvenile numbers being so low, and with the limited amount of data, it seems we may be way off on these estimates.

Bartell: The limitation is in the amount of available data. However, we have been extremely conservative in our assumptions, thus limiting the likelihood of underestimating impacts.

Beorkrem: How many miles are we assuming?

Barr: We calculate densities and larval mortality for the trend reach of the open river which covers about 43 miles, and then use a multiplier of 4.625 to estimate for the open river. The juvenile densities are much lower down there in the Open River.

Moore: Why did the numbers on the IWW change so much when traffic changed so little?

Barr: I'm not exactly sure, but I suspect that with the new locks in 2017, something has been activated by 2040.

Moore: How would moving a boat faster affect these values?

Barr: If we do nothing at all, there will be a certain amount of traffic. With new locks, there will be additional traffic, but less of an affect on traffic compared to the UMR, thus some of the reasoning for the differences.
Moore: You have an 11% change in traffic, but a 50% change in EAL.
Bartell: I'm not certain why that EAL value is so great. I will go back and look at these values, identify if there are any errors.
Barr: We'll give you an IOU on this.

NOTE: Bartell has re-examined the modeling output for EAL on the IWW. The values are correct (presentation is included at Appendix X). The confusion arose because we are addressing the incremental traffic differences, and the fact that the without project forecasts change as well. The 11% change in traffic is referenced to previous traffic for the same scenario, but the incremental difference in traffic is closer to the percent difference in the entrainment calculations (e.g., around 50%). So, the confusion comes mainly from the fact that the percentages presented in the slide are not directly comparable.

Bertrand: Within the discussion of fisheries resources, you should give a separate paragraph to discuss sturgeon, because this is a sensitive issue.
Beorkrem: Does it make sense that we are talking about such huge differences between the lower UMR and the open river.
Barr: Juvenile densities are a lot lower in the open river.
Moore: Is there an ecological reason, or a limitation of data?
Barr: The data we have shows lower densities.
Beorkrem: Does this suggest we have far fewer fish?
Wilcox: Yes, per unit of water volume, there are less.
Barr: Let us be sure we are not making the same mistake as before. We are using the trend reach, and we need to multiply to get the values for the entire Open River.
Sallee: Will you agree that there is a great deal of uncertainty?
Barr: Yes.

7. REVISED ENVIRONMENTAL MODELING: FISH SPAWNING HABITAT – STEVE BARTELL (PowerPoint presentation at Attachment 7)

Wilcox: Its important to note that this is a broad brush approach to evaluating fish spawning habitat. Because of the dynamic nature of river systems and fish spawning, this is one generalized approach for doing this.
Moore: Can you establish a relationship between loss of spawning habitat and loss of adults?
Bartell: Not necessarily. This gives some correlation between habitat conditions and spawning habitat suitability. Species populations may or may not be limited by spawning habitat availability.
Moore: We have talked about utilization of cells for analysis of spawning habitat, plants and the like. Are these cells that are uniform for substrate conditions, water quality, etc?
Knight: Not necessarily. The reason for this is because bathymetry and substrate were only taken every half mile.
Moore: So you have a cell one half mile long that is given characteristics of the one point.
Barr: Yes.
Bartell: This analysis would suggest that under ambient conditions, there is zero spawning habitat for some species. However, this is for the main channel only. Also, there are some limitations with the available data for each cell.

8. REVISED ENVIRONMENTAL MODELING: BACKWATERS AND SIDE CHANNELS – SANDRA KNIGHT (PowerPoint presentation at Attachment 8)

Ken Barr distributed the minutes from the previous NECC Meeting, requesting comments in the days ahead so that these minutes can be revised and finalized.

Adjourn for the Day

November 29, 2000

9. CALL TO ORDER - KEN BARR

Ken Barr called Day Two of the 31st NECC to order. No immediate comments were available yet on the minutes from the previous NECC. Barr requested that comments should be sent to himself or E. Stefanik for incorporation into the Final Minutes.

10. DISCUSSION ON MITIGATION MANAGEMENT FRAMEWORK – RICH FRISTIK

Fristik: I'll open with the planning for this mitigation workshop. We initially planned on a two-day meeting, then focused this to a one-day workshop. I put together a read ahead packet to focus today's effort (included at **Attachment 9**). We're not here to do Pool Planning, but rather to put together possible management frameworks for mitigation. We would like to have further discussion about developing a trust fund to see if that is something that would be reasonable for this mitigation. The goals and objectives are ones presented before. They are very broad, and deal with how we are approaching mitigation planning. We are emphasizing avoid and minimize in accordance with NEPA, coordinating with resource folks, using an adaptive mitigation approach, and, to the extent possible, linking spatial and or temporal impacts with mitigation measures. For now, we should focus on a management framework. We may take a shot, time permitting, to look at a Pool Specific plan. Finally, we can talk about additional tools and measures for mitigation. We talked about some various things, but we want additional suggestions of what else we can include in the matrix, what "tools" we can utilize for mitigation. We will first go over what is in place now as far as coordination teams within the different districts of the UMRS. We'll start with what is in place up in St. Paul District and then move down river.

Barr: (Referring to a list of acronyms representing various coordination groups) If you have any other acronyms (groups) to put up on the board, go ahead. The NECC originated in 1992 when we were first in the recon phase of the Nav Study. At that time, we asked for state and Federal representatives to serve on the NECC, which is basically how the NECC group was initially developed. The GLC was formed around 1994, at which point we were a year into feasibility. There was additional concern if we were getting perspective from the states, so we formed the GLC. If there are no other questions, move on to Clevenstine.

Clevenstine: About the FWIC (Fish and Wildlife Interagency Committee; display of the charter notebook). The FWIC are the field level staff in support of the RRCT (River Resources Coordinating Team), which is administrative in function. Most often, the FWIC commonly addresses dredging issues. The FWIC specifically addresses issues within the Rock Island District, although St. Paul has a similar group. These groups are related to the GREAT I and GREAT II efforts. (Clevenstine handout "Fish and Wildlife Component" at **Attachment 10**.) The first objective was to define fish and wildlife management. We didn't follow though with the third bullet on Pool 19. The FWIC has been a little more independent than the RRF (River Resources Forum). The last bullet, we haven't addressed that to any degree.
Barr: Can you relate this to the EMP (Environmental Management Program) program?
Clevenstine: The District developed a prioritization process for EMP.
Barr: Did this develop a loose relationship to the EMPCC (EMP Coordinating Committee)?
Clevenstine: Yes. After habitat projects were ranked, the list was handed over to the RRCT. They went along with this as budget and capabilities would allow. This was then presented to the EMPCC for additional massaging at the administrative level.
Barr: Any further discussion on the FWIC? Jon, is this going how we need to?
Duyvejonck: We may need to put boxes on where we all relate to these groups. We need to reach a consensus on how this additional work can be accomplished.
Wilcox: Here are the existing institutional arrangements. With mitigation, we have additional habitat issues to address. In some ways this is similar to EMP, yet these are different projects with different colors of money. We should consider how we can integrate this with existing river management.
Barr: We need to come up with an array of alternatives. Hopefully, we will have three or four possible organizational structures in place for dealing with mitigation. We won't have a final alternative until following public review.
Clevenstine: We will need to come back to HREP (Habitat Rehabilitation and Enhancement Project) prioritization. Pool Planning is occurring which crosses several administrative boundaries. I'll come back to this later.

Barr: The NECC charter is to facilitate coordination with the FWS, which facilitates development of the CAR (Coordination Act Report) for the Nav study.
Johnson: Did the charter ever get finalized?
Barr: Yes. We will attach this to the minutes (Charter at **Attachment 11**).
Clevenstine: Some of these other groups also have some level of additional administrative role compared to the FWIC.
Nelson: We went through the recommendations, the focus recently has dealt more with dredging and CARS (Committee to Assess Regulatory Structures) issues. Previously, it was a forum to bring up almost any river issue. The general coordination issue declined in the 90s, probably due to implementation of long-term dredging plans and their importance – the focus turned to dredging. But the other focus between '85 and '90 was the EMP.
Barr: I think at the District level we have some effective groups. However, I think we need to integrate to deal with issues at the regional level.
Schonhoff: The FWIC has less formal interaction than the RRCT. We don't have an official charter with the FWIC.
Bertrand: It seems the MVR recognizes the RRCT as its official body.
Benjamin: I'm assuming for mitigation it would be the On-Site group compared to the FWIC?
Clevenstine: Whoever it is, they will basically be the same guy, whatever hat they are wearing.
Bertrand: These committees are already tackling more than they care to handle. If we put in another assignment with mitigation, and they will likely fall off on addressing these other areas.
Nelson: We are doing EMP2 planning, Pool Planning, and now Navigation Planning, all being thrown up into the mix. We may have the opportunity to develop more integrated river management. But it will ultimately become a staffing issue.
Fenedick: We skipped over a major step of what the objectives are for adaptive mitigation. If we are talking about $100 million in mitigation, there is no way one group can take this on. Money may need to come out of the mitigation to deal with this.
Johnson: Lets ignore for the moment existing structures, but lets look at what we need, and then determine how we can get this with or without these structures.

Barr: Before we get into these details, lets go north to St. Paul and identify coordination within this District.
Wilcox: Up north, there has been an outgrowth of the river resources forum. It has been renamed, but it's basically the same people that participate. This forum is the interagency group for river management. It is co-chaired by a member of St. Paul District and Wisconsin. Reps are from the District, the States, the FWS, industry, NGOs; its basically the group for river planning. One of their major focuses is dredging and dredge material placement. The group is also active in planning of channel training structures. About half the pools in MVP have gone through this planning process. Its also been involved with Weaver Bottoms (restoration). Under this forum is the Fish and Wildlife Work Group (FWWG), which are the on-the-river folks. Members of this group staff the On-Site inspection team. They are on call for emergency events. FWWG has been the eyes and ears for the Forum, as they provide the technical expertise to the Forum. They have prioritized different efforts. The forum ensures that MVP hears the concerns of the various stakeholders. There also is a Water Level Management Work Group, which is investigating water level management. These groups have worked well together. They are beginning to go toward integrated river management. This FWWG are the people you know – different hats and committees, but the same folks. Planning for mitigation measures will be one more thing for these groups to do. But this institutional arrangement seems to work.
Barr: You said the NGOs participate. Are they members?
Johnson: They are not official members, but they do participate.
Barr: EPA, NRCS?
Johnson: Generally, they are not real active, but they do vote.
Clevenstine: They generally are not active participants in the Rock Island District.
Benjamin: RRF has plans in place, so we don't waste time with dredging issues.
Johnson: Our agreement is the DMMP sites must be agreed upon in consensus.

Barr: Lets go downstream and discuss coordination within the St. Louis District.
Brummet: We have the MMCT (Middle Mississippi Coordination Team) which is a mixture of people. We meet on a barge and discuss river issues starting at Lock 22 and moving downstream. Pools 24, 25 and 26, not the Alton Pool on the IWW. This began in the late 80s early 90s. A new way of dredging coordination also is on the internet. It has information available for review on dredge sites and placement sites. A couple years back, we put together a list of do's and don'ts for dredging. We put together a plan on recommended placement for some areas. Avoid and minimize came out a few years ago.
Clevenstine: MMCT really kicked in after completion of the Design Memo (for L/D 26 second lock) in '91 or '92.

Brummett: Avoid and Minimize (A&M) has annual funding of $1.1 million. It has included bull noses, chevron, off-bank revetments, side-channel protection, etc. The $1.1 million in funding has been spent each year. It has a team that includes FWS, COE, and the States. MMCE and A&M does have some things it can do. Bill, any thoughts on HREP prioritization?
Bertrand: We've been slow to the game, now catching up on HREP prioritization.
Brummett: Under EMP2, I think Gordon submitted for 9 HREP projects. St. Louis District has been effective at getting these things done.
Beorkrem: But the group is very limited.
Brummet: Brescia was there, but I don't believe you guys were involved.
Pullen: I don't have a good feel for these groups and how they act. Frankly, Division finds this to be confusing. Many have said we need to bring order to these processes and streamline our efforts.
Moore: I want to agree with what Tom said. This seems to be a perfect recipe for confusion. I'm sure it evolved very unintentionally. Hopefully we can use this mitigation effort as a catalyst for integration.
Wilcox: It does sound confusing with the different acronyms. However, the general structure is the same within each district. EMPCC is an umbrella organization, as is the Nav Study. We need to decide which institutional arrangement is best suited for this effort.
Johnson: In St. Louis, is there an A&M team?
Brummett: I think T Miller is in charge of these efforts. It's the same people.
Pullen: Our actions for the ESA consultation should be wrapped up into what we are doing here for Nav Study.
Sallee: If we have confusion, it needs to be addressed irrespective of mitigation.
Barr: Any other discussion about these other groups?
Nelson: I agree with what Dan W. has said. The terminology is confusing but the structure is the same, and the people we are meeting with are the same.
Barr: I think this points to a great challenge. For mitigation, we are going to need some framework similar to the GLC, EMPCC, etc. Now is the time to look at the synergies and how these programs inter-relate to develop the mitigation effort.

Break

Duyvejonck: In the read ahead packet are excerpts from the CAR. It basically reflects our thoughts on the mitigation plan. This was actually taken from the CAR for the second lock, thus our thoughts haven't changed greatly in last fifteen years. One of the first things that is a priority is to achieve some type of integrated framework for navigation mitigation efforts, A&M, O&M effects, and EMP. All three Districts should be implementing an A&M Program. Channel maintenance, rock work, etc. should be done under one group. The second point is that we want an adaptive mitigation approach, including monitoring. We can have discussion on who does monitoring and to what level. Another reason for the adaptive approach is, if you don't believe the affects won't happen for 30 years, we don't want to go through with these mitigation efforts if they don't work. We want the flexibility to change the plan. The effects will occur over time. Thus, you should be off-setting the impacts over the entire project life. The third major point is funding. FWS and the States are pretty sensitive to how this will be funded, especially after the Second Lock issue. We want some certainty on funding, and not have to rely on annual appropriations every year for 30 years. I can't see the Corps having and open CG account for the life of the project. We need a dedicated funding source. This would also encourage participation if money was available for spending. Another more minor point of the scheme is to have someone else from the outside come in and give advice on handling the mitigation framework, sort of an independent review. We have asked for an independent review of the impact analysis. It didn't happen. But we can at least do this for mitigation. Also, what can we do to refine our impact predictions? We don't know if the money proposed will be too much or too little, due to all the uncertainties. The next one is the Navigation Steering Committee, how do we set one up and who is going to be involved – this goes back to the integrated management framework. I think the FWS is willing to act as a leader for this since we can take funding from the COE. It's similar to Clevenstine acting as the Chair of the FWIC.
Barr: The EMPCC is co-chaired between the FWS and the COE.
Wilcox: Do you see the EMPCC as being able to oversee this effort, similar to the navigation steering committee?
Duyvejonck: I'm not sure the Basin Association is willing to take this on. Maybe you could modify the GLC for this.
Wilcox: The EMPCC has the same structure as what you recommended for a steering committee, and they currently oversee EMP projects, which are similar to what we will likely do for impact mitigation.
Bertrand: It might be well suited for this because it would all be under the UMRBA.
Duyvejonck: One of the reasons we suggest a trust fund would be to remove the COE as being the sole entity in control of funding.
Pullen: The Costal Wetlands Program has an interagency group that oversees this. The COE participates, but is not in charge. The funding is based upon a tax. A coordinating group decides how it is spent.

Wilcox: Who administers the inland waterways trust fund?
Duyvejonck: I think it is the Corps.
Barr: You are on point 3; do you want to discuss 4 through 7? [points under section B of the CAR excerpt, **Attachment 9**]
Duyvejonck: What would the role of the LTRMP be to evaluate the affects of navigation impacts and mitigation? There would be the opportunity for LTRMP to get involved with the monitoring.
Nelson: The "general plan" idea would give more support and visibility for an adaptive mitigation plan.
Pullen: I agree it would be a good title to use.
Beorkrem: Are you proposing to use an overarching resource body that incorporates regular operations and EMP?
Duyvejonck: I think we need to be addressing these issues on a systemic level, O&M issues, fish passage, water level, exotics control, effects of channelization, indirect affects need to be addressed on a system-wide basis. We need to develop a plan to address the big picture. We need to outline these system objectives with an EMPCC type group.
Beorkrem: This year's WRDA had at least a dozen river restoration actions authorized, but where is the funding going to come from? Where or what will be the prioritization by Congress? It seems that this could be a dilemma we face here.
Duyvejonck: I disagree because this is mitigation, a project cost and not a "restoration" effort. I am simply looking for a way to coordinate this effort.
Pullen: This is a concern because of the way Congress looks at how it divies up money. We will need to be aware of this.
Wilcox: We will need full support from the States to obtain and spend mitigation money. We have the institutional arrangements in place, but we want to add additional funds for mitigation.
Bertrand: There is a danger with associating with EMP.
Wilcox: I agree, we need to have a clear fence (delineation) between EMP funding and mitigation funding. The EMPCC administers similar efforts, it would be another function for them to oversee. This would be better then setting up a separate group to oversee the mitigation.
Duyvejonck: For point 6, we would volunteer to be a co-leader with the COE. Number 7, ensure adequate funding. That hits the high points.
Fristik: Do you see the independent review panel as a long-term or short-term thing?
Duyvejonck: I see it as a short-term effort.

Johnson: Describing how we all work together on the river is extremely difficult. (Summary of flip chart notes at **Attachment 12**). EMPCC is the central group. They make recommendation to MVD. It also makes recommendation to USGS for the LTRM. The A-Team gives advice to the EMPCC on LTRM issues. MMCT through RRAT, FWIC through the RRCT, and the FWWG through the RRF. For the Nav Study, ENGCC, ECONCC and NECC (Engineering, Economics and Environmental coordinating committees) through the GLC to MVD and UMRBA (Upper Mississippi River Basin Association). For river management policy as a whole, the UMRBA has the water quality work group, it makes recommendations to Congress (see attachment). I also know a couple models for a trust fund (another attachment). They use a 501C3 corporation to accept money, 25 million, to mitigate for adverse impacts to a refuge affected by runway extensions at the Minneapolis airport. Maybe we can create a 501C3 organization where the States are all voting members.
Barr: Where does the money come from?
Johnson: The money is federal from the DOT.
Barr: The source of funds is a fuel tax?
Johnson: Its appropriation through the federal government, and maybe 10% from the State. The other potential model is for a bridge over the St. Croix. Department of Interior is asking for $15 million for land protection. They also would create a 501C3 with the states, the Forest Service, etc., as voting members.
Bertrand: For appropriations, we would set up a certain amount, appropriated at so much per year? Is that what we would do?
Duyvejonck: The Corps needs to establish a total cost for mitigation. The FWS also has O&M issues that it thinks needs to be included, although this would be separate funds from this mitigation. Every year, there should be appropriations from separate pots of money, with one group overseeing this.
Nelson: If we had this in law as a trust fund, then the money is much more secure.
Barr: Lets do point #5 again [CAR excerpt, **Attachment 9**]. These funds that begin with plans and specs in 2001 to 2015 which would allow us to build 7 locks, for example. The other line is environmental mitigation cost which ramps up, ramps down, another small spike and continuing on over the life of the project. At the bottom are CG funds for the projects. With this traditional approach, we would get appropriations for 50% of construction funds from the Inland Waterways Trust Fund, collected from the fuel tax. The hard part, is when we are done in 2015, what if we have a CG account which is set to be closed. The CG account for Lock and Dam 26 is still open. Tom Pullen?

Pullen: We do have plans that will kick off shortly for mitigation at the Second Lock. I don't have a lot of details, but it looks like we will begin before the end of the year.
Barr: This is one example of how a CG account can stay open. Perhaps we can discuss how half of the funding will come from appropriations, and the other half from a trust fund.
Duyvejonck: It would seem you use appropriations to build up the trust fund over time.
Bertrand: You are proposing diverting money from navigation funds to mitigation funds?
Barr: Potentially.
Johnson: This seems to be a political nightmare, navigation won't be happy with this.
Wilcox: You can put less away now and get the funding later, or get the money upfront. It's a policy question on how we obtain and manage money for mitigation. We are including a tax to force cost-sharing on a navigation project. The main thing is that we want to ensure that the money is there in the future.
Barr: 50% would be the cost share, the same as any other project cost.
Barr: The first alternative (Alternative 1, see **Attachment 12**) is that we keep the NECC and the GLC, doing the specific pool by pool planning for mitigation. The pros: We would know about other pool planning efforts, HNA, channel maintenance, etc. We know the strengths and weakness of the different analyses (institutional knowledge). They would answer to the GLC for navigation efforts.
Wilcox: Another reason to keep the NECC, we will be able to continue detailed planning. There aren't other groups that have the knowledge of what has gone on previously. The cons are burn-out, disinterest, and for implementing mitigation measures, there would be redundancies.
Fenedick: A pro is that it is an existing organization, the con is that this group may not be the proper mix for adaptive mitigation, who should be part of the NECC at the point and time for mitigation implementation.
Johnson: The NECC is an advisory group. We have never made policy. We are talking about making policy decisions. Maybe the NECC isn't appropriate for this.
Fenedick: The con is that it still doesn't get resource support, we are advisory, not authoritative. Are we the right people to be talking about mitigation for the UMRS?
Barr: The lack of ability of being able to get a flow from the NECC to the GLC to the MVD is problematic.
Moore: Is the COE going to make a recommendation where it will give up some of its authorities?
Barr: It may not get great support from my agency, but we would have an alternative where we set up an advisory committee.
Wilcox: If everything flows through the Corps, then the Corps has the responsibility to maintain funds and make mitigation happen. It makes the most sense to have a group like EMPCC take on this responsibility. If there was a separate fund like Steve talked about, then we could set up a board of directors, and the Corps wouldn't necessarily have the last say. Where Headquarters and Congress would like to see this remains to be seen.
Nelson: Your agency wants to mitigate the project. However, our agency wants to mitigate for all traffic.
Moore: The mechanism for distributing the funds over the next 30 years is what is most important.
Wilcox: If we are going to be effective, and do things to mitigate the navigation system, then we need to do more planning for integrated management. Make good use of existing funds. These things need to be executed in a more coordinated effort. It will be important to plan mitigation with these other efforts. The EMPCC would be a regionally coordination point. The UMRBA is the main sounding board for policy issues. To set up another entity for just mitigation measures doesn't seem to make sense.
Duyvejonck: It gets back to co-equal objectives. Not just navigation, but environmental issues. Thus, the Corps doesn't have the final say. We see the Nav Study as the avenue to raise that problem and issue.
Barr: Because of the uncertain future of the GLC, the alternative with the NECC would proceed without the GLC and that the NECC would report directly to MVD.
Johnson: The EMPCC could use the existing highways to get suggestions from the field biologists up to the policy people and, thus, move forward with mitigation.
Wilcox: One of the main reasons for the GLC was to get the State's perspective. As far as planning for mitigation, I'm not sure we need that type of representation.
Lundberg: Two things before lunch. First, we do have about 90 days for public review. Second, I have heard a lot of good discussion. My fear is that this will be decided far above anyone here in the District. Thus, we need to lay these ideas out very clearly as we proceed.

Lunch

Barr: Bullet two. MVD, flows from two or three levels. Technical folks to an EMPCC type body to MVD.
Bertrand: States may have a hard time with technical folks giving official state recommendations.
Duyvejonck: The question now becomes what is in that box (the second or third levels between technical folks and MVD).

Barr: The second alternative (Alternative 2, see **Attachment 12**) is to set up a new steering committee with the Corps and the FWS as co-chairs. The third alternative (Alternative 3, see **Attachment 12**) is to modify existing groups to handle this task.
Duyvejonck: We would like to see one integrated river management group.
Barr: We could start up a brand new structure with brand new names. Lets talk pros and cons of starting up new groups to solely deal with Nav Study Mitigation.
Fristik: This is becoming blurry to me. It seems to me that the existing bodies will be involved. But do we use another existing body, or create a new body as the middle box between the technical folks and MVD.
Barr: For Alternative 2, with the NECC being dissolved, is there support for starting with one of these groups?
Bertrand: Yes.
Barr: The proposal for Alternative 2 is that this is not a re-chartered group, but is a new body. Its not EMPCC or UMRBA, but a new body.
Bertrand: This new group should still work under the auspices of the UMRBA.
Brummett: This unknown level needs to be appointed by the governor or by a State department.
Duyvejonck: I don't know if I would vote for naming it a mitigation steering committee, but a navigation steering committee. This would address Avoid and Minimize, O&M, channel structures, etc.
Pullen: I'm concerned with integrated river management, and to me, this is going in an opposite direction if you come up with another group. This should be put in one box.
Barr: This is Alternative 3.
Moore: Isn't this kind of Alternative 2a and 2b, one for mitigation and one for river management activities?
Barr: I think we can acknowledge that Alternative 2 can include these other activities.
Barr: Alternative 2 Pros: technical level, use existing structures (organizations), focused on adaptive mitigation. Cons for Alternative 2, existing groups would be overloaded; new steering committee, may not have resource focus; redundant; and the need for staffing these additional committees (**Attachment 12**).
Barr: Alternative 3 would include MVD from EMPCC from RRF, RRCT, from FWWG and FWIC (field biologist). This would involve a recharter of the EMPCC (**Attachment 12**).
Pullen: When you send this out, define the roles of each level and entity, especially for those in MVD.
Nelson: It seems we're relying on the lower two layers, and you can't have one committee dealing with all these issues, and I'm wondering if we shouldn't be talking about empowering the RRCT and the RRF to get things done on the ground.
Millar: For developing ideas and setting up mitigation, maybe we need to set up an independent process, contracting out work, and other methods to develop new ideas. There is no way you can designate someone to do a job if you don't know what the job is. Lets not preclude bringing in new faces.
Wilcox: As far as a programmatic administration, we can make a whole new one at Alt 2, or Alt 3 having the EMPCC doing the administration. We would be loading up the EMPCC with additional responsibilities. I also think we could benefit by having a team of experts on restoration. If these folks worked with the technical folks, as opposed to being a review group.
Barr: Pros and cons of Alt 3: Pros- it would reduce redundancy, better integration between programs, co-chaired by FWS and the Corps. The cons- it would confuse lines of funding and authority between the Nav Study and EMP, it also may overload the EMPCC.
Beorkrem: The Corps doesn't have a unified group, they have individual districts. This perpetuates a pool-level thinking process.
Nelson: The pool-level is a convenient break point for management.
Wilcox: These efforts are supposed to move toward goals of a preferred condition. The HNA is a first step towards this. There may be other targets we want to define, whether it's a hydrologic regime, habitat conditions, etc. We have not set out to define these specifically. It seems that the overseeing body like an EMPCC would need to consider this.
Beorkrem: I agree with Dan. The money for various projects on the river is fragmented. And there needs to be a body and not local technical folks overseeing a systemic approach.
Duyvejonck: Its like we are asking a state to take one or two people and assign them to these issues.
Beorkrem: How do the States get funding for dealing with the federal actions?
Nelson: We say you can do it, the Corps says it is extremely difficult.
Wilcox: There has been some work out west where money has been exchanged between state and Federal hands.
Barr: We have never funded the states for coordination.
Moore: What is the barrier?
Pullen: The navigation is a benefit to the state, so the state should go along with the coordination.
Benjamin: The Corps is going to implement a project that impacts the river and you want the State to pay for the coordination? I disagree with that idea.

Barr: Roles of Alt 3: Level one: Assist in detailed planning for implementation (**Attachment 12**). Anything else?

Millar: I could see where you would have assigned functions for a field biologists, but I also see systemic alternative ideas that could be contracted out to Universities.
Wilcox: The interdisciplinary teams do most of the planning. What we are discussing today is the coordination and institutional arrangements above them.
Barr: Level two roles, assist in prioritization at the District level; more focus on administrative issues; state prioritization. Level 3: Systems Team; Independent new ideas from other areas; objective review; science addition; evaluate recommendations from each district and determine goals; technical input to planning design. Level 4: Systemic regional priorities; allocation of funds relative to priorities; integration with other programs (Attachment 12).
Wilcox: Throughout the UMRS, we are talking about a group that makes the tough choices for allocation of funds.
Barr: Level 5, Advocacy role (now where the UMRBA is found). They formally represent the States on conflicting interests – agriculture, commercial development, transportation, natural resources; constructive criticism. Level 6 (MVD) higher authority, Budget Test, Regional PM, and federal policy (**Attachment 12**).
Pullen: The role of the Corps and FWS is to be a good listener and listen to the states.
Duyvejonck: We probably also should talk about mitigation prioritization, in-kind, out-of-kind, etc.
Barr: Lets first jump back to trust funds.
Wilcox: Lets talk funding alternatives and the pros and cons of each.
Duyvejonck: Traditional vs. trust fund.
Wilcox: One would be lock box examined; the second would be a 501C3 (non-profit organization, board of directors); third would be an Inland Waterways trust fund to track mitigation dollars.
Fenedick: A trust fund is an odd framework, because it's actually a mechanism when a framework is in place. This is not an alternative management framework.

Break

Fristik: Before we resume our previous discussion, this is a last call for tools to utilize for mitigation. Some examples of tools that we are considering included off-shore revetments, closing structures, dredging of backwaters, woody structures, island creation, structural methods to protect plant species, etc. From this list, is there anything else we should consider?
Benjamin: Land acquisition from willing sellers.
Barr: Water level control on Pool 25 will require land purchase.
Fristik: We also can consider methods to improve fish passage.
Bertrand: Lets consider water level management scenarios. Having flexibility for hinge-point and dam-point control.
Barr: We realize that fish passage is a systemic issue.
Beorkrem: What about bathymetry research?
Barr: Some of this has been targeted. We are not targeting this as a part of the Nav Study.
Beorkrem: Why wouldn't you include this?
Barr: Because we don't feel this is a data needed to avoid and minimize impacts.
Sallee: You have good models, and really bad data. So you made your best guess. You really have done a "best guess" of what the impacts may be.
Barr: We have used best available information.
Sallee: Shouldn't we identify the data gaps to better assess the impacts?
Barr: We have a good enough database to evaluate alternatives, but not to manage the whole upper river.
Sallee: I think you should identify your biggest data gaps. I also think you should look at better ways to minimize affects.
Barr: We are continuing to look at alternate traffic patterns. We also will do some additional years of fish entrainment sampling.
Bertrand: You also should have money to collect additional data to refine impact conclusions.
Sallee: I would like to see further refinement of these data sets. Also to do some ground truthing and field observations on this model output.
Wilcox: We could also do some GPS work on tows to track their progress and the speed of movement through pools. What we can do is evaluate what are the measures that would be effective to make a difference in modeled mortality.
Schonhoff: Tow (seasonal restrictions) are an avoidance measure.
Fristik: You do realize the tremendous changes in policy and other issues that come with closing the tow season for a few months.
Wilcox: For example, if we wanted to protect Pool 13 walleye. They would be present for approximately so many days. So you could shut it down for that many days during the identified period. Or, you could shut it down during the night, and allow transportation during the day.

Barr: So what species do you shut down for?
Bertrand: Probably walleye, sauger, paddlefish, sturgeon, maybe others.
Schonhoff: You could shut down for March through July; that would cover most of the season. For a minimization, you could increase flows into side channels and sloughs.
Brummett: I'm not sure you just want to open up some of these areas to direct flows.
Moore: We should look at redirecting flow back across the floodplain and not just in the main channel.
Wilcox: This is going on in some areas.
Schonhoff: You could also examine creating spawning habitat in areas away from tow areas.
Brummett: The split-flow area will be difficult because you will be fighting navigation interests.
Benjamin: You also should consider providing these fish other areas than just the main channel.
Duyvejonck: In some places it may not be possible to improve main channel and channel boarder habitat. Reconnecting the floodplain is attractive, but could become expensive. This will be a tough decision for the group, what direction do we want to go for mitigation.
Beorkrem: This is precisely the problem without ground-truthing. We are talking about impacts in 5 or 6 pools. We need to look at costs for mitigation and how this will offset impacts.
Wilcox: As a part of this effort, we can estimate the cost per acre and thus the cost for purchase, as well as the cost for moving the levee, etc., thus giving you a project cost.
Sallee: I think some people may be able to estimate what habitat needs are out there as well as the modeled mortality.
Beorkrem: we need to go through a couple day workshop to see how far our mitigation dollars go.
Nelson: I agree.
Beorkrem: I have no confidence about the money we are spending.
Fenedick: I want to re-emphasize stepping out of the box. If we are going after mitigation, we should go after additional ground truthing and monitoring to identify effectiveness of a mitigation measure for mitigating an impact.
Duyvejonck: We should continue trying to leverage the money with other authorities. If we can combine efforts, we may be able to address many issues.
Fenedick: I think its the mindset. We need to change our mindset. And to be sure we are replacing what we are taking.
Wilcox: The best approach would be to simulate a natural hydrograph. We are working on this. To the extent we can establish off-channel habitat, we will likely increase fish production.

Barr: Lets get final thoughts before we wrap up.
Moore: No comment
Nelson: Just because we participated in this discussion that includes various mitigation framework alternatives, it doesn't mean we support mitigation for the Nav Study, we want mitigation for the whole project.
Bertrand: No comment.
Duyvejonck: I echo Rick's comment.
Sallee: I echo Jon's comment.
Brummett: Lets continue to strive for uniformity amongst districts.
Millar: No comment.
Pullen: I thought this was a good meeting. We heard candid thoughts. Hopefully we'll get to the bottom line.
Fristik: No comment.
Fenedick: Some effort needs to be given for the objectives, why we need a structure, how is it going to work, and what is the strategy. Some goal/objective language. Second, we now have a new branch chief – Ken Weslake.
Johnson: Nothing to add.
Benjamin: Its time to balance the two uses out on the river, and not bias navigation. It should be the keystone of our discussion.
Beorkrem: This is the first meeting we have discussed how these numbers affect navigation. I'm concerned about our timetable. If we are to do more mitigation work, we have a problem because you are looking to go to Headquarters in Feb.
Schonhoff: I echo Gretchen's comment.
Wilcox: Nothing.

Barr: Would this group like to spend 2 or 3 hours on economics? Sounds like we may do this. We'll probably have our next meeting sometime in February.

Beorkrem: What about ground truthing? Are we going to talk about this, or let this slide with the way the Corps has proposed it?
Nelson: We can host this meeting.
Wilcox: It may be premature for us to have this meeting.

Barr: We could possibly do some experimental mitigation planning a sample pool.
Beorkrem: No, do all the pools with traffic. Why can't we meet in January?
Barr: We'll get all the data together we can and present to the NECC, perhaps on February 21 from 8 to 3.

13. NEXT MEETING

The next meeting will be the mitigation workshops tentatively scheduled for February.

Attachment 1

ATTENDANCE LIST

31st Meeting of the NECC
November 28 and 29, 2000

Attendance List

November 28 & 29, 2000 -- Holiday Inn, Bettendorf, Iowa

Name	Affiliation	Address	Phone	E-mail
Ken Barr	CEMVR-PM-R	P.O. Box 2004, Clock Tower Bldg. Rock Island, IL 61204-2004	(309) 794-5349	Kenneth.A.Barr@usace.army.mil
Rich Fristik	CEMVR-PM-R	P.O. Box 2004, Clock Tower Bldg. Rock Island, IL 61204-2004	(309) 794-5308	Richard.Fristik@usace.army.mil
Steve Bartell	Cadmus Group	136 Mitchell Rd. Oak Ridge, TN 37830	(423) 425-0401	sbartell@cadmusgroup.com
Rick Nelson	USFWS	4469 48th Ave. Ct. Rock Island, IL 61201	(309) 793-5800	Rick_Nelson@fws.gov
John Duyvejonck	USFWS	4469 48th Ave. Ct. Rock Island, IL 61201	(309) 793-5800	Jon_Duyvejonck@fws.gov
Lauri Walters	USFWS	4469 48th Ave. Ct. Rock Island, IL 61201	(309) 793-5800	Lauri_Walters@fws.gov
Bob Clevenstine	USFWS	4469 48th Ave. Ct. Rock Island, IL 61201	(309) 793-5800	Robert_Clevenstine@fws.gov
Jody Millar	USFWS	4469 48th Ave. Ct. Rock Island, IL 61201	(309) 793-5800	Jody_Millar@fws.gov
Ken Brummett	MO DNR	Box 428 Hannibal, MO 63401	(573) 248-2530	brummk@mail.conservation.state.mo.us
Bill Bertrand	IL DNR	P.O. Box 149, 2106 SE Third Aledo, IL 61231	(309) 582-5611	billbert@winco.net
Gretchen Benjamin	WI DNR	3550 Mormon Coulee Rd. La Crosse, WI 54601	(608) 785-9982	benjag@dnr.state.wi.us
Bernard Schonoff	IA DNR	3390 Hwy. 22 Muscatine, IA 52761	(319) 263-5062	fishiowa@muscanet.com
Al Fenedick	USEPA	77 West Jackson Blvd. Chicago, IL 60604	(312) 886-6872	Fenedick.Al@epamail.epa.gov
Elliott Stefanik	CEMVR-PM-AR	P.O. Box 2004, Clock Tower Bldg. Rock Island, IL 61204-2004	(309) 794-5285	Elliott.L.Stefanik@usace.army.mil
Denny Lundberg	CEMVR-PM	P.O. Box 2004, Clock Tower Bldg. Rock Island, IL 61204-2004	(309) 794-5632	Denny.A.Lundberg@usace.army.mil
Sandra Knight	ERDC-CHL-MS	3909 Halls Ferry Road Vicksburg, MS 39180-6199	(601) 634-2693	Sandra.K.Knight@erdc.usace.army.mil
Dan Wilcox	CEMVP-PE-M	190 Fifth Street East St. Paul, MN 55101-1638	(612) 290-5276	Daniel.B.Wilcox@usace.army.mil
Tom Pullen	CEMVD	P.O. Box 80 Vicksburg, MS 39191-0080	(601) 634-5851	Tom.M.Pullen@usace.army.mil
Dan Sallee	IL DNR	P.O. Box 149, 2106 SE Third Aledo, IL 61231	(309) 582-5611	dansalle@winco.net
Steve Johnson	MN DNR	500 Lafayette Road St. Paul, MN 55155-4032	(612) 296-4802	Steve.Johnson@dnr.state.mn.us
Rick Moore	Isaac Walton League	1619 Dayton Ave. Suite 202 St. Paul, MN 55104--6206	(651) 649-1446	rxmoore@iwla.org

Mark Beorkrem	Sierra Club	P.O. Box 370, 204 Wyandotte Morrisonville, IL 62546	(217) 526-4480	Mbeorkrem@hotmail.com

Attachment 2

NAVIGATION STUDY UPDATE

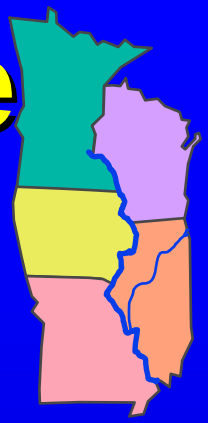
Presented by

Denny Lundberg

US Army Corps of Engineers – Rock Island District

31st Meeting of the NECC
November 28 and 29, 2000

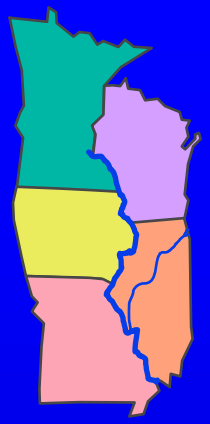
Navigation Study Update



- New Project Manager
- What Has Happened in the Last Year?
- Revised Study Schedule

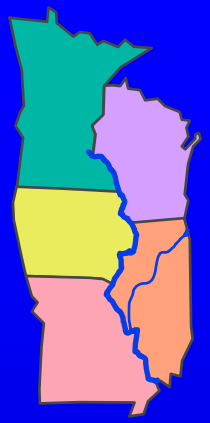
Navigation Study

What Has Happened in the Last Year?



- Investigations
  - OSC-DA Inspector General Investigations
  - House Approp Comm-S&I Investigations
  - National Academy of Science Review

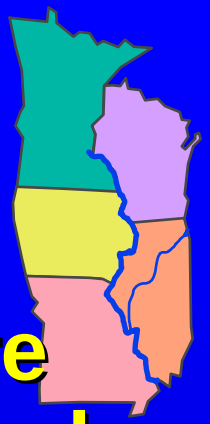
What Has Happened in the Last Year?



- HQ's Policy Review Completed

- Review found that the study has been conducted in accordance with the Principles and Guidelines.

What Has Happened in the Last Year?

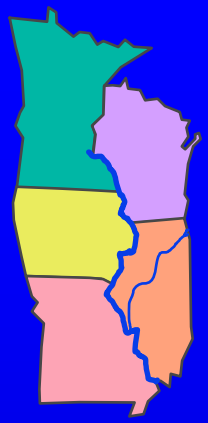


- Study results and conclusions are sensitive to certain parameters and assumptions. Additional info requested:
  - Optimal timing of measures for NED
  - Review industry self help assumptions
  - Independent Technical Review
  - System Mitigation Justification
  - Additional Sensitivity Analysis
  - *Traffic Projection Update*

Revised Study Schedule

- Dec 00 — Complete Ecological Modeling and Environmental Impacts Assessment
- Jan 01 — Complete Environmental Mitigation Costs
- Feb 01 — Complete Economic Analyses of Alternatives
- Mar 01-Aug 01 — Complete Corps Review of Draft Rpt & EIS
- Sep 01 — Initiate Public Review of Draft Rpt & EIS
- Oct 01 — Hold Public Meetings
- Dec 01 — End of Public Review Period
- Apr 02 — Division Commander's Public Notice (End of Feasibility Study)
- July 02 — Chief of Engineers Submits Report to ASACW

For More Information



- **Toll Free Telephone Number:**
  800/872-8822
- **Newsletters**
- **Internet Homepage Address:**
  www.mvr.usace.army.mil/pdw/nav_study
- **Denny Lundberg 309/794-5632, 5355**
  Denny.A.Lundberg@mvr02.usace.army.mil

Attachment 3

REVISED TRAFFIC FORECAST

Presented by

Ken Barr

U.S. Army Corps of Engineers, Rock Island District

31st Meeting of the NECC
November 28 and 29, 2000

Forecast of Grain Traffic on the Upper Mississippi River and Illinois Waterway

Chris Holleyman

Jack Faucett Associates

Upper Mississippi River Basin Association Meeting

St. Louis, MO

November 15, 2000

Jack Faucett Associates

- *Economic and Public Policy Consulting Firm in Business for over 30 Years*
- *Located in Bethesda, MD*
- *Completed over 600 Projects*
- *Specialize in Economic Analysis*

Chris Holleyman

- *Joined JFA in 1992*
- *Masters in Economics from The American University*
- *Managed JFA's Initial Forecasting Effort for the Upper Mississippi River (UMR) and Illinois Waterway (ILW).*
- *Forecast Commodity Flows by Mode for the Huntington District, the IACP, and the California ARB.*

Overview of Previous Effort

- *In April 1997, Jack Faucett Associates submitted a nine volume report which contained traffic forecasts to 2050 for the Upper Mississippi River and Illinois Waterway*
- *Subcontractors on the project inlcuded the Criton Corporation and the Sparks Companies Corporation*

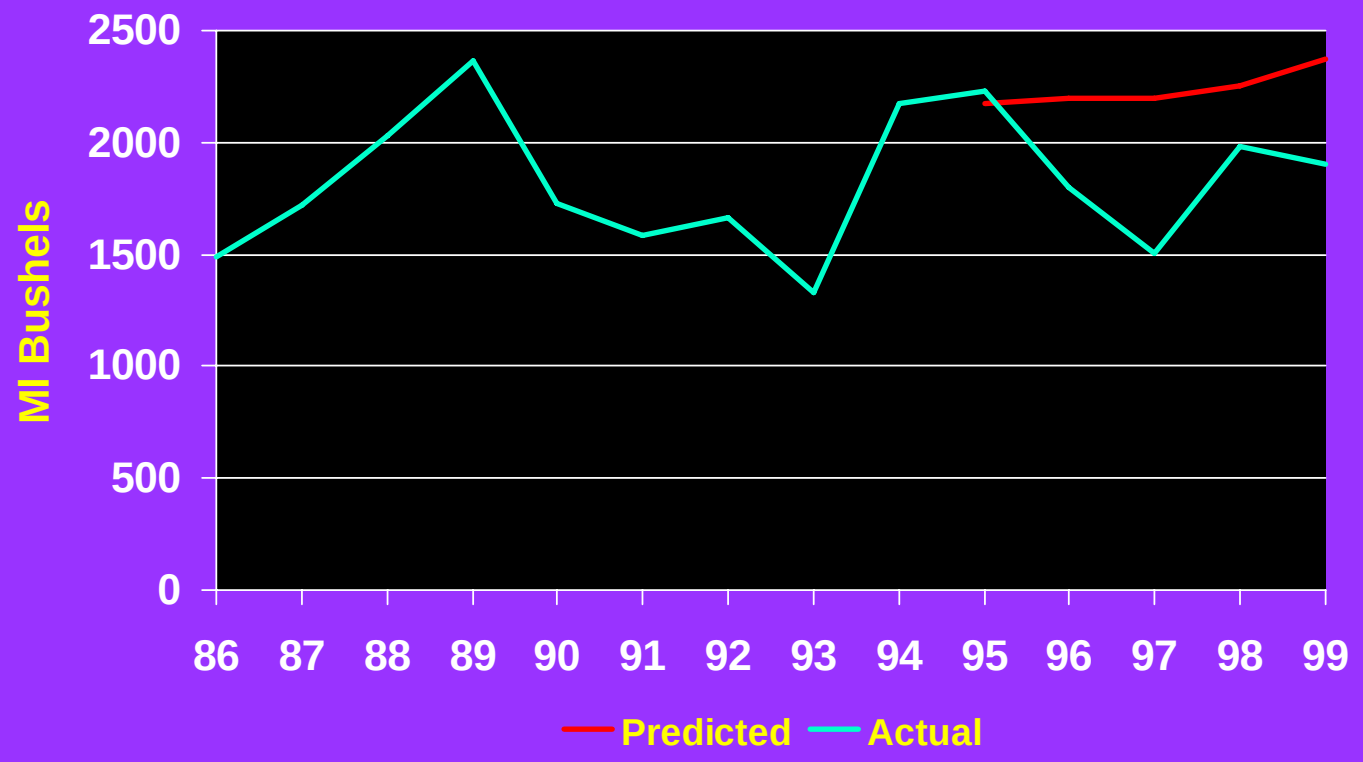
Topics of Discussion

- *Evaluate sources of error in the initial corn and soybean export forecasts*
- *Assess whether recent export volumes are due to long-term phenomena not captured in the original projections*
- *Present revised corn and soybean forecasts for the two river systems.*

