

APPROVED MINUTES

25th Meeting of the NECC
May 4-5, 1999
Holiday Inn - Moline, IL

by

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(CEMVR-PM-R)

Navigation Environmental Coordination Committee (NECC)

May 4-5, 1999

Holiday Inn, Moline, Illinois

1. Welcome and Approval of Minutes of Last Meeting

The twenty-fifth meeting of the NECC was called to order by Ken Barr. An attendance list is provided as *Attachment 1*. The minutes of the January 11-12, 1999 meeting were approved with suggested revisions provided by Gretchen Benjamin.

2. Ken Barr - Study Status and Economic Modeling

Powerpoint presentation provided as *Attachment 2*.

Review of Study Objectives and Engineering Considerations (Slides 1-14)

- Ken reiterated that the primary reason the Navigation Feasibility Study was undertaken was to identify ways to reduce costly delays associated with double lockage.
- The Corps has received Congressional approval for increased funding and time extension to reflect the delay associated with the review of the Economics Model. The Navigation Feasibility Study will be completed by December 2000 at a total cost of \$55.6 million:

<u>Work Group</u>	<u>Cost (Mil)</u>
Environmental	\$23.73
Historic Properties	1.35
Economics	6.74
Engineering	13.63
Public Involvement	2.46
<u>Project/Study Mgmt</u>	<u>7.69</u>
TOTAL	\$55.60

- Engineering measures were evaluated based on cost and benefits. Benefits were primarily viewed in terms of time savings associated with lockage which could easily be converted into a \$ value.

<u>Measure</u>	<u>Average Time Savings</u>	<u>Average First Cost³</u>
• Lock Extension	45 min	\$113-135M/lock
• Guidewall Ext.	20 min upbound ¹	\$36M/lock
w/ Powered Kevels	23 min downbound ¹	
• 2 Switchboats	22 min upbound ¹	\$35M/lock
w/Guidewall Ext	27 min downbound ¹	(plus boat cost)
• Improve Channel	3 min downbound	\$600k/site (11 Sites)
• Adjacent Moorings	7-13 min/exchange	\$50k/buoy
		\$500k/cell

Notes:

1. Only applicable to turnback lockages.
2. Applicable to all lockages.
3. Costs exclude impacts to navigation during construction, system environmental costs, and other life-cycle costs.

Questions/Comments:

Rick Nelson: Question regarding the pre-Engineering design and associated costs.

Ken Barr: 7-million dollars was included in the feasibility study to do pre-design engineering once a recommendation was available. We are currently using this money for the detailed design of guidewalls. In the system study, there were provisions for a generic less detailed design. The Senate side of WRDA, if approved will provide funding for the engineering and design of 7 new locks.

Rick Nelson: How much will this design cost?

Ken Barr: Approximately 10% of construction costs. 113 to 135 mil new range for lock extensions with revisions in engineering. Small scale measures that are being carried forward: Guidewall Time savings 18 min

Ken Brummet: Don't the guidewalls also include some safety concerns.

Ken Barr: Yes

Gretchen Benjamin: What are channel improvements?

Ken Barr: In site specific report, channel realignment. Rock work, to help approach

Review of Economic Evaluation (Slides 18-41)

The economic considerations employed by the Corps included: commodity movements, traffic projections, economic models, and commodity demand curves. Economic Benefits were evaluated in terms of National Economic Development (NED) and Regional Economic Development (RED). Ken presented a series of slides which reviewed the considerations and economic benefits. The Economic modelling effort was discussed in detail, primarily focusing on the demand curves and values attributed to each commodity based on their elasticity. The economic model will generate a series of look up tables for expected traffic levels (average number of tows by Pool). As an example, Ken provided a series of Excel Spreadsheets showing traffic forecasts for three potential alternatives:

Alternative 1: implemented in 2008, mooring cells 12, 18, 20, 22, 24, and guidewalls 20-25

Alternative 2: implemented in 2012, locks at 20-25 plus guidewalls

Alternative 3: implemented in 2014, locks 20-25 plus LaGrange, Peoria

An example traffic forecast spreadsheet is provided for year 2020 (**Attachment 2**). NECC members were reminded that these spreadsheets were for a preliminary run of the economic model, which is still being refined. The Economic model is expected to be completed during Summer 1999 with a recommended plan coming out during Fall 1999.

Review of Public Involvement Activities (Slides 43-45)

Review of Plan Formulation Process and Schedule Deadlines (Slides 46-58)

Questions/Comments:

Rick Nelson: Has there been cost benefit analysis on these different scenarios?