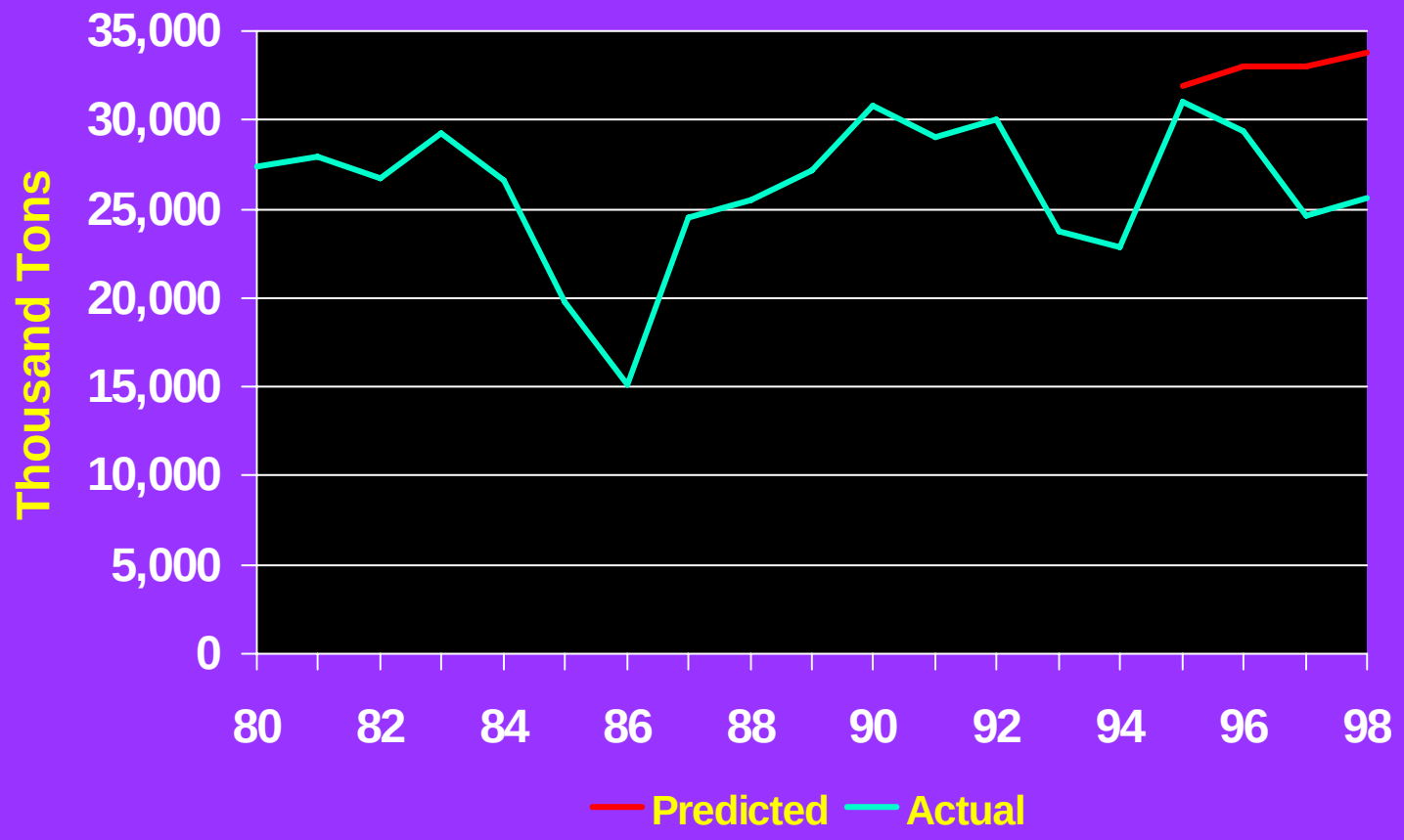
Rationale for Revisiting the Grain Forecast

- *Corn exports between 1995 and 1999 were 26.8% lower than predicted in our original report.*
- *Corn accounts for approximately 34% of the freight on UMR and 27% of the freight on the ILW.*
- *Corn freight out to 2050 was predicted to grow by 161% on the UMR and 184% on the ILW.*

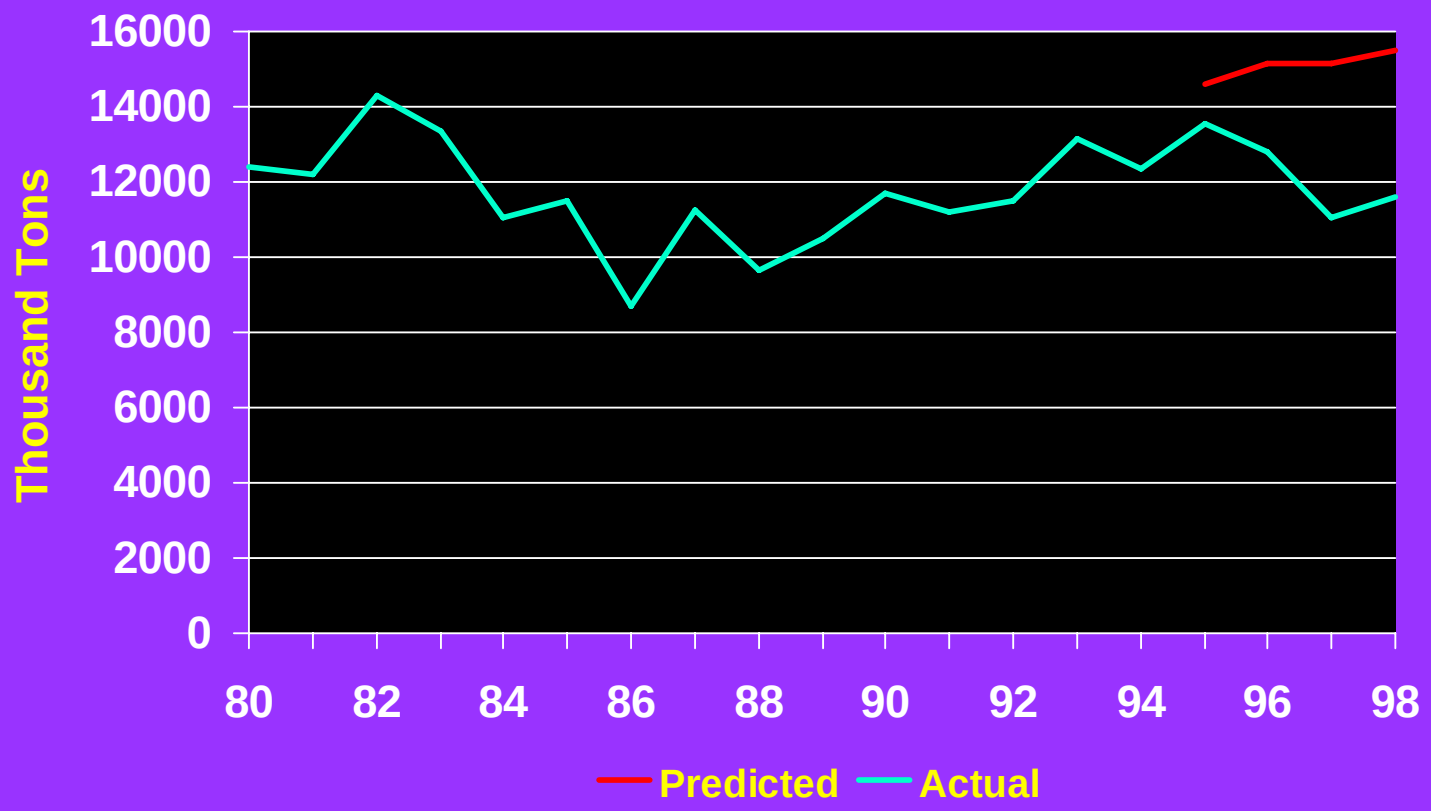
Original U.S. Corn Export Forecast



Original Corn Traffic Forecast: UMR



Original Corn Traffic Forecast: ILW



Sources of Statistical Error in Export Forecast

- Acreage
  - Total arable land for grain
  - Crop shares
- Yield
- Domestic Consumption
- Change in Stocks

Average Forecast Errors: 1995 - 99

	Corn	Soybeans
Acreage	+3.5%	-8.6%
Yield	+2.3%	-1.1%
Domestic Consumption	+1.2%	-8.4%
Change in Stocks	+154.3%	-9.3%
Exports	+26.8%	-13.9%

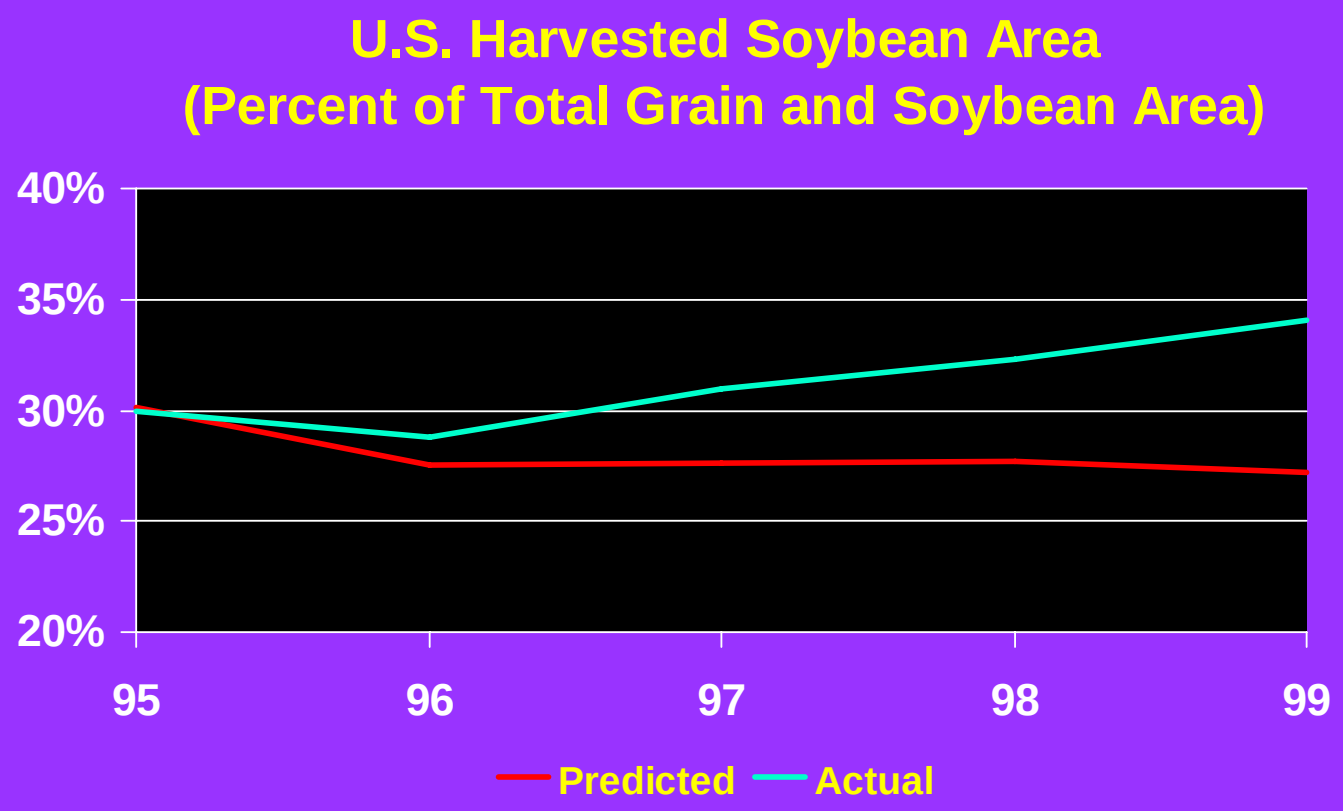
Impact of Statistical Errors on Export Forecasts

	Corn	Soybeans
Acreage	+23.7%	-26.8%
Yield	+1.5%	-3.8%
Domestic Consumption	-1.5%	+17.5%
Change in Stocks	+3.2%	0%
Exports	+26.8%	-13.9%

Reasons for Over-Estimation of Corn Acreage

- *International competition was higher than expected.*
- *International Financial Crisis dampened world demand.*
- *Concerns over genetically modified grain reduced European demand for U.S. corn.*
- *Change in U.S. crop mix as a result of the FAIR Act of 1996 was unexpected.*

Change in U.S. Crop Mix



Long-Term or Short-Term Impacts

- *International competition should ease up after China enters the WTO. Increased competition from Argentina was already taken into account.*
- *The world economy has already made a significant recovery from the International Financial Crisis, which was much shorter than originally anticipated.*

Long-Term or Short-Term Impacts

- *Compared to other countries, the U.S. can more easily inventory and identify different varieties of grain. As world demand for specialized varieties increases, the U.S. will be in a better position to guarantee non-GM products.*
- *Over the long-run, it is believed that crop shares will stabilize at recent levels, which are different than those predicted in the original report.*

Revised Forecast of Waterborne Grain Movements - Methodology

- Forecast U.S. export volumes
- Allocate export forecasts to U.S. ports
- Distribute Central Gulf exports to inland origins
- Adjust traffic for non-export related freight

Revised Forecast of U.S. Exports

- *Rely upon forecasts published in USDA's Agricultural Baseline Projections to 2009*
- *Extrapolated USDA forecasts to 2050*
- *Adjusted forecasts for China's entry into WTO*

Use of USDA Forecast

- *Source is both neutral and credible.*
- *Projections take into account production, consumption, and economic policies of individual countries around the world.*
- *It is explicitly recognized that some variables cannot be quantified due to large uncertanties and timing issues.*
- *We do not believe that our critics would be able to develop forecasts as accurate as those published by USDA.*

Famous Last Words

- *“stocks have reached what looks like a permanently high plateau.” - noted Yale economist Irving Fisher in 1929*
- *“640K ‘of memory’ ought to be enough for anyone.” - Bill Gates*
- *“there is a world market for about five computers.” - IBM Chairman Thomas Watson in 1958*

Extrapolation of Forecast - Corn

- Assumed the future would evolve along the same trend as predicted in USDA's ten year forecast
- Selected equation based upon comparison of R^2

Regression Statistics	
Equation:	Exports = A + B * LN (Year - 1990)
Adjusted R^2	0.9977
Period	2001 - 2009

Extrapolation of Forecast - Soybeans

- Assumed the future would evolve along the trend seen over the last 12 years
- Assumed growth in world per-capita meat consumption would continue to drive growth in U.S. exports to 2050
- Comparison of R^2 determined equation

Regression Results	
Equation:	Exports = A + B * LN (Year - 1982) + 35
Adjusted R^2	0.7194
Period	1988 - 1999

Adjustment for China Entering the WTO - Corn Assumptions

- China will enter the WTO.
- Chinese imports will achieve TRQ levels around 2009
- The U.S. will supply 70% of China's imports.
- Given a TRQ of 7.2 MMT in 2009, U.S. exports will be 8.2% higher than projected by USDA. We assume this impact will continue throughout the forecast horizon.

Adjustment for China Entering the WTO - Soybean Assumptions

- China will enter the WTO.
- China will begin to import more meal and oil at the expense of raw soybeans.
- As a result, U.S. soybean exports will be 4.5% lower than the projections based on USDA's baseline.
- U.S. soybean meal exports will increase by 12%

Revised Forecast of U.S. Corn Exports

Revised U.S. Soybean Export Forecast

Comparison of Corn Export Forecasts

Comparison of Soybean Export Forecasts

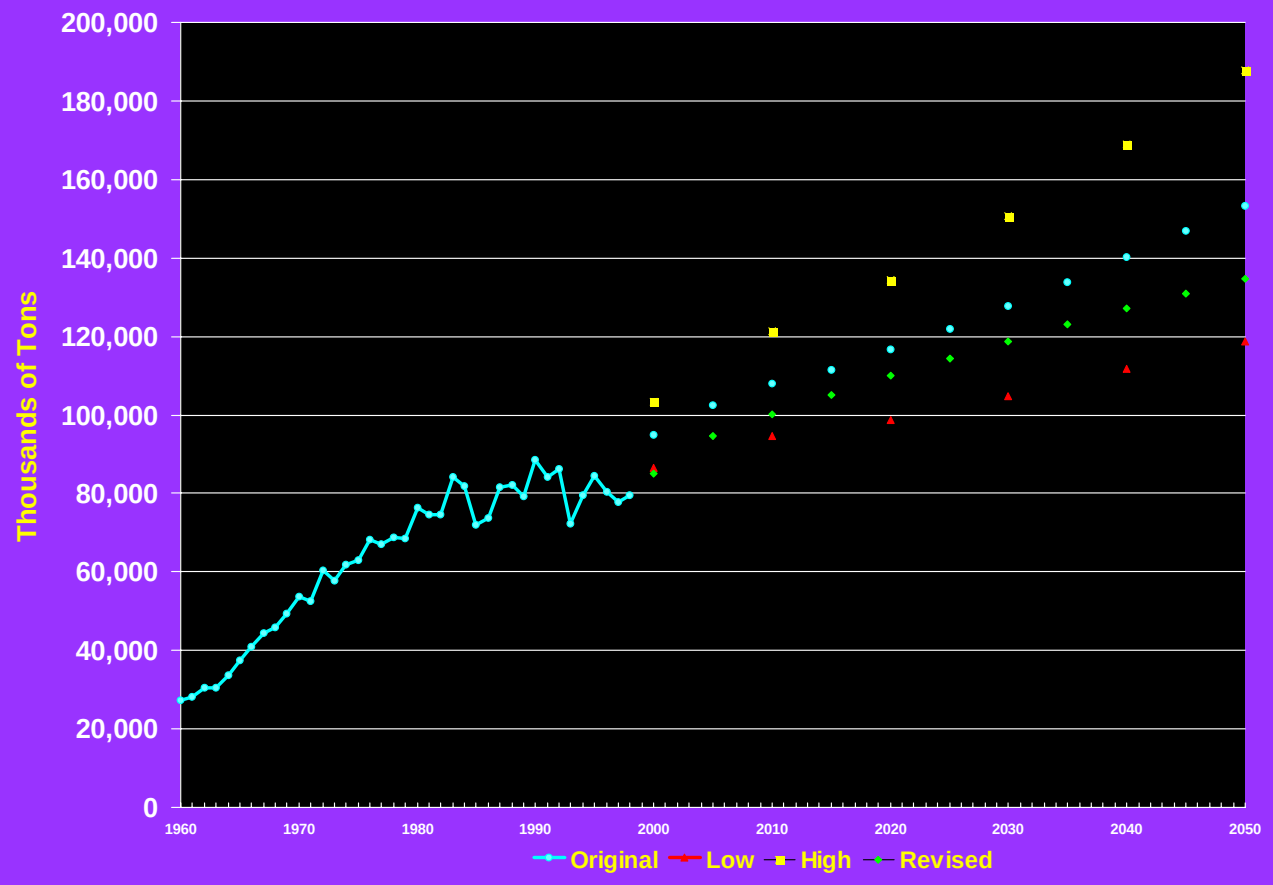
Allocation of Exports to U.S. Ports

- *To distribute U.S. corn exports to the Central Gulf, we used the original port share developed by SCI. This share is just over one percentage point less than the average share over the last five years.*
- *To allocate soybean exports, we used the average percent of exports handled by the Central Gulf between 1994 and 1998. This share is three and a half percentage points less than the figure used to develop the original traffic projections.*

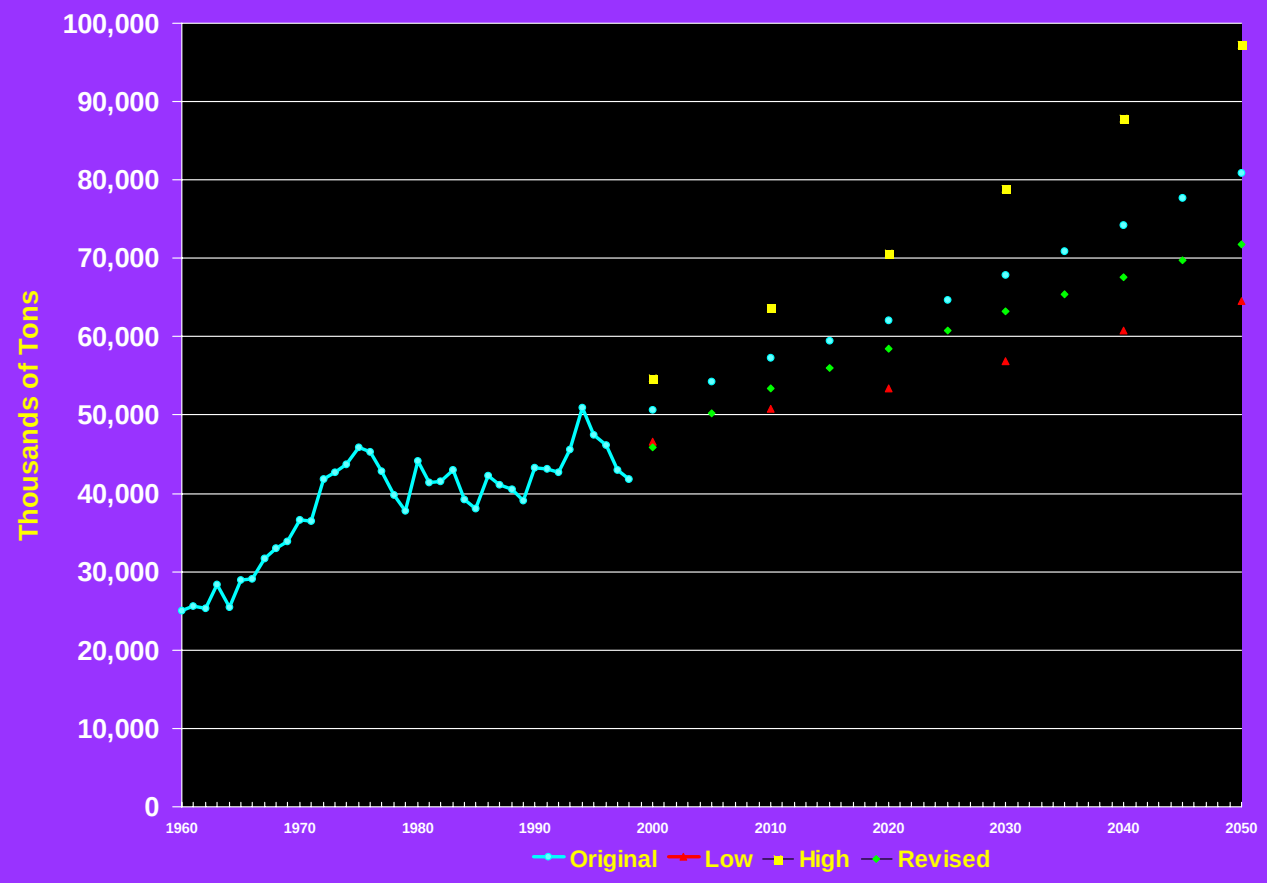
Construct Waterway Traffic Forecasts

- *Assignment of Central Gulf export volumes to inland origins was based on average historical shares. In all cases the trends have been fairly flat over the last ten years.*
- *A slight upward adjustment for non-export traffic was made using historical ratios. Over 90% of the corn and soybean traffic on both river systems has been export related since 1980. These shares have been fairly constant with minimal deviation*

UMR Total Traffic Forecast



ILW Total Traffic Forecast



Attachment 4

TRAFFIC SUMMARY FOR REVISED GRAIN FORECAST #2

Presented by

Steve Bartell

31st Meeting of the NECC
November 28 and 29, 2000

UMR-IWW Navigation Study
31st NECC Meeting

Traffic Summary for Revised Grain Forecast #2

S.M. Bartell
S.K. Nair

The Cadmus Group, Inc.
Oak Ridge, TN

November 28-29, 2000
Bettendorf, Iowa

Revised Grain Forecast #2

August 30, 2000 revision

	Total UMR_IWW Trips/YeaR						
Year	WOP	B	E	F	J	K	L
1992	112,186	112,186	112,186	112,186	112,186	112,186	112,186
2000	117,098	117,098	117,098	117,098	117,098	117,098	117,098
2010	127,360	133,106	127,360	127,360	127,360	127,360	127,360
2020	132,776	139,974	150,352	150,731	151,045	158,314	156,188
2030	137,330	145,341	157,534	158,060	158,463	167,057	164,639
2040	141,503	150,741	163,545	164,298	164,798	174,008	172,826
2050	145,316	155,022	168,641	169,707	170,317	179,861	178,273

Without Project

B: Mooring Cells 12,18,20,22,24 Guidewalls 20 - 25

E: Mooring Cells 12,18,20,22,24; Powered Kevel Guidewalls 14 - 18; & Locks 20 - 25

F: Mooring Cells 12,18,20,22,24; Powered Kevel Guidewalls 14 - 18 and LaGrange & Peoria; Locks 20-25

J: Mooring Cells 12,18,20,22,24; Powered Kevel Guidewalls 14 - 18; Locks 20-25 and new (1C) locks at LaGrange & Peoria

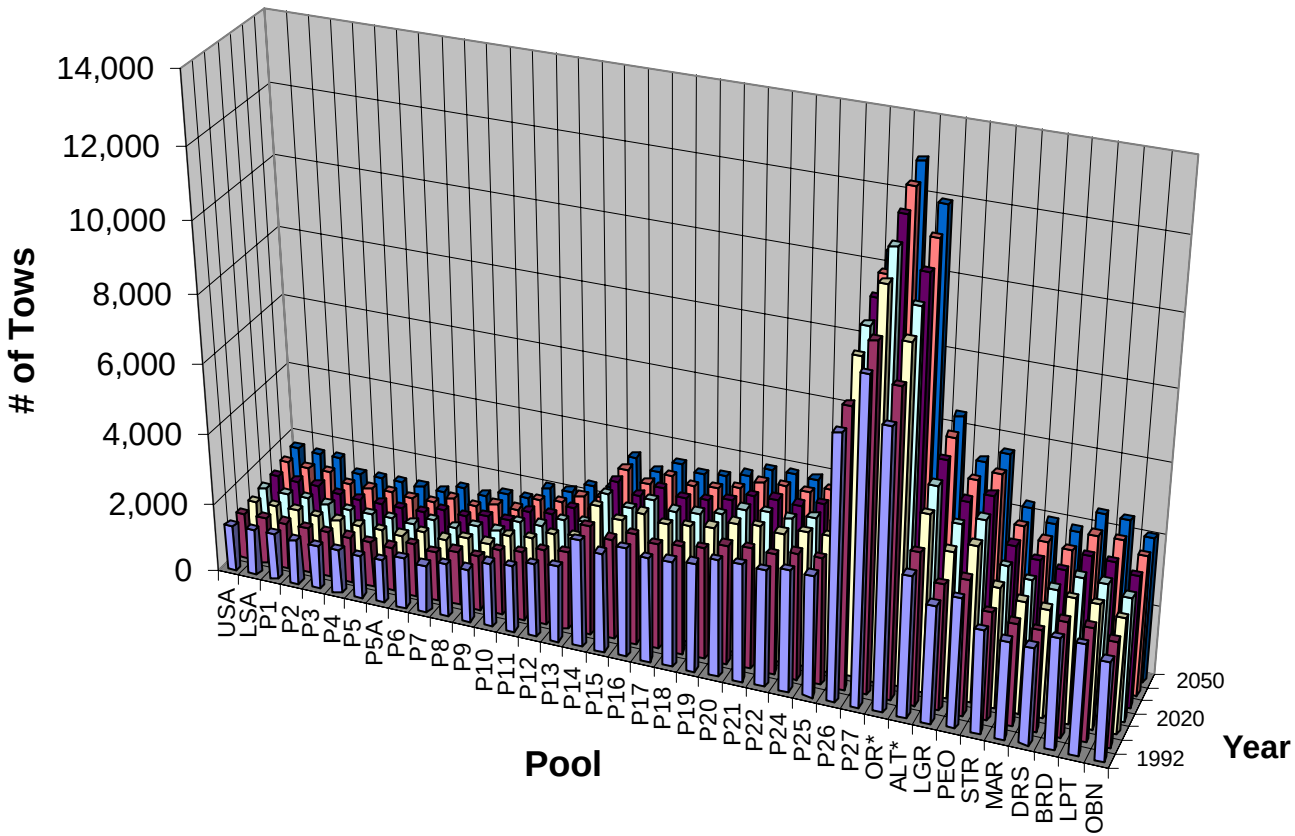
K: Mooring Cells 12,18,20,22,24; Locks 14-18, 20-25, Peoria & LaGrange (In place by 2017)

L: Mooring Cells 12,18,20,22,24; Locks 14-18, 20-25 (In place by 2017)

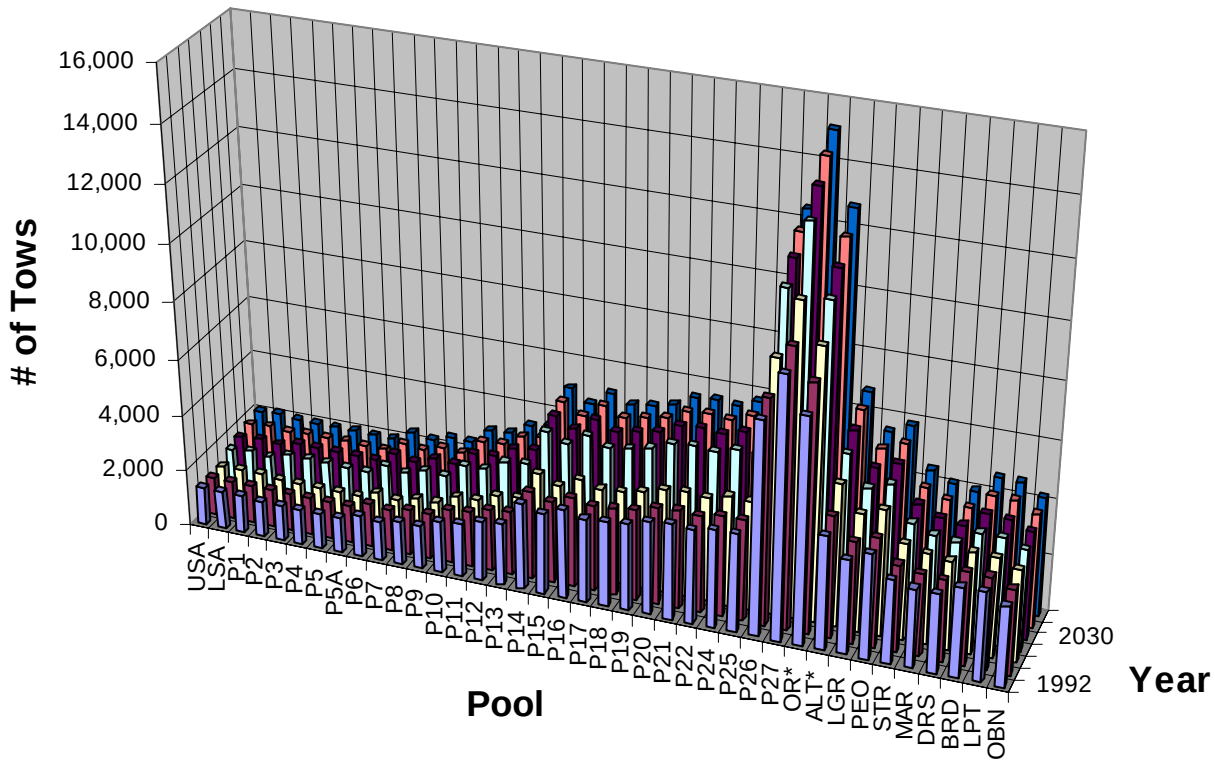
Revised Grain Forecast #2

Year by Pool Summaries
For Without Project and Alternative K

Projected Traffic for Upper Mississippi and Illinois Rivers for Without Project Conditions



Projected Traffic for Upper Mississippi and Illinois Rivers for Alternative K



Example May – September Summaries of Average Trips/Day for Trend Pools

- Inputs to assessments of :
  - Larval fish entrainment *
  - Plant growth and vegetative reproduction
  - Fish spawning habitat (plus April, October)
  - Mussel growth and reproduction*

* Uses all 12 months in calculations

Forecast #2

Without Project

YEAR 2040
Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	**5.8**	5.5	**5.6**	5.3	**6.1**	5.8	**6.0**	5.7	**4.8**	4.6
8	**7.0**	6.6	**6.9**	6.5	**7.6**	7.2	**7.2**	6.8	**5.9**	5.6
13	**10.5**	10.4	**9.7**	9.7	**10.8**	10.7	**9.7**	9.6	**8.1**	8.0
26A	**14.8**	14.9	**13.9**	14.0	**15.6**	15.7	**14.4**	14.5	**12.5**	12.6
26B	**30.9**	32.5	**30.1**	31.6	**32.3**	34.0	**29.6**	31.2	**28.7**	30.2
LaGrange	**12.6**	13.5	**11.9**	12.7	**12.9**	13.8	**12.2**	13.1	**12.8**	13.7
Open River*	**18.6**	19.2	**17.3**	17.8	**18.3**	18.8	**16.8**	17.4	**16.3**	16.8

*Four larger horsepower classes

Forecast #2

Alt-B

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	6.7	6.3	6.4	6.1	6.9	6.6	6.8	6.5	5.5	5.2
8	7.9	7.6	7.9	7.5	8.7	8.3	8.2	7.8	6.7	6.5
13	11.7	11.7	10.9	10.9	12.0	12.0	10.8	10.8	9.0	9.0
26A	16.6	17.0	15.6	15.9	17.5	18.0	16.1	16.5	14.0	14.3
26B	32.6	34.4	31.6	33.5	34.0	35.9	31.2	33.0	30.3	32.0
LaGrange	12.6	13.5	11.9	12.7	12.9	13.8	12.2	13.1	12.8	13.7
Open River*	19.3	19.9	17.9	18.5	19.0	19.8	17.4	18.1	16.8	17.5

*Four larger horsepower classes

Forecast #2

Alt-E

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	7.7	7.7	7.3	7.3	8.0	8.0	7.8	7.8	6.3	6.3
8	9.2	9.2	9.1	9.1	10.0	10.0	9.5	9.5	7.8	7.8
13	13.2	13.8	12.3	12.8	13.6	14.1	12.3	12.7	10.2	10.6
26A	19.1	19.9	17.9	18.7	20.2	21.1	18.6	19.4	16.1	16.8
26B	34.8	37.1	33.9	36.1	36.4	38.7	33.4	35.6	32.4	34.5
LaGrange	12.7	13.5	11.9	12.7	12.9	13.8	12.2	13.1	12.9	13.7
Open River*	20.1	21.0	18.6	19.5	20.0	20.7	18.2	19.0	17.7	18.4

*Four larger horsepower classes

Forecast #2

Alt-F

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	7.7	7.7	7.3	7.3	8.0	8.0	7.8	7.8	6.3	6.3
8	9.2	9.2	9.1	9.1	10.0	10.0	9.5	9.5	7.8	7.8
13	13.2	13.8	12.3	12.8	13.6	14.1	12.3	12.7	10.2	10.6
26A	19.1	20.0	17.9	18.7	20.2	21.1	18.6	19.4	16.1	16.9
26B	35.1	37.7	34.1	36.7	36.6	39.4	33.7	36.2	32.6	35.0
LaGrange	12.9	14.0	12.1	13.2	13.2	14.3	12.5	13.6	13.1	14.2
Open River*	20.2	21.3	18.7	19.8	20.1	21.2	18.3	19.4	17.9	18.7

*Four larger horsepower classes

Forecast #2

Alt-J

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	7.7	7.7	7.4	7.3	8.0	8.0	7.8	7.8	6.3	6.3
8	9.2	9.2	9.1	9.1	10.0	10.1	9.5	9.5	7.8	7.8
13	13.2	13.8	12.3	12.8	13.6	14.2	12.3	12.8	10.2	10.6
26A	19.1	20.0	17.9	18.7	20.2	21.1	18.6	19.4	16.1	16.9
26B	35.3	38.0	34.3	37.0	36.8	39.7	33.8	36.5	32.8	35.3
LaGrange	13.0	14.3	12.2	13.4	13.3	14.6	12.6	13.8	13.2	14.5
Open River*	20.4	21.4	18.8	19.9	20.1	21.3	18.5	19.5	18.0	18.8

*Four larger horsepower classes

Forecast #2

Alt-K

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	8.6	8.5	8.3	8.1	8.9	8.8	8.8	8.7	7.1	7.0
8	10.3	10.2	10.2	10.1	11.2	11.2	10.6	10.5	8.7	8.7
13	14.7	15.1	13.6	14.0	15.1	15.5	13.6	14.0	11.3	11.6
26A	20.5	21.3	19.2	20.0	21.6	22.6	19.9	20.7	17.3	18.0
26B	36.5	39.3	35.5	38.2	38.1	41.0	35.0	37.7	33.9	36.5
LaGrange	13.0	14.3	12.2	13.4	13.3	14.6	12.6	13.8	13.2	14.5
Open River*	20.8	21.9	19.4	20.4	20.6	21.8	18.8	19.9	18.3	19.4

*Four larger horsepower classes

Forecast #2

Alt-L

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	8.6	8.5	8.3	8.1	8.9	8.8	8.8	8.7	7.1	7.0
8	10.3	10.2	10.2	10.1	11.2	11.2	10.6	10.5	8.7	8.7
13	14.7	15.1	13.6	14.0	15.1	15.5	13.6	14.0	11.3	11.6
26A	20.4	21.3	19.2	20.0	21.6	22.6	19.9	20.7	17.3	18.0
26B	36.1	38.4	35.1	37.3	37.7	40.1	34.6	36.8	33.5	35.7
LaGrange	12.7	13.5	11.9	12.7	12.9	13.8	12.2	13.1	12.9	13.7
Open River*	20.6	21.5	19.3	20.0	20.4	21.3	18.7	19.5	18.2	18.8

*Four larger horsepower classes

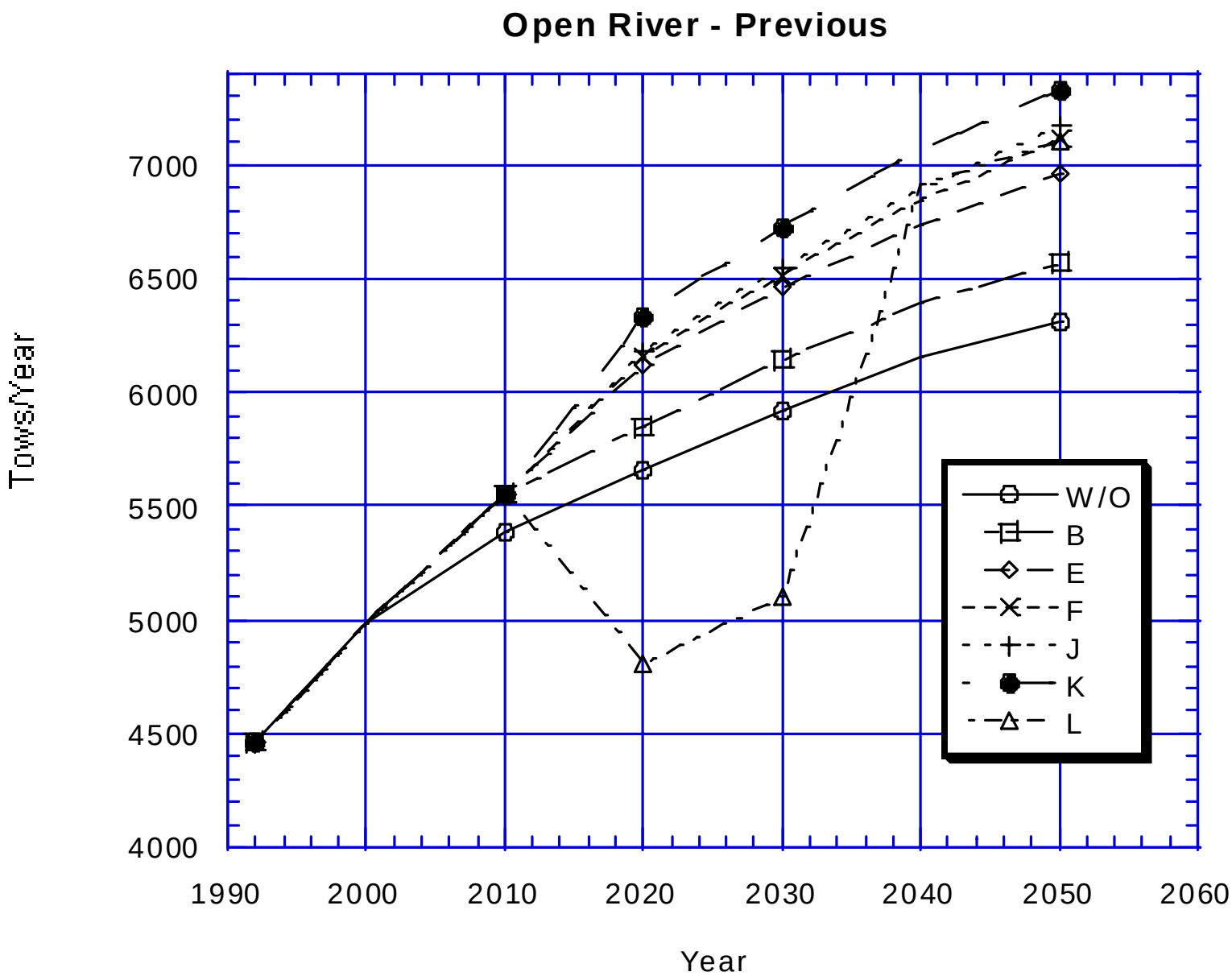
Larger Tow Configurations for Open River

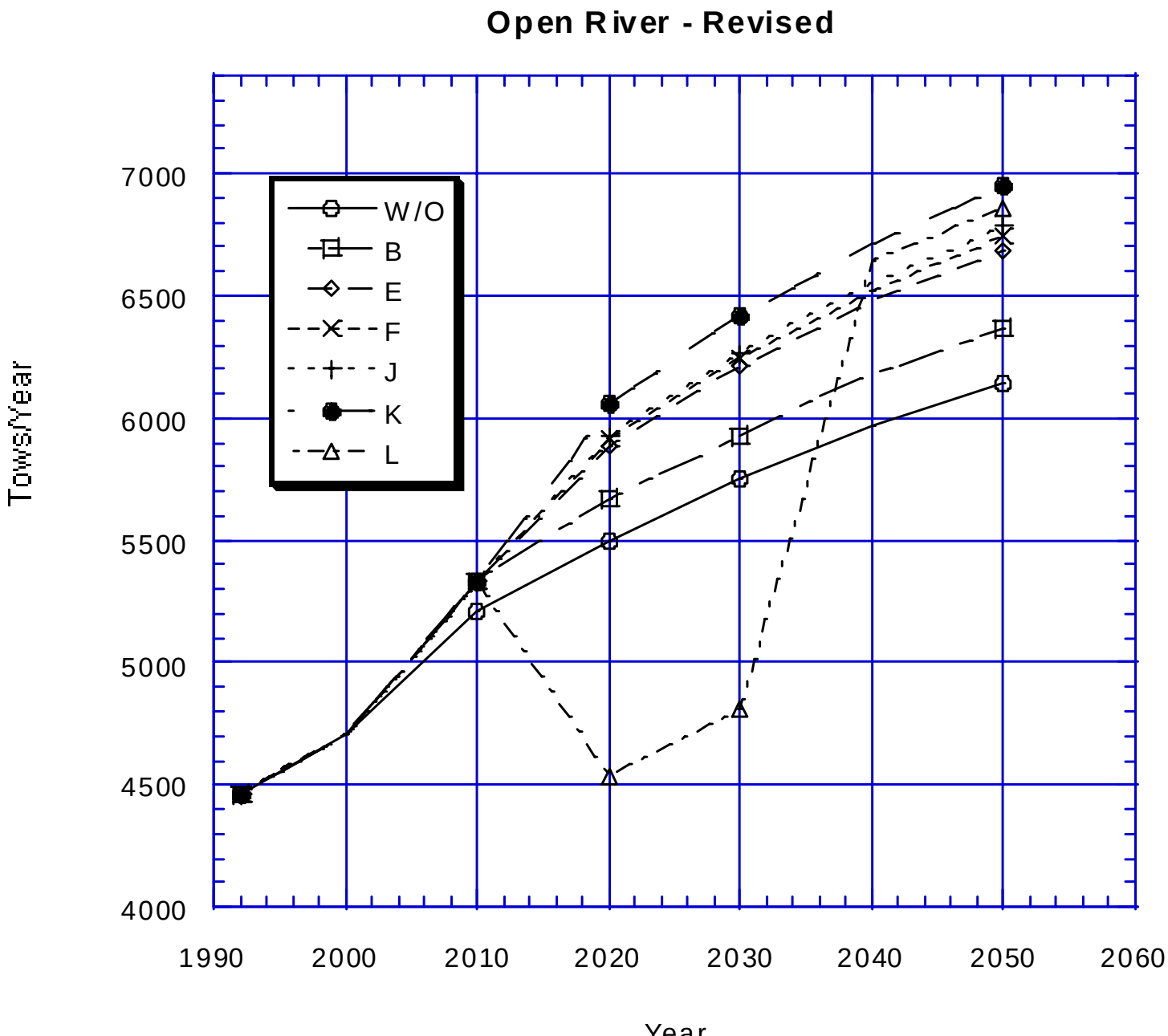
- Horsepower classes
  - Less than or equal to 1,800 hp
  - >1,800 to 3,000 hp
  - >3000 to 5,500 hp
  - >5,500 hp
- Used in calculation of larval fish entrainment for Open River
  - Class-specific entrainment rates (m^3/s)
  - Class-specific F_i values

Open River Traffic: Larger Horsepower Classes

	Forecast #2 Open River Larger Horsepower Trips/Y						
Year	W/O	B	E	F	J	K	L
1992	4,461	4,461	4,461	4,461	4,461	4,461	4,461
2000	4,706	4,706	4,706	4,706	4,706	4,706	4,706
2010	5,207	5,333	5,333	5,333	5,333	5,333	5,333
2020	5,496	5,669	5,890	5,913	5,930	6,062	4,537
2030	5,753	5,926	6,210	6,242	6,264	6,419	4,814
2040	5,972	6,183	6,476	6,522	6,551	6,716	6,642
2050	6,144	6,368	6,684	6,749	6,785	6,954	6,854

	Previous Open River Larger Horsepower Trips/Y						
Year	W/O	B	E	F	J	K	L
1992	4,461	4,461	4,461	4,461	4,461	4,461	4,461
2000	4,984	4,984	4,984	4,984	4,984	4,984	4,984
2010	5,381	5,550	5,550	5,550	5,550	5,550	5,550
2020	5,655	5,850	6,122	6,155	6,176	6,337	4,807
2030	5,925	6,147	6,459	6,514	6,547	6,730	5,103
2040	6,155	6,399	6,743	6,843	6,893	7,064	6,914
2050	6,305	6,575	6,958	7,112	7,179	7,332	7,100


Open River - Previous
Tows/Year
7000
6500
6000
5500
5000
4500
4000
1990
2000
2010
2020
2030
2040
2050
2060
Year
W/O
B
E
F
J
K
L


Open River - Revised
Tows/Year
Year
7000
6500
6000
5500
5000
4500
4000
1990
2000
2010
2020
2030
2040
2050
2060
W/O
B
E
F
J
K
L

UMR-IWW Navigation Study
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Traffic Summary for Revised Grain Forecast #2