Ken Barr: That is what they are currently undertaking, optimization process, once we have the preliminary NED plan, the environmental consequences will be projected

Rick Nelson: Am I correct in seeing that there will be a higher impact in upper reaches ie. 37 % increase in traffic?

Ken Barr: That is misleading. You need to look at the actual numbers of boats. The % increase on the upper system is based on a much lower base (i.e. 4 boats/day) than on the lower system (i.e. 12 boats/day).

3. Scott Estergard – State Listed Species Assessment

Powerpoint presentation provided as **Attachment 3**.

The state listed species assessment was accomplished by obtaining Natural Heritage Databases from each of the five UMR states. These databases contain a record of species sightings and collections in counties bordering the Mississippi and Illinois Rivers from the Twin Cities, MN to Cairo, IL and from Chicago, IL to the confluence with the Mississippi. Data was obtained for the period from 1994-1997. A total of 8306 records in the five databases were reviewed in this assessment. Some states provided greater detail than others in terms of the number of attributes associated with each siting or collection. The attribute columns ranged from 17 to 45, with Minnesota providing the most detailed assessment. Using a GIS query, the list was reduced in size by selecting only those records occurring within the floodplain. The list was reviewed for errors, updated, and species grouped by habitat type.

Some complications were encountered in trying to merge the datasets. For example, scientific and common names were not always consistent (esp. for plants), FIPS code errors in Illinois database, and state/federal status columns were mixed in WI database.

Site Specific Evaluation - Determined those species that have recorded occurrences within an approximate 2-mile radius of lock and dam sites. Potential impacts will be evaluated further when a recommended plan is formulated. This listing of species is included in Appendix G of the Site Specific Habitat Assessment (USACE 1998).

Systemic Evaluation - commercial traffic-related impacts were evaluated in terms of the direct and/or indirect effects on the following components: bank erosion, fish, mussels, and plants. Scott provided a series of slides demonstrating the systemic evaluation process for the aforementioned components (**Attachment 3, Slides 9-27**).

Preliminary Results - indicate that the majority of terrestrial impacts are restricted to the actual construction areas where lock expansion would occur. Aquatic species impacts are more complex and still need a more detailed evaluation and screening. The species impact assessment is being accomplished using a risk-analysis approach. Once the assessment is complete the results will be provided to the partner states and resource agencies for review and comment. Scott indicated that he hoped to have the report out for coordination in June/July 1999.

Questions/Comments:

Ken Barr: Is there any relationship between bank erosion and mussel beds?

Ken Brummet: Erosion of bank may change velocity around mussel bed, causing increased deposition or decreased food availability.

4. Kevin Landwehr – Hydraulic Classification

Kevin updated the group on the Hydraulic Classification work being carried out by staff at the Waterways Experiment Station (Tom Pokrefke). The WES group has finished coding model and have begun running the model on the various trend pools. Hydraulic classification two main differences

Analyses are using the most likely traffic configurations based upon Steve Maynords' analysis of traffic characteristics.

Single opening (outlet) backwaters - model assumes water that is sucked out is considered to be clean and what goes in is a function of ambient plus increase to re-suspension from wave action

Expect the Hydraulic Classification report will be completed by Mid June.

At the previous NECC meeting there was a comment regarding the use of a 300-foot main channel (by definition) for the NAVEFF (physical effects model). The Hydraulic Classification effort uses a more realistic approach and does allow for some flexibility.

Questions/Comments:

Steve Bartell: Selection of which vessels of 108 is random (Monte Carlo) but it is determined by those which are typical for each pool and each month. Using historic data

Bill Bertrand: This effort only calculates delivery to the backwater, and does not evaluate how much is carried in or out?

Kevin Landwehr: That is correct. This model calculates delivery to the doorstep.

5. Rich Fristik – Mitigation Planning

Rich Fristik provided a handout which contained a series of questions or concerns for the mitigation planning process (*Attachment 4*). NECC members were given this in advance of the Mitigation Planning discussion, which was scheduled for later in the meeting. Mitigation will be tied to the time period when a specific action is proposed to begin. For example, if lock expansion is not begun until 2015 mitigation efforts would not begin until that time. Mitigation efforts are likely to focus on critical time periods (spawning, migration) or limiting factors (fish passage, overwintering habitat). The following is the discussion, which resulted:

Bill Bertrand: Expressed concern about backwater sedimentation, maybe we do not have enough info to do this. Is it realistic to expect voluntary compliance by towboat captains to slow down their vessels to reduce re-suspension in sensitive areas? NGO's have picked up on the idea that increased navigation will increase sedimentation to backwaters. Hopefully we will have a list and maps of those backwaters that will be impacted. If the total number of impacted backwaters is relatively small then the public may buy into minor alterations, however if there are numerous impacted backwaters then it will be a much harder sell.

Ken Barr: We have the pieces necessary to do this type of analysis. Moving the navigation channel may also be an option as would dredging out problem backwaters.

Dan Wilcox: Another potential option would be to increase flow through backwater

Bill Bertrand: Increased flow may also caused increased deposition.

Rick Nelson: Sounds like I am hearing a suite of options that may vary from one area and backwater to the next. I don't think the vessel speed issue is very viable since past history has shown that barge operators are unwilling to slow down since it cost them money.

Gretchen Benjamin: Barge operators need to realize that if they are getting everything they want (navigation improvements) then they need to be willing to compromise.

Ken Barr: Mitigation of backwater habitat is likely to be multi-beneficial and compensate for various other resources, i.e. fish populations, plants, shorebirds, ect.

Dan Wilcox: We may design backwater complexes that may not be connected to the river and are more protected for most of the year since they would not be subjected to increased deposition from flood events.

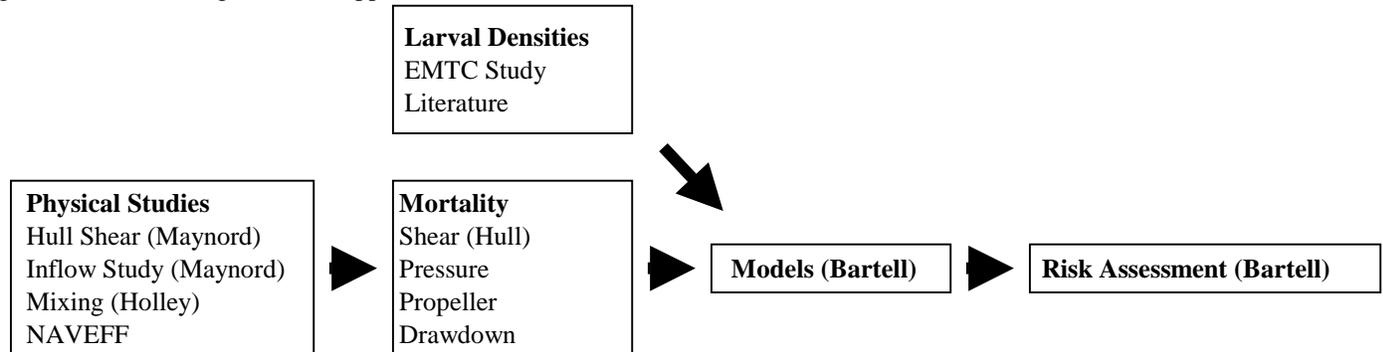
Scott Whitney: The Nature Conservancy of Illinois is attempting just such a project at Spunky Bottoms in the lower Illinois River. We should follow the progress of this project to determine its viability and benefits.

Ken Barr: Is there a sense that HREP projects are providing enhanced environmental resources and if so would you like to see more of such projects as a mitigation alternative. In essence, we are providing compensatory habitat and/or

food resources that create considerable more environmental benefits than the adverse conditions created by the barges.

6. Tom Keevin – Fish Impact Assessment

Tom provided a set of handouts which outlined the larval fish work completed for the Nav. Study (*Attachment 5*). In general, the following flowchart applies to the larval fish work:



Larval Mortality attributable to Shear Forces: 1976 paper by Morgan et al. was the only shear paper using LD₅₀ values. He compared to a ship hull passing through a concrete channel. He came up with a fixed value for his equations, Steve Maynord (WES) found a continuum of shear forces along the hull of a barge and at varying depths surrounding the vessel. Another paper by Lampra 1992 described shear values in a "collet cell" under all kinds of scenarios (he was compulsive). The "collet cell" was merely a cylindrical drum submersed in a water bath, as the cylinder increases in revolutions there is a proportionate increase in shear forces. This methodology has been used for a variety of items. Not looking at velocities of the propeller but looking at the forces that were generated. Did not have much of the basic information necessary to make these quantification's. Lab and field studies. Device was not capable of producing shear forces sufficient to calculate a LD 50. Overall not a lot of mortality. The bigmouth buffalo showed high mortality at 250 dynes/cm² (fast moving) in shallow water this was only in 5% of the water column under the barge (relatively small area)

Other sources of Information: Field studies of larval fish mortality have been conducted and published by Leslie Holland Bartells. One aspect of the Nav. Study was to evaluate larval mortality in P26 and Alton Reach. Another body of literature that is often overlooked is that generated by the Power Generating facilities along the UMRS. Most have some type of larval fish monitoring program however acquiring such information can be a monumental task.