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Without Project

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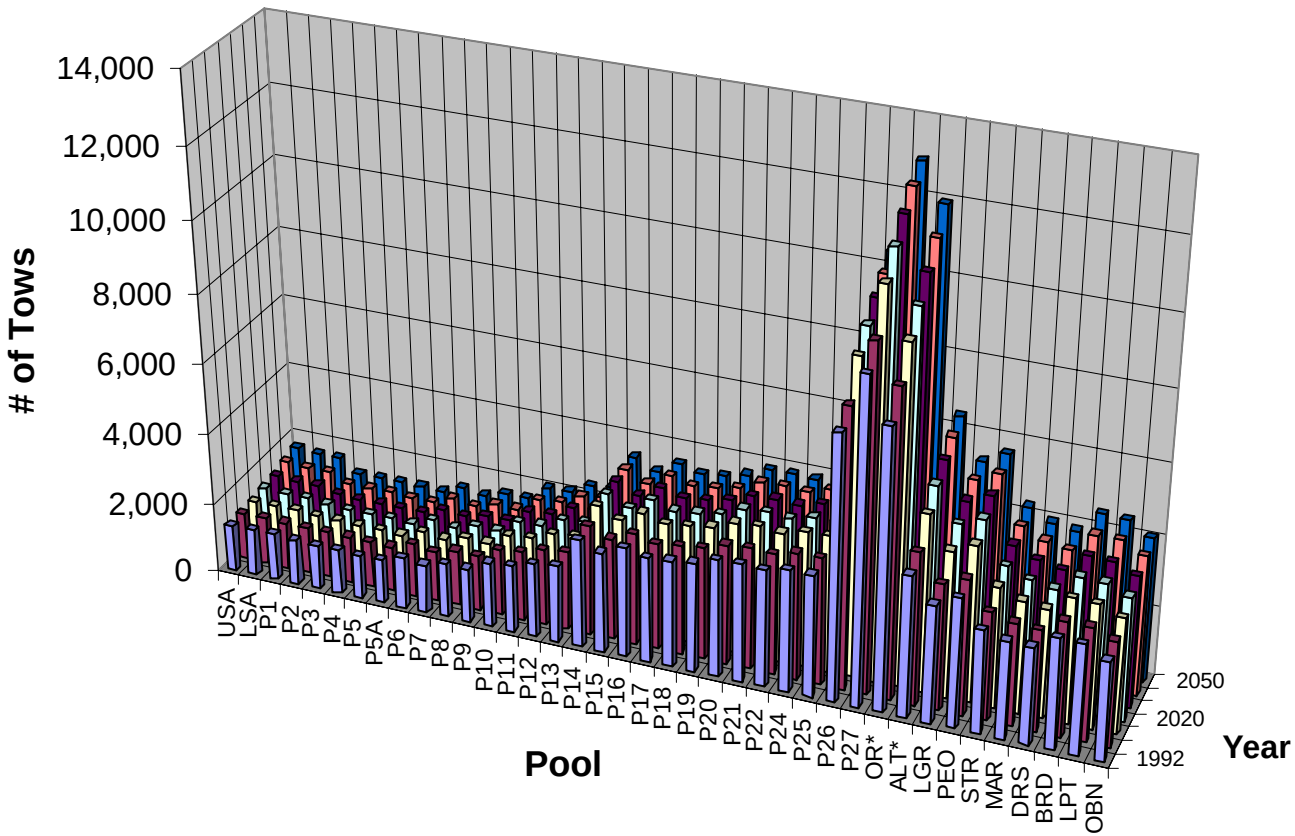
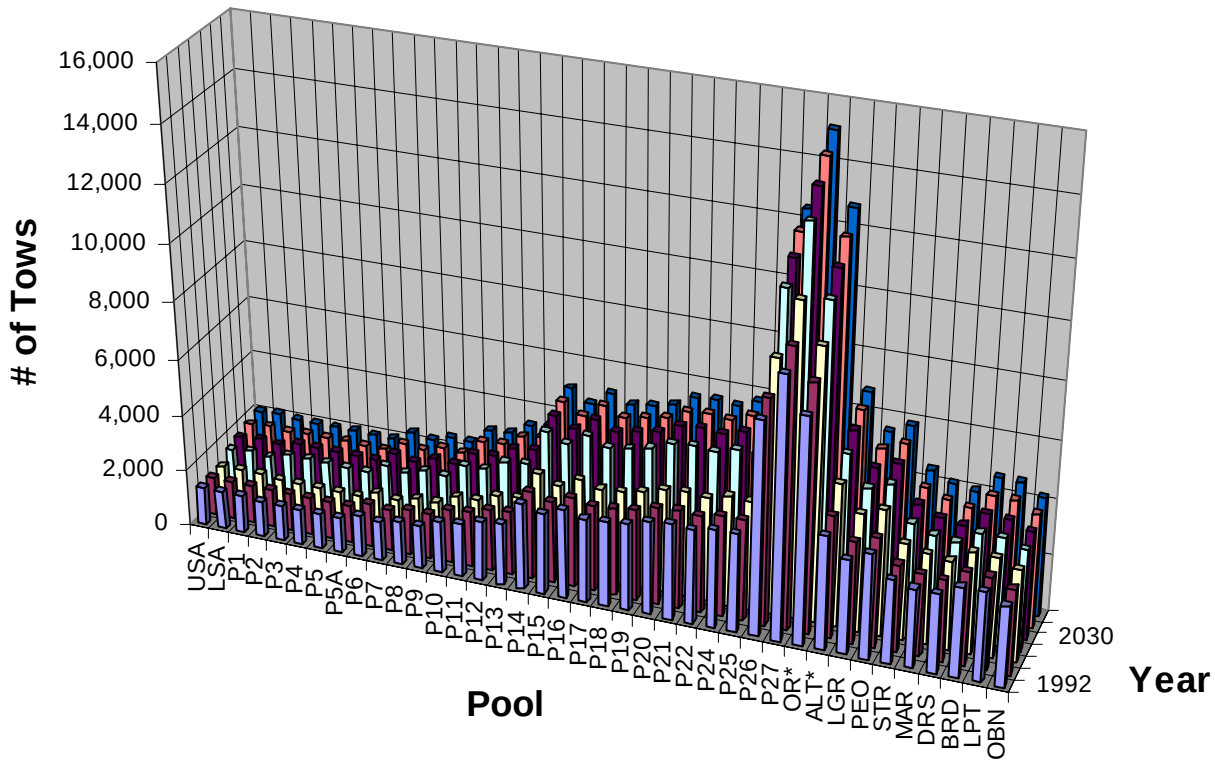
Revised Grain Forecast #2

Year by Pool Summaries
For Without Project and Alternative K

Projected Traffic for Upper Mississippi and Illinois Rivers for Without Project Conditions



Projected Traffic for Upper Mississippi and Illinois Rivers for Alternative K



Example May – September Summaries of Average Trips/Day for Trend Pools

- Inputs to assessments of :
  - Larval fish entrainment *
  - Plant growth and vegetative reproduction
  - Fish spawning habitat (plus April, October)
  - Mussel growth and reproduction*

* Uses all 12 months in calculations

Forecast #2

Without Project

YEAR 2040
Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	**5.8**	5.5	**5.6**	5.3	**6.1**	5.8	**6.0**	5.7	**4.8**	4.6
8	**7.0**	6.6	**6.9**	6.5	**7.6**	7.2	**7.2**	6.8	**5.9**	5.6
13	**10.5**	10.4	**9.7**	9.7	**10.8**	10.7	**9.7**	9.6	**8.1**	8.0
26A	**14.8**	14.9	**13.9**	14.0	**15.6**	15.7	**14.4**	14.5	**12.5**	12.6
26B	**30.9**	32.5	**30.1**	31.6	**32.3**	34.0	**29.6**	31.2	**28.7**	30.2
LaGrange	**12.6**	13.5	**11.9**	12.7	**12.9**	13.8	**12.2**	13.1	**12.8**	13.7
Open River*	**18.6**	19.2	**17.3**	17.8	**18.3**	18.8	**16.8**	17.4	**16.3**	16.8

*Four larger horsepower classes

Forecast #2

Alt-B

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	6.7	6.3	6.4	6.1	6.9	6.6	6.8	6.5	5.5	5.2
8	7.9	7.6	7.9	7.5	8.7	8.3	8.2	7.8	6.7	6.5
13	11.7	11.7	10.9	10.9	12.0	12.0	10.8	10.8	9.0	9.0
26A	16.6	17.0	15.6	15.9	17.5	18.0	16.1	16.5	14.0	14.3
26B	32.6	34.4	31.6	33.5	34.0	35.9	31.2	33.0	30.3	32.0
LaGrange	12.6	13.5	11.9	12.7	12.9	13.8	12.2	13.1	12.8	13.7
Open River*	19.3	19.9	17.9	18.5	19.0	19.8	17.4	18.1	16.8	17.5

*Four larger horsepower classes

Forecast #2

Alt-E

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	7.7	7.7	7.3	7.3	8.0	8.0	7.8	7.8	6.3	6.3
8	9.2	9.2	9.1	9.1	10.0	10.0	9.5	9.5	7.8	7.8
13	13.2	13.8	12.3	12.8	13.6	14.1	12.3	12.7	10.2	10.6
26A	19.1	19.9	17.9	18.7	20.2	21.1	18.6	19.4	16.1	16.8
26B	34.8	37.1	33.9	36.1	36.4	38.7	33.4	35.6	32.4	34.5
LaGrange	12.7	13.5	11.9	12.7	12.9	13.8	12.2	13.1	12.9	13.7
Open River*	20.1	21.0	18.6	19.5	20.0	20.7	18.2	19.0	17.7	18.4

*Four larger horsepower classes

Forecast #2

Alt-F

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	7.7	7.7	7.3	7.3	8.0	8.0	7.8	7.8	6.3	6.3
8	9.2	9.2	9.1	9.1	10.0	10.0	9.5	9.5	7.8	7.8
13	13.2	13.8	12.3	12.8	13.6	14.1	12.3	12.7	10.2	10.6
26A	19.1	20.0	17.9	18.7	20.2	21.1	18.6	19.4	16.1	16.9
26B	35.1	37.7	34.1	36.7	36.6	39.4	33.7	36.2	32.6	35.0
LaGrange	12.9	14.0	12.1	13.2	13.2	14.3	12.5	13.6	13.1	14.2
Open River*	20.2	21.3	18.7	19.8	20.1	21.2	18.3	19.4	17.9	18.7

*Four larger horsepower classes

Forecast #2

Alt-J

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	7.7	7.7	7.4	7.3	8.0	8.0	7.8	7.8	6.3	6.3
8	9.2	9.2	9.1	9.1	10.0	10.1	9.5	9.5	7.8	7.8
13	13.2	13.8	12.3	12.8	13.6	14.2	12.3	12.8	10.2	10.6
26A	19.1	20.0	17.9	18.7	20.2	21.1	18.6	19.4	16.1	16.9
26B	35.3	38.0	34.3	37.0	36.8	39.7	33.8	36.5	32.8	35.3
LaGrange	13.0	14.3	12.2	13.4	13.3	14.6	12.6	13.8	13.2	14.5
Open River*	20.4	21.4	18.8	19.9	20.1	21.3	18.5	19.5	18.0	18.8

*Four larger horsepower classes

Forecast #2

Alt-K

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	8.6	8.5	8.3	8.1	8.9	8.8	8.8	8.7	7.1	7.0
8	10.3	10.2	10.2	10.1	11.2	11.2	10.6	10.5	8.7	8.7
13	14.7	15.1	13.6	14.0	15.1	15.5	13.6	14.0	11.3	11.6
26A	20.5	21.3	19.2	20.0	21.6	22.6	19.9	20.7	17.3	18.0
26B	36.5	39.3	35.5	38.2	38.1	41.0	35.0	37.7	33.9	36.5
LaGrange	13.0	14.3	12.2	13.4	13.3	14.6	12.6	13.8	13.2	14.5
Open River*	20.8	21.9	19.4	20.4	20.6	21.8	18.8	19.9	18.3	19.4

*Four larger horsepower classes

Forecast #2

Alt-L

YEAR 2040

Average Trips/Day

Pool	May	(Old)	June	(Old)	July	(Old)	August	(Old)	September	(Old)
4	8.6	8.5	8.3	8.1	8.9	8.8	8.8	8.7	7.1	7.0
8	10.3	10.2	10.2	10.1	11.2	11.2	10.6	10.5	8.7	8.7
13	14.7	15.1	13.6	14.0	15.1	15.5	13.6	14.0	11.3	11.6
26A	20.4	21.3	19.2	20.0	21.6	22.6	19.9	20.7	17.3	18.0
26B	36.1	38.4	35.1	37.3	37.7	40.1	34.6	36.8	33.5	35.7
LaGrange	12.7	13.5	11.9	12.7	12.9	13.8	12.2	13.1	12.9	13.7
Open River*	20.6	21.5	19.3	20.0	20.4	21.3	18.7	19.5	18.2	18.8

*Four larger horsepower classes

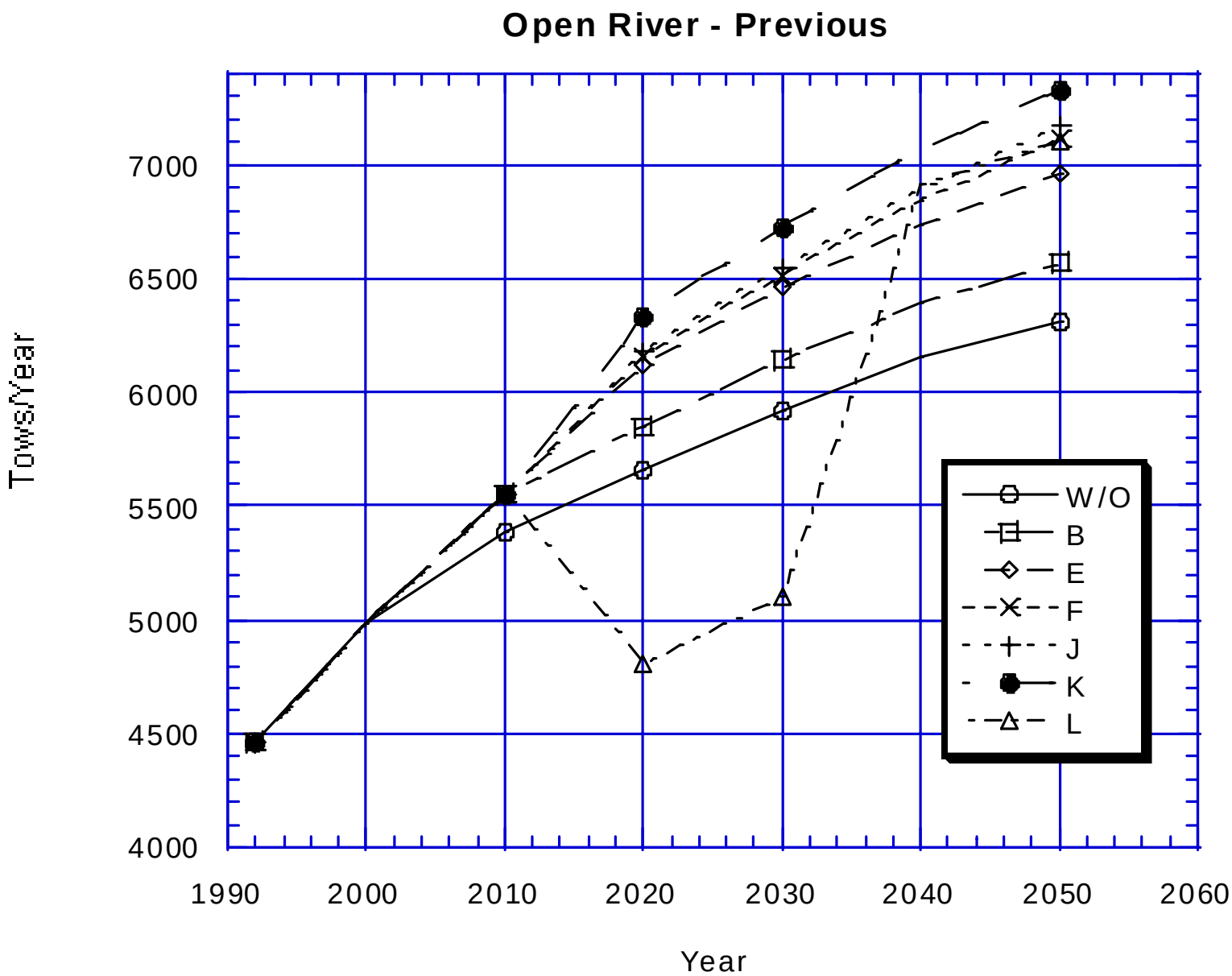
Larger Tow Configurations for Open River

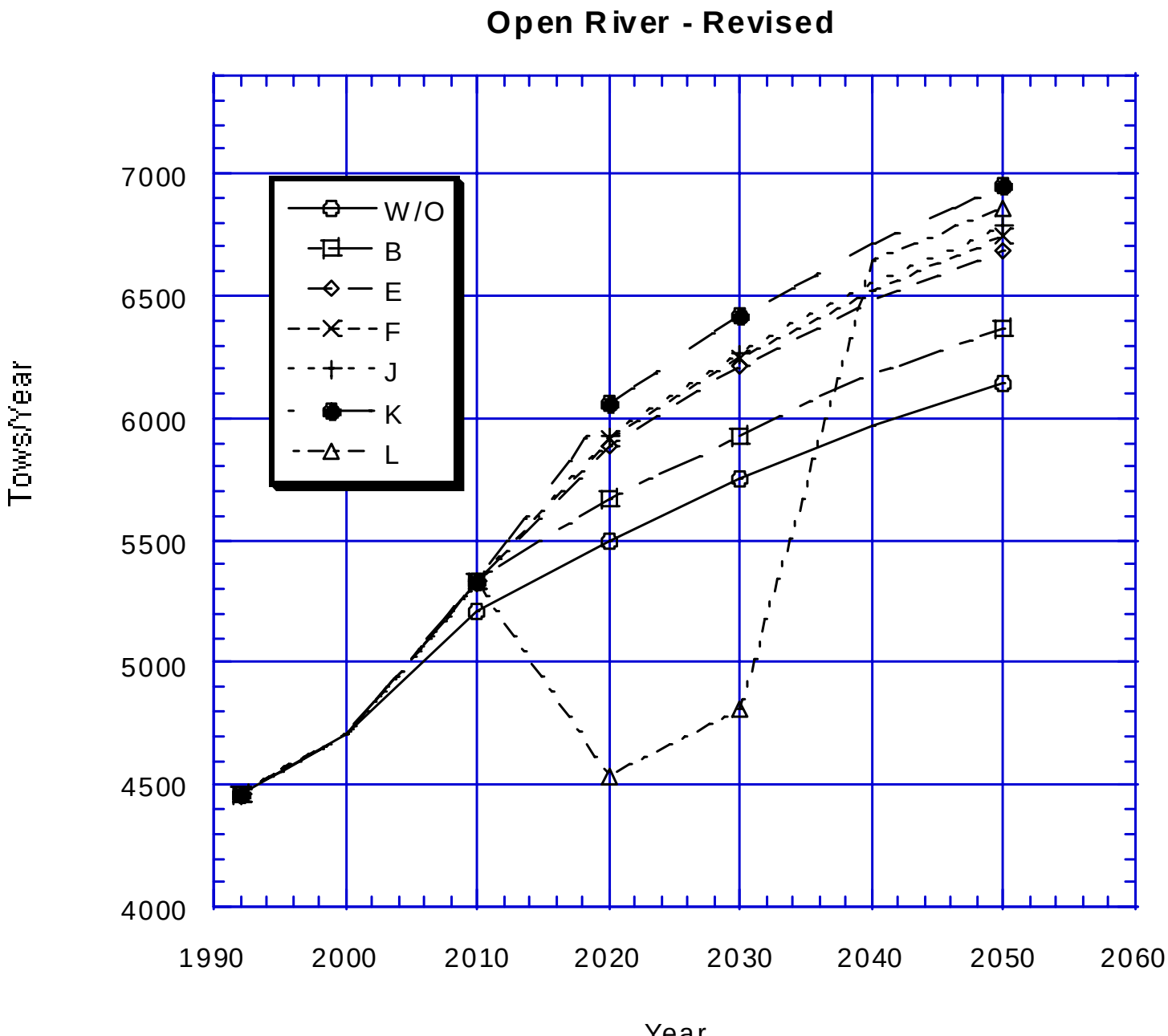
- Horsepower classes
  - Less than or equal to 1,800 hp
  - >1,800 to 3,000 hp
  - >3000 to 5,500 hp
  - >5,500 hp
- Used in calculation of larval fish entrainment for Open River
  - Class-specific entrainment rates (m^3/s)
  - Class-specific F_i values

Open River Traffic: Larger Horsepower Classes

	Forecast #2 Open River Larger Horsepower Trips/Y						
Year	W/O	B	E	F	J	K	L
1992	4,461	4,461	4,461	4,461	4,461	4,461	4,461
2000	4,706	4,706	4,706	4,706	4,706	4,706	4,706
2010	5,207	5,333	5,333	5,333	5,333	5,333	5,333
2020	5,496	5,669	5,890	5,913	5,930	6,062	4,537
2030	5,753	5,926	6,210	6,242	6,264	6,419	4,814
2040	5,972	6,183	6,476	6,522	6,551	6,716	6,642
2050	6,144	6,368	6,684	6,749	6,785	6,954	6,854

	Previous Open River Larger Horsepower Trips/Y						
Year	W/O	B	E	F	J	K	L
1992	4,461	4,461	4,461	4,461	4,461	4,461	4,461
2000	4,984	4,984	4,984	4,984	4,984	4,984	4,984
2010	5,381	5,550	5,550	5,550	5,550	5,550	5,550
2020	5,655	5,850	6,122	6,155	6,176	6,337	4,807
2030	5,925	6,147	6,459	6,514	6,547	6,730	5,103
2040	6,155	6,399	6,743	6,843	6,893	7,064	6,914
2050	6,305	6,575	6,958	7,112	7,179	7,332	7,100


Open River - Previous
Tows/Year
7000
6500
6000
5500
5000
4500
4000
1990
2000
2010
2020
2030
2040
2050
2060
Year
W/O
B
E
F
J
K
L


Open River - Revised
Tows/Year
Year
7000
6500
6000
5500
5000
4500
4000
1990
2000
2010
2020
2030
2040
2050
2060
W/O
B
E
F
J
K
L

Attachment 5

FORECAST #2: IMPACTS ON SAV

Presented by

Steve Bartell

31st Meeting of the NECC
November 28 and 29, 2000

UMR-IWW Navigation Study
31st NECC Meeting

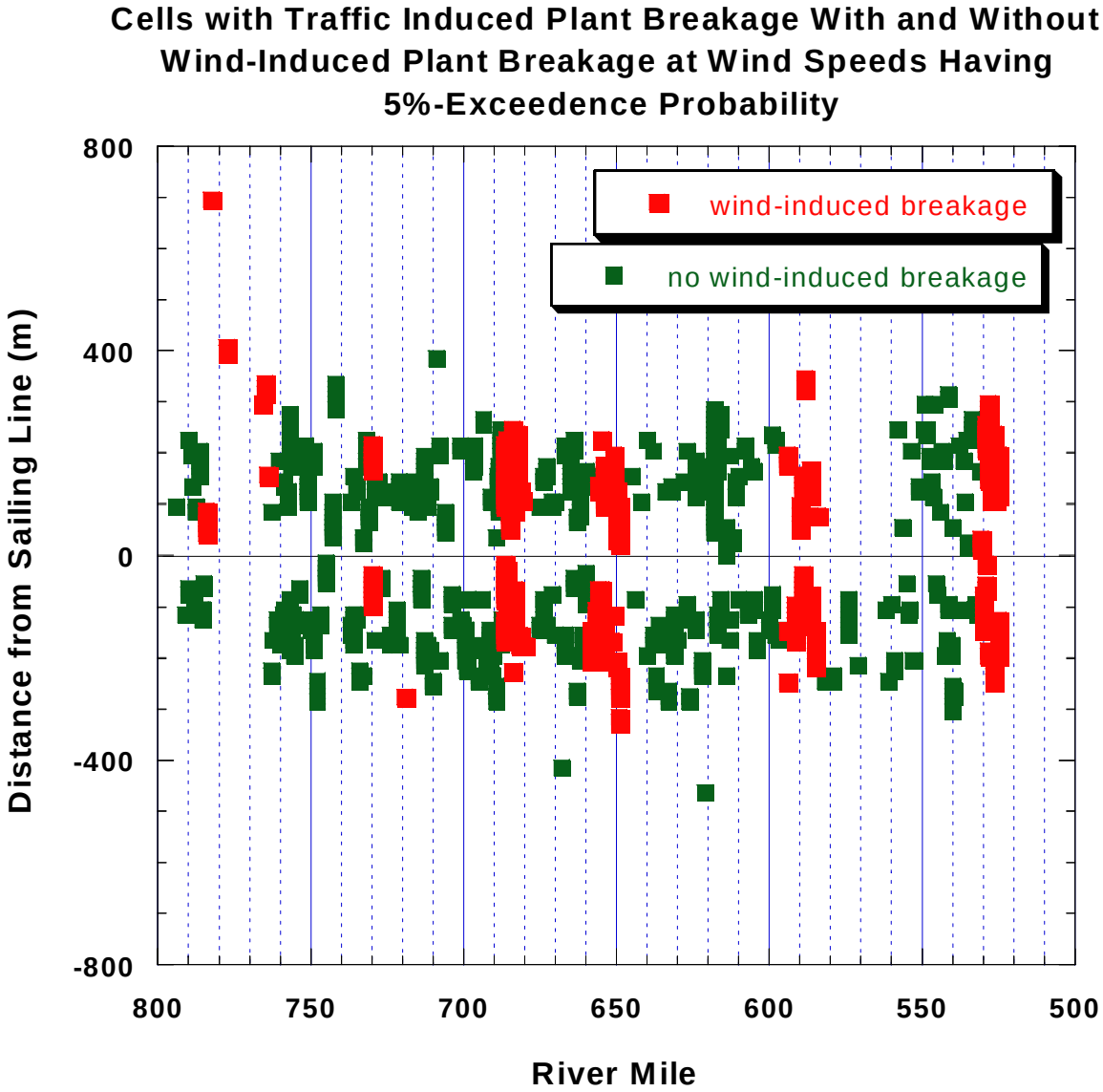
Forecast #2: Impacts on SAV

S.M. Bartell
S.K. Nair

The Cadmus Group, Inc.
Oak Ridge, TN

November 28-29, 2000
Bettendorf, Iowa

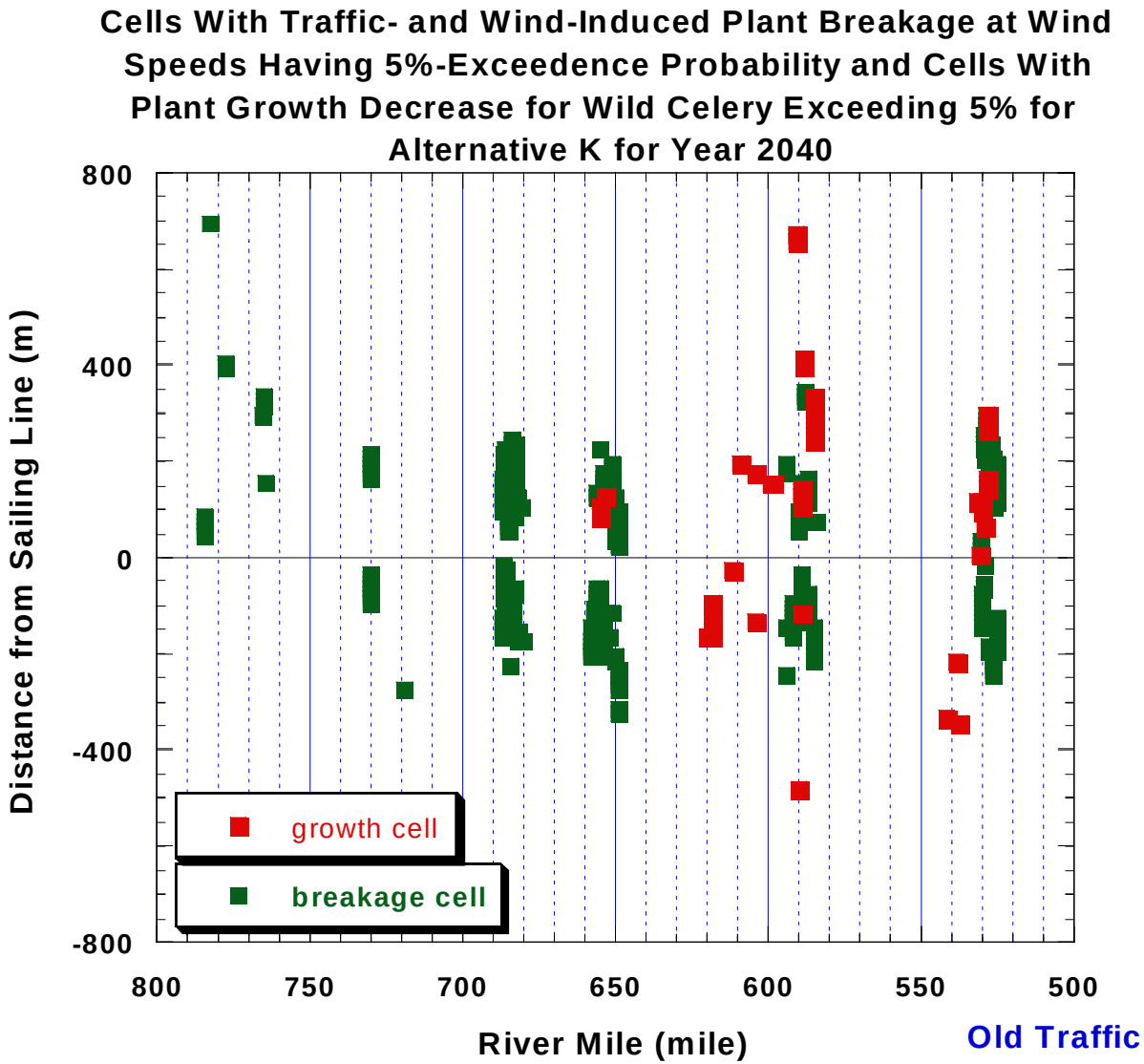
Wind-driven Plant Breakage

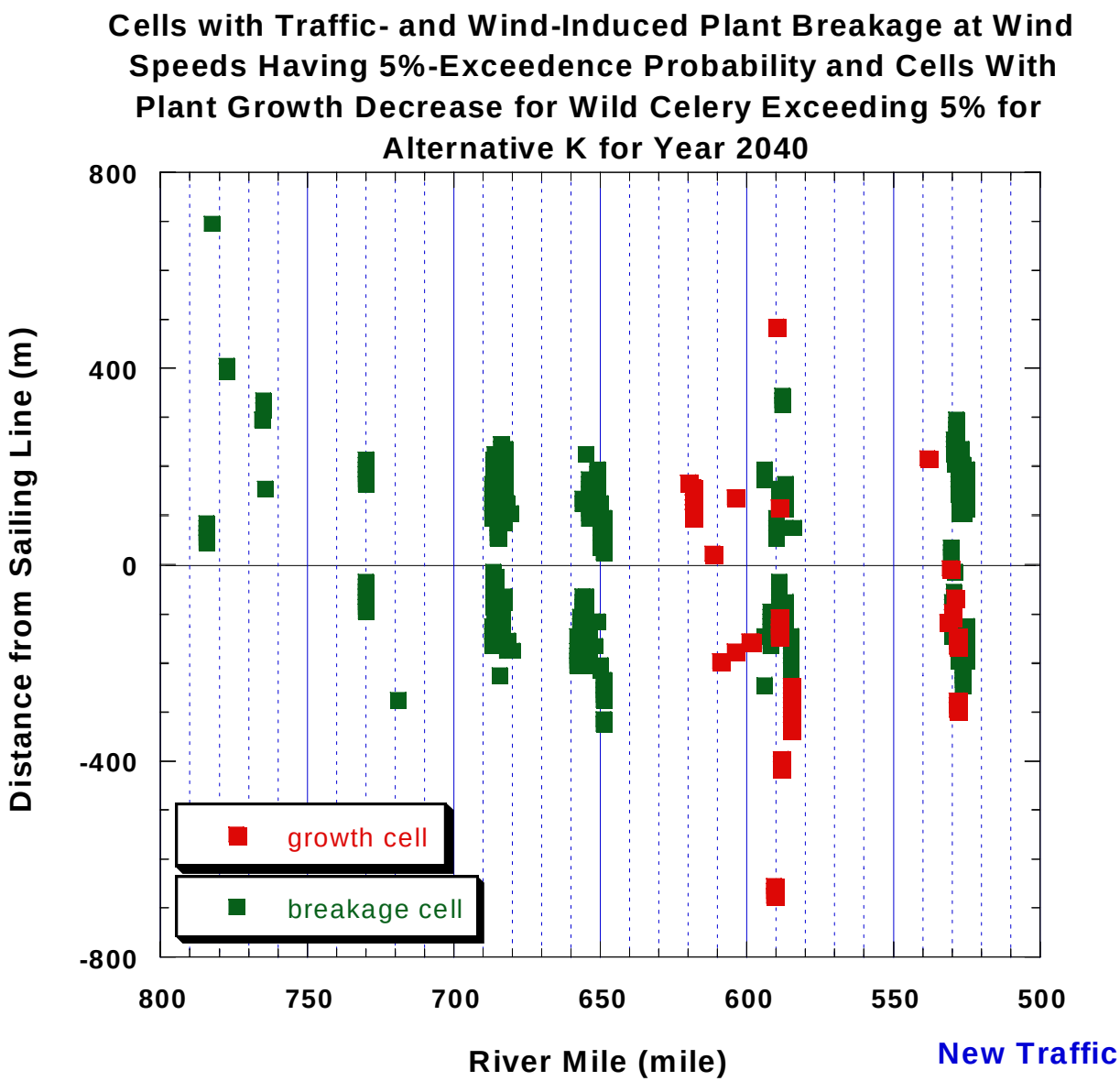

Cells with Traffic Induced Plant Breakage With and Without
Wind-Induced Plant Breakage at Wind Speeds Having
5%-Exceedence Probability
wind-induced breakage
no wind-induced breakage
Distance from Sailing Line (m)
800
400
0
-400
-800
800
750
700
650
600
550
500
River Mile

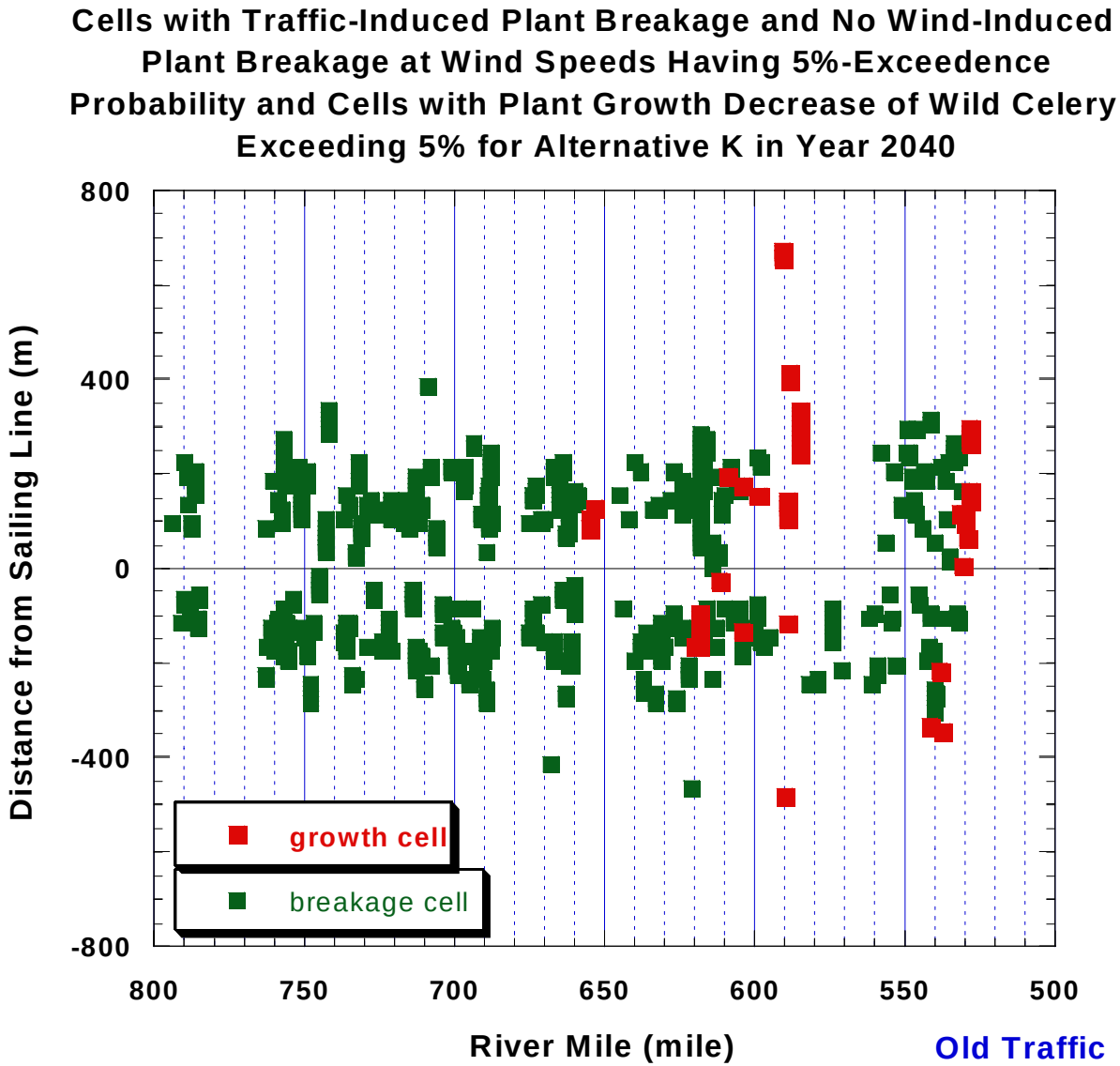
Impacts on Plant Growth

Review of SAV Impacts Assessment

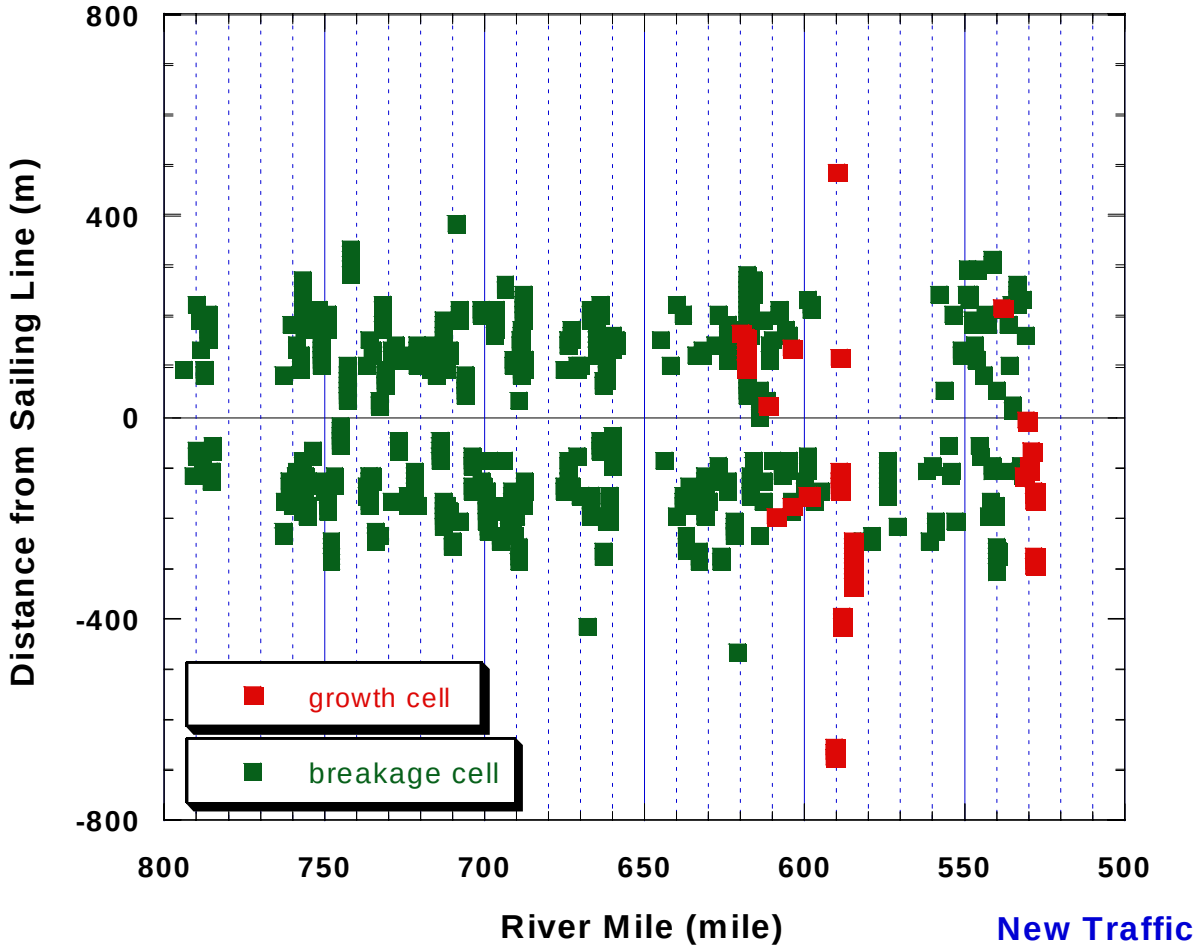
- Generate time series of vessel passages
  - Time series of sediment re-suspension
  - Adjust daily light extinction coefficients
  - Simulate growth and reproduction of SAV
- Note locations where growth decreases by >5% for Pools 4, 8, and 13
- Extrapolate impacts to non-trend pools

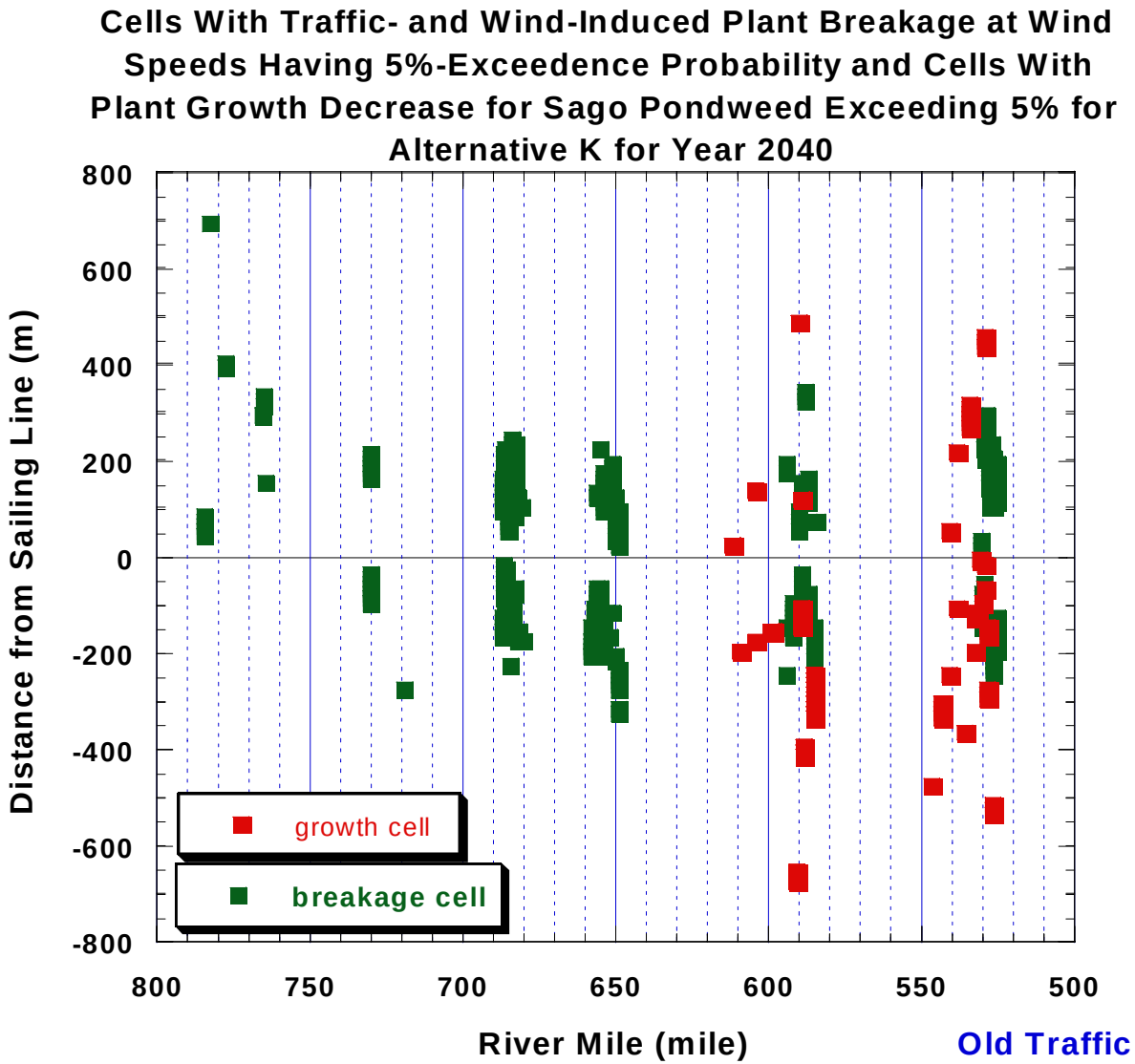

Cells With Traffic- and Wind-Induced Plant Breakage at Wind Speeds Having 5%-Exceedence Probability and Cells With Plant Growth Decrease for Wild Celery Exceeding 5% for Alternative K for Year 2040
800
400
0
-400
-800
Distance from Sailing Line (m)
growth cell
breakage cell
800
750
700
650
600
550
500
River Mile (mile)
Old Traffic

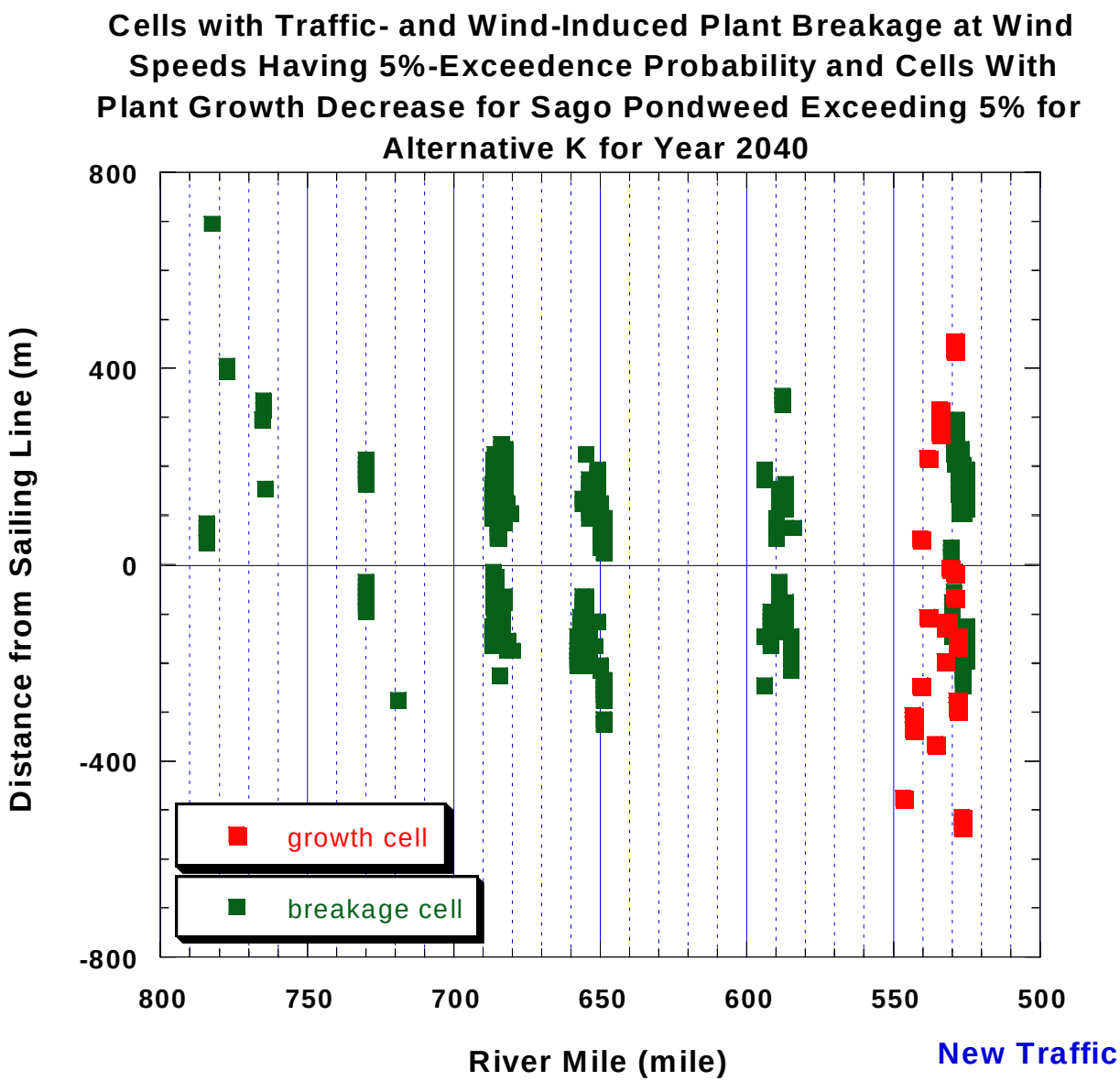

Cells with Traffic- and Wind-Induced Plant Breakage at Wind Speeds Having 5%-Exceedence Probability and Cells With Plant Growth Decrease for Wild Celery Exceeding 5% for Alternative K for Year 2040
800
400
0
-400
-800
Distance from Sailing Line (m)
growth cell
breakage cell
800
750
700
650
600
550
500
River Mile (mile)
New Traffic