Questions/Comments:

Jon Duyvejonck: Did you look at multiple exposure for the same group of individual larval fish?

Tom Keevin: No. This was the second most common criticisms of this study coming out of the ITR process. The most common criticism was that we did not use the right fish. Larval fish are extremely hard to work with especially the handling process, this mortality alone would out weigh effect of multiple effects.

Gretchen Benjamin: How much of the water goes through the gamut of forces: i.e. shear, turbulence, etc?

Tom Keevin: We may be able to calculate this but there will be some question as to the relevance.

Dan Wilcox: Shear pressure changes, stopping, acceleration/deceleration, impingement, abrasion are items that are looked at by the power industry we do not have estimates for towboats. Odum and Leslie Holland-Bartells tried this test in the field and both failed since there are numerous uncontrollable variables

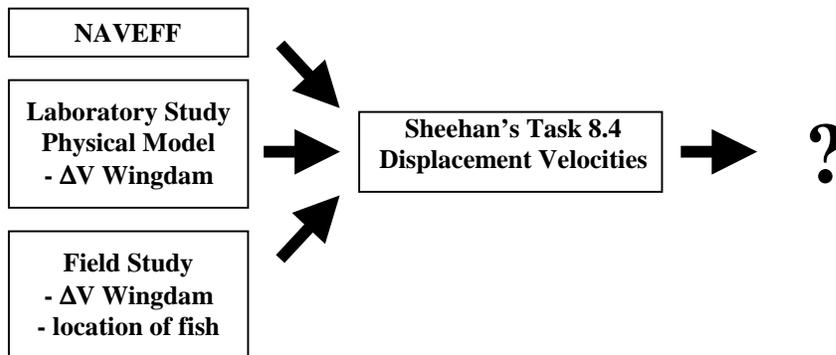
Steve Bartell: A prop is pushing water out of the way, a very small fraction actually goes through the prop. Steve Maynord conducted experiments to provide this type of information. All fish sampled were endogenous feeders, subsequently they were very small and their air bladders were not yet inflated.

Bill Bertrand: What are the impacts on walleye and sauger? NGO's are going to hit this topic quite hard.

Tom Keevin: Did not test these species due to scheduling problems. May be able to run additional ones in the future, not very costly.

Tom provided a series of tables, graphs, and figures which illustrated various lab and field studies which have evaluated the relationship between towboat generated forces and larval fish mortality (*Attachment 5*). Assuming no mortality of any fish from pressure and shear, the concern will still be out there that we did not measure the effects on larval walleye. Tom indicated he would look into the possibility of testing walleye, the tests are relatively inexpensive.

WINTER FISH STUDIES



Laboratory Study - Was conducted by Steve Maynard at WES. His report looked at how velocities change in a scale model designed to replicate the attributes of an actual wing dam. Elevation in December set at 375 ft above sea level 120,000 cfs, with flows of 2-ft over the top of the wing dam = 247,000cfs. The Miss. is in constant state of flux, 2 ft/ sec is not constant, "the river pulses". Steve selected a current velocity of 3 ft per second. Tom provided example figures of lab results using various flows and barge configurations (*Attachment 5*)

Field Study - The field validation for this study have not yet been completed. Using a doppler unit (velocity) and a hydroacoustic fish finder we planned to go in during winter and find out where the fish were and what the velocities were at actual wing dam locations under ambient and when a barge passes. Other studies have indicated that modified wing dam designs (L-dikes) are loaded with fish seeking shelter from the currents during the winter months. Actual field measurements of velocity at these structures indicate that velocities were 0.1 m less at L-dike sites than at conventional wing dam sites. This may be a feasible mitigation alternative. Sheehan's report indicated that fish can not swim very well during extremely cold water conditions. Tom indicated he would try to get summary reports out for each study sometime this summer.

7. Steve Bartell – Fish Modelling

Steve presented a powerpoint presentation (*Attachment 6*) which reviewed the traffic projections and environmental impacts resulting from the without project condition and from the two possible scenarios of navigation improvements. CAUTION: These are preliminary runs of the fish model using *possible* improvement alternatives and a range of possible traffic scenarios, since neither the Recommended Alternatives or Economic model traffic projections were not yet available.

Scenario 2 - Would include Guidewalls at Locks and Dams 20-25

Scenario 3 - Would include Guidewalls at L&D 14-18 and Lock extensions at L&D 20-25

Without project some of the traffic will go down in some pools, you get a floating baseline when computing 2000 traffic from a 1992 baseline.

Gretchen Benjamin: Explain your reference to Pools 26B and 26A?

Steve Bartell: Due to the amount of traffic coming down the Illinois River we thought it best to break Pool 26 into two parts, above (26B) and below (26A) the mouth of the Illinois River.

Steve provided a series of overheads which compared the model outputs under a range of traffic rates and alternatives for selected UMR navigation pools (*Attachment 6*). The following are general remarks made while discussing the model or its outputs:

- Illinois River demonstrates a completely different traffic pattern, showing decrease barge movement in the summer months and navigation during winter months.
- Six species selected as guilds that were important and representative Drum, Walleye, Gizzard shad, Mooneye, Emerald Shiner, and Channel Catfish.
- Revised fish parameters based on ITR and NECC comments and other noticeable inconsistencies (i.e. size/age relationship of fish species).
- With Maynard have adjusted horsepower to calculate entrainment volume for each of the various configurations and loaded, unloaded, and configuration..

Questions/Comments:

Gretchen Benjamin: Why don't you reflect decrease in adult population over the 50-year time frame?

Steve Bartell: We are resetting the population at the beginning of each consecutive year.

Dan Wilcox: Holleys' model suggests complete mixing in the channel within a relatively short distance, therefore we are assuming vessel passages are individual events.

Bartell: Even with 100% traffic increase the same water is not being entrained from one barge to the next. This model has been a useful tool for comparing with and without conditions which bring about the traffic increases.

Incremental Impacts

Comparison of 1995 commercial catch data for drum in pools 4, 8, 13, 26

Bill Bertrand: Where did you get numbers for commercial catch?

Steve Bartell: We back-calculated the number of fish caught from the average size of fish at a specific age.

Steve provided a comparison of tow-induced mortality predictions with that from power plant entrainment estimates. Steve indicated they would try to do similar comparisons for other sources as available. The estimates will likely become more believable by using more realistic traffic scenarios and trying to make comparisons with other forms of mortality.

Bill Bertrand: Concerned about attempt to relate power plant entrainment of walleye, which was measured, with barge traffic, which was not measured. Encourage you to acquire information from the Commonwealth Edison plant near the Quad Cities. They have access to a large dataset of fisheries information, esp. walleye for Pool 14.

8. Rich Fristik – Mitigation Planning

Review of handout which listed potential measures for mitigation :

The following discussion focused primarily around mitigation of fisheries impacts.

Bill Bertrand: Fish hatcheries are the solution in Illinois, direct compensation for those lost in a fish kill or other events.

Dan Wilcox: Wisconsin and Minnesota are not required to compensate in kind but have installed measures to minimize effects the also fund state fisheries surveys. Losses are within the compensatory reserve of the population and therefore no mitigation necessary. 316B demonstration guidelines used stock assessment data and the fact that the sport fishery was not experiencing a decline.

Ken Barr: May be able to reduce traffic during months of reproduction, however this type of avoid/minimize measure will not likely be acceptable to the industry.

Bill Bertrand: Main channel fish would be hard to compensate for with a backwater project.

Ken Barr: Could we improve side channel?

Dan Wilcox: Fish passage may be an alternative by allowing fish to more spawning habitat.

Gretchen Benjamin: WI would not regard this as mitigation since it is already ongoing.

Dan Wilcox: Increasing access to tributaries would be another approach (i.e. rock river).

Ken Barr: Is the USFWS going to recommend improved measures (restoration) for fish passage at L&D in the CAR?

Jon Duyvejonck: Yes, but not ready to discuss in any detail. Haven't thought it out completely.

Ken Barr: 1930 report indicated that design of dam was prohibitive to fish passage and was discretionary to DE to spend money on fish passage.

Dan Wilcox: This was a War Department Report the led to development of the Act. We have the stated federal intent to provide fish passage.

Tom Keevin: Description of Brian Johnson's fish movement (passage) study at L&D 25. Currently supported by Avoid and Minimize funds asking Ken to provide monies from Nav Study. Concern about degrading the structural integrity of the dam would have to beef up to prevent erosion.