Cells with Traffic-Induced Plant Breakage and No Wind-Induced Plant Breakage at Wind Speeds Having 5%-Exceedence Probability and Cells with Plant Growth Decrease of Wild Celery Exceeding 5% for Alternative K in Year 2040
800
400
0
-400
-800
Distance from Sailing Line (m)
growth cell
breakage cell
800
750
700
650
600
550
500
River Mile (mile)
Old Traffic

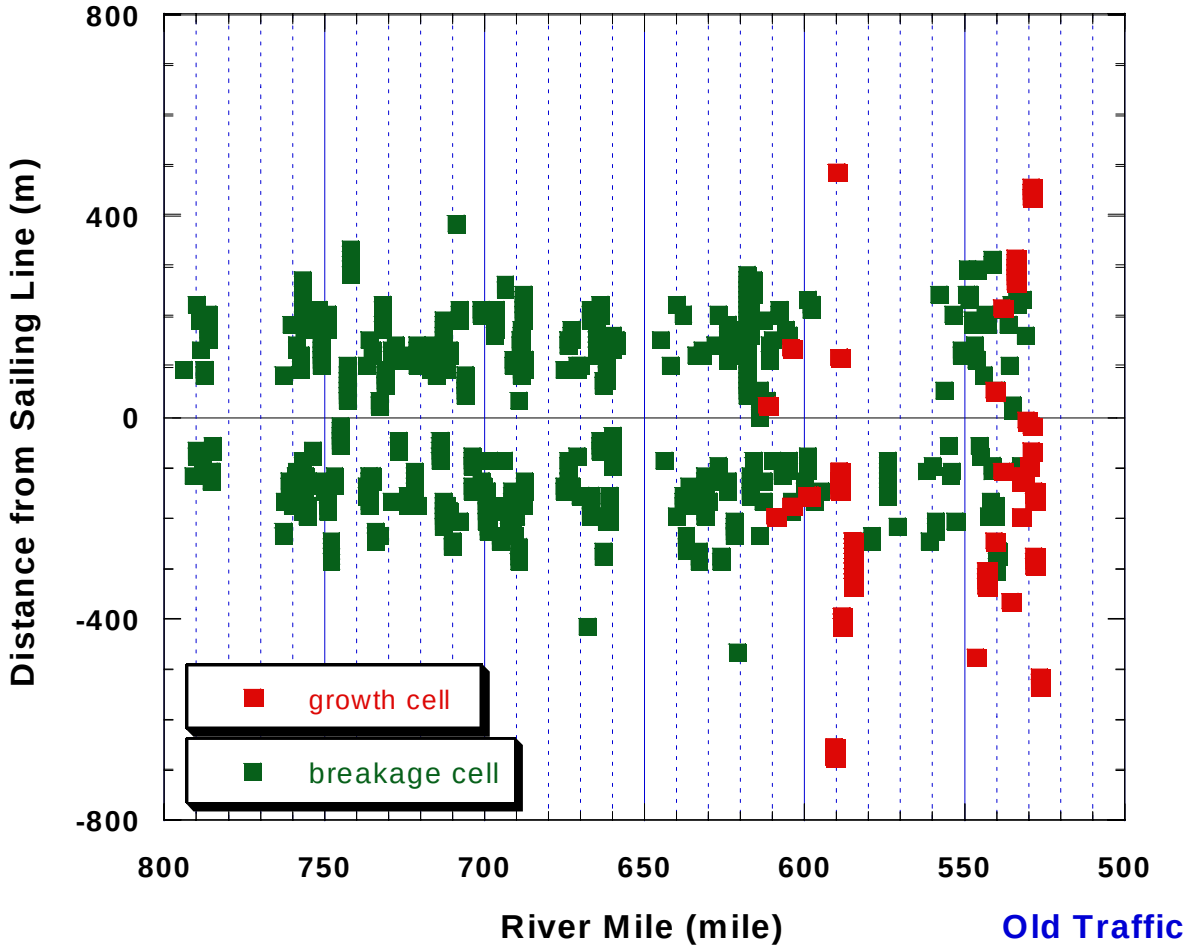
Cells with Traffic-Induced Plant Breakage and No Wind-Induced Plant Breakage at Wind Speeds Having 5%-Exceedence Probability and Cells with Plant Growth Decrease of Wild Celery Exceeding 5% for Alternative K for Year 2040



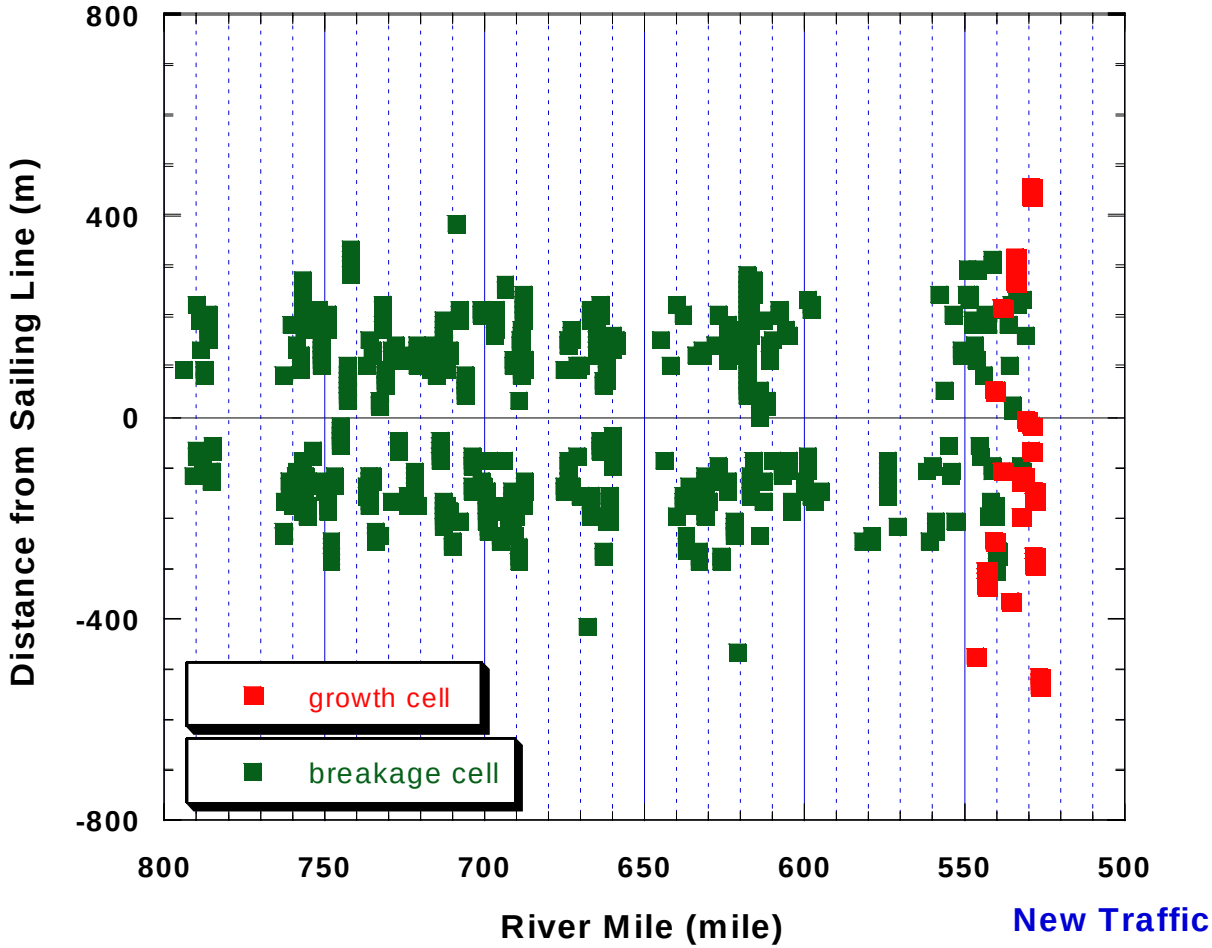

Cells With Traffic- and Wind-Induced Plant Breakage at Wind Speeds Having 5%-Exceedence Probability and Cells With Plant Growth Decrease for Sago Pondweed Exceeding 5% for Alternative K for Year 2040
Distance from Sailing Line (m)
800
600
400
200
0
-200
-400
-600
-800
800
750
700
650
600
550
500
River Mile (mile)
Old Traffic
growth cell
breakage cell

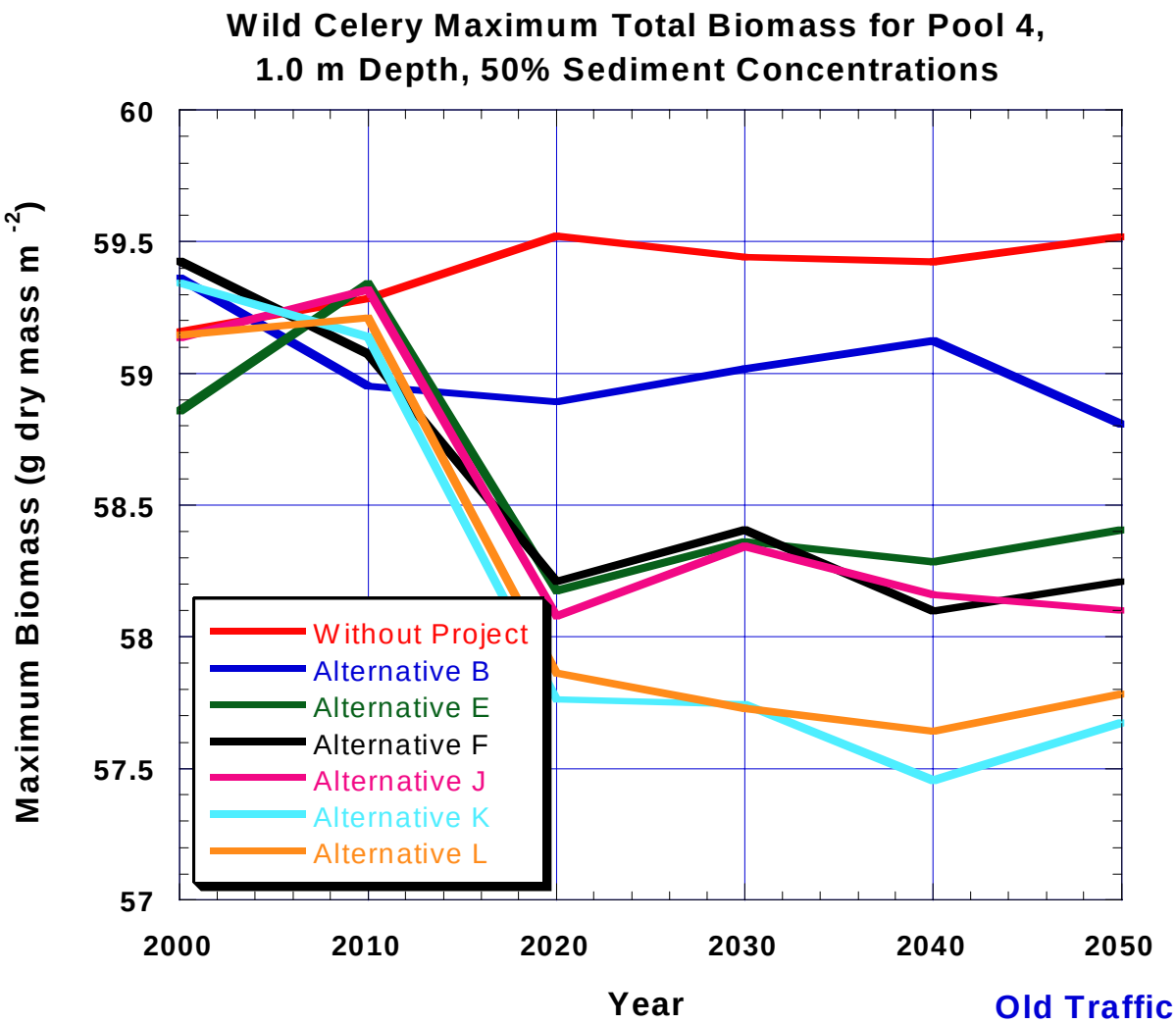

Cells with Traffic- and Wind-Induced Plant Breakage at Wind Speeds Having 5%-Exceedence Probability and Cells With Plant Growth Decrease for Sago Pondweed Exceeding 5% for Alternative K for Year 2040
800
400
0
-400
-800
Distance from Sailing Line (m)
growth cell
breakage cell
800
750
700
650
600
550
500
River Mile (mile)
New Traffic

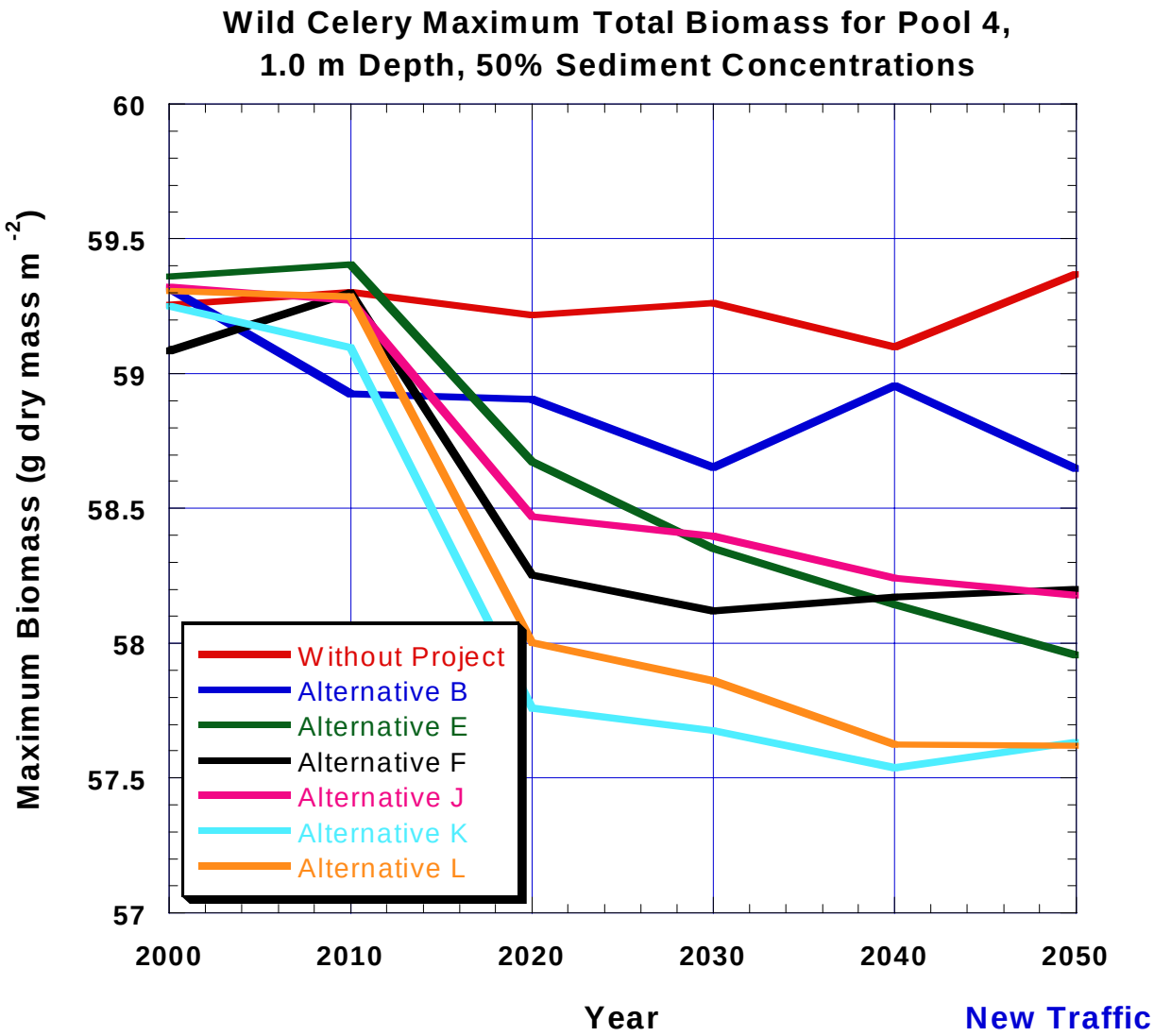
Cells with Traffic-Induced Plant Breakage and No Wind-Induced Plant Breakage at Wind Speeds Having 5%-Exceedence Probability and Cells with Plant Growth Decrease of Sago Pondweed Exceeding 5% for Alternative K in Year 2040

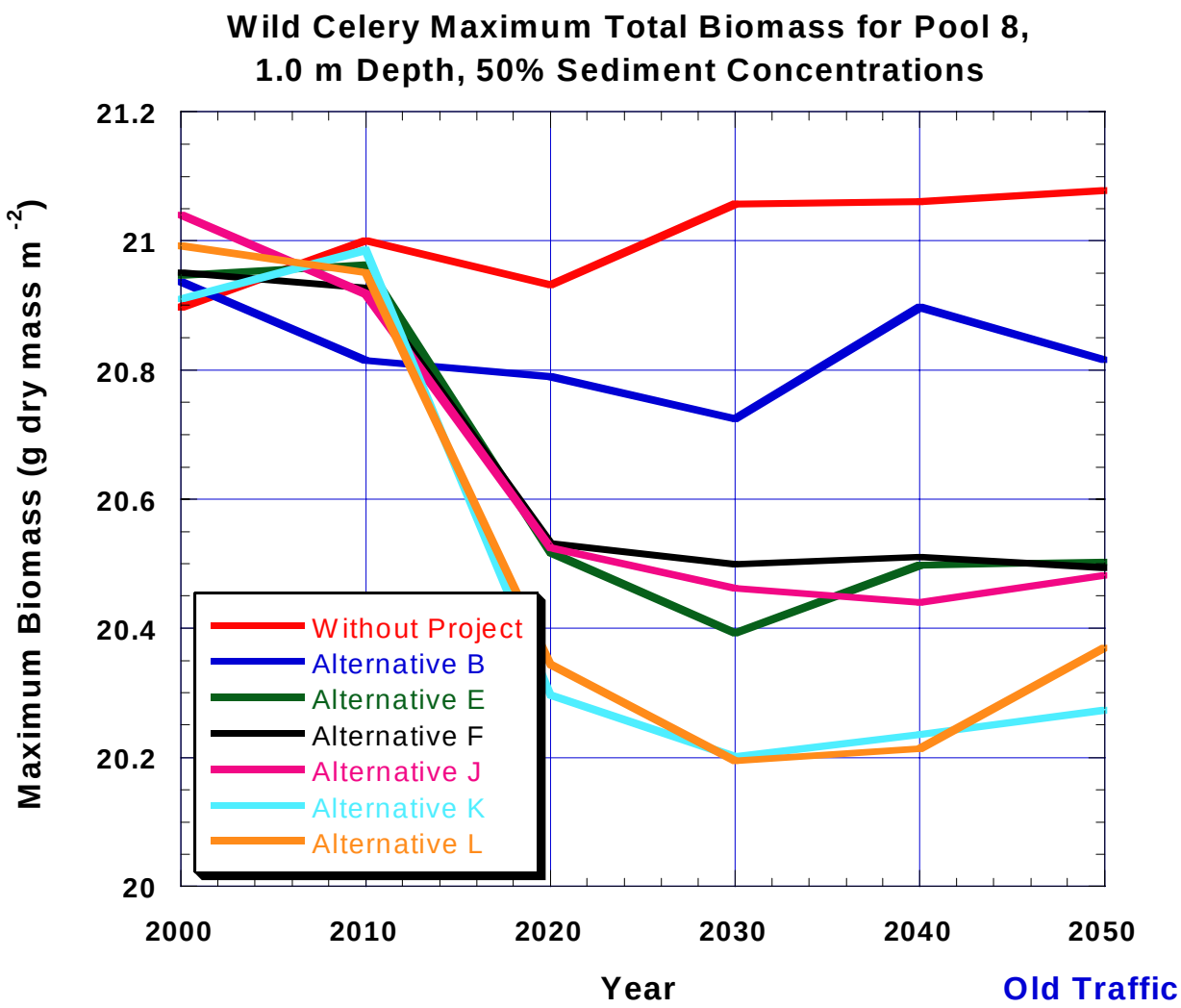


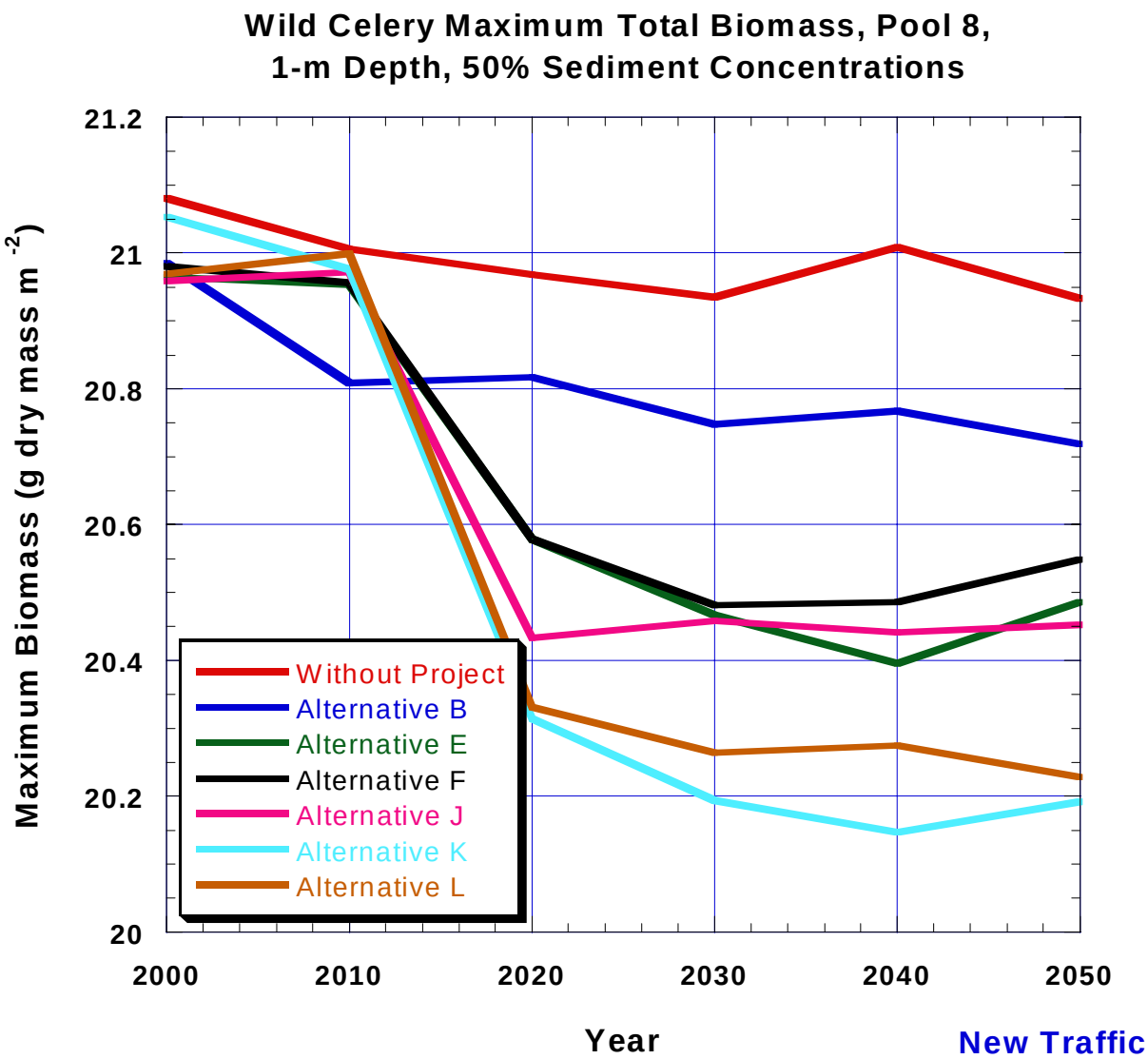
Cells with Traffic-Induced Plant Breakage and No Wind-Induced Plant Breakage at Wind Speeds Having 5%-Exceedence Probability and Cells with Plant Growth Decrease of Sago Pondweed Exceeding 5% for Alternative K for Year 2040

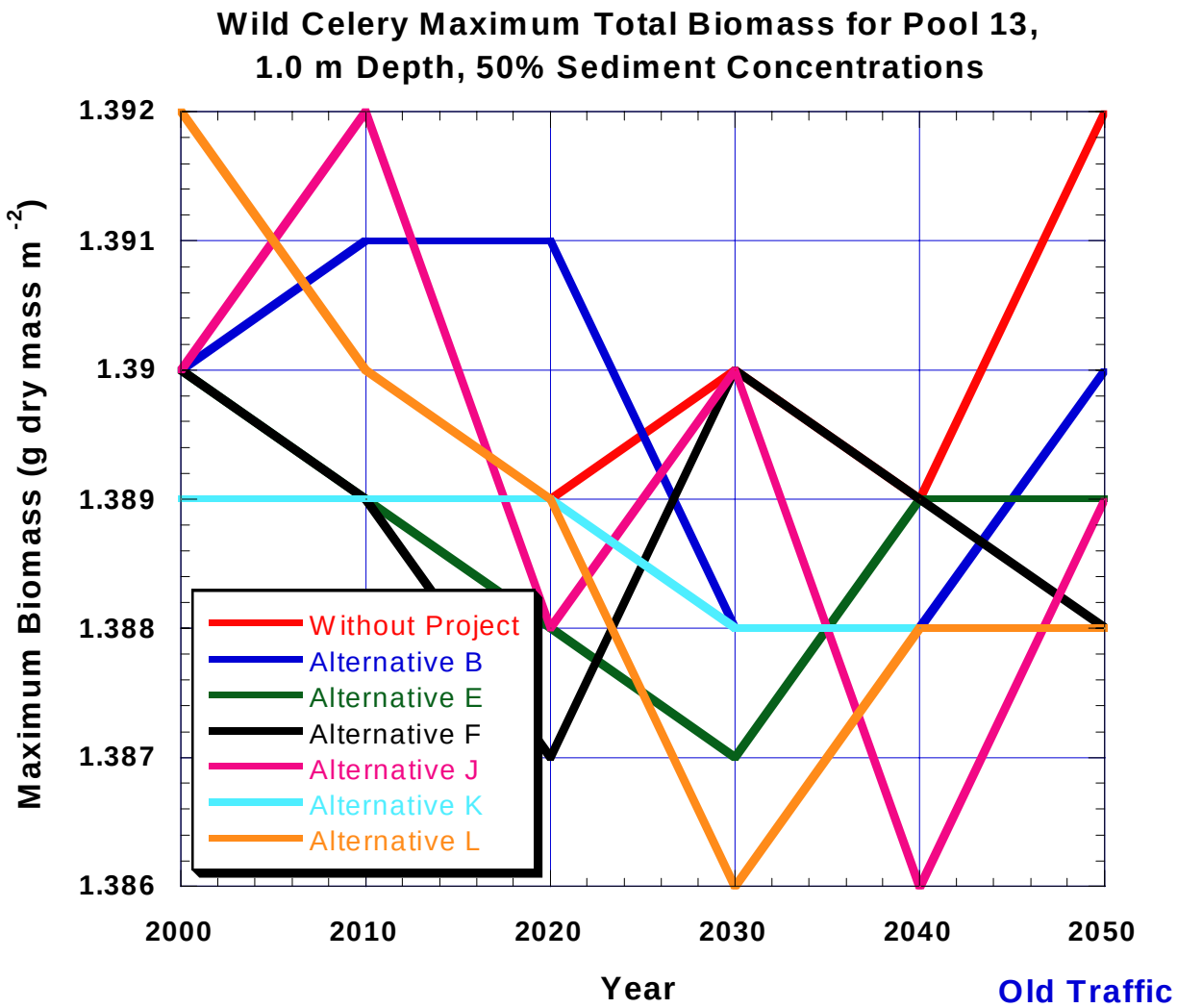


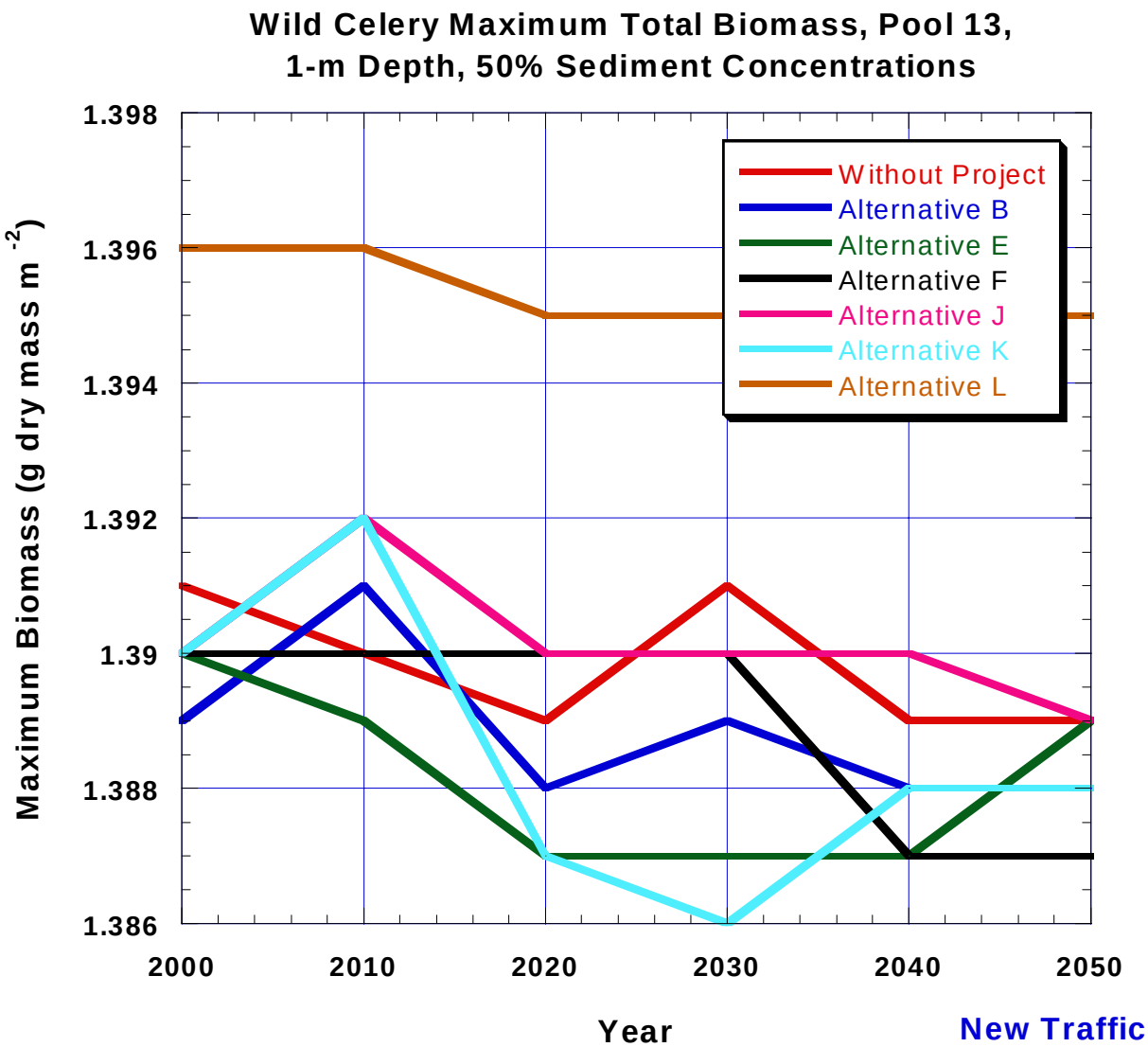

Wild Celery Maximum Total Biomass for Pool 4,
1.0 m Depth, 50% Sediment Concentrations
Maximum Biomass (g dry mass m -2)
60
59.5
59
58.5
58
57.5
57
2000
2010
2020
2030
2040
2050
Year
Without Project
Alternative B
Alternative E
Alternative F
Alternative J
Alternative K
Alternative L
Old Traffic

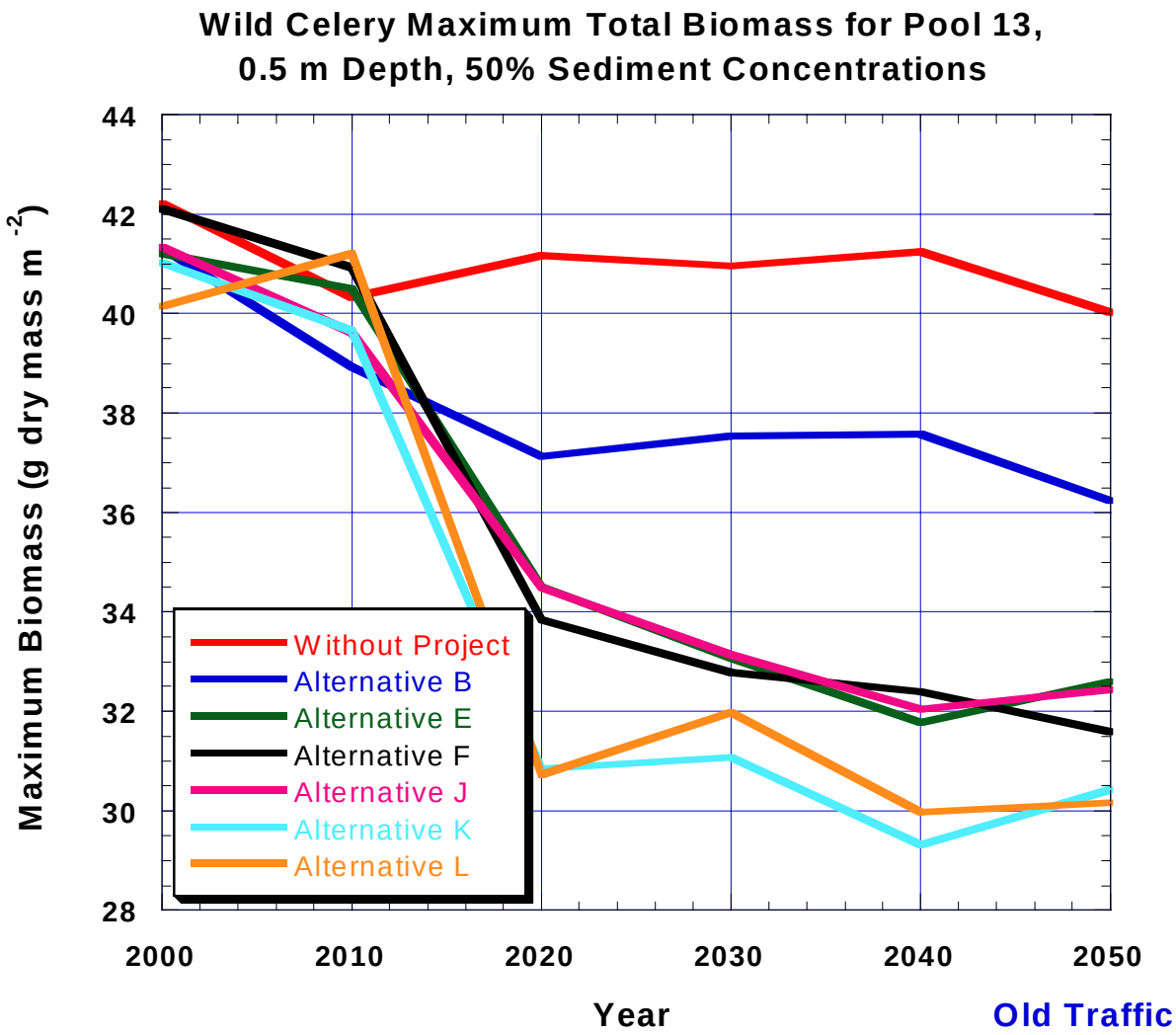

Wild Celery Maximum Total Biomass for Pool 4,
1.0 m Depth, 50% Sediment Concentrations
Maximum Biomass (g dry mass m -2)
60
59.5
59
58.5
58
57.5
57
2000
2010
2020
2030
2040
2050
Year
New Traffic
Without Project
Alternative B
Alternative E
Alternative F
Alternative J
Alternative K
Alternative L

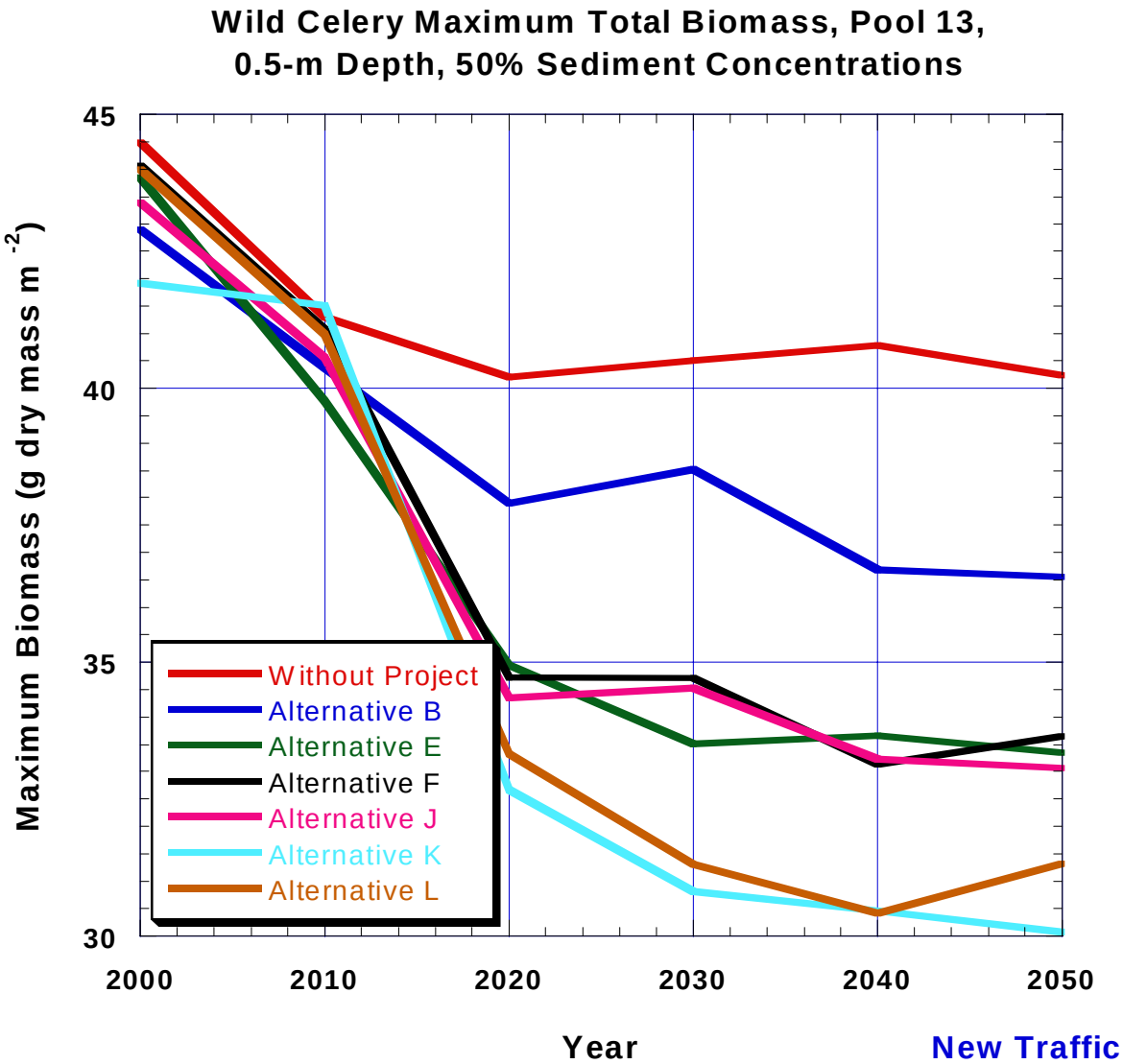

Wild Celery Maximum Total Biomass for Pool 8,
1.0 m Depth, 50% Sediment Concentrations
Maximum Biomass (g dry mass m -2)
21.2
21
20.8
20.6
20.4
20.2
20
2000
2010
2020
2030
2040
2050
Year
Without Project
Alternative B
Alternative E
Alternative F
Alternative J
Alternative K
Alternative L
Old Traffic


Wild Celery Maximum Total Biomass, Pool 8,
1-m Depth, 50% Sediment Concentrations
Maximum Biomass (g dry mass m -2)
21.2
21
20.8
20.6
20.4
20.2
20
2000
2010
2020
2030
2040
2050
Year
New Traffic
Without Project
Alternative B
Alternative E
Alternative F
Alternative J
Alternative K
Alternative L


Wild Celery Maximum Total Biomass for Pool 13,
1.0 m Depth, 50% Sediment Concentrations
Maximum Biomass (g dry mass m -2)
1.392
1.391
1.39
1.389
1.388
1.387
1.386
2000
2010
2020
2030
2040
2050
Year
Without Project
Alternative B
Alternative E
Alternative F
Alternative J
Alternative K
Alternative L
Old Traffic


Wild Celery Maximum Total Biomass, Pool 13,
1-m Depth, 50% Sediment Concentrations
Maximum Biomass (g dry mass m -2)
1.398
1.396
1.394
1.392
1.39
1.388
1.386
2000
2010
2020
2030
2040
2050
Year
New Traffic
Without Project
Alternative B
Alternative E
Alternative F
Alternative J
Alternative K
Alternative L


Wild Celery Maximum Total Biomass for Pool 13,
0.5 m Depth, 50% Sediment Concentrations
Maximum Biomass (g dry mass m -2)
44
42
40
38
36
34
32
30
28
2000
2010
2020
2030
2040
2050
Year
Without Project
Alternative B
Alternative E
Alternative F
Alternative J
Alternative K
Alternative L
Old Traffic


Wild Celery Maximum Total Biomass, Pool 13,
0.5-m Depth, 50% Sediment Concentrations
Maximum Biomass (g dry mass m -2)
45
40
35
30
2000
2010
2020
2030
2040
2050
Year
New Traffic
Without Project
Alternative B
Alternative E
Alternative F
Alternative J
Alternative K
Alternative L

Attachment 6

FORECAST #2: LARVAL FISH ENTRAINMENT

Presented by

Steve Bartell

31st Meeting of the NECC
November 28 and 29, 2000

UMR-IWW Navigation Study
31st NECC Meeting

Forecast #2: Larval Fish Entrainment

S.M. Bartell
S.K. Nair

The Cadmus Group, Inc.
Oak Ridge, TN

November 28-29, 2000
Bettendorf, Iowa

Review of Larval Entrainment Estimates

- Traffic: average vessels/day (month, pool)
- Average volume entrained per vessel
- Larval density, distribution (w_i), mortality (F_i)
- Calculate number of larvae entrained, killed
- Extrapolate to EAL, RF, and PF

Factors That Can Change Entrainment Estimates

- Traffic forecasts
  - Average vessels/day (month, pool); WOP
  - Average tow configuration
  - F_i values (i.e., tow-dependent)
- Fish data revisions
  - Larval density estimates
  - Extrapolation model parameters (e.g., EAL, RF)

Alternative K: UMR Pools 16-27 Increase in EAL

Year 2040

	Species	Forecast #2 Traffic	Previous Traffic	Percent Change
1	Blue Sucker	4	5	-20
2	Smallmouth Bass	41	47	-14
3	Northern Pike	86	98	-12
4	Bigmouth Buffalo	206	231	-11
5	Smallmouth Buffalo	649	728	-11
6	Largemouth Bass	1,054	1,211	-13
7	Sturgeon	1,214	1,406	-14
8	Paddlefish	1,264	1,447	-13
9	Walleye	2,153	2,419	-11
10	Blue Catfish	2,583	2,957	-13
11	Goldeye	2,830	3,174	-11
12	Flathead Catfish	4,393	5,039	-13
13	River Carpsucker	6,021	6,796	-11
14	Mooneye	6,661	7,468	-11
15	Sauger	7,860	8,770	-10
16	Bluegill	9,055	10,280	-12
17	Shorthead Redhorse	9,362	10,450	-10
18	Channel Catfish	31,820	36,430	-13
19	Crappie	32,580	36,710	-11
20	Freshwater Drum	39,230	43,780	-10
21	White Bass	40,080	45,170	-11
22	Spotted Sucker	47,190	53,090	-11
	TOTALS	246,336	277,706	-11

Alternative K: Percent Change in EAL Year 2040			
River Section	Forecast #2 Traffic	Previous Traffic	Percent Change
Mississippi River			
USA-3	4,582	4,702	-3
4-8	10,808	11,631	-7
9-15	123,695	137,121	-10
16-27	246,336	277,706	-11
Open River	4,513	5,652	-20
Ilinois Waterway			
Lower	3,843	5,888	-35
Middle	3,912	8,197	-52
Upper	756	1,241	-39

Forecast #2: Incremental Increase in EAL for Year 2040

Alternative	Mississippi River					Illinois Waterway		
	USA-3	4-8	9-15	16-27	Open River	Lower	Middle	Upper
B	1,225	3,147	33,467	70,931	1,245	546	26	66
E	2,856	7,069	83,138	177,045	3,062	1,577	170	201
F	2,856	7,069	83,138	177,516	3,346	2,633	2,549	552
J	2,856	7,118	83,225	178,107	3,553	3,328	3,912	756
K	4,582	10,808	123,695	246,336	4,513	3,843	3,912	756
L	4,582	10,808	123,695	245,592	4,125	2,118	170	194

EAL Summary for Revised Traffic Forecast #2 Alternatives B - L

Forecast #2: Incremental Percent Increase

Alternative	Mississippi River				Illinois Waterway			
	Y 2020	Y 2030	Y 2040	Y 2050	Y 2020	Y 2030	Y 2040	Y 2050
B	0.29	0.33	0.39	0.40	0.03	0.00	0.01	0.02
E	0.73	0.84	0.92	0.97	0.04	0.03	0.04	0.04
F	0.73	0.85	0.92	0.97	0.09	0.10	0.13	0.17
J	0.73	0.85	0.92	0.98	0.11	0.14	0.17	0.22
K	1.05	1.22	1.32	1.39	0.12	0.14	0.18	0.22
L	0.99	1.16	1.32	1.39	0.05	0.04	0.05	0.05

Summary of Incremental Percentage Increases for Forecast #2 Alternatives B - L

Upper Mississippi River

UMR Pool	Length[a] (km)	Volume[b] (m^3 x 10^6) High	Medium	Low	River Mile[c] Upper	Dam	ERA Lengths[d] (km)	Estimated Transit Time (h) Slow[1]	Medium[2]	Fast[3]	Estimated Total Transit Time (days)
UMUSA		827.4	633.4	586.1			71.0				
UMLSA		827.4	633.4	586.1			71.0				
UM01	8.7	827.4	633.4	586.1	853.0	847.6	71.0	1.1	0.8	0.7	
UM02	52.0	827.4	633.4	586.1	847.6	815.3	71.0	6.4	5.0	4.0	
UM03	29.6	827.4	633.4	586.1	815.3	796.9	71.0	3.7	2.8	2.3	
UM04	71.0	827.4	633.4	586.1	796.9	752.8	71.0	8.8	6.8	5.5	
UM05	23.5	46.3	39.4	23.7	752.8	738.2	23.7	2.9	2.2	1.8	
UM05A	15.8	23.7	18.5	18.1	738.2	728.4	15.5	2.0	1.5	1.2	
UM06	22.7	35.5	27.4	27.8	728.4	714.3	23.3	2.8	2.2	1.8	
UM07	19.0	40.1	34.4	33.2	714.3	702.5	19.3	2.4	1.8	1.5	
UM08	37.5	52.9	52.5	46.0	702.5	679.2	37.0	4.7	3.6	2.9	
UM09	50.6	93.4	68.7	66.9	679.2	647.8	51.5	6.3	4.8	3.9	
UM10	52.8	122.5	86.2	77.5	647.8	615.0	51.5	6.5	5.0	4.1	
UM11	51.5	124.7	102.3	92.3	615.0	583.0	51.5	6.4	4.9	4.0	
UM12	42.2	137.2	108.3	100.8	583.0	556.8	43.5	5.2	4.0	3.3	
UM13	55.2	151.2	121.6	109.9	556.8	522.5	54.7	6.8	5.3	4.3	
UM14	46.9	143.0	117.2	105.7	522.5	493.4	46.7	5.8	4.5	3.6	
UM15	16.9	53.1	45.1	42.3	493.4	482.9	16.3	2.1	1.6	1.3	
UM16	41.5	122.0	89.5	77.5	482.9	457.1	41.4	5.2	4.0	3.2	
UM17	32.2	93.0	63.2	57.2	457.1	437.1	32.4	4.0	3.1	2.5	
UM18	43.0	154.7	119.5	105.5	437.1	410.4	42.8	5.3	4.1	3.3	
UM19	74.1	420.6	350.2	326.1	410.4	364.4	74.5	9.2	7.1	5.7	
UM20	34.1	153.4	104.1	90.2	364.4	343.2	33.8	4.2	3.3	2.6	
UM21	29.5	109.9	74.2	66.3	343.2	324.9	29.5	3.7	2.8	2.3	
UM22	38.2	167.5	113.2	100.5	324.9	301.2	38.1	4.7	3.6	3.0	
UM24	44.9	193.5	148.2	134.0	301.2	273.3	44.7	5.6	4.3	3.5	
UM25	51.2	191.1	138.0	117.2	273.3	241.5	51.5	6.3	4.9	4.0	
UM26A[e]	34.6	111.6	81.9	74.7	241.5	220.0	39.2	4.3	3.3	2.7	
UM26B[f]	30.9	226.7	166.3	151.6	220.0	200.8	26.1	3.8	3.0	2.4	
UM27	21.4	423.1	256.6	159.1	200.8	187.5	24.6	2.7	2.0	1.7	
UMOR	70.8[g]	432.1	256.6	159.1			70.4	8.8	6.8	5.5	
								5.9	**4.5**	**3.7**	

[a]Based on river mile values

[b]Derived from 5th, 50th, and 90th percentiles of discharge data (Landwehr, pers. Comm.)

[c]Estimated from UMR-IW navigation charts

[d]Used in estimation of larval fish entrainment

[e]From Lock and Dam 25 to confluence with Illinois River

[f]From confluence with Illinois River to Lock and Dam 26

[g]Open River Reach (Miles 31 -74)

[1]Assumes constant vessel speed of 2.24 m/s

[2]Assumes constant vessel speed of 2.91 m/s

[3]Assumes constant vessel speed of 3.58 m/s

Forecast #2: Alternative B

Forecast #2: Alternative B - Incremental Increase in Number of Larvae Entrained and Killed

		Mississippi River						Illinois Waterway			
Species	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	167,725,408	226,453,648	243,364,192	270,619,520	286,749,056		1,844,780	2,832,320	-593,630	1,732,100	2,300,030
Blue Catfish	9,255,090	12,745,220	13,595,105	15,263,920	16,259,144		0	0	0	0	0
Blue Sucker	5,472,837	7,602,830	7,904,737	9,223,326	9,945,048		0	0	0	0	0
Bluegill	431,536,352	582,033,536	634,035,520	714,603,712	768,735,872		8,323,136	14,390,260	-3,440,544	7,843,600	8,519,620
Channel Catfish	9,336,820	12,786,620	13,720,415	15,345,310	16,270,254		14,475	100,875	-63,797	51,854	93,216
Crappie	105,499,632	139,713,712	153,659,824	171,280,144	180,331,376		3,369,200	3,128,870	-960,537	1,917,300	3,115,198
Flathead Catfish	6,531,982	8,327,718	9,327,103	10,687,243	11,236,654		5,391	66,712	-46,928	34,019	65,656
Freshwater Drum	4,063,125,760	5,656,722,432	5,986,698,752	6,556,372,992	6,829,439,488		6,293,330	52,293,000	-22,178,900	31,436,790	43,940,500
Goldeye	28,776,758	39,176,832	41,843,064	46,471,052	49,178,088		192,504	206,680	-105,846	112,004	208,880
Largemouth Bass	13,239,257	16,826,278	18,894,308	21,733,804	23,175,508		55,798	248,397	-222,298	125,671	247,651
Mooneye	21,575,788	29,704,226	31,629,110	34,637,852	36,605,552		188,000	202,895	-96,890	103,600	206,980
Northern Pike	2,238,332	2,332,504	3,012,074	3,571,440	3,657,537		4,709	16,485	-7,608	9,273	16,991
Paddlefish	305,589	385,530	422,493	496,999	524,118		3,621	4,464	-1,731	2,709	5,372
River Carpsucker	73,491,560	102,215,648	107,601,520	120,041,104	128,829,360		1,502,150	2,682,300	-1,026,860	1,506,619	2,382,830
Sauger	22,988,368	27,931,030	32,108,524	35,819,876	38,008,864		38,951	64,180	-34,887	34,952	65,269
Shorthead Redhorse	515,979,936	703,164,160	749,600,064	820,976,256	874,717,248		777,590	5,644,800	-3,704,570	2,922,660	5,468,460
Smallmouth Bass	695,612	877,373	975,944	1,128,228	1,215,514		5,817	12,629	-6,857	6,541	12,094
Smallmouth Buffalo	167,725,408	226,453,648	243,364,192	270,619,520	286,749,056		1,844,780	2,832,320	-593,630	1,732,100	2,300,030
Spotted Sucker	350,721,376	488,798,368	500,745,248	543,083,200	576,393,664		554,864	7,174,000	-7,133,000	3,643,663	7,182,000
Sturgeon	272,464	354,814	383,076	448,251	478,947		2,727	3,576	-1,561	3,152	3,643
Walleye	38,474,536	45,784,704	54,407,448	61,093,244	64,215,736		41,094	64,180	-34,887	34,952	65,269
White Bass	140,321,968	176,418,960	198,133,728	227,975,424	237,732,224		836,150	851,140	-309,760	431,510	815,325
TOTALS	**6,175,290,833**	**8,506,809,791**	**9,045,426,441**	**9,951,492,417**	**10,440,448,308**		**25,899,067**	**92,820,083**	**-40,564,721**	**53,685,069**	**77,015,014**
		EXCLUDED FROM CONSIDERATION									
Bowfin	384,847	482,513	533,931	621,650	658,702		5,208	4,835	-2,865	4,037	5,833
Carp	1,339,803,136	1,842,392,960	1,970,679,680	2,196,800,256	2,308,942,592		18,412,788	23,758,866	-11,064,554	11,955,151	22,885,560
Emerald Shiner	1,478,465,152	2,043,776,768	2,181,458,432	2,439,605,248	2,558,996,736		15,819,064	62,271,700	-41,521,432	30,942,808	61,776,300
Gizzard Shad	734,802,112	944,534,464	1,062,933,760	1,204,226,560	1,261,636,864		11,820,150	92,456,896	-66,848,200	45,630,540	92,328,304
Shortnose Gar	3,969,562	4,673,781	5,480,650	6,292,308	6,514,809		4,568	13,020	-8,004	7,708	10,807

Forecast #2: Alternative B - Incremental Increase in Percentage of Entrained Larvae

		Mississippi River						Illinois Waterway			
Species	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	0.50	0.61	0.70	0.83	0.86		0.05	0.08	0.00	0.05	0.05
Blue Catfish	0.05	0.08	0.09	0.10	0.10		0.00	0.00	0.00	0.00	0.00
Blue Sucker	0.08	0.09	0.10	0.13	0.14		0.00	0.00	0.00	0.00	0.00
Bluegill	0.38	0.45	0.53	0.61	0.64		0.04	0.08	0.01	0.05	0.06
Channel Catfish	0.08	0.12	0.13	0.15	0.15		0.00	0.00	0.00	0.00	0.00
Crappie	0.27	0.33	0.37	0.44	0.45		0.04	0.05	0.00	0.03	0.04
Flathead Catfish	0.08	0.10	0.11	0.14	0.15		0.00	0.00	0.00	0.00	0.00
Freshwater Drum	0.41	0.50	0.58	0.67	0.68		0.01	0.09	-0.01	0.03	0.05
Goldeye	0.27	0.34	0.40	0.46	0.48		0.01	0.01	-0.01	0.00	0.01
Largemouth Bass	0.11	0.13	0.15	0.17	0.17		0.00	0.00	0.00	0.00	0.00
Mooneye	0.17	0.23	0.25	0.29	0.30		0.01	0.01	-0.01	0.00	0.01
Northern Pike	0.10	0.12	0.14	0.16	0.18		0.00	0.00	0.00	0.00	0.00
Paddlefish	0.14	0.16	0.18	0.22	0.22		0.00	0.00	0.00	0.00	0.00
River Carpsucker	0.26	0.34	0.39	0.44	0.46		0.01	0.05	-0.01	0.01	0.03
Sauger	0.29	0.36	0.41	0.47	0.49		0.01	0.04	0.00	0.01	0.04
Shorthead Redhorse	0.30	0.36	0.42	0.47	0.48		0.01	0.05	0.00	0.01	0.03
Smallmouth Bass	0.09	0.12	0.14	0.15	0.15		0.00	0.00	0.00	0.00	0.00
Smallmouth Buffalo	0.50	0.61	0.70	0.83	0.86		0.05	0.08	0.00	0.05	0.05
Spotted Sucker	0.48	0.58	0.68	0.77	0.80		0.00	0.03	-0.03	0.01	0.03
Sturgeon	0.07	0.09	0.10	0.11	0.12		0.00	0.00	0.00	0.00	0.00
Walleye	0.27	0.34	0.39	0.46	0.48		0.01	0.04	0.00	0.01	0.04
White Bass	0.28	0.35	0.40	0.46	0.48		0.04	0.04	-0.01	0.00	0.03
TOTALS	**0.24**	**0.29**	**0.33**	**0.39**	**0.40**		**0.01**	**0.03**	**0.00**	**0.01**	**0.02**
		EXCLUDED FROM CONSIDERATION									
Bowfin	0.11	0.13	0.15	0.16	0.18		0.00	0.00	0.00	0.00	0.00
Carp	0.26	0.34	0.39	0.45	0.47		0.04	0.05	-0.01	0.03	0.04
Emerald Shiner	0.40	0.50	0.57	0.65	0.68		0.03	0.06	-0.01	0.04	0.08
Gizzard Shad	0.25	0.31	0.35	0.42	0.43		0.01	0.05	0.00	0.01	0.04
Shortnose Gar	0.08	0.10	0.12	0.14	0.14		0.00	0.00	0.00	0.00	0.00

Forecast #2: Alternative B- Incremental Increase in Equivalent Adults Lost (EAL)

		Mississippi River						Illinois Waterway			
Species	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	54	73	78	87	92		1	1	0	1	1
Blue Catfish	551	771	828	937	1,003		0	0	0	0	0
Blue Sucker	1	1	1	2	2		0	0	0	0	0
Bluegill	1,935	2,603	2,832	3,188	3,425		39	67	-16	37	39
Channel Catfish	6,591	9,253	9,934	11,190	11,962		13	94	-60	48	90
Crappie	7,619	10,210	11,123	12,395	13,069		263	247	-75	148	241
Flathead Catfish	1,209	1,587	1,778	2,046	2,170		2	18	-13	9	19
Freshwater Drum	9,428	13,137	13,870	15,171	15,787		15	126	-52	76	104
Goldeye	701	957	1,028	1,131	1,195		6	6	-3	3	6
Largemouth Bass	337	445	508	578	630		2	9	-8	4	9
Mooneye	1,519	2,096	2,238	2,437	2,573		16	17	-8	9	17
Northern Pike	193	206	261	319	329		1	2	-1	1	3
Paddlefish	421	547	612	700	758		7	8	-3	5	10
River Carpsucker	1,324	1,842	1,948	2,162	2,302		32	58	-22	33	51
Sauger	3,023	3,673	4,212	4,686	4,978		5	9	-5	5	9
Shorthead Redhorse	2,514	3,417	3,639	3,979	4,232		4	31	-20	16	29
Smallmouth Bass	13	17	20	22	25		0	0	0	0	0
Smallmouth Buffalo	170	230	246	273	289		2	3	-1	2	2
Spotted Sucker	16,920	23,584	24,154	26,156	27,769		28	366	-364	186	365
Sturgeon	394	524	585	674	735		7	8	-4	8	9
Walleye	786	952	1,112	1,251	1,321		1	2	-1	1	2
White Bass	12,587	15,975	17,975	20,634	21,584		90	92	-34	46	88
TOTALS	**68,290**	**92,100**	**98,982**	**110,018**	**116,230**		**534**	**1,164**	**-690**	**638**	**1,094**
		EXCLUDED FROM CONSIDERATION									
Bowfin	68,364	89,949	101,435	115,966	126,885		1,592	1,273	-814	1,256	1,800
Carp	88,268	121,376	129,712	144,470	151,765		1,354	1,754	-796	873	1,656
Emerald Shiner	73,730	104,143	112,421	127,211	134,931		1,213	4,180	-2,852	2,119	4,574
Gizzard Shad	16,992	22,424	24,817	28,183	29,647		341	2,727	-1,956	1,343	2,675
Shortnose Gar	8,559	10,607	12,203	14,172	14,877		16	44	-31	27	41

Forecast #2: Alternative B - Incremental Increase in Recruitment Forgone

		Mississippi River					Illinois Waterway			
Species	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	646	872	937	1,042	1,103	8	12	-2	7	10
Blue Catfish	1,278	1,759	1,876	2,107	2,244	0	0	0	0	0
Blue Sucker	180	251	261	306	324	0	0	0	0	0
Bluegill	31,930	43,057	46,904	52,873	56,876	667	1,151	-269	630	683
Channel Catfish	3,642	4,985	5,351	5,985	6,344	6	42	-26	22	39
Crappie	4,124	5,456	6,005	6,693	7,046	140	130	-39	79	129
Flathead Catfish	205	260	292	335	352	0	2	-2	1	2
Freshwater Drum	58,360	81,253	85,969	94,162	98,071	97	800	-335	481	671
Goldeye	7,917	10,771	11,522	12,772	13,447	62	66	-34	36	67
Largemouth Bass	865	1,094	1,228	1,416	1,496	4	18	-16	9	18
Mooneye	18,379	25,308	26,957	29,498	31,010	183	197	-94	101	201
Northern Pike	21	22	28	33	34	0	0	0	0	0
Paddlefish	0	1	1	1	1	0	0	0	0	0
River Carpsucker	3,042	4,235	4,461	4,985	5,305	75	133	-50	75	118
Sauger	1,174	1,424	1,639	1,828	1,939	2	3	-2	2	4
Shorthead Redhorse	187,248	255,066	271,961	297,881	317,103	322	2,308	-1,496	1,193	2,230
Smallmouth Bass	72	89	100	116	123	1	2	-1	1	2
Smallmouth Buffalo	1,690	2,280	2,452	2,726	2,885	20	31	-6	19	25
Spotted Sucker	30,811	42,949	43,993	47,691	50,591	51	665	-663	338	665
Sturgeon	3	4	5	5	6	0	0	0	0	0
Walleye	515	612	729	818	860	1	1	0	0	1
White Bass	1,133	1,423	1,598	1,840	1,918	8	8	-3	4	7
TOTALS	**353,235**	**483,171**	**514,269**	**565,113**	**599,078**	**1,647**	**5,569**	**-3,038**	**2,998**	**4,872**
		EXCLUDED FROM CONSIDERATION								
Bowfin	153	189	212	247	259	3	2	-1	2	3
Carp	488	670	717	799	840	8	10	-4	5	9
Emerald Shiner	19,858,262	27,448,498	29,297,666	32,762,076	34,367,696	227,599	892,470	-591,633	443,197	884,101
Gizzard Shad	13,656	17,498	19,739	22,372	23,406	251	1,935	-1,384	953	1,927
Shortnose Gar	39,262	46,047	54,186	62,216	64,304	52	148	-91	88	122

Forecast #2: Alternative B - Incremental Increase in Production Forgone

		Mississippi River						Illinois Waterway			
Species	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	105,412	142,154	152,861	169,942	179,778		1,239	1,904	-391	1,164	1,540
Blue Catfish	2,428	3,343	3,566	4,004	4,264		0	0	0	0	0
Blue Sucker	1,356	1,890	1,965	2,303	2,438		0	0	0	0	0
Bluegill	2,298	3,098	3,374	3,803	4,090		48	82	-19	45	49
Channel Catfish	1,223	1,674	1,797	2,010	2,130		2	14	-9	7	13
Crappie	2,937	3,885	4,275	4,765	5,015		99	92	-28	56	92
Flathead Catfish	9,657	12,274	13,774	15,789	16,584		10	116	-80	59	114
Freshwater Drum	1,062,015	1,477,295	1,562,900	1,710,990	1,780,835		1,710	14,343	-6,017	8,626	11,930
Goldeye	2,862	3,891	4,162	4,613	4,855		22	24	-12	13	24
Largemouth Bass	183	231	259	299	316		1	4	-3	2	4
Mooneye	928	1,277	1,360	1,488	1,563		9	10	-5	5	10
Northern Pike	1,921	1,994	2,587	3,064	3,132		5	16	-7	9	17
Paddlefish	1,474	1,850	2,036	2,399	2,511		19	24	-9	14	28
River Carpsucker	13,141	18,287	19,258	21,519	22,892		322	575	-215	323	508
Sauger	2,345	2,843	3,272	3,650	3,871		4	7	-4	4	7
Shorthead Redhorse	31,043	42,280	45,076	49,364	52,547		53	382	-248	198	369
Smallmouth Bass	18	22	25	29	30		0	0	0	0	0
Smallmouth Buffalo	39,550	53,338	57,353	63,763	67,460		465	715	-147	437	578
Spotted Sucker	10,060	14,018	14,357	15,563	16,506		17	217	-216	110	217
Sturgeon	184	238	259	304	320		2	3	-1	3	3
Walleye	11,446	13,593	16,173	18,160	19,078		13	20	-11	11	20
White Bass	2,719	3,413	3,834	4,414	4,600		18	18	-7	9	17
TOTALS	**1,305,200**	**1,802,888**	**1,914,523**	**2,102,235**	**2,194,815**		**4,058**	**18,566**	**-7,429**	**11,095**	**15,540**
		EXCLUDED FROM CONSIDERATION									
Bowfin	0	0	0	0	0		0	0	0	0	0
Carp	1,702,321	2,339,600	2,502,424	2,789,191	2,930,802		26,354	33,985	-15,589	17,092	32,581
Emerald Shiner	51	70	75	84	88		1	2	-1	1	2
Gizzard Shad	43,753	56,036	63,215	71,636	74,934		795	6,168	-4,409	3,037	6,125
Shortnose Gar	10	12	14	17	17		0	0	0	0	0

Forecast #2: Alternative B - Incremental Increase in EAL for Year 2040

		Mississippi River					Illinois Waterway		
	Species	USA-3	4-8	9-15	16-27	Open River	Lower	Middle	Upper
1	Blue Sucker	0	0	0	1	0	0	0	0
2	Smallmouth Bass	0	2	5	11	4	0	0	0
3	Northern Pike	22	79	185	25	8	1	0	0
4	Bigmouth Buffalo	2	2	20	60	3	0	0	0
5	Smallmouth Buffalo	6	6	64	189	8	2	0	0
6	Largemouth Bass	0	45	141	297	94	4	0	0
7	Sturgeon	3	43	143	333	151	6	2	0
8	Paddlefish	10	49	161	364	116	5	0	0
9	Walleye	95	167	325	654	10	1	0	0
10	Blue Catfish	0	0	198	735	4	0	0	0
11	Goldeye	4	26	239	808	54	3	0	0
12	Flathead Catfish	22	186	583	1,240	14	8	0	2
13	River Carpsucker	3	7	238	1,806	109	27	0	6
14	Mooneye	3	12	439	1,911	71	9	0	0
15	Sauger	74	97	2,209	2,251	56	4	0	1
16	Shorthead Redhorse	5	11	1,287	2,655	21	14	0	2
17	Bluegill	1	35	332	2,818	2	25	0	11
18	Channel Catfish	88	253	1,744	9,051	53	39	0	9
19	Crappie	248	397	1,964	9,773	14	105	18	25
20	Freshwater Drum	81	164	3,750	11,130	45	67	0	9
21	White Bass	382	1,369	7,040	11,820	22	41	5	0
22	Spotted Sucker	174	197	12,400	13,000	387	185	0	0
	TOTALS	**1,225**	**3,147**	**33,467**	**70,931**	**1,245**	**546**	**26**	**66**
	Percent of River	1.1	2.9	30.8	65.2	1.1	85.6	4.0	10.4
Total Mississippi River =		**108,771**		**Impact Index (EAL)**			**Total IWW =**		**637**
Total UMR-IWW =		**109,408**			1000 to 5000				
	% Miss =	**99.4**			5000 to 15,000			**% IWW =**	**0.6**
					>15,000				

Forecast #2: Alternative E

Forecast #2: Alternative E - Incremental Increase in Number of Larvae Entrained and Killed

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	533,407,744	613,773,504	667,515,904	709,032,512		4,509,290	4,392,960	5,223,850	4,348,620
Blue Catfish	29,527,406	33,992,500	37,300,068	39,713,948		0	0	0	0
Blue Sucker	17,026,942	20,330,644	22,094,604	23,856,312		0	0	0	0
Bluegill	1,345,992,064	1,560,201,472	1,724,483,072	1,845,714,176		20,501,360	21,452,320	21,663,400	19,723,700
Channel Catfish	29,679,536	34,130,980	37,407,760	39,797,524		178,162	154,719	147,846	192,719
Crappie	329,260,832	380,733,952	415,885,184	443,602,464		5,035,600	5,294,090	6,114,370	5,425,090
Flathead Catfish	20,289,596	23,333,964	25,472,108	26,928,026		122,076	102,881	98,035	133,273
Freshwater Drum	13,161,500,672	15,012,222,976	16,459,310,080	17,207,238,656		94,512,000	85,249,000	84,595,304	97,493,000
Goldeye	91,245,944	105,705,192	114,912,960	122,054,976		326,780	327,168	411,794	333,484
Largemouth Bass	40,856,088	48,119,280	51,422,548	56,182,144		469,191	375,885	401,997	470,700
Mooneye	68,702,656	79,290,088	86,295,584	91,877,328		319,095	314,982	399,590	323,180
Northern Pike	6,436,418	7,407,896	7,943,060	8,328,548		32,562	27,527	27,328	34,136
Paddlefish	926,742	1,082,200	1,169,087	1,251,749		8,979	9,035	9,007	9,887
River Carpsucker	232,388,352	270,606,688	295,096,288	317,073,824		4,366,230	4,062,620	4,649,870	4,413,400
Sauger	69,586,040	80,223,416	86,471,064	92,234,200		109,611	102,640	108,690	120,599
Shorthead Redhorse	1,666,013,952	1,904,847,872	2,058,465,536	2,189,123,584		10,171,500	8,690,620	8,477,980	11,024,900
Smallmouth Bass	2,127,878	2,485,623	2,671,330	2,899,323		21,098	18,784	20,603	22,184
Smallmouth Buffalo	533,407,744	613,773,504	667,515,904	709,032,512		4,509,290	4,392,960	5,223,850	4,348,620
Spotted Sucker	1,138,549,760	1,291,025,536	1,400,816,768	1,477,814,144		14,172,000	10,918,377	11,169,963	14,189,664
Sturgeon	837,261	987,013	1,068,406	1,140,217		7,199	7,830	7,820	7,859
Walleye	114,813,336	133,106,728	143,557,952	153,040,496		111,754	104,783	108,690	122,742
White Bass	431,625,024	495,538,432	541,802,240	572,124,864		1,309,840	1,336,820	1,550,460	1,338,470
TOTALS	**19,864,201,987**	**22,712,919,460**	**24,848,677,507**	**26,130,061,527**		**160,793,617**	**147,336,001**	**150,410,447**	**164,076,227**
	EXCLUDED FROM CONSIDERATION								
Bowfin	1,163,493	1,359,159	1,464,209	1,571,230		9,914	11,087	10,868	12,007
Carp	4,279,712,768	4,926,054,912	5,387,712,000	5,729,210,368		36,437,768	33,655,856	41,050,952	37,506,984
Emerald Shiner	4,708,359,168	5,430,088,704	5,955,672,064	6,329,333,248		108,857,696	93,194,992	94,215,000	118,547,000
Gizzard Shad	2,264,837,376	2,616,794,368	2,860,082,688	3,036,966,656		166,534,912	140,084,400	134,782,896	183,131,984
Shortnose Gar	11,943,350	13,657,959	14,789,282	15,512,074		23,289	20,826	22,544	22,216

Forecast #2: Alternative E - Incremental Increase in Percentage of Entrained Larvae

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	1.55	1.78	1.93	2.04		0.10	0.09	0.14	0.13
Blue Catfish	0.18	0.21	0.23	0.25		0.00	0.00	0.00	0.00
Blue Sucker	0.24	0.27	0.31	0.31		0.00	0.00	0.00	0.00
Bluegill	1.14	1.32	1.44	1.51		0.09	0.10	0.10	0.09
Channel Catfish	0.27	0.33	0.35	0.38		0.00	0.00	0.00	0.00
Crappie	0.81	0.95	1.03	1.08		0.06	0.05	0.06	0.06
Flathead Catfish	0.25	0.28	0.31	0.34		0.00	0.00	0.00	0.00
Freshwater Drum	1.24	1.44	1.57	1.65		0.10	0.06	0.09	0.11
Goldeye	0.86	0.98	1.08	1.13		0.01	0.01	0.03	0.01
Largemouth Bass	0.34	0.39	0.42	0.44		0.01	0.01	0.01	0.01
Mooneye	0.53	0.62	0.69	0.75		0.01	0.01	0.03	0.01
Northern Pike	0.31	0.37	0.39	0.44		0.00	0.00	0.00	0.00
Paddlefish	0.40	0.46	0.50	0.53		0.01	0.01	0.01	0.01
River Carpsucker	0.82	0.96	1.04	1.10		0.06	0.04	0.06	0.08
Sauger	0.92	1.04	1.13	1.20		0.06	0.05	0.05	0.08
Shorthead Redhorse	0.89	1.04	1.13	1.18		0.06	0.05	0.05	0.08
Smallmouth Bass	0.29	0.34	0.37	0.39		0.00	0.00	0.00	0.00
Smallmouth Buffalo	1.55	1.78	1.93	2.04		0.10	0.09	0.14	0.13
Spotted Sucker	1.45	1.69	1.84	1.94		0.04	0.03	0.03	0.04
Sturgeon	0.22	0.25	0.27	0.29		0.00	0.00	0.00	0.00
Walleye	0.86	1.00	1.09	1.15		0.06	0.05	0.05	0.08
White Bass	0.88	1.00	1.09	1.15		0.04	0.03	0.04	0.03
TOTALS	**0.73**	**0.84**	**0.92**	**0.97**		**0.04**	**0.03**	**0.04**	**0.04**
	EXCLUDED FROM CONSIDERATION								
Bowfin	0.33	0.39	0.41	0.45		0.00	0.00	0.00	0.00
Carp	0.84	0.97	1.05	1.12		0.06	0.05	0.06	0.06
Emerald Shiner	1.23	1.39	1.53	1.61		0.08	0.10	0.08	0.14
Gizzard Shad	0.77	0.90	0.98	1.02		0.06	0.05	0.05	0.09
Shortnose Gar	0.25	0.30	0.33	0.35		0.00	0.00	0.00	0.00

Forecast #2: Alternative E - Incremental Increase in Equivalent Adults Lost (EAL)

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	171	197	214	227		2	2	2	1
Blue Catfish	1,830	2,131	2,360	2,529		0	0	0	0
Blue Sucker	3	4	4	5		0	0	0	0
Bluegill	5,991	6,927	7,639	8,162		96	101	101	92
Channel Catfish	21,877	25,466	28,215	30,232		161	142	137	183
Crappie	23,881	27,576	30,119	32,128		396	412	473	418
Flathead Catfish	3,954	4,601	5,079	5,413		32	28	27	38
Freshwater Drum	30,394	34,580	37,875	39,535		229	206	203	231
Goldeye	2,239	2,584	2,814	2,988		10	10	12	10
Largemouth Bass	1,113	1,314	1,432	1,563		16	13	14	17
Mooneye	4,852	5,587	6,087	6,470		26	26	33	26
Northern Pike	587	681	737	776		5	4	4	5
Paddlefish	1,344	1,575	1,720	1,856		16	17	17	19
River Carpsucker	4,194	4,851	5,300	5,670		95	88	100	95
Sauger	9,086	10,444	11,246	11,983		15	14	15	17
Shorthead Redhorse	8,046	9,171	9,894	10,506		56	47	46	59
Smallmouth Bass	44	51	56	61		1	1	1	1
Smallmouth Buffalo	539	618	672	712		5	5	6	5
Spotted Sucker	54,887	62,180	67,481	71,174		724	557	569	722
Sturgeon	1,294	1,544	1,703	1,843		15	18	18	20
Walleye	2,357	2,732	2,951	3,152		3	3	3	3
White Bass	39,313	45,325	49,585	52,500		142	144	167	144
TOTALS	**217,996**	**250,139**	**273,183**	**289,485**		**2,045**	**1,838**	**1,948**	**2,106**
	EXCLUDED FROM CONSIDERATION								
Bowfin	224,354	265,609	292,242	317,567		2,670	3,315	3,268	3,762
Carp	281,224	323,146	353,061	375,016		2,693	2,472	2,980	2,725
Emerald Shiner	249,610	293,935	326,544	351,563		6,941	6,234	6,468	8,558
Gizzard Shad	53,265	61,616	67,655	71,940		4,912	4,122	3,963	5,342
Shortnose Gar	27,823	32,333	35,509	37,625		77	71	81	81

Forecast #2: Alternative E - Incremental Increase in Recruitment Forgone

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	2,055	2,363	2,570	2,729		19	18	22	18
Blue Catfish	4,076	4,692	5,149	5,481		0	0	0	0
Blue Sucker	562	666	726	782		0	0	0	0
Bluegill	99,592	115,428	127,569	136,561		1,638	1,716	1,733	1,576
Channel Catfish	11,577	13,311	14,589	15,519		74	65	62	80
Crappie	12,866	14,877	16,249	17,329		209	219	253	225
Flathead Catfish	635	731	797	842		4	4	4	5
Freshwater Drum	189,075	215,618	236,402	247,114		1,443	1,304	1,294	1,491
Goldeye	25,141	29,022	31,575	33,488		105	105	132	107
Largemouth Bass	2,652	3,119	3,341	3,631		34	27	29	34
Mooneye	58,519	67,471	73,480	78,095		310	306	388	314
Northern Pike	60	69	74	77		0	0	0	0
Paddlefish	1	2	2	2		0	0	0	0
River Carpsucker	9,651	11,196	12,240	13,103		217	202	231	219
Sauger	3,551	4,093	4,412	4,705		6	6	6	6
Shorthead Redhorse	604,669	691,095	746,903	793,936		4,138	3,546	3,457	4,502
Smallmouth Bass	218	254	273	294		3	2	3	3
Smallmouth Buffalo	5,374	6,181	6,722	7,136		49	48	56	47
Spotted Sucker	100,030	113,405	123,065	129,776		1,313	1,012	1,035	1,315
Sturgeon	10	12	13	14		0	0	0	0
Walleye	1,537	1,782	1,922	2,048		2	1	2	2
White Bass	3,484	3,999	4,372	4,615		12	12	14	12
TOTALS	**1,135,335**	**1,299,386**	**1,412,445**	**1,497,277**		**9,576**	**8,593**	**8,721**	**9,956**
	EXCLUDED FROM CONSIDERATION								
Bowfin	460	537	579	619		5	5	5	6
Carp	1,558	1,792	1,961	2,084		15	14	17	15
Emerald Shiner	63,249,268	72,932,200	79,990,208	85,004,328		1,556,620	1,333,762	1,347,887	1,697,660
Gizzard Shad	42,056	48,567	53,080	56,329		3,468	2,926	2,812	3,829
Shortnose Gar	118,027	134,861	146,044	153,049		264	236	256	252

Forecast #2: Alternative E - Incremental Increase in Production Forgone

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	334,835	384,928	418,585	444,253		3,030	2,951	3,502	2,917
Blue Catfish	7,747	8,917	9,784	10,415		0	0	0	0
Blue Sucker	4,228	5,011	5,463	5,884		0	0	0	0
Bluegill	7,162	8,298	9,171	9,814		118	123	124	113
Channel Catfish	3,888	4,470	4,898	5,210		25	22	21	27
Crappie	9,157	10,588	11,564	12,330		148	156	180	160
Flathead Catfish	29,966	34,455	37,598	39,727		211	178	170	231
Freshwater Drum	3,430,866	3,909,161	4,283,316	4,474,480		25,965	23,380	23,169	26,555
Goldeye	9,075	10,472	11,390	12,075		38	38	47	38
Largemouth Bass	560	658	705	766		7	6	6	7
Mooneye	2,950	3,399	3,701	3,932		16	15	20	16
Northern Pike	5,516	6,347	6,805	7,128		32	27	27	33
Paddlefish	4,457	5,201	5,623	6,004		48	48	48	52
River Carpsucker	41,650	48,302	52,787	56,495		933	869	993	944
Sauger	7,087	8,168	8,802	9,385		12	11	12	13
Shorthead Redhorse	100,190	114,443	123,664	131,445		686	587	573	745
Smallmouth Bass	53	62	67	72		1	1	1	1
Smallmouth Buffalo	125,649	144,431	157,102	166,750		1,138	1,108	1,316	1,096
Spotted Sucker	32,620	36,967	40,113	42,280		430	331	338	429
Sturgeon	566	662	718	763		6	7	7	7
Walleye	34,112	39,533	42,625	45,420		35	33	34	38
White Bass	8,352	9,583	10,475	11,057		28	29	33	29
TOTALS	**4,200,686**	**4,794,056**	**5,244,956**	**5,495,685**		**32,907**	**29,920**	**30,621**	**33,451**
	EXCLUDED FROM CONSIDERATION								
Bowfin	0	0	0	0		0	0	0	0
Carp	5,433,584	6,250,702	6,834,822	7,264,825		51,998	47,981	58,421	53,494
Emerald Shiner	161	185	202	214		4	3	3	4
Gizzard Shad	134,621	155,419	169,811	180,145		11,065	9,325	8,959	12,176
Shortnose Gar	31	36	39	41		0	0	0	0

Forecast #2: Alternative E - Incremental Increase in EAL for Year 2040

		Mississippi River					Illinois Waterway		
	Species	USA-3	4-8	9-15	16-27	Open River	Lower	Middle	Upper
1	Blue Sucker	0	0	0	3	1	0	0	0
2	Smallmouth Bass	1	4	13	29	10	0	0	0
3	Northern Pike	52	181	422	62	21	4	0	0
4	Bigmouth Buffalo	5	5	50	148	6	1	0	0
5	Smallmouth Buffalo	14	14	158	467	19	4	1	1
6	Largemouth Bass	1	103	336	752	240	13	1	0
7	Sturgeon	7	102	355	858	382	15	3	0
8	Paddlefish	24	113	383	909	292	15	2	0
9	Walleye	224	366	756	1,582	24	2	0	0
10	Blue Catfish	0	0	493	1,856	11	0	0	0
11	Goldeye	10	59	599	2,015	132	9	3	0
12	Flathead Catfish	53	428	1,415	3,147	36	23	0	4
13	River Carpsucker	6	15	607	4,402	270	73	11	16
14	Mooneye	8	26	1,121	4,756	176	26	7	0
15	Sauger	169	217	5,132	5,592	137	11	2	2
16	Shorthead Redhorse	12	25	3,144	6,661	53	39	1	6
17	Bluegill	3	76	769	6,787	4	76	1	25
18	Channel Catfish	209	583	4,418	22,870	132	113	0	24
19	Crappie	570	885	4,805	23,820	35	308	89	76
20	Freshwater Drum	191	358	9,354	27,860	111	169	2	33
21	White Bass	898	3,076	16,370	29,180	54	121	34	13
22	Spotted Sucker	403	433	32,440	33,290	918	555	14	0
	TOTALS	2,856	7,069	83,138	177,045	3,062	1,577	170	201
	Percent of River	1.1	2.6	30.8	65.5	1.1	80.9	8.7	10.3
Total Mississippi River =		270,108		Impact Index (EAL)			Total IWW =		1,948
Total UMR-IWW =		272,056			1000 to 5000				
	% Miss =	99.3			5000 to 15,000			% IWW =	0.7
					>15,000				

Forecast #2: Alternative F

Forecast #2: Alternative F - Incremental Increase in Number of Larvae Entrained and Killed

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	535,239,104	615,607,872	670,671,616	714,086,016		9,907,800	10,953,800	14,609,200	18,482,100
Blue Catfish	29,597,606	34,040,416	37,420,408	39,925,448		0	0	0	0
Blue Sucker	17,522,222	20,615,550	22,968,872	25,290,438		0	0	0	0
Bluegill	1,349,611,392	1,565,055,360	1,732,798,336	1,859,395,456		51,105,000	52,930,000	71,252,000	86,072,000
Channel Catfish	29,751,736	34,178,896	37,528,100	40,009,024		383,552	399,527	469,900	676,190
Crappie	329,781,376	381,494,944	417,229,152	445,443,040		11,003,700	12,911,800	17,035,300	21,654,000
Flathead Catfish	20,330,602	23,366,028	25,546,818	27,059,730		256,139	267,062	307,495	455,104
Freshwater Drum	13,210,736,640	15,017,687,040	16,472,346,624	17,228,607,488		199,904,992	209,750,016	256,992,000	354,110,016
Goldeye	91,991,936	106,106,608	116,235,608	123,978,472		745,700	853,600	1,157,600	1,487,700
Largemouth Bass	41,257,088	48,441,784	52,523,296	57,588,892		980,902	1,011,657	1,193,174	1,769,816
Mooneye	69,066,144	79,532,264	87,092,608	92,868,928		612,500	620,600	817,100	1,025,700
Northern Pike	6,450,043	7,425,143	7,969,915	8,372,185		53,666	56,968	68,637	94,609
Paddlefish	940,974	1,091,946	1,196,497	1,296,890		15,211	17,048	21,545	26,810
River Carpsucker	234,489,168	272,088,384	298,955,392	322,772,448		9,513,400	10,397,300	13,310,100	17,627,800
Sauger	69,680,248	80,357,456	86,825,480	92,543,440		235,252	260,979	320,437	441,483
Shorthead Redhorse	1,667,705,472	1,906,214,656	2,061,474,944	2,193,703,168		21,473,600	22,523,300	26,305,900	38,341,000
Smallmouth Bass	2,144,300	2,513,188	2,729,268	2,983,685		45,531	49,176	60,441	83,739
Smallmouth Buffalo	535,239,104	615,607,872	670,671,616	714,086,016		9,907,800	10,953,800	14,609,200	18,482,100
Spotted Sucker	1,140,586,112	1,292,521,344	1,404,714,240	1,484,000,000		29,107,000	29,418,000	33,610,000	51,540,000
Sturgeon	855,854	997,628	1,100,468	1,193,121		15,126	17,359	23,128	29,465
Walleye	114,906,536	133,205,744	143,912,368	153,686,832		237,395	263,121	324,720	445,766
White Bass	432,023,040	496,150,336	542,343,360	572,750,656		2,918,400	3,356,400	4,421,900	5,691,400
TOTALS	**19,929,906,697**	**22,734,300,459**	**24,894,254,986**	**26,201,641,373**		**348,422,666**	**367,011,513**	**456,909,777**	**618,536,798**
	EXCLUDED FROM CONSIDERATION								
Bowfin	1,182,578	1,372,062	1,501,748	1,632,345		20,764	24,879	32,031	41,828
Carp	4,288,915,200	4,933,892,608	5,405,452,800	5,751,271,424		81,034,000	90,363,000	115,708,000	153,979,008
Emerald Shiner	4,723,081,216	5,439,072,256	5,979,732,480	6,366,254,592		232,301,984	246,267,008	289,276,032	419,635,008
Gizzard Shad	2,271,655,168	2,622,356,480	2,872,579,072	3,059,098,368		352,146,048	368,470,944	423,630,976	628,050,944
Shortnose Gar	11,974,094	13,682,564	14,827,940	15,571,221		51,320	53,110	69,020	91,950

Forecast #2: Alternative F - Incremental Increase in Percentage of Entrained Larvae

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	1.55	1.79	1.94	2.05		0.24	0.26	0.31	0.40
Blue Catfish	0.18	0.21	0.23	0.25		0.00	0.00	0.00	0.00
Blue Sucker	0.24	0.27	0.31	0.31		0.00	0.00	0.00	0.00
Bluegill	1.15	1.32	1.44	1.52		0.18	0.21	0.25	0.31
Channel Catfish	0.28	0.33	0.35	0.38		0.04	0.05	0.09	0.10
Crappie	0.81	0.96	1.04	1.08		0.14	0.15	0.19	0.25
Flathead Catfish	0.25	0.28	0.31	0.34		0.00	0.04	0.06	0.09
Freshwater Drum	1.25	1.44	1.58	1.65		0.20	0.25	0.28	0.36
Goldeye	0.87	0.99	1.08	1.14		0.05	0.05	0.08	0.10
Largemouth Bass	0.34	0.39	0.42	0.44		0.08	0.06	0.10	0.11
Mooneye	0.53	0.63	0.69	0.75		0.04	0.04	0.05	0.08
Northern Pike	0.31	0.37	0.40	0.44		0.04	0.05	0.09	0.10
Paddlefish	0.40	0.47	0.50	0.54		0.01	0.03	0.03	0.03
River Carpsucker	0.82	0.96	1.04	1.11		0.14	0.15	0.18	0.23
Sauger	0.92	1.05	1.13	1.20		0.11	0.14	0.16	0.20
Shorthead Redhorse	0.89	1.04	1.13	1.18		0.11	0.15	0.16	0.21
Smallmouth Bass	0.29	0.34	0.38	0.40		0.03	0.05	0.06	0.09
Smallmouth Buffalo	1.55	1.79	1.94	2.05		0.24	0.26	0.31	0.40
Spotted Sucker	1.46	1.69	1.84	1.95		0.09	0.09	0.09	0.15
Sturgeon	0.22	0.25	0.27	0.30		0.00	0.00	0.01	0.04
Walleye	0.86	1.01	1.10	1.16		0.11	0.14	0.16	0.20
White Bass	0.88	1.01	1.10	1.16		0.11	0.11	0.14	0.19
TOTALS	**0.73**	**0.85**	**0.92**	**0.97**		**0.09**	**0.10**	**0.13**	**0.17**
	EXCLUDED FROM CONSIDERATION								
Bowfin	0.34	0.39	0.42	0.45		0.01	0.01	0.05	0.05
Carp	0.84	0.98	1.05	1.13		0.14	0.16	0.20	0.26
Emerald Shiner	1.23	1.39	1.53	1.62		0.23	0.25	0.28	0.39
Gizzard Shad	0.77	0.90	0.98	1.03		0.13	0.15	0.16	0.21
Shortnose Gar	0.25	0.30	0.33	0.35		0.00	0.00	0.01	0.04

Forecast #2: Alternative F - Incremental Increase in Equivalent Adults Lost (EAL)

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	172	197	215	228		3	4	5	6
Blue Catfish	1,834	2,134	2,367	2,542		0	0	0	0
Blue Sucker	3	4	4	5		0	0	0	0
Bluegill	6,008	6,948	7,677	8,222		239	246	328	394
Channel Catfish	21,928	25,501	28,305	30,394		354	377	448	654
Crappie	23,920	27,633	30,217	32,262		862	1,001	1,312	1,659
Flathead Catfish	3,962	4,606	5,094	5,439		70	76	89	134
Freshwater Drum	30,504	34,591	37,902	39,577		482	501	611	835
Goldeye	2,249	2,589	2,834	3,012		22	25	34	44
Largemouth Bass	1,117	1,322	1,460	1,596		34	36	44	66
Mooneye	4,867	5,598	6,124	6,507		50	51	67	83
Northern Pike	588	683	739	780		8	9	11	15
Paddlefish	1,356	1,588	1,755	1,905		28	32	41	52
River Carpsucker	4,217	4,869	5,344	5,734		207	224	285	375
Sauger	9,094	10,461	11,286	12,013		33	36	44	61
Shorthead Redhorse	8,051	9,175	9,903	10,519		117	122	142	205
Smallmouth Bass	44	52	57	63		1	2	2	3
Smallmouth Buffalo	540	619	674	717		11	12	16	20
Spotted Sucker	54,967	62,244	67,642	71,421		1,487	1,500	1,713	2,625
Sturgeon	1,313	1,557	1,744	1,906		34	42	58	76
Walleye	2,359	2,734	2,959	3,165		6	6	8	11
White Bass	39,349	45,381	49,631	52,551		316	363	477	613
TOTALS	**218,442**	**250,486**	**273,933**	**290,558**		**4,364**	**4,665**	**5,735**	**7,931**
	EXCLUDED FROM CONSIDERATION								
Bowfin	226,600	268,047	298,527	326,668		5,846	7,541	10,152	13,506
Carp	281,801	323,636	354,162	376,351		5,958	6,592	8,376	11,079
Emerald Shiner	250,440	294,421	327,864	353,639		15,536	17,402	21,050	31,393
Gizzard Shad	53,423	61,747	67,946	72,460		10,390	10,815	12,387	18,261
Shortnose Gar	27,892	32,401	35,602	37,753		179	196	263	365

Forecast #2: Alternative F - Incremental Increase in Recruitment Forgone

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	2,061	2,369	2,580	2,745		55	65	86	105
Blue Catfish	4,086	4,699	5,165	5,509		0	0	0	0
Blue Sucker	574	674	746	817		0	0	0	0
Bluegill	99,863	115,785	128,191	137,562		5,150	6,217	8,313	10,203
Channel Catfish	11,604	13,329	14,633	15,598		201	242	292	376
Crappie	12,887	14,907	16,301	17,400		639	779	1,018	1,238
Flathead Catfish	637	732	799	846		12	14	17	22
Freshwater Drum	189,773	215,690	236,569	247,392		3,900	4,639	5,708	7,275
Goldeye	25,277	29,099	31,806	33,809		342	413	543	651
Largemouth Bass	2,680	3,138	3,400	3,710		91	110	132	167
Mooneye	58,756	67,606	73,948	78,641		800	902	1,182	1,392
Northern Pike	60	69	74	78		1	1	1	1
Paddlefish	1	2	2	2		0	0	0	0
River Carpsucker	9,710	11,245	12,344	13,269		627	744	960	1,187
Sauger	3,555	4,099	4,428	4,718		17	20	25	32
Shorthead Redhorse	605,166	691,451	747,588	795,028		11,079	13,299	16,000	20,626
Smallmouth Bass	219	256	278	301		8	9	12	15
Smallmouth Buffalo	5,391	6,197	6,749	7,180		144	170	225	275
Spotted Sucker	100,191	113,520	123,354	130,246		3,396	4,097	4,847	6,179
Sturgeon	10	12	13	14		0	0	1	1
Walleye	1,538	1,783	1,926	2,056		4	5	7	8
White Bass	3,487	4,003	4,376	4,620		37	44	58	70
TOTALS	**1,137,526**	**1,300,665**	**1,415,270**	**1,501,541**		**26,503**	**31,770**	**39,427**	**49,823**
	EXCLUDED FROM CONSIDERATION								
Bowfin	466	541	590	637		10	12	16	20
Carp	1,561	1,795	1,967	2,092		33	37	48	63
Emerald Shiner	63,444,884	73,051,240	80,311,984	85,497,152		3,327,920	3,531,050	4,147,500	6,015,900
Gizzard Shad	42,171	48,663	53,287	56,703		7,363	7,716	8,874	13,145
Shortnose Gar	118,277	135,073	146,324	153,491		587	608	791	1,054