Dan Wilcox: The velocity measures he (Brian) is taking are also important since we know the swimming speeds of fish and could determine if they could pass.

Bill Bertrand: We find this study very attractive since it shows us that modification of current operations are successful.

Dan Wilcox: Example of L&D 3 for a potential fish passage structure feasibility and initial cost estimate. Fish swimming performance model suggest that only a few migratory fish are able to make this.

Rick Nelson: Has anyone looked at the L&D 14 situation where they used a 1 foot gate opening

Dan Wilcox: This constricted opening has unacceptable velocities for passage.

Bill Bertrand: L&D 19 was not constructed for navigation and could therefore be considered as mitigation

Ken Barr: What else are we missing?

Tom Keevin: If we can find a prime spawning area and we could somehow move traffic away from this area this would be a form of mitigation.

Bill Bertrand: Reconnection of backwaters, reopening some of these areas.

Steve Bartell: Reducing vessel speeds there is a non-linear relationship between entrainment volume and vessel speed

Tom Keevin: Claude Strausser MVS has been talking about putting out spawning beds rock rip-rap area

DAY 2

9. Tom Keevin – *Adult Fish Entrainment Study*

This study was performed by Steve Gutreuter (USGS) and John Dettmers (INHS) in Pool 26 and Alton Reach during the 1996 field season. They utilized a large main channel trawler to follow tows up or down the river. A total of 50 events (tows) were surveyed. Only on two occasions did they identify recent dead adult fish, for a total catch of 3 dead gizzard shad. Very hard to come to any conclusions based on just three dead fish. We are currently developing a SOW and coordinating with Gutreuter to get the boat back out there in June-August- October of this year.

While they were waiting for the next tow to pass they did collect ambient samples. There was considerably more effort placed on sampling the fishery than actually following tows. Future efforts will still be conducted in Pool 26. They will try to work with the barge industry to get a GPS unit on the barge to be able to follow the wake zone more closely.

Steve Bartell – Habitat suitability models for 13 species of fish to represent the various spawning guilds. This analysis will be done on a cell by cell basis. Base GIS coverage with habitat areas and run the traffic model to see velocity changes and bed scour. Will generate maps of different habitat quality based on both a fish model and physical model results. Hopes to have completed by next NECC meeting

10. Steve Bartell – *Plant Modelling*

Dan Wilcox provided a review of plant studies that have been completed to date.

Steve displayed an overhead showing flow diagram of a submerged macrophyte growth model (reference Best 1981). This was provided with minutes for the 24th NECC, so it will not accompany these minutes. This model follows the theory that increased sediment in water will decrease the available light energy to the plant over the growing season, this will ultimately result in decreased growth. Physical damage only showed about 1% damage, discontinued further studies towards this effort.

Hydrodynamic Physiological Model - Again focused on pool 13 and above for a pool specific plant model. Interpolate results from a subset of model runs at selected locations and utilize variability in sediment conc. to see what happens in other areas. Selected areas where we expected to see the most severe events based on planform analysis

Reviewed primary steps in plant model

Overheads - Pool 8 shows no difference at any of the ratcheting traffic levels in sago pondweed. In pool 13 shows a measurable reduction in plant growth.

Steve's Powerpoint presentation (*Attachment 7*) showed the model outputs for various scenarios and trend pools. The main points for each series of slides were summarized in the presentation and are reiterated below:

For Scenario 2, With Project:

- Because no impacts were observed as a result of the 25% increase in traffic scenario (higher traffic than this scenario):
 - Vegetative reproduction of sago pondweed was not affected in Pools 4, 8, and 13.
 - Vegetative reproduction of wild celery was not affected in Pools 8 and 13.

For Scenario 2, Without Project:

- In Pools 4 and 8, traffic was at or below 1992 baseline values.
- Therefore, this scenario would not affect the growth or vegetative reproduction of sago pondweed and wild celery in Pools 4 and 8.
- In addition, vegetative reproduction of wild celery was not affected in Pool 13.

For Scenario 3, With Project:

- Because no impacts were observed as a result of the 25% increase in traffic scenario (higher traffic than this scenario):
 - Vegetative reproduction of sago pondweed was not affected in Pools 4 and 8.
 - Vegetative reproduction of wild celery was not affected in Pool 8.

For Scenario 3, Without Project:

- In Pools 4 and 8, traffic was at or below 1992 baseline values.

- Therefore, this scenario would not affect the growth or vegetative reproduction of sago pondweed and wild celery in Pools 4 and 8.
- In addition, vegetative reproduction of sago pondweed was not affected in Pool 13.