Forecast #2: Alternative F - Incremental Increase in Production Forgone

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	335,886	385,967	420,236	446,970		6,664	7,364	9,809	12,397
Blue Catfish	7,764	8,929	9,814	10,469		0	0	0	0
Blue Sucker	4,319	5,069	5,615	6,147		0	0	0	0
Bluegill	7,181	8,324	9,216	9,887		293	304	408	493
Channel Catfish	3,897	4,476	4,913	5,237		54	56	66	95
Crappie	9,172	10,609	11,601	12,382		324	381	502	638
Flathead Catfish	30,022	34,497	37,695	39,900		445	465	536	792
Freshwater Drum	3,443,514	3,910,470	4,286,335	4,479,534		54,897	57,392	70,172	96,359
Goldeye	9,124	10,499	11,472	12,191		86	99	134	172
Largemouth Bass	566	662	717	783		15	15	18	27
Mooneye	2,962	3,406	3,724	3,959		30	30	40	50
Northern Pike	5,524	6,359	6,820	7,155		52	56	67	92
Paddlefish	4,519	5,242	5,734	6,192		81	90	114	142
River Carpsucker	41,905	48,509	53,234	57,208		2,040	2,231	2,852	3,774
Sauger	7,095	8,181	8,835	9,411		25	28	34	47
Shorthead Redhorse	100,269	114,502	123,777	131,626		1,454	1,526	1,781	2,593
Smallmouth Bass	54	63	68	74		1	2	2	3
Smallmouth Buffalo	126,043	144,821	157,720	167,765		2,502	2,766	3,684	4,658
Spotted Sucker	32,672	37,005	40,208	42,435		883	892	1,019	1,561
Sturgeon	575	667	731	787		13	15	20	26
Walleye	34,136	39,559	42,721	45,600		74	82	101	139
White Bass	8,359	9,594	10,484	11,068		63	72	95	122
TOTALS	**4,215,558**	**4,797,410**	**5,251,670**	**5,506,780**		**69,996**	**73,866**	**91,454**	**124,180**
	EXCLUDED FROM CONSIDERATION								
Bowfin	0	0	0	0		0	0	0	0
Carp	5,444,785	6,260,181	6,856,120	7,291,282		115,848	129,325	165,333	219,836
Emerald Shiner	161	185	203	215		8	8	10	14
Gizzard Shad	134,986	155,726	170,468	181,345		23,474	24,562	28,226	41,776
Shortnose Gar	31	36	39	41		0	0	0	0

Forecast #2: Alternative F - Incremental Increase in EAL for Year 2040

		Mississippi River					Illinois Waterway		
	Species	USA-3	4-8	9-15	16-27	Open River	Lower	Middle	Upper
1	Blue Sucker	0	0	0	3	1	0	0	0
2	Smallmouth Bass	1	4	13	29	11	1	1	0
3	Northern Pike	52	181	422	62	23	6	4	1
4	Bigmouth Buffalo	5	5	50	148	7	2	2	1
5	Smallmouth Buffalo	14	14	158	468	21	6	7	2
6	Largemouth Bass	1	103	336	758	263	22	21	1
7	Sturgeon	7	102	355	864	417	26	31	0
8	Paddlefish	24	113	383	916	319	27	14	0
9	Walleye	224	366	756	1,587	26	3	3	1
10	Blue Catfish	0	0	493	1,863	12	0	0	0
11	Goldeye	10	59	599	2,023	144	16	18	0
12	Flathead Catfish	53	428	1,415	3,159	40	37	34	17
13	River Carpsucker	6	15	607	4,423	293	119	124	43
14	Mooneye	8	26	1,121	4,776	192	43	24	0
15	Sauger	169	217	5,132	5,619	149	19	18	7
16	Shorthead Redhorse	12	25	3,144	6,665	57	64	54	24
17	Bluegill	3	76	769	6,824	4	126	153	50
18	Channel Catfish	209	583	4,418	22,950	144	188	178	82
19	Crappie	570	885	4,805	23,920	38	528	598	187
20	Freshwater Drum	191	358	9,354	27,880	121	270	243	98
21	White Bass	898	3,076	16,370	29,220	59	204	235	38
22	Spotted Sucker	403	433	32,440	33,360	1,006	926	787	0
	TOTALS	**2,856**	**7,069**	**83,138**	**177,516**	**3,346**	**2,633**	**2,549**	**552**
	Percent of River	1.1	2.6	30.7	65.6	1.2	45.9	44.5	9.6
Total Mississippi River =		**270,579**		**Impact Index (EAL)**			**Total IWW =**		**5,734**
Total UMR-IWW =		**276,313**			1000 to 5000				
	% Miss =	**97.9**			5000 to 15,000			**% IWW =**	**2.1**
					>15,000				

Forecast #2: Alternative J

Forecast #2: Alternative J - Incremental Increase in Number of Larvae Entrained and Killed

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	538,069,184	618,314,304	674,489,728	719,716,480		12,162,300	14,623,300	19,702,400	24,923,700
Blue Catfish	29,740,722	34,190,116	37,587,260	40,195,512		0	0	0	0
Blue Sucker	17,980,568	21,231,024	23,490,356	26,193,972		0	0	0	0
Bluegill	1,358,481,536	1,570,673,920	1,743,251,712	1,875,547,264		58,980,000	72,393,000	98,571,000	123,304,000
Channel Catfish	29,895,452	34,330,372	37,693,044	40,287,984		407,860	537,790	658,640	860,700
Crappie	331,098,976	382,698,912	418,773,984	447,157,888		13,961,800	17,484,700	23,237,700	29,471,500
Flathead Catfish	20,404,942	23,454,050	25,670,508	27,217,494		269,030	358,619	431,854	568,258
Freshwater Drum	13,227,753,472	15,032,744,960	16,496,263,168	17,311,555,584		220,523,008	281,958,976	351,600,960	454,772,992
Goldeye	92,795,536	107,000,152	117,098,528	125,379,328		948,400	1,177,200	1,581,200	2,003,400
Largemouth Bass	42,366,592	49,323,576	53,845,372	58,821,468		1,039,228	1,389,790	1,704,122	2,206,980
Mooneye	69,581,936	79,965,000	87,710,304	93,663,056		711,700	825,300	1,112,800	1,418,300
Northern Pike	6,478,275	7,466,353	8,039,158	8,397,479		57,729	76,943	90,356	118,365
Paddlefish	961,402	1,109,586	1,218,407	1,323,377		17,948	22,397	27,794	35,780
River Carpsucker	236,836,864	274,907,264	302,753,472	327,738,496		11,223,900	13,891,400	18,210,100	23,296,500
Sauger	70,273,776	80,829,768	87,331,016	92,786,704		271,019	351,817	444,911	575,286
Shorthead Redhorse	1,670,995,840	1,908,740,096	2,070,050,816	2,204,108,032		22,897,400	30,227,700	36,797,100	48,246,000
Smallmouth Bass	2,206,478	2,552,428	2,798,305	3,051,023		51,635	65,749	83,850	108,457
Smallmouth Buffalo	538,069,184	618,314,304	674,489,728	719,716,480		12,162,300	14,623,300	19,702,400	24,923,700
Spotted Sucker	1,143,068,416	1,295,958,400	1,408,215,552	1,498,187,520		29,678,000	40,490,000	48,550,000	63,170,000
Sturgeon	874,474	1,020,501	1,119,998	1,226,763		18,841	24,276	31,117	39,540
Walleye	115,464,272	133,856,568	144,719,504	153,898,384		273,162	356,100	449,201	581,716
White Bass	432,997,152	497,496,000	543,562,624	574,249,984		3,655,200	4,536,100	6,051,300	7,692,900
TOTALS	**19,976,395,049**	**22,776,177,654**	**24,960,172,544**	**26,350,420,272**		**389,310,460**	**495,414,457**	**629,038,805**	**808,318,074**
	EXCLUDED FROM CONSIDERATION								
Bowfin	1,211,107	1,396,192	1,531,429	1,667,728		25,849	35,046	43,998	55,947
Carp	4,298,740,224	4,944,399,360	5,425,018,368	5,772,618,240		97,306,000	120,316,000	159,975,008	204,729,984
Emerald Shiner	4,732,816,896	5,459,630,592	6,004,216,832	6,403,911,680		250,936,000	329,781,056	405,726,976	531,326,016
Gizzard Shad	2,278,895,616	2,638,534,912	2,888,908,544	3,080,257,280		370,571,008	494,502,976	596,969,984	786,110,080
Shortnose Gar	12,034,966	13,742,015	14,891,700	15,654,739		58,190	73,080	94,570	121,260

Forecast #2: Alternative J - Incremental Increase in Percentage of Entrained Larvae

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	1.56	1.79	1.94	2.05		0.26	0.32	0.46	0.55
Blue Catfish	0.18	0.21	0.23	0.25		0.00	0.00	0.00	0.00
Blue Sucker	0.24	0.27	0.31	0.32		0.00	0.00	0.00	0.00
Bluegill	1.15	1.32	1.45	1.53		0.21	0.28	0.35	0.43
Channel Catfish	0.28	0.33	0.35	0.38		0.08	0.10	0.10	0.11
Crappie	0.82	0.96	1.04	1.09		0.15	0.19	0.24	0.33
Flathead Catfish	0.25	0.28	0.32	0.34		0.04	0.08	0.10	0.10
Freshwater Drum	1.25	1.45	1.59	1.66		0.24	0.31	0.36	0.50
Goldeye	0.87	1.00	1.09	1.15		0.05	0.08	0.10	0.14
Largemouth Bass	0.34	0.39	0.43	0.45		0.09	0.10	0.10	0.13
Mooneye	0.54	0.64	0.70	0.75		0.04	0.05	0.08	0.10
Northern Pike	0.31	0.37	0.40	0.44		0.06	0.10	0.10	0.11
Paddlefish	0.40	0.47	0.51	0.55		0.03	0.03	0.03	0.05
River Carpsucker	0.82	0.96	1.05	1.12		0.15	0.20	0.25	0.33
Sauger	0.93	1.05	1.14	1.21		0.14	0.19	0.21	0.29
Shorthead Redhorse	0.89	1.04	1.14	1.20		0.15	0.19	0.21	0.30
Smallmouth Bass	0.29	0.34	0.38	0.40		0.04	0.09	0.10	0.11
Smallmouth Buffalo	1.56	1.79	1.94	2.05		0.26	0.32	0.46	0.55
Spotted Sucker	1.47	1.70	1.85	1.96		0.09	0.11	0.14	0.17
Sturgeon	0.22	0.25	0.27	0.30		0.00	0.01	0.04	0.04
Walleye	0.87	1.01	1.10	1.16		0.14	0.19	0.21	0.29
White Bass	0.89	1.01	1.11	1.16		0.11	0.14	0.19	0.25
TOTALS	**0.73**	**0.85**	**0.92**	**0.98**		**0.11**	**0.14**	**0.17**	**0.22**
	EXCLUDED FROM CONSIDERATION								
Bowfin	0.34	0.39	0.42	0.45		0.01	0.05	0.05	0.05
Carp	0.84	0.98	1.06	1.13		0.16	0.20	0.26	0.34
Emerald Shiner	1.23	1.40	1.54	1.63		0.26	0.30	0.38	0.53
Gizzard Shad	0.78	0.90	0.99	1.03		0.15	0.19	0.21	0.30
Shortnose Gar	0.25	0.30	0.33	0.36		0.01	0.03	0.04	0.04

Forecast #2: Alternative J - Incremental Increase in Equivalent Adults Lost (EAL)

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	173	198	216	230		4	5	7	9
Blue Catfish	1,843	2,144	2,378	2,560		0	0	0	0
Blue Sucker	3	4	4	5		0	0	0	0
Bluegill	6,046	6,973	7,723	8,293		276	336	454	564
Channel Catfish	22,042	25,620	28,428	30,618		378	509	631	834
Crappie	24,009	27,706	30,331	32,389		1,093	1,354	1,789	2,254
Flathead Catfish	3,977	4,625	5,117	5,473		74	102	125	168
Freshwater Drum	30,537	34,624	37,949	39,760		532	673	834	1,072
Goldeye	2,262	2,602	2,848	3,032		28	35	47	59
Largemouth Bass	1,143	1,344	1,491	1,627		36	50	63	82
Mooneye	4,889	5,617	6,153	6,543		59	68	91	115
Northern Pike	591	686	745	782		9	12	14	19
Paddlefish	1,380	1,611	1,781	1,939		33	42	53	69
River Carpsucker	4,244	4,901	5,389	5,791		244	299	389	495
Sauger	9,166	10,518	11,348	12,039		38	49	61	79
Shorthead Redhorse	8,063	9,183	9,939	10,562		125	164	198	258
Smallmouth Bass	45	53	59	64		2	2	3	4
Smallmouth Buffalo	542	622	678	721		13	16	21	27
Spotted Sucker	55,067	62,395	67,792	72,070		1,516	2,065	2,474	3,217
Sturgeon	1,335	1,587	1,769	1,948		43	59	79	103
Walleye	2,370	2,747	2,973	3,169		7	9	11	14
White Bass	39,438	45,479	49,743	52,687		397	491	653	827
TOTALS	**219,165**	**251,239**	**274,854**	**292,302**		**4,907**	**6,340**	**7,997**	**10,269**
	EXCLUDED FROM CONSIDERATION								
Bowfin	230,775	272,191	303,192	332,874		7,488	10,779	13,989	18,306
Carp	282,431	324,279	355,378	377,688		7,155	8,768	11,570	14,705
Emerald Shiner	250,973	295,526	329,245	355,800		17,015	23,293	29,695	40,112
Gizzard Shad	53,589	62,098	68,307	72,960		10,927	14,515	17,452	22,836
Shortnose Gar	28,050	32,522	35,745	37,940		205	272	364	483

Forecast #2: Alternative J - Incremental Increase in Recruitment Forgone

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	2,071	2,379	2,594	2,765		50	61	82	103
Blue Catfish	4,105	4,719	5,188	5,546		0	0	0	0
Blue Sucker	584	687	760	839		0	0	0	0
Bluegill	100,507	116,188	128,955	138,750		4,718	5,793	7,889	9,870
Channel Catfish	11,660	13,386	14,696	15,704		170	225	275	360
Crappie	12,939	14,954	16,361	17,467		579	725	964	1,223
Flathead Catfish	639	734	803	851		10	13	16	21
Freshwater Drum	189,994	215,897	236,880	248,562		3,376	4,317	5,386	6,968
Goldeye	25,429	29,248	31,977	34,065		305	379	509	645
Largemouth Bass	2,738	3,186	3,474	3,778		75	101	124	160
Mooneye	59,043	67,842	74,328	79,106		691	802	1,081	1,378
Northern Pike	60	69	75	78		1	1	1	1
Paddlefish	1	2	2	2		0	0	0	0
River Carpsucker	9,779	11,319	12,457	13,420		559	692	908	1,161
Sauger	3,585	4,123	4,453	4,729		15	19	24	31
Shorthead Redhorse	606,045	692,088	750,332	798,409		9,369	12,363	15,064	19,752
Smallmouth Bass	224	259	283	306		7	9	11	14
Smallmouth Buffalo	5,415	6,221	6,784	7,231		132	159	214	270
Spotted Sucker	100,373	113,783	123,626	131,449		2,755	3,760	4,511	5,866
Sturgeon	10	12	13	14		0	0	0	1
Walleye	1,546	1,792	1,937	2,059		4	5	6	8
White Bass	3,494	4,014	4,385	4,631		33	41	55	69
TOTALS	**1,140,241**	**1,302,902**	**1,420,363**	**1,509,761**		**22,849**	**29,465**	**37,120**	**47,901**
	EXCLUDED FROM CONSIDERATION								
Bowfin	475	548	599	648		13	17	22	27
Carp	1,564	1,799	1,973	2,099		40	50	66	84
Emerald Shiner	63,574,612	73,326,016	80,638,584	85,998,792		3,597,500	4,727,270	5,819,800	7,619,300
Gizzard Shad	42,291	48,948	53,566	57,064		7,760	10,350	12,508	16,467
Shortnose Gar	118,811	135,599	146,859	154,206		666	838	1,085	1,391

Forecast #2: Alternative J - Incremental Increase in Production Forgone

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	337,426	387,467	422,398	450,212		8,182	9,828	13,227	16,716
Blue Catfish	7,801	8,967	9,857	10,538		0	0	0	0
Blue Sucker	4,399	5,173	5,713	6,309		0	0	0	0
Bluegill	7,227	8,353	9,271	9,972		338	415	565	706
Channel Catfish	3,915	4,495	4,935	5,273		57	75	92	121
Crappie	9,209	10,643	11,643	12,429		412	515	684	867
Flathead Catfish	30,122	34,619	37,869	40,118		469	624	752	990
Freshwater Drum	3,447,232	3,914,240	4,292,084	4,500,570		60,558	77,141	95,969	123,780
Goldeye	9,179	10,552	11,534	12,283		110	136	183	231
Largemouth Bass	578	672	733	797		16	21	26	34
Mooneye	2,976	3,418	3,743	3,983		35	40	54	69
Northern Pike	5,543	6,391	6,875	7,170		56	75	88	116
Paddlefish	4,603	5,314	5,825	6,301		95	118	147	189
River Carpsucker	42,199	48,830	53,722	57,856		2,408	2,979	3,902	4,989
Sauger	7,154	8,227	8,884	9,433		29	38	48	62
Shorthead Redhorse	100,417	114,608	124,244	132,190		1,552	2,047	2,492	3,265
Smallmouth Bass	55	64	70	75		2	2	3	3
Smallmouth Buffalo	126,620	145,385	158,528	168,976		3,072	3,691	4,969	6,280
Spotted Sucker	32,732	37,095	40,297	42,834		901	1,228	1,472	1,913
Sturgeon	583	677	741	802		17	21	27	35
Walleye	34,295	39,747	42,954	45,654		85	111	140	181
White Bass	8,377	9,620	10,508	11,095		79	98	130	165
TOTALS	**4,222,642**	**4,804,557**	**5,262,428**	**5,534,870**		**78,473**	**99,203**	**124,970**	**160,712**
	EXCLUDED FROM CONSIDERATION								
Bowfin	0	0	0	0		0	0	0	0
Carp	5,456,821	6,272,835	6,879,885	7,317,424		139,232	172,014	228,574	292,259
Emerald Shiner	162	186	203	216		9	11	14	18
Gizzard Shad	135,378	156,632	171,364	182,515		24,727	32,949	39,779	52,318
Shortnose Gar	31	36	39	41		0	0	0	0

Forecast #2: Alternative J - Incremental Increase in EAL for Year 2040

		Mississippi River					Illinois Waterway		
	Species	USA-3	4-8	9-15	16-27	Open River	Lower	Middle	Upper
1	Blue Sucker	0	0	0	3	1	0	0	0
2	Smallmouth Bass	1	4	13	29	12	1	1	1
3	Northern Pike	52	183	424	63	24	8	6	1
4	Bigmouth Buffalo	5	5	50	149	7	3	3	1
5	Smallmouth Buffalo	14	14	158	470	22	8	10	3
6	Largemouth Bass	1	104	337	763	287	27	35	1
7	Sturgeon	7	103	356	869	435	33	46	0
8	Paddlefish	24	114	384	921	338	34	19	0
9	Walleye	224	371	760	1,591	27	4	5	2
10	Blue Catfish	0	0	494	1,872	12	0	0	0
11	Goldeye	10	59	600	2,030	150	22	25	0
12	Flathead Catfish	53	430	1,418	3,174	42	45	59	22
13	River Carpsucker	6	15	607	4,447	314	153	177	59
14	Mooneye	8	27	1,121	4,793	204	59	32	0
15	Sauger	169	218	5,156	5,647	158	24	28	9
16	Shorthead Redhorse	12	25	3,144	6,697	60	77	90	30
17	Bluegill	3	77	770	6,869	5	175	204	74
18	Channel Catfish	209	586	4,421	23,060	153	230	295	106
19	Crappie	570	888	4,816	24,020	40	704	824	261
20	Freshwater Drum	191	363	9,358	27,910	130	324	379	131
21	White Bass	898	3,092	16,400	29,290	61	274	323	56
22	Spotted Sucker	403	441	32,440	33,440	1,070	1,124	1,350	0
	TOTALS	**2,856**	**7,118**	**83,225**	**178,107**	**3,553**	**3,328**	**3,912**	**756**
	Percent of River	1.1	2.6	30.7	65.6	1.3	41.6	48.9	9.5
Total Mississippi River =		**271,306**		**Impact Index (EAL)**			**Total IWW =**		**7,996**
Total UMR-IWW =		**279,302**			1000 to 5000				
	% Miss =	**97.1**			5000 to 15,000			**% IWW =**	**2.9**
					>15,000				

Forecast #2: Alternative K

Forecast #2: Alternative K - Incremental Increase in Number of Larvae Entrained and Killed

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	754,225,472	873,470,848	951,815,808	1,004,493,504		13,346,300	15,725,300	20,803,400	25,355,700
Blue Catfish	41,119,340	47,629,284	52,038,968	55,064,804		0	0	0	0
Blue Sucker	23,852,636	27,976,620	30,769,440	33,480,450		0	0	0	0
Bluegill	1,838,067,968	2,136,307,584	2,341,498,368	2,490,067,968		64,410,000	77,723,000	103,911,000	127,524,000
Channel Catfish	41,346,156	47,803,884	52,274,072	55,245,804		481,010	578,590	699,440	900,520
Crappie	460,342,016	534,629,984	582,938,816	615,394,752		15,409,300	18,783,700	24,540,700	29,829,500
Flathead Catfish	28,926,312	33,401,708	36,367,240	38,344,520		321,690	386,319	459,454	595,758
Freshwater Drum	18,671,210,496	21,495,590,912	23,530,790,912	24,581,242,880		254,912,992	303,058,944	372,700,992	475,112,960
Goldeye	129,568,832	150,355,184	164,007,680	173,536,176		1,062,200	1,282,800	1,686,800	2,020,200
Largemouth Bass	59,056,592	68,381,960	74,555,456	79,864,968		1,256,628	1,513,490	1,827,822	2,304,180
Mooneye	96,839,472	112,259,040	122,502,800	129,453,368		823,500	928,900	1,216,400	1,433,200
Northern Pike	9,698,096	11,143,770	12,083,858	12,656,701		72,702	85,113	98,526	125,855
Paddlefish	1,330,564	1,543,631	1,689,015	1,806,356		21,510	25,107	30,504	37,610
River Carpsucker	323,491,040	376,388,736	411,197,568	438,685,152		12,605,900	14,953,400	19,273,100	23,821,100
Sauger	100,859,016	117,009,160	126,867,144	133,547,672		311,749	378,317	471,511	591,586
Shorthead Redhorse	2,366,006,784	2,730,438,912	2,968,488,704	3,123,955,968		27,128,400	32,537,700	39,107,100	50,416,000
Smallmouth Bass	3,073,403	3,563,688	3,875,890	4,166,160		59,365	70,849	88,950	111,527
Smallmouth Buffalo	754,225,472	873,470,848	951,815,808	1,004,493,504		13,346,300	15,725,300	20,803,400	25,355,700
Spotted Sucker	1,617,441,536	1,868,507,776	2,027,534,592	2,134,761,600		36,587,000	44,120,000	52,190,000	66,540,000
Sturgeon	1,202,429	1,401,322	1,534,341	1,649,274		21,422	26,356	33,197	41,100
Walleye	165,658,032	191,799,456	208,017,744	219,139,760		316,030	382,600	475,801	598,016
White Bass	615,253,568	711,614,912	774,667,648	814,625,216		4,052,100	4,903,100	6,418,300	7,791,900
TOTALS	**28,102,795,232**	**32,414,689,219**	**35,427,331,872**	**37,145,676,557**		**446,546,098**	**533,188,885**	**666,836,397**	**840,506,412**
	EXCLUDED FROM CONSIDERATION								
Bowfin	1,674,255	1,940,980	2,122,458	2,274,743		29,888	37,986	46,938	57,937
Carp	5,982,614,528	6,931,709,952	7,570,648,064	7,981,344,768		108,836,000	129,646,000	169,295,008	207,227,008
Emerald Shiner	6,552,660,992	7,583,705,600	8,290,163,712	8,750,683,136		295,656,000	354,981,056	431,027,008	551,915,968
Gizzard Shad	3,192,284,160	3,698,087,680	4,028,275,456	4,256,394,752		442,550,976	532,502,976	635,070,016	822,220,032
Shortnose Gar	17,552,672	20,234,452	21,925,532	22,980,392		67,250	79,650	101,150	126,130

Forecast #2: Alternative K - Incremental Increase in Percentage of Entrained Larvae

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	2.23	2.59	2.81	2.96		0.28	0.34	0.46	0.55
Blue Catfish	0.25	0.29	0.32	0.34		0.00	0.00	0.00	0.00
Blue Sucker	0.34	0.40	0.43	0.45		0.00	0.00	0.00	0.00
Bluegill	1.65	1.92	2.09	2.19		0.23	0.28	0.35	0.43
Channel Catfish	0.41	0.47	0.51	0.53		0.08	0.10	0.10	0.11
Crappie	1.18	1.36	1.49	1.56		0.15	0.19	0.24	0.34
Flathead Catfish	0.36	0.41	0.45	0.49		0.05	0.08	0.10	0.10
Freshwater Drum	1.81	2.08	2.27	2.38		0.25	0.32	0.38	0.50
Goldeye	1.23	1.42	1.55	1.62		0.06	0.09	0.11	0.13
Largemouth Bass	0.48	0.56	0.60	0.65		0.09	0.10	0.10	0.13
Mooneye	0.76	0.87	0.96	1.03		0.05	0.06	0.09	0.09
Northern Pike	0.45	0.52	0.58	0.60		0.09	0.10	0.10	0.11
Paddlefish	0.58	0.67	0.72	0.76		0.03	0.03	0.04	0.05
River Carpsucker	1.19	1.37	1.50	1.58		0.15	0.20	0.25	0.33
Sauger	1.30	1.52	1.65	1.74		0.14	0.19	0.23	0.29
Shorthead Redhorse	1.29	1.48	1.62	1.71		0.16	0.19	0.23	0.30
Smallmouth Bass	0.42	0.48	0.53	0.56		0.05	0.09	0.10	0.11
Smallmouth Buffalo	2.23	2.59	2.81	2.96		0.28	0.34	0.46	0.55
Spotted Sucker	2.11	2.45	2.66	2.79		0.10	0.13	0.15	0.17
Sturgeon	0.33	0.37	0.40	0.43		0.01	0.01	0.04	0.04
Walleye	1.25	1.46	1.57	1.65		0.15	0.19	0.23	0.29
White Bass	1.25	1.45	1.58	1.67		0.13	0.15	0.20	0.24
TOTALS	**1.05**	**1.22**	**1.32**	**1.39**		**0.12**	**0.14**	**0.18**	**0.22**
	EXCLUDED FROM CONSIDERATION								
Bowfin	0.48	0.55	0.61	0.63		0.04	0.05	0.05	0.05
Carp	1.21	1.39	1.51	1.60		0.18	0.21	0.26	0.34
Emerald Shiner	1.77	2.03	2.20	2.33		0.28	0.31	0.39	0.54
Gizzard Shad	1.12	1.28	1.41	1.48		0.16	0.19	0.23	0.30
Shortnose Gar	0.37	0.43	0.48	0.50		0.01	0.03	0.04	0.04

Forecast #2: Alternative K - Incremental Increase in Equivalent Adults Lost (EAL)

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	242	279	304	321		5	5	7	9
Blue Catfish	2,589	3,039	3,350	3,568		0	0	0	0
Blue Sucker	4	5	6	6		0	0	0	0
Bluegill	8,156	9,448	10,331	10,964		302	361	479	584
Channel Catfish	30,878	36,180	39,943	42,531		445	546	668	871
Crappie	33,256	38,558	42,026	44,361		1,207	1,456	1,890	2,284
Flathead Catfish	5,730	6,711	7,383	7,843		88	109	133	176
Freshwater Drum	42,919	49,254	53,828	56,140		615	724	885	1,120
Goldeye	3,174	3,680	4,010	4,227		32	38	50	59
Largemouth Bass	1,625	1,907	2,097	2,262		44	54	67	86
Mooneye	6,823	7,902	8,610	9,068		68	76	99	116
Northern Pike	904	1,048	1,146	1,209		11	13	16	20
Paddlefish	1,941	2,273	2,497	2,688		40	47	58	73
River Carpsucker	5,801	6,723	7,335	7,779		274	322	412	507
Sauger	13,104	15,154	16,398	17,242		44	53	65	81
Shorthead Redhorse	11,368	13,078	14,185	14,899		148	176	210	269
Smallmouth Bass	64	75	83	89		2	2	3	4
Smallmouth Buffalo	759	877	955	1,006		14	17	22	27
Spotted Sucker	77,937	89,998	97,611	102,759		1,868	2,250	2,659	3,389
Sturgeon	1,894	2,253	2,503	2,715		48	64	83	107
Walleye	3,383	3,915	4,247	4,482		8	9	11	14
White Bass	56,215	65,196	71,083	74,864		439	530	693	838
TOTALS	**308,766**	**357,553**	**389,931**	**411,023**		**5,702**	**6,852**	**8,510**	**10,634**
	EXCLUDED FROM CONSIDERATION								
Bowfin	327,769	388,201	430,131	466,773		8,601	11,619	14,859	18,879
Carp	392,214	453,419	494,475	520,530		8,004	9,451	12,248	14,905
Emerald Shiner	356,790	422,593	468,762	500,845		19,841	24,891	31,345	41,424
Gizzard Shad	74,753	86,706	94,700	100,214		13,040	15,634	18,568	23,896
Shortnose Gar	41,914	49,214	54,121	57,323		235	294	388	499

Forecast #2: Alternative K - Incremental Increase in Recruitment Forgone

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	2,905	3,364	3,665	3,866		55	65	86	105
Blue Catfish	5,678	6,576	7,185	7,602		0	0	0	0
Blue Sucker	778	911	1,002	1,081		0	0	0	0
Bluegill	136,018	158,087	173,263	184,263		5,150	6,217	8,313	10,203
Channel Catfish	16,131	18,651	20,393	21,550		201	242	292	376
Crappie	17,997	20,897	22,785	24,050		639	779	1,018	1,238
Flathead Catfish	907	1,047	1,140	1,201		12	14	17	22
Freshwater Drum	268,216	308,750	338,008	353,056		3,900	4,639	5,708	7,275
Goldeye	35,639	41,324	45,048	47,500		342	413	543	651
Largemouth Bass	3,828	4,433	4,838	5,162		91	110	132	167
Mooneye	82,393	95,548	104,245	109,806		800	902	1,182	1,392
Northern Pike	90	104	112	117		1	1	1	1
Paddlefish	2	2	3	3		0	0	0	0
River Carpsucker	13,389	15,562	17,007	18,079		627	744	960	1,187
Sauger	5,149	5,973	6,476	6,813		17	20	25	32
Shorthead Redhorse	858,846	991,060	1,077,342	1,133,072		11,079	13,299	16,000	20,626
Smallmouth Bass	314	364	396	423		8	9	12	15
Smallmouth Buffalo	7,599	8,797	9,586	10,111		144	170	225	275
Spotted Sucker	142,105	164,161	178,125	187,465		3,396	4,097	4,847	6,179
Sturgeon	14	17	18	19		0	0	1	1
Walleye	2,219	2,569	2,786	2,934		4	5	7	8
White Bass	4,968	5,746	6,255	6,576		37	44	58	70
TOTALS	**1,605,185**	**1,853,943**	**2,019,678**	**2,124,749**		**26,503**	**31,770**	**39,427**	**49,823**
	EXCLUDED FROM CONSIDERATION								
Bowfin	662	768	839	893		15	19	23	28
Carp	2,178	2,523	2,756	2,904		45	53	70	85
Emerald Shiner	88,025,256	101,880,368	111,367,280	117,558,120		4,234,000	5,086,270	6,178,800	7,914,200
Gizzard Shad	59,325	68,712	74,832	79,025		9,248	11,137	13,294	17,212
Shortnose Gar	173,566	200,035	216,710	226,956		769	912	1,159	1,447

Forecast #2: Alternative K - Incremental Increase in Production Forgone

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	473,176	547,585	596,469	628,895		8,973	10,564	13,962	17,009
Blue Catfish	10,789	12,495	13,651	14,443		0	0	0	0
Blue Sucker	5,852	6,857	7,536	8,132		0	0	0	0
Bluegill	9,779	11,360	12,450	13,237		369	446	595	730
Channel Catfish	5,417	6,262	6,847	7,235		67	81	98	126
Crappie	12,806	14,871	16,211	17,109		454	553	722	878
Flathead Catfish	42,765	49,374	53,741	56,632		558	672	800	1,037
Freshwater Drum	4,858,524	5,586,867	6,111,367	6,378,898		69,978	82,941	101,749	129,303
Goldeye	12,857	14,899	16,238	17,115		123	148	195	234
Largemouth Bass	808	935	1,021	1,089		19	23	28	35
Mooneye	4,150	4,810	5,245	5,523		40	45	59	70
Northern Pike	8,313	9,554	10,355	10,835		71	83	96	123
Paddlefish	6,395	7,421	8,118	8,647		114	133	161	199
River Carpsucker	57,754	67,093	73,306	77,901		2,701	3,204	4,127	5,101
Sauger	10,271	11,912	12,913	13,585		33	41	50	63
Shorthead Redhorse	142,190	164,033	178,292	187,496		1,836	2,202	2,648	3,410
Smallmouth Bass	77	89	97	104		2	2	3	4
Smallmouth Buffalo	177,571	205,499	223,866	236,070		3,369	3,968	5,245	6,390
Spotted Sucker	46,314	53,476	58,001	61,030		1,110	1,338	1,582	2,015
Sturgeon	810	942	1,030	1,097		19	23	29	36
Walleye	49,226	56,980	61,783	65,059		99	119	148	186
White Bass	11,906	13,764	14,978	15,744		87	105	138	167
TOTALS	**5,947,750**	**6,847,078**	**7,483,515**	**7,825,876**		**90,022**	**106,691**	**132,435**	**167,116**
	EXCLUDED FROM CONSIDERATION								
Bowfin	0	0	0	0		0	0	0	0
Carp	7,592,755	8,793,910	9,601,613	10,118,188		155,503	185,174	241,684	295,789
Emerald Shiner	222	256	279	293		10	12	15	18
Gizzard Shad	189,858	219,811	239,323	252,673		29,475	35,459	42,279	54,701
Shortnose Gar	46	53	57	60		0	0	0	0

Forecast #2: Alternative K - Incremental Increase in EAL for Year 2040

		Mississippi River					Illinois Waterway		
	Species	USA-3	4-8	9-15	16-27	Open River	Lower	Middle	Upper
1	Blue Sucker	0	0	0	4	2	0	0	0
2	Smallmouth Bass	2	6	20	41	15	1	1	1
3	Northern Pike	83	283	663	86	31	9	6	1
4	Bigmouth Buffalo	7	7	75	206	9	3	3	1
5	Smallmouth Buffalo	21	21	235	649	28	9	10	3
6	Largemouth Bass	2	161	520	1,054	361	31	35	1
7	Sturgeon	11	162	558	1,214	558	37	46	0
8	Paddlefish	38	176	589	1,264	429	39	19	0
9	Walleye	359	561	1,139	2,153	35	5	5	2
10	Blue Catfish	0	0	751	2,583	16	0	0	0
11	Goldeye	16	90	883	2,830	191	25	25	0
12	Flathead Catfish	86	667	2,183	4,393	53	52	59	22
13	River Carpsucker	10	23	887	6,021	395	176	177	59
14	Mooneye	13	41	1,638	6,661	258	67	32	0
15	Sauger	271	333	7,733	7,860	201	28	28	9
16	Bluegill	5	114	1,151	9,055	6	200	204	74
17	Shorthead Redhorse	19	38	4,688	9,362	77	90	90	30
18	Channel Catfish	345	907	6,674	31,820	195	267	295	106
19	Crappie	914	1,350	7,128	32,580	51	805	824	261
20	Freshwater Drum	306	546	13,580	39,230	163	375	379	131
21	White Bass	1,438	4,653	24,840	40,080	78	314	323	56
22	Spotted Sucker	635	667	47,760	47,190	1,364	1,309	1,350	0
	TOTALS	4,582	10,808	123,695	246,336	4,513	3,843	3,912	756
	Percent of River	1.2	2.8	32.1	63.9	1.2	45.2	46.0	8.9
Total Mississippi River =		385,420		Impact Index (EAL)			Total IWW =		8,511
Total UMR-IWW =		393,931			1000 to 5000				
	% Miss =	97.8			5000 to 15,000			% IWW =	2.2
					>15,000				

Forecast #2: Alternative L

Forecast #2: Alternative L - Incremental Increase in Number of Larvae Entrained and Killed

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	671,626,112	785,560,960	946,492,480	997,635,200		5,786,900	5,493,960	6,260,800	6,135,620
Blue Catfish	40,237,436	46,699,544	51,840,888	54,779,264		0	0	0	0
Blue Sucker	-2,217,090	522,670	29,397,716	31,580,000		0	0	0	0
Bluegill	1,825,314,304	2,121,831,168	2,327,941,120	2,471,226,112		25,871,960	26,792,320	26,056,000	25,263,700
Channel Catfish	40,464,252	46,874,144	52,075,988	54,978,864		219,397	195,519	187,211	233,519
Crappie	457,532,032	531,373,120	580,495,616	613,164,096		6,502,700	6,375,250	7,667,230	7,681,090
Flathead Catfish	28,083,802	32,502,732	36,248,132	38,183,320		150,123	130,571	125,336	161,263
Freshwater Drum	18,444,963,840	21,255,948,288	23,512,178,688	24,554,612,736		116,976,000	106,389,000	104,445,304	119,503,000
Goldeye	93,488,488	112,367,936	162,083,328	170,927,904		432,380	428,686	521,594	530,084
Largemouth Bass	23,504,344	30,813,212	73,267,080	77,558,008		593,421	499,585	525,617	621,500
Mooneye	78,879,648	93,383,392	121,483,104	127,995,216		422,795	414,600	507,490	517,880
Northern Pike	8,916,310	10,319,112	12,044,152	12,596,874		40,839	34,985	36,349	43,006
Paddlefish	547,538	717,328	1,647,890	1,745,519		11,692	10,840	12,650	13,500
River Carpsucker	219,962,896	267,364,640	405,437,696	430,695,840		5,550,200	5,124,620	5,678,000	6,025,400
Sauger	96,140,488	112,023,344	126,555,240	133,127,904		137,849	126,770	138,108	157,589
Shorthead Redhorse	2,287,478,272	2,647,163,392	2,963,887,104	3,117,865,216		12,547,400	11,006,620	10,757,000	13,497,900
Smallmouth Bass	1,134,465	1,506,963	3,801,878	4,039,558		26,577	23,884	25,644	29,364
Smallmouth Buffalo	671,626,112	785,560,960	946,492,480	997,635,200		5,786,900	5,493,960	6,260,800	6,135,620
Spotted Sucker	1,535,317,120	1,781,570,944	2,021,319,808	2,126,585,088		17,812,000	14,549,664	14,819,963	18,089,664
Sturgeon	200,449	347,060	1,484,242	1,578,529		9,276	9,369	10,448	10,465
Walleye	160,939,488	186,813,648	207,638,848	218,720,000		139,992	128,913	140,251	159,732
White Bass	611,196,800	707,325,120	773,791,808	814,204,544		1,676,840	1,660,850	1,959,228	1,981,470
TOTALS	**27,295,337,106**	**31,558,589,677**	**35,357,605,286**	**37,051,434,992**		**200,695,241**	**184,889,966**	**186,135,023**	**206,791,366**
	EXCLUDED FROM CONSIDERATION								
Bowfin	579,585	786,920	2,066,688	2,190,923		12,859	13,034	15,002	15,922
Carp	5,916,813,312	6,859,333,120	7,541,691,904	7,955,493,376		46,896,064	42,984,784	50,355,808	53,826,984
Emerald Shiner	6,521,043,456	7,543,897,088	8,255,135,744	8,711,288,832		134,966,688	118,474,992	119,318,000	148,527,008
Gizzard Shad	3,088,906,496	3,586,898,176	4,008,023,808	4,231,901,184		204,969,904	178,184,400	172,542,992	223,031,984
Shortnose Gar	16,508,395	19,132,150	21,866,524	22,908,838		29,859	27,396	29,114	30,526

Forecast #2: Alternative L - Incremental Increase in Percentage of Entrained Larvae

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	2.14	2.49	2.80	2.95		0.14	0.10	0.14	0.14
Blue Catfish	0.23	0.27	0.32	0.34		0.00	0.00	0.00	0.00
Blue Sucker	0.32	0.37	0.43	0.45		0.00	0.00	0.00	0.00
Bluegill	1.56	1.84	2.08	2.18		0.10	0.10	0.08	0.09
Channel Catfish	0.39	0.45	0.50	0.53		0.01	0.01	0.01	0.01
Crappie	1.13	1.31	1.48	1.55		0.09	0.06	0.08	0.08
Flathead Catfish	0.34	0.39	0.45	0.48		0.00	0.00	0.01	0.00
Freshwater Drum	1.72	2.00	2.26	2.37		0.10	0.06	0.09	0.11
Goldeye	1.14	1.33	1.54	1.61		0.03	0.03	0.04	0.03
Largemouth Bass	0.45	0.54	0.60	0.64		0.01	0.01	0.01	0.01
Mooneye	0.69	0.80	0.95	1.02		0.03	0.03	0.04	0.03
Northern Pike	0.42	0.49	0.58	0.60		0.01	0.01	0.01	0.01
Paddlefish	0.55	0.64	0.72	0.75		0.01	0.01	0.01	0.01
River Carpsucker	1.11	1.29	1.48	1.57		0.09	0.05	0.08	0.09
Sauger	1.25	1.46	1.65	1.73		0.06	0.05	0.05	0.09
Shorthead Redhorse	1.21	1.39	1.61	1.70		0.08	0.06	0.06	0.09
Smallmouth Bass	0.39	0.46	0.53	0.56		0.01	0.01	0.01	0.01
Smallmouth Buffalo	2.14	2.49	2.80	2.95		0.14	0.10	0.14	0.14
Spotted Sucker	2.01	2.34	2.65	2.77		0.05	0.04	0.04	0.05
Sturgeon	0.30	0.35	0.40	0.42		0.00	0.00	0.00	0.00
Walleye	1.20	1.40	1.57	1.65		0.06	0.05	0.05	0.09
White Bass	1.16	1.35	1.57	1.66		0.05	0.04	0.05	0.04
TOTALS	**0.99**	**1.16**	**1.32**	**1.39**		**0.05**	**0.04**	**0.05**	**0.05**
	EXCLUDED FROM CONSIDERATION								
Bowfin	0.45	0.52	0.61	0.63		0.01	0.01	0.01	0.01
Carp	1.13	1.31	1.50	1.59		0.09	0.06	0.08	0.08
Emerald Shiner	1.68	1.95	2.19	2.32		0.10	0.11	0.09	0.15
Gizzard Shad	1.04	1.20	1.40	1.47		0.08	0.06	0.06	0.10
Shortnose Gar	0.35	0.40	0.48	0.50		0.00	0.00	0.01	0.01

Forecast #2: Alternative L - Incremental Increase in Equivalent Adults Lost (EAL)

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	222	259	303	319		2	2	2	2
Blue Catfish	2,551	2,998	3,338	3,550		0	0	0	0
Blue Sucker	1	2	6	6		0	0	0	0
Bluegill	8,105	9,390	10,271	10,881		122	126	122	118
Channel Catfish	30,410	35,674	39,790	42,311		198	179	173	221
Crappie	33,096	38,366	41,849	44,197		512	498	594	594
Flathead Catfish	5,612	6,582	7,359	7,809		40	35	34	46
Freshwater Drum	42,555	48,869	53,790	56,086		284	257	251	284
Goldeye	2,765	3,251	3,985	4,193		13	13	15	16
Largemouth Bass	893	1,123	2,065	2,203		20	17	18	22
Mooneye	6,257	7,311	8,569	9,012		35	34	42	42
Northern Pike	842	981	1,142	1,204		6	5	6	7
Paddlefish	1,077	1,350	2,450	2,610		21	20	24	26
River Carpsucker	4,936	5,813	7,265	7,688		121	111	122	129
Sauger	12,665	14,695	16,367	17,199		20	18	19	22
Shorthead Redhorse	11,202	12,902	14,171	14,882		69	60	58	73
Smallmouth Bass	34	43	81	87		1	1	1	1
Smallmouth Buffalo	699	813	950	1,000		6	6	7	7
Spotted Sucker	75,022	86,904	97,360	102,427		909	742	754	920
Sturgeon	836	1,106	2,442	2,622		20	21	25	26
Walleye	3,307	3,835	4,240	4,474		3	3	3	4
White Bass	56,043	65,014	71,010	74,837		181	179	211	213
TOTALS	**299,130**	**347,281**	**388,803**	**409,597**		**2,583**	**2,327**	**2,481**	**2,773**
	EXCLUDED FROM CONSIDERATION								
Bowfin	173,515	220,970	421,388	452,248		3,465	3,776	4,555	4,928
Carp	390,070	450,959	492,723	518,984		3,465	3,155	3,658	3,903
Emerald Shiner	355,460	420,783	466,697	498,564		8,534	7,817	8,091	10,586
Gizzard Shad	73,470	85,295	94,221	99,628		6,046	5,242	5,073	6,510
Shortnose Gar	40,130	47,264	53,970	57,132		99	93	104	112

Forecast #2: Alternative L - Incremental Increase in Recruitment Forgone

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	2,659	3,100	3,647	3,844		24	23	26	25
Blue Catfish	5,580	6,473	7,159	7,564		0	0	0	0
Blue Sucker	245	347	969	1,039		0	0	0	0
Bluegill	135,150	157,096	172,264	182,879		2,065	2,140	2,080	2,016
Channel Catfish	15,855	18,360	20,319	21,451		91	81	78	97
Crappie	17,906	20,790	22,691	23,965		269	264	317	318
Flathead Catfish	889	1,028	1,136	1,197		5	5	5	6
Freshwater Drum	265,701	306,077	337,770	352,718		1,785	1,625	1,595	1,826
Goldeye	30,473	35,848	44,724	47,092		138	137	167	169
Largemouth Bass	1,964	2,456	4,766	5,037		43	36	38	45
Mooneye	74,580	87,268	103,665	109,075		411	403	493	503
Northern Pike	85	99	112	117		0	0	0	0
Paddlefish	1	1	3	3		0	0	0	0
River Carpsucker	11,103	13,138	16,838	17,862		275	254	281	299
Sauger	4,966	5,779	6,462	6,796		7	7	7	8
Shorthead Redhorse	844,573	975,781	1,076,217	1,131,693		5,100	4,482	4,377	5,501
Smallmouth Bass	175	216	390	413		3	3	3	4
Smallmouth Buffalo	6,953	8,107	9,539	10,053		63	59	68	66
Spotted Sucker	136,564	158,274	177,648	186,863		1,650	1,348	1,373	1,677
Sturgeon	7	9	18	19		0	0	0	0
Walleye	2,171	2,518	2,782	2,930		2	2	2	2
White Bass	4,952	5,729	6,248	6,574		15	15	18	18
TOTALS	**1,562,552**	**1,808,494**	**2,015,367**	**2,119,184**		**11,946**	**10,884**	**10,928**	**12,580**
	EXCLUDED FROM CONSIDERATION								
Bowfin	361	450	822	869		6	6	7	8
Carp	2,165	2,508	2,746	2,896		19	18	21	22
Emerald Shiner	87,652,336	101,400,864	110,906,608	117,033,552		1,928,740	1,693,762	1,706,180	2,123,660
Gizzard Shad	58,291	67,571	74,492	78,629		4,263	3,712	3,593	4,654
Shortnose Gar	166,940	193,014	216,261	226,470		339	311	331	346