OVERVIEW

- Interpretation of this model seems realistic
- As expected, actual traffic values show minimal impact throughout the system with the exception of certain areas.
- REMEMBER that this decrease is not in the entire plant community but rather within a single plant bed.
- Under the two scenarios, Pool 13 is the most likely to be impacted, in some cases the effects were approaching the 50% level.
- This type of output can set the stage for discussions of mitigation or avoidance.

Gretchen Benjamin: You are resetting the clock every year so you are not looking at cumulative effects?

Ken Barr: Model starts each year with the same vegetative tuber bank since this model shows no impact on reproduction.

Gretchen Benjamin: Where is the dividing line for impacts is it pool 9, pool 10?

Steve Bartell: May be able to run the physical forces model to help interpolate results. Much of the necessary information is currently missing, light temperature can be acquired from local airports. NAVEFF may be able to calculate areas with elevated sediment levels.

Dan Wilcox: The major limiting factor is the necessary bathymetry, weather data may be interpolated from adjacent airports.

Steve Bartell: One of the big factors in the downriver trend is the fact that barges become bigger and more frequent. As we get out of the trend pools we get more assumptions.

Bill Bertrand: I think it would be wise to assess the Pool 19 plant bed since this area is very important to migratory waterfowl migration.

Jon Duvejonck: Western University, Rick Anderson has done some work in this area.

Dan Wilcox: The Montrose flats bed is similar to the area where this work was completed. This study suggested that the primary effect will be on the edge of the plant bed since the outside plants serve as a filter with the inner edges of the bed. Canopy forming bed and clump formation are two types of plant communities that react differently in the river. Dan proceeded to show an overhead of potential A&M mitigation possibilities for plant beds.

Other recommendations from representatives:

Jon Duvejonck: Island construction In Pool 8 are an example of something that works.

Bill Bertrand: Moving sailing line, does this mean moving the navigation channel?

Dan Wilcox: No, if physical removal of material is required then it would be highly unlikely that either the navigation channel or sailing line would be moved.

Ken Brummett: revetments may be counterproductive since in some cases they have served as sediment traps not being far enough out. Chevrons in St. Louis district have worked

Dan Wilcox: Talked about seed islands that also create areas of protected backwater areas that may serve as plant

Ken Brummett: May consider using some of these areas as dredge disposal areas, using large rock to keep them in place since without rocks they disappear fairly quickly also may think about the geotubes

Ken Barr: ice rips this stuff up once plants become established.

Dan Wilcox: later in May there is a engineering conference to discuss HREP design.

Ken Barr: Will revetments provide fish habitat mitigation?

Rick Nelson: Does the Corps even have authority to regulate traffic?

Ken Barr: We will be seeking whatever authority we need from congress.

Bill Bertrand: Ohio river Corps authority is one mile above and below lock and dams

Group agree that proper design and placement of breakwaters or revetments is the most promising

11. Drew Miller – Mussel Studies

Drew provided a review of the mussel report entitled "*Physiological Effects on Freshwater Mussels of Intermittent Exposure to Physical Effects of Navigation Traffic*" which he and Barry Payne co-authored. He reviewed the following Tables and Figures directly from the report (**Attachment 8**):

Table 1 summary of previously conducted laboratory studies on current velocity effects

Table 2 summary of previously conducted laboratory studies on suspended sediments and current velocity effects

Collected Field measures in water velocity for 60 tow passages (events):

- Major effects in 20 %
- Minor effects in 37%
- No effect in 43%
- Upbound tow 11-22 cm/sec
- Downbound tow 18–55 cm/s

Table 3 design of laboratory studies of physiological effects of intermittent turbulence

Table 4 Tissue Condition Index (TCI), filtration rate, respiration rate. None of the indices were effected by water velocity

Table 6 Design of experiment 1 Effects of frequent exposure to total suspended solids Results table

Table 7 Design of Experiment II

Table 10 Results from experiment II: Infrequent exposure to suspended solids and turbulence. Drew pointed out that the O:N ratio is a precursor of effect to tissue condition.

Table 8 Design of Experiment III

Table 11 Results of Experiment III some statistical significance but unlike to be biological significance

Figure 1 Shell gape monitor schematic and explain how the experiment was carried out

Figure 4 Valve activity of 6 *A. plicata* over a 2-day period in the East Channel

Figure 5 Results from Shell gape during a pleasure boat skiing exposition

Figure 6 Results from shell gape during passage of a 21 foot work boat in East channel

Questions/Comments:

Bill Bertrand: This is not expected to vary with species?