Forecast #2: Alternative L - Incremental Increase in Production Forgone

	Mississippi River					Illinois Waterway			
Species	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	432,829	504,514	593,566	625,260		3,888	3,687	4,195	4,109
Blue Catfish	10,603	12,299	13,601	14,371		0	0	0	0
Blue Sucker	1,851	2,616	7,290	7,811		0	0	0	0
Bluegill	9,716	11,289	12,378	13,138		148	154	149	145
Channel Catfish	5,324	6,164	6,822	7,202		31	27	26	33
Crappie	12,742	14,795	16,144	17,048		191	187	225	226
Flathead Catfish	41,930	48,479	53,584	56,422		259	226	216	279
Freshwater Drum	4,812,647	5,538,203	6,107,049	6,372,791		32,151	29,180	28,618	32,565
Goldeye	11,000	12,933	16,122	16,969		50	49	60	61
Largemouth Bass	414	518	1,006	1,063		9	8	8	9
Mooneye	3,758	4,395	5,216	5,487		21	20	25	25
Northern Pike	7,887	9,103	10,331	10,801		40	34	35	42
Paddlefish	3,366	4,218	7,948	8,404		62	57	67	71
River Carpsucker	47,903	56,654	72,574	76,970		1,186	1,094	1,210	1,284
Sauger	9,905	11,523	12,886	13,550		15	14	15	17
Shorthead Redhorse	139,830	161,507	178,107	187,268		846	743	725	910
Smallmouth Bass	43	53	96	102		1	1	1	1
Smallmouth Buffalo	162,441	189,344	222,773	234,710		1,460	1,384	1,576	1,543
Spotted Sucker	44,500	51,549	57,845	60,834		540	441	449	547
Sturgeon	417	526	1,008	1,068		8	8	9	9
Walleye	48,158	55,848	61,682	64,958		44	40	44	50
White Bass	11,867	13,722	14,963	15,738		36	36	42	42
TOTALS	**5,819,131**	**6,710,252**	**7,472,991**	**7,811,965**		**40,986**	**37,390**	**37,695**	**41,968**
	EXCLUDED FROM CONSIDERATION								
Bowfin	0	0	0	0		0	0	0	0
Carp	7,546,530	8,741,069	9,566,484	10,087,899		66,865	61,150	71,549	76,474
Emerald Shiner	221	255	277	292		5	4	4	5
Gizzard Shad	186,561	216,181	238,235	251,410		13,605	11,835	11,448	14,806
Shortnose Gar	44	51	57	60		0	0	0	0

Forecast #2: Alternative L - Incremental Increase in EAL for Year 2040

		Mississippi River					Illinois Waterway		
	Species	USA-3	4-8	9-15	16-27	Open River	Lower	Middle	Upper
1	Blue Sucker	0	0	0	4	1	0	0	0
2	Smallmouth Bass	2	6	20	40	14	1	0	0
3	Northern Pike	83	283	663	85	28	5	0	0
4	Bigmouth Buffalo	7	7	75	205	8	2	0	0
5	Smallmouth Buffalo	21	21	235	647	26	5	1	1
6	Largemouth Bass	2	161	520	1,046	337	17	1	0
7	Sturgeon	11	162	558	1,205	505	22	3	0
8	Paddlefish	38	176	589	1,254	392	22	2	0
9	Walleye	359	561	1,139	2,149	32	3	0	0
10	Blue Catfish	0	0	751	2,572	15	0	0	0
11	Goldeye	16	90	883	2,823	173	13	3	0
12	Flathead Catfish	86	667	2,183	4,374	49	30	0	4
13	River Carpsucker	10	23	887	5,981	365	96	11	15
14	Mooneye	13	41	1,638	6,642	236	34	7	0
15	Sauger	271	333	7,733	7,846	183	15	2	2
16	Bluegill	5	114	1,151	8,995	5	101	1	20
17	Shorthead Redhorse	19	38	4,688	9,354	70	51	1	6
18	Channel Catfish	345	907	6,674	31,680	179	151	0	22
19	Crappie	914	1,350	7,128	32,410	46	427	89	78
20	Freshwater Drum	306	546	13,580	39,210	151	220	2	30
21	White Bass	1,438	4,653	24,840	40,010	71	165	34	12
22	Spotted Sucker	635	667	47,760	47,060	1,240	741	14	0
	TOTALS	**4,582**	**10,808**	**123,695**	**245,592**	**4,125**	**2,118**	**170**	**194**
	Percent of River	1.2	2.8	32.2	63.8	1.1	85.3	6.9	7.8

Total Mississippi River =	**384,677**	**Impact Index (EAL)**		**Total IWW =**	**2,482**
Total UMR-IWW =	**387,159**		1000 to 5000		
% Miss =	**99.4**		5000 to 15,000	**% IWW =**	**0.6**
			>15,000		

Forecast #2: WOP – Year 2000

Forecast #2: Without - Year 2000 Incremental Increase in Number of Larvae Entrained and Killed

		Mississippi River					Illinois Waterway			
Species	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	195,222,496	256,244,848	312,632,960	360,893,376	404,256,704	61,446,000	102,239,000	138,434,016	168,212,000	193,075,984
Blue Catfish	10,176,774	12,972,625	15,360,222	17,223,870	18,914,044	0	0	0	0	0
Blue Sucker	14,900,717	22,852,472	30,421,384	37,405,740	43,239,784	0	0	0	0	0
Bluegill	470,158,464	618,363,456	736,857,408	825,203,712	909,995,136	295,521,024	488,926,016	660,779,968	804,430,016	922,450,048
Channel Catfish	9,822,076	12,540,933	15,028,152	17,045,192	19,046,212	2,166,200	3,577,730	4,868,900	5,953,900	6,799,200
Crappie	101,980,880	129,535,680	152,154,080	171,312,256	189,144,320	71,878,000	120,981,000	163,374,000	198,154,016	227,352,000
Flathead Catfish	5,921,875	7,799,550	9,067,044	10,085,105	11,180,880	1,442,130	2,381,160	3,240,880	3,962,810	4,521,500
Freshwater Drum	4,168,303,360	4,966,208,000	5,820,294,144	6,381,266,944	7,092,525,568	1,147,589,888	1,891,789,952	2,571,579,904	3,144,859,904	3,598,400,256
Goldeye	40,446,976	55,117,972	68,839,472	81,015,904	91,540,848	4,986,000	8,265,000	11,021,000	13,163,000	14,961,000
Largemouth Bass	26,049,530	39,725,376	51,853,640	63,640,312	73,522,192	5,655,797	9,291,330	12,494,370	15,049,740	17,026,710
Mooneye	28,054,212	36,888,640	45,467,104	52,815,520	59,190,024	3,270,000	5,412,000	7,248,000	8,588,000	9,710,000
Northern Pike	1,323,814	2,160,790	2,514,257	3,004,769	3,626,577	293,994	485,682	654,499	788,493	894,106
Paddlefish	568,422	866,954	1,140,058	1,390,307	1,614,930	85,820	142,120	189,460	226,100	255,600
River Carpsucker	112,636,296	157,174,080	198,952,224	235,623,104	266,366,480	57,733,000	96,026,000	130,170,000	158,296,000	181,344,000
Sauger	20,510,206	27,513,818	31,517,798	35,680,680	39,129,360	1,428,980	2,386,130	3,235,630	3,940,440	4,508,300
Shorthead Redhorse	529,687,680	649,852,672	760,933,440	849,999,040	918,129,408	122,063,000	201,734,016	274,512,992	335,578,048	383,180,000
Smallmouth Bass	1,317,185	2,020,125	2,656,226	3,262,299	3,780,216	270,391	449,460	609,870	742,280	848,840
Smallmouth Buffalo	195,222,496	256,244,848	312,632,960	360,893,376	404,256,704	61,446,000	102,239,000	138,434,016	168,212,000	193,075,984
Spotted Sucker	380,152,448	454,673,600	546,615,360	613,800,064	676,966,336	163,180,000	267,300,000	359,800,000	433,600,000	489,700,000
Sturgeon	588,897	900,085	1,182,003	1,441,753	1,663,571	99,130	163,590	217,850	261,670	297,070
Walleye	28,676,638	39,786,536	45,866,752	53,687,580	61,109,380	1,441,830	2,411,840	3,274,240	3,991,840	4,570,500
White Bass	112,157,512	143,466,416	161,248,144	173,945,584	189,390,208	18,893,800	31,504,800	42,208,000	50,813,000	57,880,000
TOTALS	**6,453,878,954**	**7,892,909,476**	**9,323,234,832**	**10,350,636,487**	**11,478,588,882**	**2,020,890,984**	**3,337,705,826**	**4,526,347,595**	**5,518,823,257**	##########
		EXCLUDED FROM CONSIDERATION								
Bowfin	734,066	1,123,612	1,485,231	1,823,473	2,124,082	139,654	232,888	310,012	372,656	423,001
Carp	1,397,257,728	1,731,826,304	2,033,219,584	2,257,973,760	2,468,253,952	503,230,976	841,580,032	1,140,130,048	1,382,949,888	1,584,240,000
Emerald Shiner	1,607,926,528	2,012,476,672	2,384,457,984	2,660,795,392	2,925,880,576	1,337,580,032	2,217,120,000	3,016,329,984	3,683,339,776	4,207,099,648
Gizzard Shad	701,996,352	941,842,752	1,127,086,848	1,299,925,248	1,478,789,760	1,989,910,016	3,290,169,856	4,479,399,936	5,477,100,544	6,248,700,416
Shortnose Gar	3,066,020	4,281,933	5,044,959	5,868,324	6,831,750	305,250	499,100	668,400	803,000	909,800

Forecast #2: Without - Year 2000 Incremental Increase in Percentage of Entrained Larvae

		Mississippi River					Illinois Waterway			
Species	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	0.39	0.56	0.63	0.70	0.78	1.31	2.31	3.25	4.15	4.91
Blue Catfish	0.07	0.08	0.11	0.13	0.14	0.00	0.00	0.00	0.00	0.00
Blue Sucker	0.06	0.08	0.09	0.11	0.12	0.00	0.00	0.00	0.00	0.00
Bluegill	0.31	0.42	0.48	0.54	0.60	0.99	1.71	2.40	3.06	3.61
Channel Catfish	0.08	0.10	0.13	0.13	0.15	0.30	0.51	0.71	0.91	1.07
Crappie	0.22	0.29	0.34	0.38	0.42	0.75	1.32	1.88	2.38	2.83
Flathead Catfish	0.07	0.09	0.11	0.12	0.14	0.21	0.39	0.55	0.69	0.81
Freshwater Drum	0.34	0.45	0.52	0.57	0.64	1.20	2.05	2.91	3.70	4.35
Goldeye	0.26	0.35	0.41	0.46	0.52	0.32	0.55	0.74	0.89	0.99
Largemouth Bass	0.09	0.14	0.15	0.15	0.18	0.31	0.56	0.81	1.00	1.17
Mooneye	0.19	0.25	0.30	0.36	0.39	0.21	0.36	0.47	0.56	0.64
Northern Pike	0.09	0.13	0.14	0.14	0.17	0.26	0.48	0.67	0.84	0.99
Paddlefish	0.11	0.15	0.17	0.19	0.21	0.10	0.16	0.22	0.25	0.29
River Carpsucker	0.24	0.32	0.36	0.41	0.46	0.74	1.31	1.85	2.38	2.80
Sauger	0.24	0.32	0.37	0.42	0.46	0.68	1.19	1.69	2.13	2.52
Shorthead Redhorse	0.25	0.35	0.40	0.45	0.50	0.70	1.21	1.71	2.20	2.57
Smallmouth Bass	0.08	0.11	0.13	0.14	0.15	0.24	0.43	0.60	0.74	0.90
Smallmouth Buffalo	0.39	0.56	0.63	0.70	0.78	1.31	2.31	3.25	4.15	4.91
Spotted Sucker	0.41	0.55	0.64	0.72	0.79	0.46	0.76	1.02	1.24	1.40
Sturgeon	0.06	0.08	0.08	0.11	0.12	0.08	0.13	0.17	0.21	0.23
Walleye	0.24	0.33	0.37	0.42	0.46	0.68	1.20	1.70	2.15	2.55
White Bass	0.25	0.34	0.40	0.45	0.49	0.59	0.99	1.38	1.70	1.94
TOTALS	**0.20**	**0.28**	**0.32**	**0.35**	**0.39**	**0.52**	**0.91**	**1.27**	**1.61**	**1.89**
		EXCLUDED FROM CONSIDERATION								
Bowfin	0.09	0.13	0.15	0.15	0.18	0.15	0.25	0.35	0.44	0.50
Carp	0.24	0.33	0.38	0.43	0.47	0.80	1.40	2.01	2.52	2.96
Emerald Shiner	0.34	0.46	0.54	0.60	0.66	1.26	2.16	3.07	3.92	4.60
Gizzard Shad	0.22	0.30	0.34	0.38	0.43	0.70	1.20	1.71	2.19	2.57
Shortnose Gar	0.07	0.09	0.11	0.13	0.14	0.09	0.14	0.20	0.23	0.26

Forecast #2: Without - Year 2000 Incremental Increase in Equivalent Adults Lost (EAL)

		Mississippi River					Illinois Waterway			
Species	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	62	81	98	113	127	21	35	48	58	66
Blue Catfish	577	735	873	980	1,079	0	0	0	0	0
Blue Sucker	2	3	4	5	6	0	0	0	0	0
Bluegill	2,114	2,781	3,312	3,708	4,088	1,408	2,317	3,116	3,779	4,321
Channel Catfish	6,750	8,547	10,242	11,515	12,783	1,916	3,218	4,435	5,479	6,299
Crappie	7,544	9,521	11,172	12,500	13,697	5,705	9,557	12,854	15,539	17,779
Flathead Catfish	1,090	1,426	1,665	1,847	2,043	374	632	876	1,087	1,253
Freshwater Drum	9,723	11,543	13,505	14,767	16,383	2,818	4,617	6,245	7,605	8,676
Goldeye	865	1,141	1,404	1,642	1,857	150	248	330	393	446
Largemouth Bass	582	877	1,146	1,416	1,650	185	311	425	518	591
Mooneye	1,793	2,292	2,784	3,212	3,595	271	447	598	707	798
Northern Pike	121	188	211	236	270	42	71	97	119	136
Paddlefish	704	1,063	1,395	1,717	2,003	152	256	345	415	471
River Carpsucker	1,795	2,424	3,035	3,572	4,045	1,270	2,104	2,843	3,447	3,940
Sauger	2,694	3,591	4,087	4,604	5,021	204	338	456	554	632
Shorthead Redhorse	2,549	3,101	3,611	4,018	4,331	679	1,117	1,512	1,842	2,097
Smallmouth Bass	22	34	44	55	64	8	14	19	23	27
Smallmouth Buffalo	196	255	309	356	399	67	111	150	182	208
Spotted Sucker	18,170	21,602	25,910	29,040	31,993	8,387	13,713	18,433	22,204	25,058
Sturgeon	685	1,042	1,366	1,681	1,954	205	352	480	589	679
Walleye	627	844	961	1,097	1,216	36	59	80	97	111
White Bass	10,197	13,023	14,649	15,862	17,232	2,049	3,421	4,582	5,514	6,277
TOTALS	**68,862**	**86,114**	**101,783**	**113,943**	**125,836**	**25,947**	**42,938**	**57,924**	**70,151**	**79,865**
		EXCLUDED FROM CONSIDERATION								
Bowfin	112,268	169,630	223,030	275,050	320,409	36,895	63,804	86,956	106,530	122,806
Carp	91,855	113,605	133,259	147,816	161,471	37,595	62,591	84,456	102,120	116,686
Emerald Shiner	75,316	94,488	112,625	126,335	139,267	82,462	141,336	197,536	246,679	286,340
Gizzard Shad	16,880	22,198	26,407	29,881	33,445	58,917	97,357	132,376	161,605	184,142
Shortnose Gar	6,724	9,028	10,415	11,601	12,997	974	1,649	2,267	2,780	3,197

Forecast #2: Without - Year 2000 Incremental Increase in Recruitment Forgone

		Mississippi River						Illinois Waterway			
Species	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	734	957	1,164	1,341	1,503		255	424	574	698	802
Blue Catfish	1,399	1,780	2,106	2,360	2,590		0	0	0	0	0
Blue Sucker	435	661	884	1,094	1,280		0	0	0	0	0
Bluegill	34,743	45,691	54,439	60,955	67,214		23,651	39,128	52,922	64,448	73,918
Channel Catfish	3,809	4,857	5,817	6,597	7,373		905	1,495	2,035	2,489	2,843
Crappie	3,973	5,047	5,926	6,672	7,371		2,983	5,022	6,784	8,233	9,448
Flathead Catfish	182	239	277	307	341		53	88	120	147	168
Freshwater Drum	59,667	71,001	83,154	91,126	101,248		17,578	28,982	39,406	48,218	55,169
Goldeye	9,981	13,241	16,353	19,119	21,635		1,608	2,667	3,556	4,247	4,827
Largemouth Bass	1,596	2,428	3,167	3,892	4,518		410	674	906	1,091	1,235
Mooneye	22,083	28,400	34,612	39,936	44,788		3,177	5,257	7,040	8,342	9,432
Northern Pike	11	19	22	26	32		3	5	7	8	10
Paddlefish	1	1	2	2	2		0	0	0	0	0
River Carpsucker	4,226	5,749	7,232	8,513	9,650		2,878	4,790	6,496	7,908	9,063
Sauger	1,030	1,378	1,573	1,777	1,948		77	128	174	212	243
Shorthead Redhorse	188,655	229,775	267,941	298,365	321,795		49,950	82,591	112,446	137,564	157,130
Smallmouth Bass	121	185	243	299	351		35	59	80	97	111
Smallmouth Buffalo	1,920	2,503	3,044	3,507	3,930		666	1,109	1,502	1,826	2,096
Spotted Sucker	32,969	39,217	47,037	52,711	58,122		15,160	24,832	33,422	40,300	45,500
Sturgeon	6	9	12	14	17		2	3	3	4	5
Walleye	379	526	604	707	806		20	34	46	56	65
White Bass	898	1,148	1,288	1,387	1,510		171	285	382	460	524
TOTALS	**368,818**	**454,812**	**536,897**	**600,707**	**658,024**		**119,582**	**197,573**	**267,901**	**326,348**	**372,589**
		EXCLUDED FROM CONSIDERATION									
Bowfin	260	398	524	645	759		68	114	152	183	207
Carp	506	625	733	814	889		207	347	470	571	654
Emerald Shiner	21,576,288	26,994,360	31,977,142	35,677,908	39,235,392		19,178,600	31,799,600	43,272,000	52,868,000	60,388,000
Gizzard Shad	12,729	17,027	20,324	23,429	26,706		41,671	68,926	93,881	114,873	131,144
Shortnose Gar	29,094	40,498	47,479	55,237	64,614		3,504	5,731	7,674	9,220	10,448

Forecast #2: Without - Year 2000 Incremental Increase in Production Forgone

		Mississippi River						Illinois Waterway			
Species	**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**		**YR 2010**	**YR 2020**	**YR 2030**	**YR 2040**	**YR 2050**
Bigmouth Buffalo	119,907	156,361	190,185	219,125	245,520		41,453	68,945	93,305	113,360	130,089
Blue Catfish	2,659	3,384	4,003	4,485	4,924		0	0	0	0	0
Blue Sucker	3,277	4,978	6,665	8,246	9,641		0	0	0	0	0
Bluegill	2,502	3,291	3,920	4,389	4,839		1,699	2,810	3,797	4,623	5,301
Channel Catfish	1,280	1,632	1,954	2,216	2,477		304	502	683	835	954
Crappie	2,830	3,595	4,221	4,752	5,250		2,121	3,571	4,822	5,850	6,712
Flathead Catfish	8,572	11,264	13,046	14,481	16,061		2,513	4,151	5,655	6,921	7,902
Freshwater Drum	1,088,584	1,295,628	1,517,191	1,662,260	1,847,372		317,201	521,940	708,220	864,830	988,420
Goldeye	3,611	4,789	5,915	6,914	7,823		581	962	1,281	1,530	1,738
Largemouth Bass	337	513	669	822	954		87	142	191	230	260
Mooneye	1,116	1,435	1,749	2,018	2,263		160	265	355	420	475
Northern Pike	1,059	1,741	2,007	2,404	2,929		287	475	640	771	875
Paddlefish	2,570	3,914	5,138	6,270	7,319		455	753	1,003	1,197	1,353
River Carpsucker	18,276	24,859	31,266	36,808	41,724		12,421	20,656	28,003	34,059	39,027
Sauger	2,058	2,755	3,143	3,552	3,894		153	256	347	423	484
Shorthead Redhorse	31,298	38,121	44,453	49,494	53,382		8,286	13,693	18,637	22,790	26,027
Smallmouth Bass	30	46	60	74	86		9	14	20	24	27
Smallmouth Buffalo	44,979	58,650	71,345	82,192	92,086		15,558	25,879	35,031	42,550	48,861
Spotted Sucker	10,777	12,824	15,381	17,238	19,005		4,963	8,125	10,932	13,175	14,873
Sturgeon	336	508	666	814	950		87	144	192	230	261
Walleye	8,412	11,669	13,420	15,706	17,903		451	754	1,024	1,249	1,430
White Bass	2,156	2,756	3,091	3,329	3,624		408	680	911	1,096	1,249
TOTALS	**1,356,626**	**1,644,713**	**1,939,488**	**2,147,589**	**2,390,026**		**409,197**	**674,717**	**915,049**	**1,116,163**	**1,276,318**
		EXCLUDED FROM CONSIDERATION									
Bowfin	0	0	0	0	0		0	0	0	0	0
Carp	1,766,785	2,185,254	2,562,276	2,842,465	3,105,337		722,000	1,207,730	1,636,220	1,985,000	2,274,340
Emerald Shiner	56	70	83	93	102		48	78	106	128	146
Gizzard Shad	40,779	54,553	65,123	75,081	85,600		133,054	219,951	299,416	366,107	417,730
Shortnose Gar	8	11	12	14	17		1	1	2	2	3

Forecast #2: Without - Year 2000 Incremental Increase in EAL for Year 2040

		Mississippi River					Illinois Waterway		
	Species	USA-3	4-8	9-15	16-27	Open River	Lower	Middle	Upper
1	Blue Sucker	0	0	0	1	4	0	0	0
2	Smallmouth Bass	0	0	3	13	38	6	12	5
3	Northern Pike	19	7	98	30	82	50	59	10
4	Bigmouth Buffalo	2	0	17	65	30	17	30	10
5	Smallmouth Buffalo	5	0	52	205	94	55	95	32
6	Largemouth Bass	0	4	84	356	972	173	338	7
7	Sturgeon	0	4	90	376	1,211	195	394	0
8	Paddlefish	-1	5	103	441	1,170	223	192	0
9	Walleye	86	13	231	651	116	29	50	17
10	Blue Catfish	0	0	159	780	41	0	0	0
11	Goldeye	1	2	192	841	606	144	249	0
12	Flathead Catfish	10	15	364	1,318	139	292	573	223
13	Mooneye	2	1	375	1,987	846	393	314	0
14	River Carpsucker	2	1	201	2,106	1,262	1,046	1,807	594
15	Sauger	57	11	1,551	2,313	671	170	290	94
16	Shorthead Redhorse	6	1	1,120	2,632	259	560	963	319
17	Bluegill	1	3	238	3,447	19	1,131	2,002	647
18	Channel Catfish	107	23	1,274	9,611	500	1,499	2,902	1,078
19	Crappie	189	37	1,513	10,600	160	4,780	8,156	2,603
20	White Bass	28	149	4,403	11,040	240	1,814	3,176	524
21	Freshwater Drum	77	13	2,992	11,160	529	2,301	3,967	1,337
22	Spotted Sucker	165	14	10,940	13,510	4,410	8,064	14,140	0
	TOTALS	758	305	26,000	73,482	13,397	22,941	39,708	7,500
	Percent of River	0.8	0.3	25.9	73.1	13.3	32.7	56.6	10.7

Total Mississippi River =	100,544	Impact Index (EAL)		Total IWW =	70,150
Total UMR-IWW =	170,694		1000 to 5000		
% Miss =	58.9		5000 to 15,000	% IWW =	41.1
			>15,000		

Attachment 7

FORECAST #2: FISH SPAWNING HABITAT

Presented by

Steve Bartell

31st Meeting of the NECC
November 28 and 29, 2000

UMR-IWW Navigation Study
31st NECC Meeting

Forecast #2: Fish Spawning Habitat

S.M. Bartell
S.K. Nair

The Cadmus Group, Inc.
Oak Ridge, TN

November 28-29, 2000
Bettendorf, Iowa

Fish Species	HSI Model Developed	Physical Forces*			
		Water Level Fluctuation	Scour Depth	Tow Velocity	Substrate Size
Lake Sturgeon	x				x
Paddlefish	x			x	x
Northern Pike					
Emerald Shiner	x			x	
Bullhead Minnow					
Bigmouth Buffalo	x			x	x
Channel Catfish					
Largemouth Bass	x	x		x	x
Spotted Bass	x			x	x
Black Crappie	x		x	x	x
Sauger	x		x	x	x
Walleye	x	x		x	x
Freshwater Drum	x			x	

*Includes ambient water depth and current velocity

Paddlefish Spawning Index (SI)

Baseline: $SI_b = (V1 \times V2 \times V3)^{1/3}$

Modified by Tow Passage: $SI_m = SI_b \times V4$

SI_m Recovery Rate = $0.04\ h^{-1}$

V1 = Substrate Size (mm)

V2 = Ambient Current (ft/s)

V3 = Water Depth (ft)

V4 = Velocity Disturbance Modifier (ft/s)

Black Crappie Spawning Index (SI)

Baseline: $SI_b = (V1 \times V2 \times V3 \times V4)^{1/4}$

Modified by Tow Passage: $SI_m = SI_b \times V5 \times V6$

V1 = Structure

V2 = Ambient Current (ft/s)

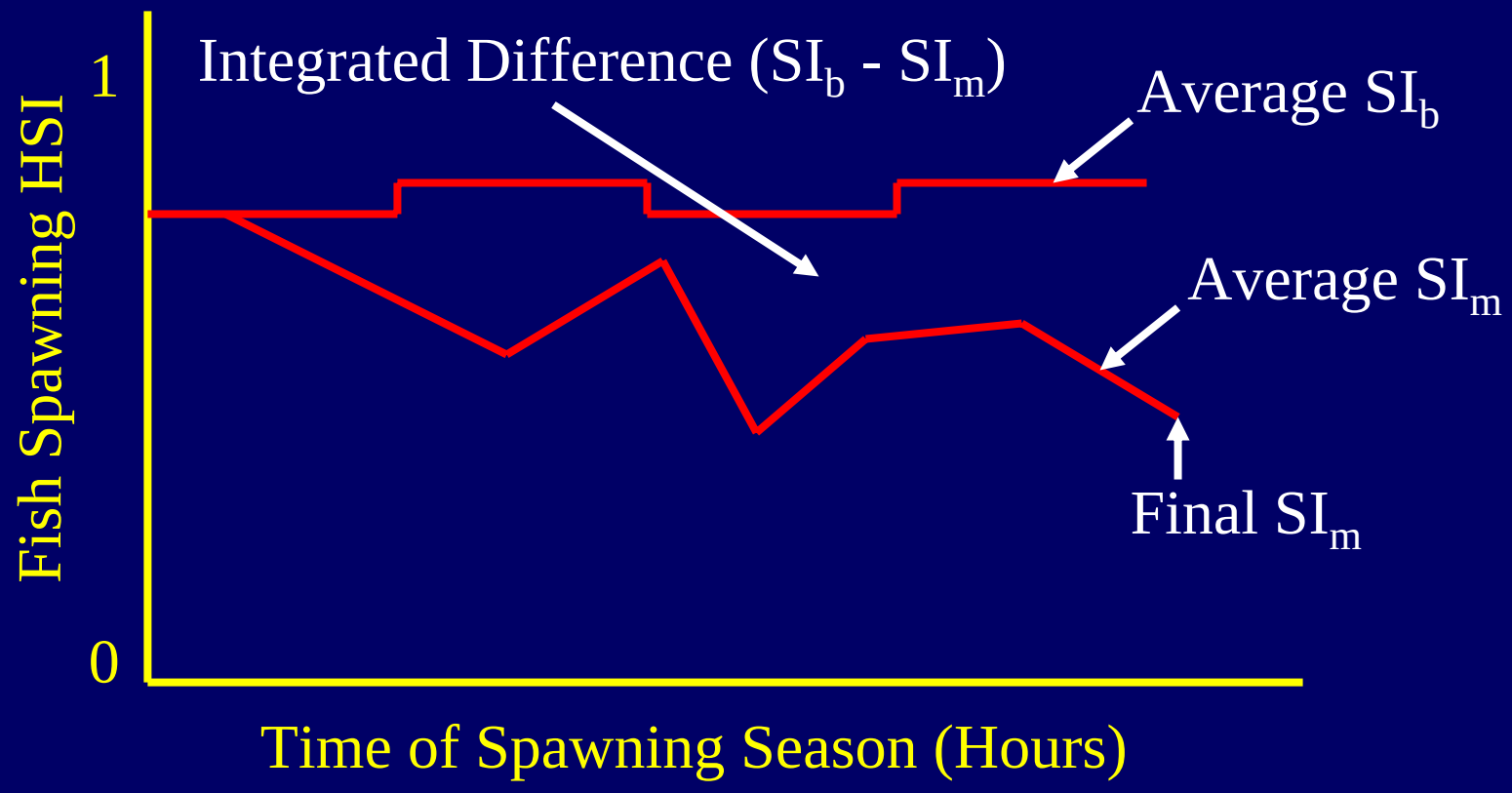
V3 = Water Depth (ft)

V4 = Substrate Size (mm)

V5 = Scour Disturbance Modifier (inches)

V6 = Velocity Disturbance Modifier (ft/s)

For Each Scenario: Cell, species, year, percentile



Average % Impact = $(SI_b - SI_m / SI_b) \times 100$

	Average HSI - Ambient Conditions, No Traffic					
Species	Pool 4	Pool 8	Pool 13	Pool 26A	Pool 26B	LaGrange
EMSH	0.22	0.23	0.08	0.07	0.04	0.16
BLCR	0.38	0.12	0.00	0.00	0.01	0.01
FRDR	0.27	0.25	0.07	0.03	0.04	0.20
LMBS	0.30	0.10	0.00	0.00	0.00	0.00
PDFI	0.21	0.42	0.37	0.37	0.73	0.47
SPBA	0.09	0.10	0.00	0.00	0.02	0.08
SAUG	0.16	0.26	0.29	0.22	0.56	0.26

EMSH – Emerald shiner
BLCR – Black crappie
FRDR – Freshwater drum
LMBS – Largemouth bass
PDFI - Paddlefish
SPBA - Spotted bass
SAUG - Sauger

Freshwater drum
Year 2040

Pool	Ambient HU's SI Acres	Decrease in HU's for Traffic Alternatives (SI Acres)						
		WOP	B	E	F	J	K	L
4	2176	0.8	0.8	0.7	0.7	0.7	0.7	0.7
			0.00	0.00	0.00	0.00	0.00	0.00
8	791	71.6	78.0	83.4	83.4	83.4	87.1	87.1
			0.89	1.64	1.64	1.64	2.15	2.15
13	486	22.6	24.3	25.1	25.1	25.1	26.9	26.9
			0.37	0.54	0.54	0.54	0.93	0.93
26A	188	1.1	1.1	1.1	1.1	1.1	1.1	1.1
			0.00	0.00	0.00	0.00	0.00	0.00
26B	196	0.3	0.3	0.3	0.3	0.3	0.3	0.3
			0.00	0.00	0.00	0.00	0.00	0.00
La Grange	585	15.6	15.7	15.7	15.7	15.7	15.7	15.7
			0.02	0.02	0.02	0.02	0.02	0.02

Sauger
Year 2040

Pool	Ambient HU's SI Acres	Decrease in HU's for Traffic Alternatives (SI Acres)						
		WOP	B	E	F	J	K	L
4	1,307	18.8	21.3	22.8	22.8	22.8	24.2	24.2
			0.19	0.31	0.31	0.31	0.42	0.42
8	805	44.8	46.8	51.2	51.2	51.2	54.0	54.0
			0.26	0.84	0.84	0.84	1.21	1.21
13	2,006	34.4	36.0	37.6	37.6	37.6	38.0	38.0
			0.08	0.16	0.16	0.16	0.18	0.18
26A	1,249	0.5	0.5	0.5	0.5	0.5	0.7	0.6
			0.00	0.00	0.00	0.00	0.02	0.01
26B	3,117	9.7	10.7	11.3	11.6	11.6	11.8	11.7
La Grange	747	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Paddlefish
Year 2040

Pool	Ambient HU's SI Acres	Decrease in HU's for Traffic Alternatives (SI Acres)						
		WOP	B	E	F	J	K	L
4	1,721	3.0	3.4	3.9	3.9	3.9	4.1	4.1
			0.02	0.05	0.05	0.05	0.06	0.06
8	1,310	5.2	5.4	6.0	6.0	6.0	6.1	6.1
			0.02	0.06	0.06	0.06	0.07	0.07
13	2,582	1.3	1.5	1.9	1.9	1.9	2.0	2.0
			0.01	0.02	0.02	0.02	0.03	0.03
26A	2,057	0.1	0.1	0.1	0.1	0.1	0.1	0.1
26B	4,070	0.0	0.0	0.0	0.0	0.0	0.0	0.0
La Grange	1,377	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Spotted Bass
Year 2040

Pool	Ambient HU's SI Acres	Decrease in HU's for Traffic Alternatives (SI Acres)						
		WOP	B	E	F	J	K	L
4	716	6.3	6.4	6.5	6.5	6.5	7.0	7.0
			0.01	0.03	0.03	0.03	0.10	0.10
8	314	27.0	28.9	31.7	31.7	31.7	34.1	34.1
			0.66	1.64	1.64	1.64	2.47	2.47
13	11	3.7	3.7	3.7	3.7	3.7	3.9	3.9
			0.00	0.00	0.00	0.00	2.74	2.74
26A	18	0.6	0.6	0.6	0.6	0.6	0.6	0.6
26B	98	18.8	19.3	20.0	20.0	20.0	20.3	20.1
			0.63	1.52	1.52	1.52	1.89	1.64
La Grange	226	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Further evaluation of spawning habitat impacts...

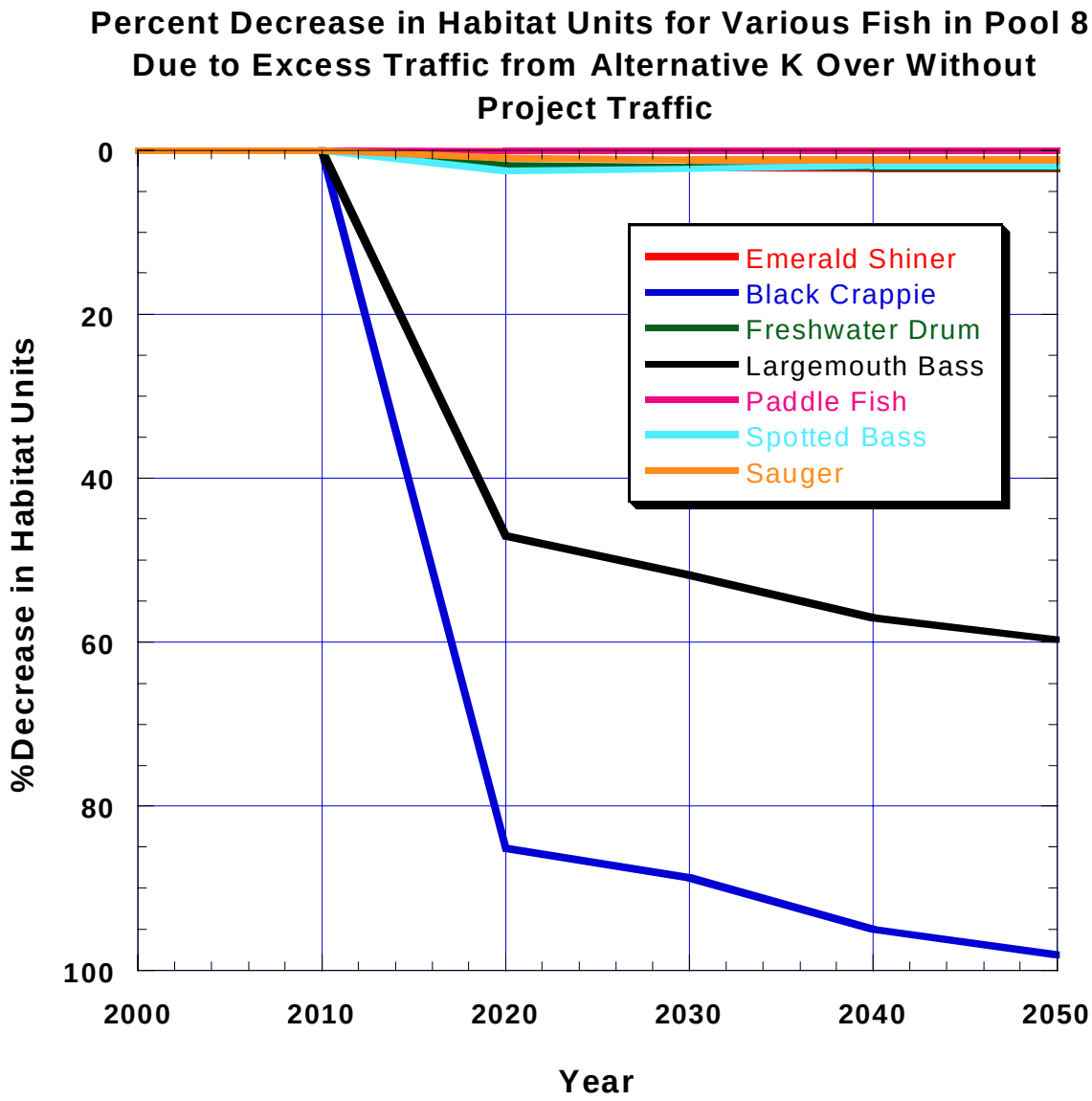
Validation of HSIs for ambient conditions

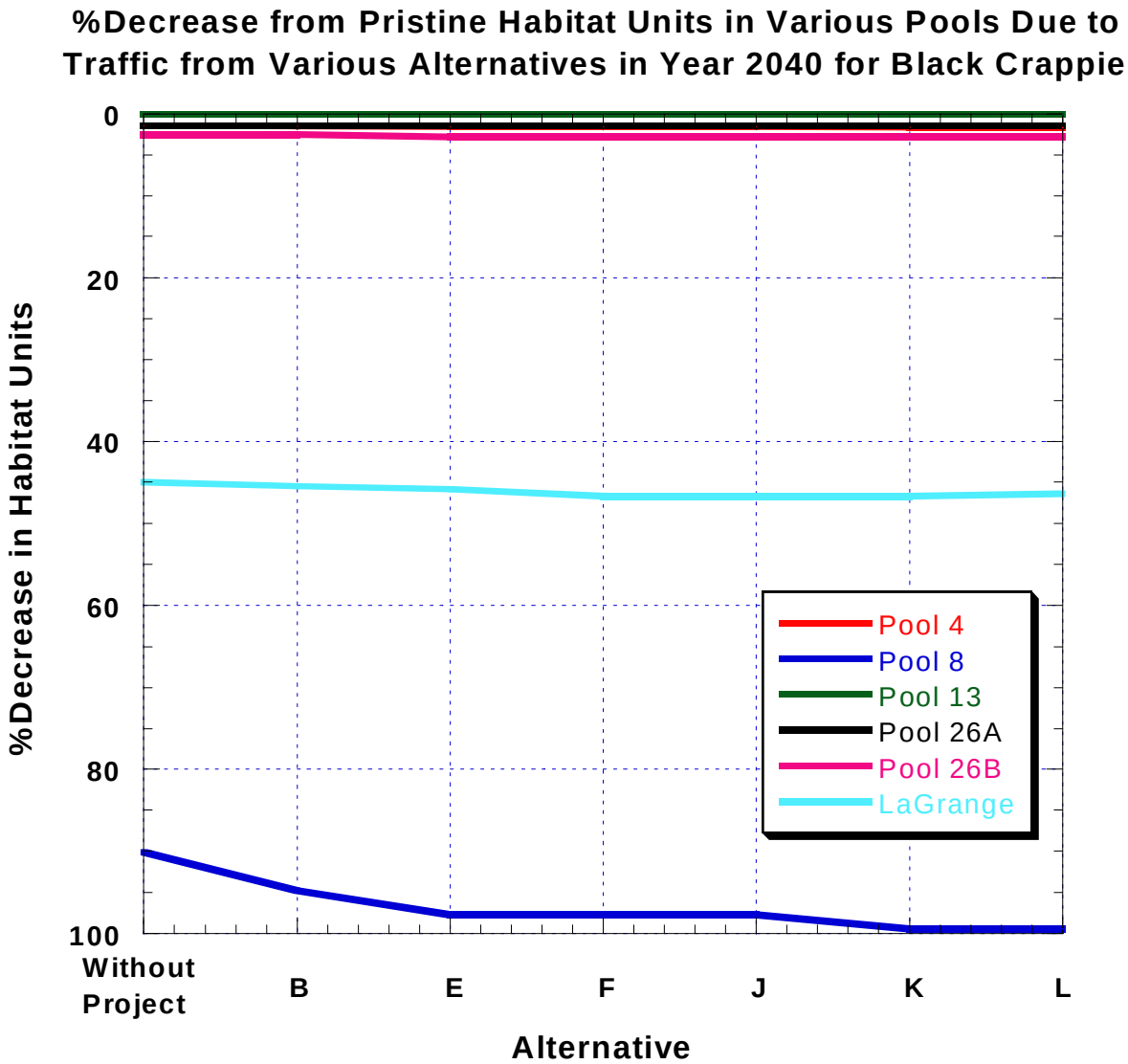
- Review reported spawning behavior and requirements
- Examine pool-specific spatial values of inputs to HSI models
- Evaluate SI functions in relation to UMR-IWW

Characterize spatial distributions of HSIs

- Identify pool-specific locations of high (low) quality spawning habitat (i.e., GIS)
- Bias introduced by pool-wide averages

Re-assess traffic impacts


Percent Decrease in Habitat Units for Various Fish in Pool 8
Due to Excess Traffic from Alternative K Over Without
Project Traffic
%Decrease in Habitat Units
0
20
40
60
80
100
2000
2010
2020
2030
2040
2050
Year
Emerald Shiner
Black Crappie
Freshwater Drum
Largemouth Bass
Paddle Fish
Spotted Bass
Sauger


%Decrease from Pristine Habitat Units in Various Pools Due to Traffic from Various Alternatives in Year 2040 for Black Crappie
%Decrease in Habitat Units
0
20
40
60
80
100
Without Project
B
E
F
J
K
L
Alternative
Pool 4
Pool 8
Pool 13
Pool 26A
Pool 26B
LaGrange

Attachment 8

FORECAST #2:
SIDE CHANNELS AND BACKWATERS

Presented by

Sandra Knight

US Army Corps of Engineers – WES

31st Meeting of the NECC
November 28 and 29, 2000

TABLE 7. SEDIMENTS TO BACKWATERS, MISSISSIPPI RIVER POOL 13

BASED ON 50% ROLLUP

			WITHOUT PROJECT						ALTERNATIVE B			ALTERNATIVES E, F, and J			ALTERNATIVES K and L		
			YEAR 2000 - 2,361 TOWS			YEAR 2050 - 2,451 TOWS			YEAR 2050 - 2,768 TOWS			YEAR 2050 - 3,280 TOWS			YEAR 2050 - 3,576 TOWS		
	WATER	ADJACENT	LOAD	SEDIMENT		LOAD	SEDIMENT		LOAD	SEDIMENT		LOAD	SEDIMENT		LOAD	SEDIMENT	
BW	AREA	SEDIMENT	into BW	DELIVERED	IMPACT	into BW	DELIVERED	IMPACT	into BW	DELIVERED	IMPACT	into BW	DELIVERED	IMPACT	into BW	DELIVERED	IMPACT
Number	(acres)	TYPE	(acre-ft/yr	(cm/yr)	COLOR	(acre-ft/yr	(cm/yr)	COLOR	(acre-ft/yr	(cm/yr)	COLOR	(acre-ft/yr	(cm/yr)	COLOR	(acre-ft/yr	(cm/yr)	COLOR
BW1	746	cohesive-med	0.0007	0.00003	BLUE	0.0007	0.00003	BLUE	0.0008	0.00003	BLUE	0.0010	0.00004	BLUE	0.0011	0.00004	BLUE
BW1			0.0000			0.0000			0.0000			0.0000			0.0000		
BW2	33	noncohesive	0.0039	0.00358	BLUE	0.0040	0.00372	BLUE	0.0045	0.00420	BLUE	0.0054	0.00496	BLUE	0.0059	0.00542	BLUE
BW3	83	cohesive-med	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
BW4	876	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
BW4			0.0000			0.0000			0.0000			0.0000			0.0000		
BW5	782	cohesive-med	0.0000	0.01924	BLUE	0.0000	0.02061	BLUE	0.0000	0.02327	BLUE	0.0000	0.02754	BLUE	0.0000	0.03306	BLUE
BW5			0.3235			0.3360			0.3795			0.4400			0.4902		
BW5			0.1849			0.1920			0.2169			0.2566			0.2801		
BW5			0.0007			0.0007			0.0008			0.0010			0.0019		
BW6	934	cohesive-soft	0.4754	0.01552	BLUE	0.4938	0.01611	BLUE	0.5576	0.01820	BLUE	0.6589	0.02153	BLUE	0.7269	0.02350	BLUE
BW7	399	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
BW7			0.0000			0.0000			0.0000			0.0000			0.0000		
BW7			0.0000			0.0000			0.0000			0.0000			0.0000		
BW7			0.0000			0.0000			0.0000			0.0000			0.0000		
BW7			0.0000			0.0000			0.0000			0.0000			0.0000		
BW9	127	cohesive-med	0.0008	0.00020	BLUE	0.0008	0.00020	BLUE	0.0010	0.00023	BLUE	0.0011	0.00027	BLUE	0.0012	0.00030	BLUE
BW10	1181	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
BW10			0.0000			0.0000			0.0000			0.0000			0.0000		
BW10			0.0000			0.0000			0.0000			0.0000			0.0000		
BW10			0.0000			0.0000			0.0000			0.0000			0.0000		
BW10			0.0000			0.0000			0.0000			0.0000			0.0000		
BW11	1422	cohesive-soft	0.0132	0.45104	YELLOW	0.0138	0.46527	YELLOW	0.0156	0.52884	YELLOW	0.0184	0.62604	YELLOW	0.0201	0.68313	YELLOW
BW11			0.0106			0.0110			0.0124			0.0147			0.0160		
BW11			0.3117			0.3236			0.3657			0.4327			0.4722		
BW11			0.3414			0.3546			0.4008			0.4739			0.5172		
BW11			0.2089			0.2169			0.2449			0.2899			0.3164		
BW11			4.0602			4.2146			4.7896			5.6352			6.1490		
BW11			11.6572			12.1029			13.6863			16.1802			17.6559		

BW 8 not included since it is part of a game refuge

TABLE C-8. SEDIMENTS TO BACKWATERS, MISSISSIPPI RIVER POOL 13
BASED ON 50% ROLLUP and SEPTEMBER 2000 FAUCETT TRAFFIC FORECAST

			WITHOUT PROJECT						ALTERNATIVE B			ALTERNATIVES E, F, and J			ALTERNATIVES K and L		
			YEAR 2000 - 2,231 TOWS			YEAR 2050 - 2,483 TOWS			YEAR 2050 - 2,784 TOWS			YEAR 2050 - 3,169 TOWS			YEAR 2050 - 3,622 TOWS		
BW Number	WATER AREA (acres)	ADJACENT SEDIMENT TYPE	LOAD into BW (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	LOAD into BW (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	LOAD into BW (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	LOAD into BW (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	LOAD into BW (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR
BW1	746	cohesive-med	0.0007	0.00003	BLUE	0.0007	0.00003	BLUE	0.0008	0.00003	BLUE	0.0009	0.00004	BLUE	0.0011	0.00004	BLUE
BW1			0.0000			0.0000			0.0000			0.0000			0.0000		
BW2	33	noncohesive	0.0036	0.00336	BLUE	0.0040	0.00373	BLUE	0.0045	0.00418	BLUE	0.0051	0.00476	BLUE	0.0057	0.00529	BLUE
BW3	83	cohesive-med	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
BW4	876	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
BW4			0.0000			0.0000			0.0000			0.0000			0.0000		
BW5	782	cohesive-med	0.0000	0.01659	BLUE	0.0000	0.02067	BLUE	0.0000	0.02319	BLUE	0.0000	0.02636	BLUE	0.0000	0.02932	BLUE
BW5			0.3031			0.3370			0.3781			0.4297			0.4781		
BW5			0.1732			0.1926			0.2160			0.2455			0.2732		
BW6			0.0006			0.0007			0.0008			0.0009			0.0010		
BW6	734	cohesive-soft	0.4452	0.01453	BLUE	0.4952	0.01616	BLUE	0.5554	0.01813	BLUE	0.6313	0.02060	BLUE	0.7023	0.02294	BLUE
BW7	399	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
BW7			0.0000			0.0000			0.0000			0.0000			0.0000		
BW7			0.0000			0.0000			0.0000			0.0000			0.0000		
BW7			0.0000			0.0000			0.0000			0.0000			0.0000		
BW7			0.0000			0.0000			0.0000			0.0000			0.0000		
BW9	127	cohesive-med	0.0008	0.00018	BLUE	0.0008	0.00020	BLUE	0.0010	0.00023	BLUE	0.0011	0.00026	BLUE	0.0012	0.00028	BLUE
BW10	1181	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
BW10			0.0000			0.0000			0.0000			0.0000			0.0000		
BW10			0.0000			0.0000			0.0000			0.0000			0.0000		
BW10			0.0000			0.0000			0.0000			0.0000			0.0000		
BW10			0.0000			0.0000			0.0000			0.0000			0.0000		
BW11	1122	cohesive-soft	0.0124	0.42213	YELLOW	0.0138	0.46951	YELLOW	0.0155	0.52861	YELLOW	0.0176	0.59845	YELLOW	0.0196	0.66596	YELLOW
BW11			0.0099			0.0110			0.0123			0.0140			0.0168		
BW11			0.2923			0.3251			0.3646			0.4144			0.4611		
BW11			0.3202			0.3560			0.3993			0.4539			0.5050		
BW11			0.1955			0.2174			0.2438			0.2771			0.3084		
BW11			3.7960			4.2246			4.7398			5.3846			5.9920		
BW11			10.9109			12.1353			13.6111			15.4679			17.2118		

BW 8 not included since it is part of a game refuge

TABLE 8. SEDIMENTS TO SECONDARY CHANNELS, MISSISSIPPI RIVER POOL 13

BASED ON 50% ROLLUP

				WITHOUT PROJECT						ALTERNATIVE B			ALTERNATIVES E, F, and J			ALTERNATIVES K and L		
				YEAR 2000 - 2,361 TOWS			YEAR 2050 - 2,451 TOWS			YEAR 2050 - 2,768 TOWS			YEAR 2050 - 3,280 TOWS			YEAR 2050 - 3,576 TOWS		
SEC Number	WATER AREA (acres)	AVG. DEPTH (ft)	ADJACENT SEDIMENT TYPE	LOAD into SEC acre-ft/yr	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	LOAD into SEC acre-ft/yr	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	LOAD into SEC acre-ft/yr	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	LOAD into SEC acre-ft/yr	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	LOAD into SEC acre-ft/yr	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR
SEC1	124	5.3	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC2	69	5.4	cohesive-med	0.0000	0.00001	BLUE	0.0000	0.00001	BLUE	0.0000	0.00001	BLUE	0.0000	0.00001	BLUE	0.0000	0.00001	BLUE
SEC3	4	1.4	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC4	20	6.3	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC5	39	2.9	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC6	28	4.0	cohesive-med	0.0000	0.00003	BLUE	0.0000	0.00003	BLUE	0.0000	0.00003	BLUE	0.0000	0.00003	BLUE	0.0000	0.00004	BLUE
SEC7	333	6.1	cohesive-med	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC8	79	8.5	cohesive-soft	0.3126	0.12061	YELLOW	0.3246	0.12525	YELLOW	0.3666	0.14146	YELLOW	0.4347	0.16771	YELLOW	0.4736	0.18274	YELLOW
SEC9	39	2.4	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC10	48	6.5	cohesive-med	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC11	44	3.8	cohesive-med	0.0006	0.00057	BLUE	0.0008	0.00059	BLUE	0.0010	0.00068	BLUE	0.0011	0.00079	BLUE	0.0012	0.00086	BLUE
SEC12	28	2.9	cohesive-med	0.2393	0.26049	YELLOW	0.2484	0.27042	YELLOW	0.2805	0.30539	YELLOW	0.3326	0.36209	YELLOW	0.3624	0.39454	YELLOW

TABLE C-6. SEDIMENTS TO SECONDARY CHANNELS, MISSISSIPPI RIVER POOL 13
BASED ON 50% ROLLUP and SEPTEMBER 2000 FAUCETT TRAFFIC FORECAST

				WITHOUT PROJECT						ALTERNATIVE B			ALTERNATIVES E, F, and J			ALTERNATIVES K and L		
				YEAR 2000 - 2,231 TOWS			YEAR 2050 - 2,483 TOWS			YEAR 2050 - 2,784 TOWS			YEAR 2050 - 3,165 TOWS			YEAR 2050 - 3,522 TOWS		
	WATER	AVG.	ADJACENT	LOAD	SEDIMENT		LOAD	SEDIMENT		LOAD	SEDIMENT		LOAD	SEDIMENT		LOAD	SEDIMENT	
SEC	AREA	DEPTH	SEDIMENT	into SEC	DELIVERED	IMPACT	into SEC	DELIVERED	IMPACT	into SEC	DELIVERED	IMPACT	into SEC	DELIVERED	IMPACT	into SEC	DELIVERED	IMPACT
Number	(acres)	(ft)	TYPE	acre-ft/yr	(cm/yr)	COLOR	acre-ft/yr	(cm/yr)	COLOR	acre-ft/yr	(cm/yr)	COLOR	acre-ft/yr	(cm/yr)	COLOR	acre-ft/yr	(cm/yr)	COLOR
SEC1	124	5.3	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC2	69	5.4	cohesive-med	0.0000	0.00001	BLUE	0.0000	0.00001	BLUE	0.0000	0.00001	BLUE	0.0000	0.00000	BLUE	0.0000	0.00001	BLUE
SEC3	4	1.4	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC4	20	6.3	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC5	39	2.9	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC6	28	4.0	cohesive-med	0.0000	0.00003	BLUE	0.0000	0.00003	BLUE	0.0000	0.00003	BLUE	0.0000	0.00000	BLUE	0.0000	0.00003	BLUE
SEC7	333	6.1	cohesive-med	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC8	79	8.5	cohesive-soft	0.2929	0.11300	YELLOW	0.3257	0.12566	YELLOW	0.3654	0.14097	YELLOW	0.0000	0.00000	YELLOW	0.3742	0.14436	YELLOW
SEC9	39	2.4	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC10	48	6.5	cohesive-med	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC11	44	3.8	cohesive-med	0.0006	0.00053	BLUE	0.0006	0.00059	BLUE	0.0010	0.00066	BLUE	0.0000	0.00000	BLUE	0.0010	0.00068	BLUE
SEC12	28	2.9	cohesive-med	0.2239	0.24372	YELLOW	0.2490	0.27108	YELLOW	0.2793	0.30407	YELLOW	0.0000	0.00000	YELLOW	0.2861	0.31144	YELLOW

TABLE 15. SEDIMENTS TO BACKWATERS AND SECONDARY CHANNELS, ILLINOIS WATERWAY, LAGRANGE POOL

BASED ON 50% ROLLUP

			ALTERNATIVES B, E, & L											
			WITHOUT PROJECT						ALTERNATIVE F			ALTERNATIVES J & K		
			YEAR 2000 - 3,955 TOWS			YEAR 2050 - 5,633 TOWS			YEAR 2050 - 6,173 TOWS			YEAR 2050 - 6,124 TOWS		
BW or SEC Number	WATER AREA (acres)	ADJACENT SEDIMENT TYPE	SEDIMENT LOAD (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	SEDIMENT LOAD (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	SEDIMENT LOAD (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	SEDIMENT LOAD (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR
BW1	3437	cohesive-med	0.0002	0.00000	BLUE	0.0003	0.00000	BLUE	0.0003	0.00000	BLUE	0.0003	0.00000	BLUE
BW2	171	noncohesive	0.5750	0.10249	YELLOW	0.8189	0.14596	YELLOW	0.8973	0.15994	YELLOW	0.8897	0.15858	YELLOW
BW3	398	noncohesive	0.0000	0.00000	BLUE	0.0001	0.00000	BLUE	0.0001	0.00000	BLUE	0.0001	0.00000	BLUE
BW4	2080	cohesive-med	0.7909	0.01159	BLUE	1.1266	0.01651	YELLOW	1.2348	0.01809	YELLOW	1.2240	0.01794	YELLOW
BW5	993	cohesive-med	0.5383	0.05258	YELLOW	0.7666	0.07489	YELLOW	0.8402	0.08209	YELLOW	0.8330	0.08138	YELLOW
BW5		cohesive-med	1.0446			1.4876			1.6308			1.6166		
BW5		cohesive-med	0.1302			0.1854			0.2033			0.2015		
BW6	15	cohesive-med	0.7076	1.79139	RED	1.0080	2.04822	RED	1.1048	2.24497	RED	1.0951	2.22522	RED
BW8	179	cohesive-med	0.1740	0.02963	BLUE	0.2478	0.04220	BLUE	0.2716	0.04624	BLUE	0.2692	0.04585	BLUE
SEC1	7	cohesive-med	20.0099	87.1290	RED	28.4928	124.0657	RED	31.2189	135.9360	RED	30.9593	134.80572	RED
SEC2	21	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC3	10	cohesive-med	0.0468	0.14251	YELLOW	0.0666	0.20312	YELLOW	0.0730	0.22266	YELLOW	0.0724	0.22063	YELLOW
SEC5	6	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00001	BLUE	0.0000	0.00001	BLUE	0.0000	0.00001	BLUE
SEC6	69	noncohesive	0.7611	0.33621	YELLOW	1.0841	0.47888	YELLOW	1.1881	0.52484	YELLOW	1.1778	0.52026	YELLOW
SEC7	24	noncohesive	0.0024	0.00302	BLUE	0.0034	0.00431	BLUE	0.0037	0.00472	BLUE	0.0037	0.00468	BLUE
SEC8	18	cohesive-med	0.0016	0.00306	BLUE	0.0023	0.00436	BLUE	0.0025	0.00479	BLUE	0.0025	0.00474	BLUE

B 7 not included because tributary flows through it. SEC4 not included due to insufficient data

TABLE C-9. SEDIMENTS TO BACKWATERS AND SECONDARY CHANNELS, ILLINOIS WATERWAY, LAGRANGE POOL
BASED ON 50% ROLLUP and SEPTEMBER 2000 FAUCETT TRAFFIC FORECAST

			ALTERNATIVES B, E, & L											
			WITHOUT PROJECT						ALTERNATIVE F			ALTERNATIVES J & K		
			YEAR 2000 - 3,547 TOWS			YEAR 2050 - 5,313 TOWS			YEAR 2050 - 5,446 TOWS			YEAR 2050 - 5,517 TOWS		
BW or SEC Number	WATER AREA (acres)	ADJACENT SEDIMENT TYPE	SEDIMENT LOAD (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	SEDIMENT LOAD (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	SEDIMENT LOAD (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR	SEDIMENT LOAD (acre-ft/yr)	SEDIMENT DELIVERED (cm/yr)	IMPACT COLOR
BW1	3437	cohesive-med	0.0002	0.00000	BLUE	0.0002	0.00000	BLUE	0.0002	0.00000	BLUE	0.0003	0.00000	BLUE
BW2	171	noncohesive	0.5157	0.09192	BLUE	0.7723	0.13765	YELLOW	0.7917	0.14111	YELLOW	0.8020	0.14295	YELLOW
BW3	398	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0001	0.00000	BLUE
BW4	2080	cohesive-med	0.7090	0.01039	BLUE	1.0626	0.01557	YELLOW	1.0666	0.01596	YELLOW	1.1031	0.01616	YELLOW
BW5	993	cohesive-med	0.4625	0.04717	BLUE	0.7231	0.07068	YELLOW	0.7410	0.07243	YELLOW	0.7506	0.07338	YELLOW
BW5		cohesive-med	0.9372			1.4044			1.4391			1.4579		
BW5		cohesive-med	0.1170			0.1753			0.1796			0.1820		
BW6	15	cohesive-med	0.6351	1.60748	RED	0.9515	1.93354	RED	0.9752	1.98167	RED	0.9880	2.00771	RED
BW8	179	cohesive-med	0.1560	0.02657	BLUE	0.2337	0.03979	BLUE	0.2395	0.04079	BLUE	0.2427	0.04132	BLUE
SEC1	7	cohesive-med	17.9649	78.2242	RED	26.8967	117.1159	RED	27.5735	120.0628	RED	27.9314	121.62117	RED
SEC2	21	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE	0.0000	0.00000	BLUE
SEC3	10	cohesive-med	0.0421	0.12819	YELLOW	0.0630	0.19210	YELLOW	0.0646	0.19691	YELLOW	0.0655	0.19953	YELLOW
SEC5	6	noncohesive	0.0000	0.00000	BLUE	0.0000	0.00001	BLUE	0.0000	0.00001	BLUE	0.0000	0.00001	BLUE
SEC6	69	noncohesive	0.6833	0.30198	YELLOW	1.0247	0.45268	YELLOW	1.0509	0.46381	YELLOW	1.0637	0.46990	YELLOW
SEC7	24	noncohesive	0.0021	0.00271	BLUE	0.0032	0.00407	BLUE	0.0033	0.00416	BLUE	0.0033	0.00422	BLUE
SEC8	16	cohesive-med	0.0014	0.00276	BLUE	0.0022	0.00413	BLUE	0.0022	0.00423	BLUE	0.0022	0.00428	BLUE

BW7 not included because tributary flows through it. SEC4 not included due to insufficient data

Attachment 9

READ-AHEAD PACKET
FOR
NECC MEETING/MITIGATION
PLANNING WORKSHOP
NOVEMBER 28-29 2000

by

Rich Fristik

Biologist
US Army Corps of Engineers – Rock Island District

31st Meeting of the NECC
November 28 and 29, 2000

READ-AHEAD FOR NECC MEETING/MITIGATION PLANNING WORKSHOP NOVEMBER 28-29, 2000

Introduction

Based on additional information presented on proposed mitigation and follow-on discussion at the NECC meeting of September 18-19, 2000, desire was expressed to hold a workshop to begin more detailed discussion of mitigation implementation for the Navigation Study. This was agreed to, but with the stipulation that this workshop would focus on the broad issues of potential management frameworks, implementation mechanisms, and any additional approaches, tools or measures that the NECC feels should be put on the table. The workshop will not attempt to conduct detailed site-, pool- or reach-specific mitigation planning. If time permits, a pool-scale example may be addressed.

Goals and Objectives (Broad)

As presented at previous NECC meetings, the following are suggested as general goals and objectives for mitigation planning. These consider NEPA requirements and both COE and FWS mitigation policy and guidelines.

1. **Avoid and minimize measures will be emphasized, and any compensation will be habitat based**. This approach follows the 'mitigation hierarchy' listed in the CEQ NEPA implementing Regulations (40 CFR, part 1508.20) and U.S. Fish and Wildlife Service (FWS) mitigation policy goals. Draft resource categories submitted by the FWS during study coordination also emphasize habitats (listing of categories will be available at workshop).
2. **Mitigation planning will be conducted in a collaborative manner with other state and federal agencies**.
3. **Utilize an adaptive approach to implementing mitigation measures.** Adaptive planning implies ongoing monitoring of traffic levels, resultant impacts and mitigation measures or programs, tying measured effectiveness (or non-effectiveness) of measures to goals for addressing specific resource impacts. Put simply, the idea is to determine if mitigation is working, and if not, make necessary modifications to the plan.
4. **Link projects or measures to resource impacts spatially and temporally**. Results indicate that impacts are 'spotty' in nature, and mitigation measures should be designed to address these impacts when and where they occur. Some resource groups, e.g., larval fish, may be more difficult to address spatially, and will likely require a pool or reach focus.

Goals and Objectives (Specific to this Workshop)

- Final solicitation of additional mitigation measures, tools or approaches.
- Discuss potential management frameworks; draft components of a charter as required.
- If time/interest permits, conduct a pool-specific mitigation planning example.
- Determine next steps, in light of overall study schedule and funding considerations.

Alternative Management Frameworks (for consideration and discussion)

1. Continuation of NECC and GLC as is, with added management or oversight responsibility for mitigation implementation.
2. A newly-formed mitigation steering committee similar to that proposed in the 2nd Lock CAR (see excerpt below from Navigation Study draft CAR, section B.3., for description).

3. Re-chartering of existing committees/coordinating bodies, e.g., RRCT, FWIC, RRF, (similar group in MVS?), EMP-CC, etc.
4. Re-visit UMRBA alternative institutional arrangements for management of UMR Basin, resulting from their 1994 conference.
5. Trust fund concept; disadvantages, advantages, management oversight.

Excerpt on mitigation from Navigation Study Draft Coordination Act Report (CAR) [text provided by Jon Duyvejonck, FWS – Rock Island Field Office]

A. Continue funding support to the Environmental Management Program (EMP). Without the EMP, the current level of knowledge concerning navigation impacts gained thus far would not have been possible. The EMP's Habitat Rehabilitation and Enhancement Program should be considered as a means to evaluate the effectiveness of different types of measures that could mitigate Nine-foot Channel Navigation Project effects. Monitoring and evaluation of mitigation measures should be integrated into the LTRMP so that, habitat values can be maximized and dollar costs minimized.

B. Implement an adaptive mitigation approach that comprehensively mitigates for all incremental traffic effects as well as the Second Lock, baseline traffic, and O&M effects. Because of the extreme uncertainty associated with future impacts, a strategy that allows flexibility in implementing mitigation actions is necessary. The adaptive approach should include the ability to monitor mitigation actions to evaluate their effectiveness for future actions. Therefore, we recommend that an adaptive mitigation strategy be developed that includes the following:

1. Since the majority of navigation effects are anticipated to occur during the latter half of the fifty-year project life, funding for a comprehensive mitigation plan should be provided by a trust fund that allows for funding over the fifty- year life of the project. This is necessary to assure the availability of funding after the completion of the proposed improvements.

2. An independent panel of scientists should be convened to give assistance in preparing a General Plan to: (a) improve the quantification of incremental, Second Lock, O&M, and baseline traffic effects; and (b) develop a strategy to implement an adaptive mitigation approach.

3. A Navigation Mitigation Steering Committee consisting of the Corps, Service, and state agencies should be established immediately. The Committee should be co-chaired by the Rock Island District and the Rock Island Ecological Services Field Office. The Committee will provide direction to adaptive mitigation implementation but should utilize the existing fish and wildlife work groups (e.g., River Resources Forum in the St. Paul District, the River Resources Coordinating Team in the Rock Island District, and any similar group in the St. Louis District) for development and implementation of specific projects. Membership should include the state agencies and the U.S. Environmental Protection Agency. Voting members should include one each from the following: a) Corps of Engineers; b) Fish and Wildlife Service; c) Iowa Department of Natural Resources; d) Illinois Department of Natural Resources; e) Minnesota Department of Natural Resources; f) Missouri Department of Conservation; and g) Wisconsin Department of Natural Resources.

4. The Committee should monitor work being done through the EMP to insure that applicable information is being incorporated into the adaptive mitigation planning

process. The Corps, in co-leadership with the Service, should complete a General Plan for implementing adaptive mitigation. The plan should use available information obtained from the EMP's habitat rehabilitation and long- term monitoring programs as well as additional information from studies needed to fill data gaps recognized in this investigation. This General Plan should be endorsed by the Committee. The adaptive mitigation concept will develop short-term (5-year) mitigation implementation plans. As one term comes to an end, the Corps, with assistance from the Service and in cooperation with the Committee, will evaluate the effectiveness of mitigation measures. This information, along with new data, will be used to develop the mitigation implementation plan for the next term. The goal is to always have full compensation of unavoidable habitat losses.

5. The General Plan will address actions which should be taken concurrent with navigation improvement construction. The General Plan should also address the mitigation funding requirements and allocations so that funding is insured throughout the life of the project and achieves the greatest mitigation value. The plan should be updated as the results of monitoring studies become available.

6. An initial mitigation implementation plan should be developed under the co-leadership of the Corps and the Service. It should be endorsed by the Committee. Primarily, the first term plan should implement all feasible measures to avoid and minimize impacts.

7. The District should complete all subsequent plans in sufficient time to be entered into the Corps' budget cycle and insure adequate funding. Compensation to mitigate adverse impacts should not be considered until all practicable measures to avoid and minimize impacts have been implemeted.

Attachment 10

FWIC CHARTER

Available Upon Request

31st Meeting of the NECC
November 28 and 29, 2000

Attachment 11

NAVIGATION STUDY CHARTER

Available Upon Request

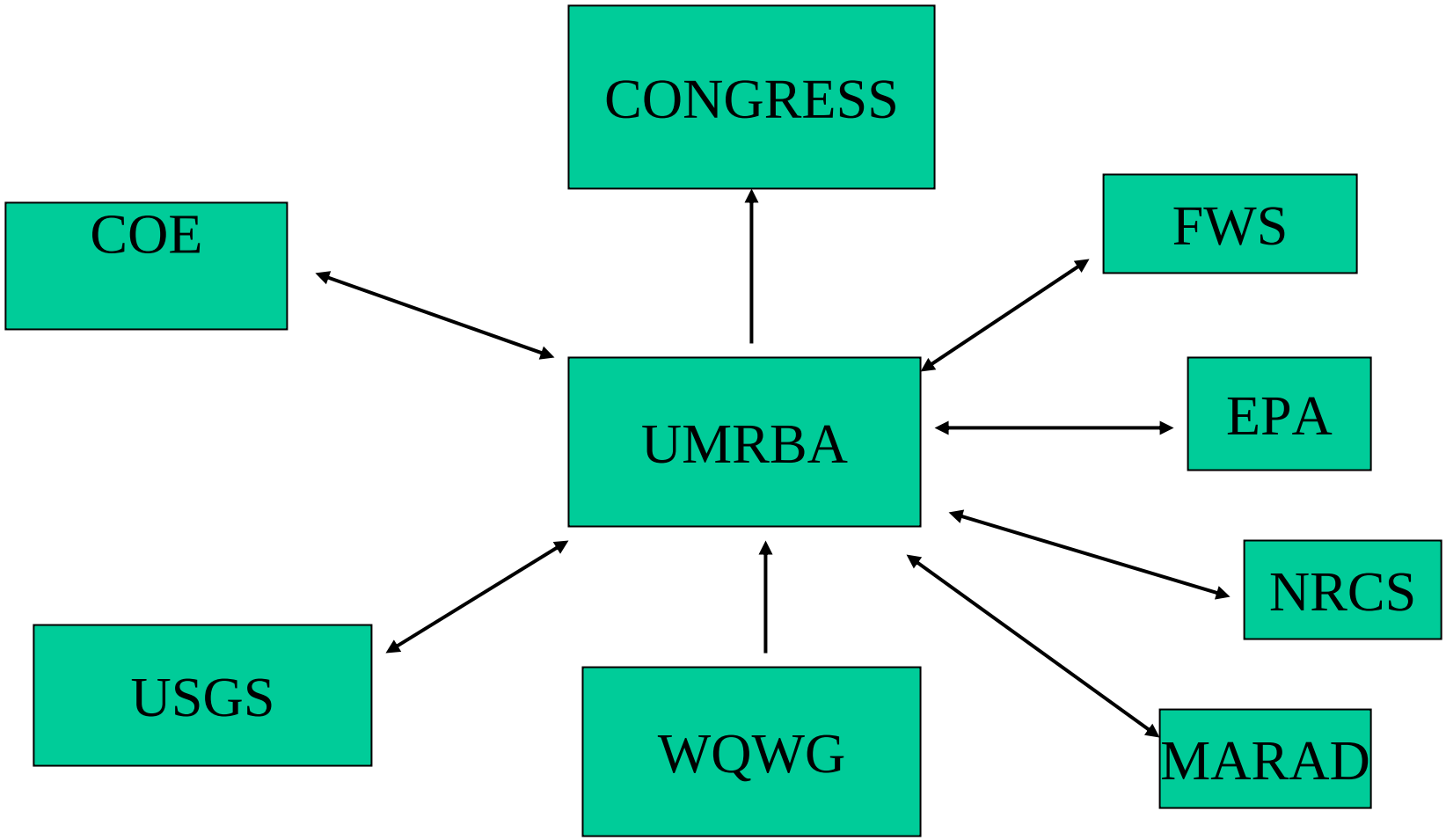
31st Meeting of the NECC
November 28 and 29, 2000

Attachment 12

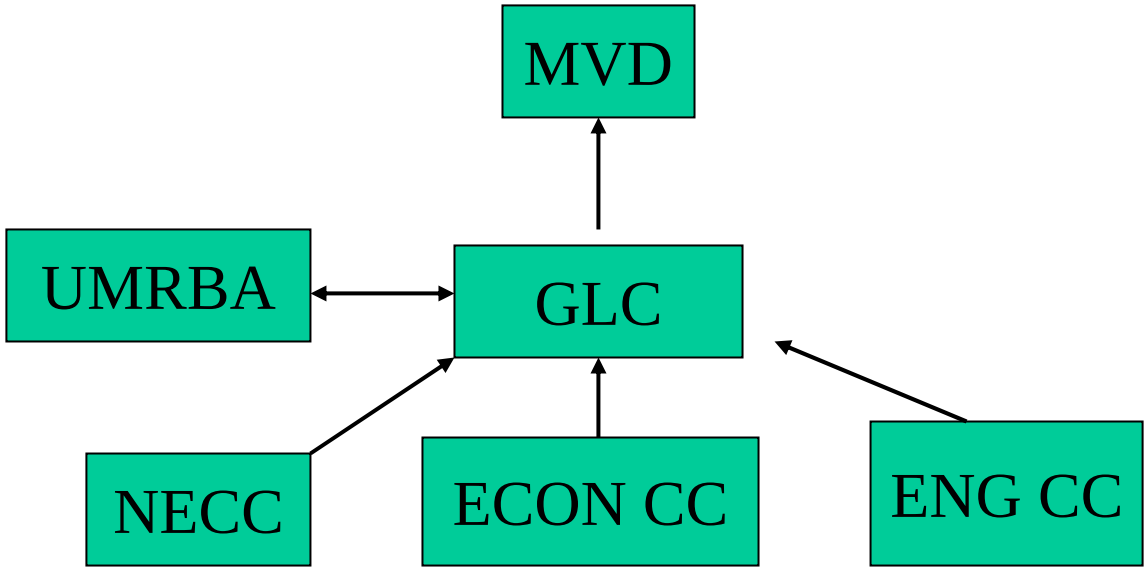
SUMMARY OF ORGANIZATION DIAGRAMS AND OTHER NOTES RECORDED ON FLIP CHARTS DURING THE 31ST NECC

31st Meeting of the NECC
November 28 and 29, 2000

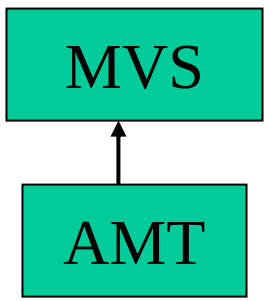
River Management Policy



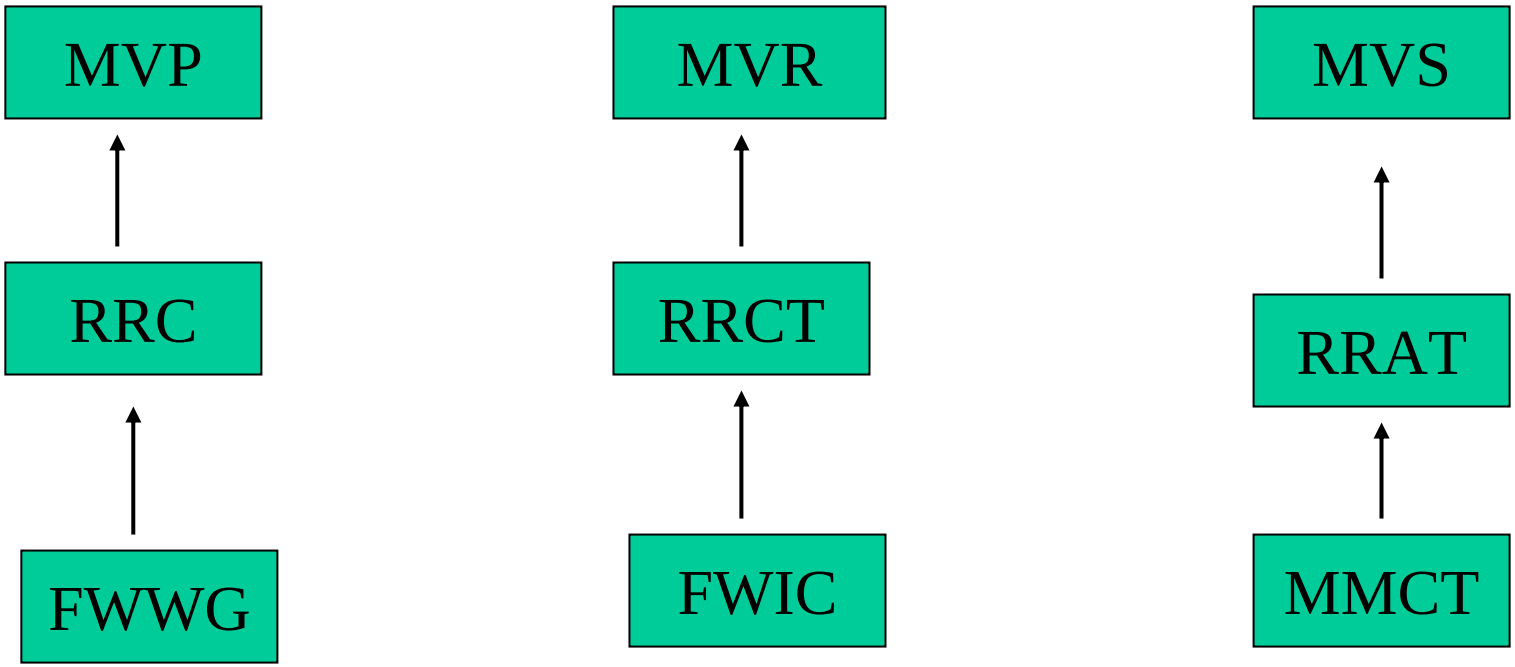
Nav Study



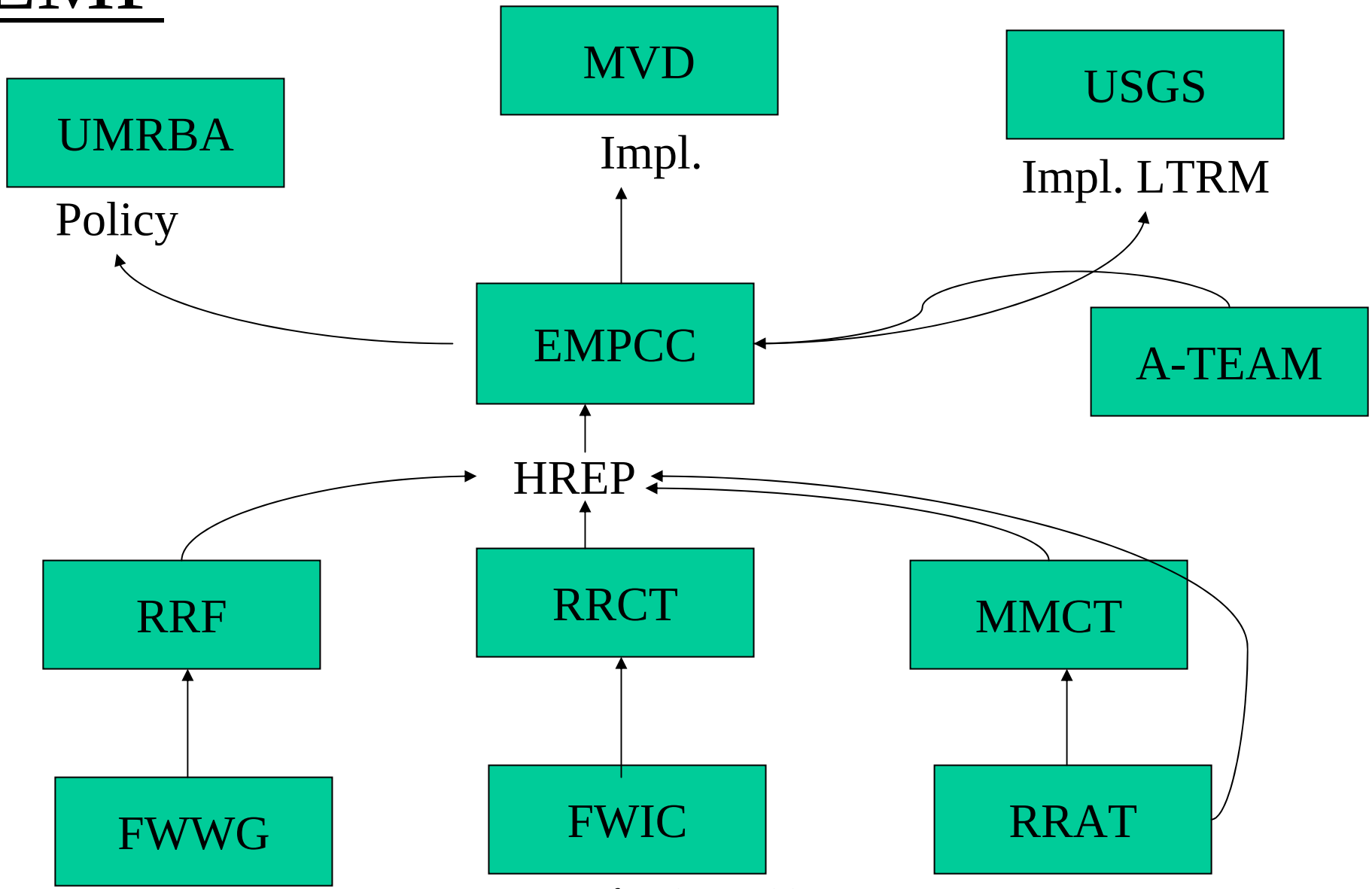
AVOID & MINIMIZE



CHANNEL MAINTENANCE



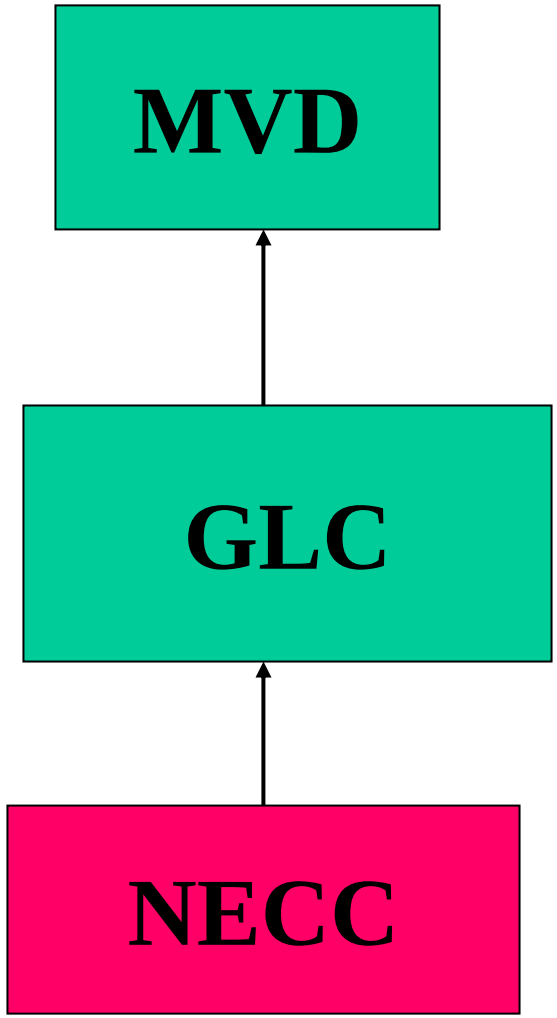
EMP


MVD
Impl.
USGS
Impl. LTRM
UMRBA
Policy
EMPCC
A-TEAM
HREP
RRF
RRCT
MMCT
FWWG
FWIC
RRAT

Alternatives frameworks for implementing mitigation

1. **Keep the NECC and the GLC**
2. **Develop complete new steering committee with FWS and Corps as co-chairs.**
3. **Modify existing systems. (A recharter of the EMPCC is one possibility.**

1. Keep NECC and GLC



Alt 1: Keep NECC and GLC

PROS:

- Institutional knowledge
- Detailed site specific
- Charter tiering clear

CONS:

- Synergize not as well w/other initiatives
- NECC is advisory group, not administrative
- Resource support from agencies
- No clear authority relationship to GLC

Alt. 2: Develop New Committee

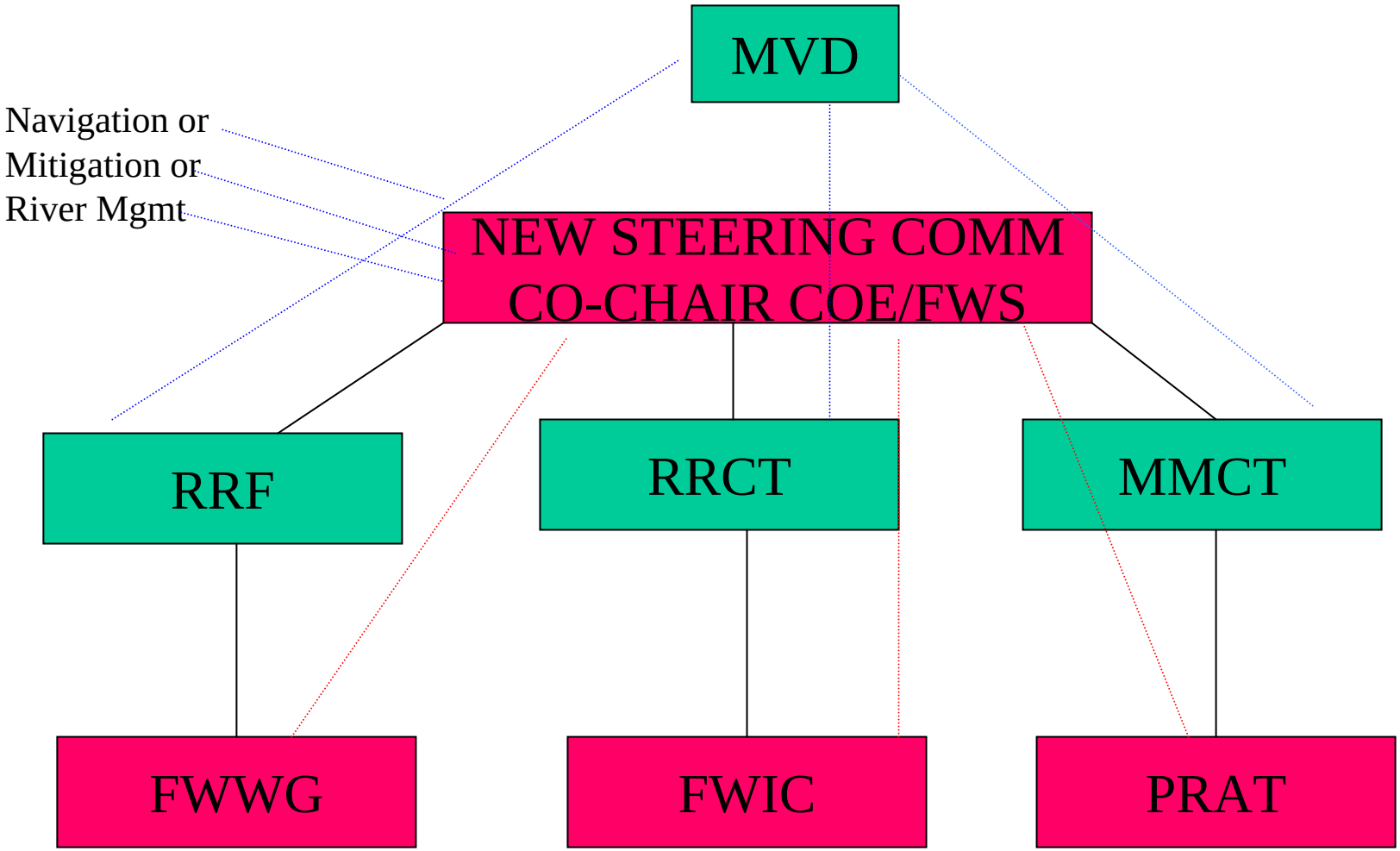
PROS

1. Technical use existing organization
2. Focused on adaptive mitigation

CONS

1. Existing Groups overloaded
2. New Steering Committee may not have natural resource focus
3. Redundant may not take advantage of other opportunities
4. New committee –vs- using existing structures in place

Alt. 2: Develop New Committee



3. Modify Exisiting and System Ecological Team

PROS

•Reduce redundancy

•Better integration between programs

•Co-chaired by FWS/COE

CONS

•Confuse lines of funding and authority

•Overload EMP CC

•Dual membership to meet workload. Potential refusal of existing groups to add to charter

Roles of Alt 3 (See Slide #14)

Level 1: Technical Field Personnel

- Assist in Detailed planning for implementation & monitoring

Level 2: Administrative level (RRF, RRCT and MMCT)

- Assist in prioritization at District level.
- More Focus on admin issues limited funding.
- State priorities

Level 3 System Technical Team

- Independent new ideas from other others
- Objective review
- Science addition
- Evaluate rec from EA Dist determine cont on goals
- Technical input to planning & design

Roles of Alt 3 (con't)

Level 4: EMPCC

- Systemic regional priority
- Allocation of funds relative to priorities
- Integration in other programs

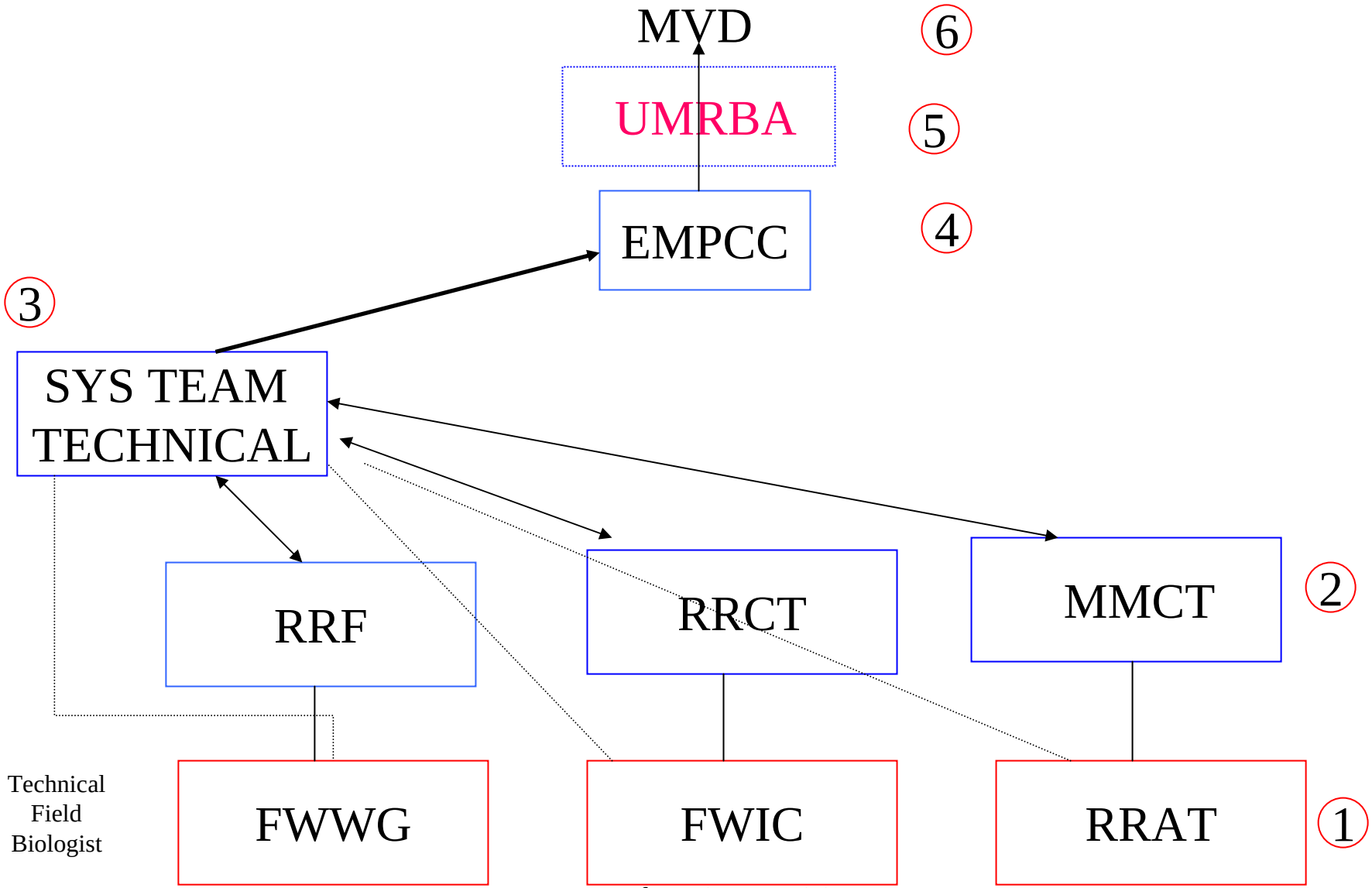
Level 5: Advocates (UMRBA)

- AG, commercial, transportation
- State level input conflicting interests
- Constructive criticism

Level 6: MVD

- Higher authority
- Budget test
- Regional PM
- FED Policy

Alt 3 MOD Existing



Trust Fund Models

MN RIVER
ST. CROIX

Trust Fund

Issues and Alts

1. Lock box earmarked
2. Not for profit org. 501 C3 Board of Dir.
3. Inland waterway trust fund to mitigation account

<u>River Commission Role</u>

1. Trad –vs- 2. Trust Fund

NECC

FWIC

RRF ← FWWG

RRAT

EMPCC

UMBRA

GLC

RRCT

FWIG

A-TEAM
SYST-TEAM