Drew Miller: May find slight differences but don't think it would be worth the extra effort.

Ken Brummett: What about impacts to Endangered species?

Drew Miller: At this point we can only assume they will be equally unaffected by the factors we evaluated.

Ken Brummett: What depth were these observation made under? and was this taken into account when evaluating the results.

Drew Miller: 3-5 m depth in the east channel at Prairie du Chien, WI.

Drew briefly reviewed the long-term mussel monitoring program he has been conducting annually at five beds in Pools 24, 17, 14, 10, 19 since 1989. Currently they are switching over to a 5-year sampling schedule. Each year we measured physical effects and collected quantitative collections of mussels from nearshore and farshore locations. Collected 60 quantitative sample per site. Data analysis includes determination of density, recruitment, species richness, species diversity, TCI, shell dry mass, and tissue dry mass. All beds had *L. higginsi*. Prior to initiation of this project the USFWS established a list of factors that would demonstrate effects of navigation on mussels. So far, this study has not shown a decrease in any of the USFWS factors.

12. Steve Bartell – Mussel Modelling

Steve reviewed the STELLA mussel bioenergetics model developed by Dave Schaeffer (*Attachment 9*). This mussel model was primarily based on a balanced energy approach where the energy present as tissue (E_t) and shell mass (E_s) are determined by the input-output equations:

$$dE_t/dt = A - (R + E + P + S)$$

$$dE_s/dt = S$$

where t represents the 3-hour time step of the model, A is food assimilation, R is respiration, E is excretion, P is reproduction, and S is shell growth. The model is calculated using energy (kJ), but outputs are converted to tissue dry mass, shell dry mass, and total dry mass using appropriate conversion factors. Steve showed a spreadsheet of Schaeffer's mussel model output for both with and without project conditions. In the without project example the mussel showed increase growth, with project the mussel loses shell size. Initial runs of this model indicate a 15% decrease in tissue mass and 5% decrease shell size attributable to increased suspended sediment concentrations. Results obtained from mussel beds in the UMRS (Drew Miller) do not support Schaeffer's model. This discrepancy was cause for concern regarding the models reliability. Steve Bartell began re-coding the model into FORTRAN so it could be linked to the traffic information. During this process he began to evaluate the various input parameters.

In late April, a meeting was convened in Chattanooga, TN to review Schaeffer's mussel model and discuss the input parameters. Those attending this meeting included Drew Miller, Tom Keevin, Steve Bartell, and Scott Whitney. A major decision point was to redirect the focus of the model application away from tow induced turbidity to look more closely at the inorganic:organic ratio of the suspended/filterable material. Secondly, the group decided to choose a more

representative mussel species that was common and widespread throughout the UMRS (i.e. Threeridge). Steve indicated that he was in the process of making these changes. Once completed he plans to test (validate) the model using information from ten naturally occurring populations (beds) in the UMRS.

Dan Wilcox: Has any sensitivity analysis has been done?

Steve Bartell: No

Ken Brummett: Is the model set up to show effects on recruitment?

Steve Bartell: Yes. We can relate to fecundity since it is in the model as a form of energy allocation.

Tom Keevin: Mussels are like plants, and may benefit by having some type of buffer (i.e. island or rock structure) to prevent adverse conditions.

Bill Bertrand: Islands or breakwaters would change hydrodynamics of the area and likely create an unsuitable site for mussels.

Dan Wilcox: Host relationship, increasing fish may benefit mussels indirectly.

Jon Duyvejonck: What about enhancing an area using artificial substrate?

Drew Miller: We have brought in gravel and it did work real well under specific conditions in Tennessee River System below a control structure which controlled water velocities and prevented deposition of fines.

Rick Nelson: Recommend we consider moving navigation lane away from the bed.

Bill Bertrand: Are there beds that are not being infested by ZBM possible to seek out these areas and concentrate recovery efforts at these places.

Ken Barr: Is there a sense that we could predict areas where we could create gravel bars?

Group Response: Skeptical, especially due to unpredictable nature of flood events and longevity.

Jon Duyvejonck: Bergun McCartney HREP had a substrate component for mussels, was it ever implemented?

Dan Wilcox: I do not believe it was.

Mitigation Options for mussels:

- Move commercial navigation sailing line away from known mussel beds

- Create favorable habitat, rock cobble or gravel bars

- Need to be careful of placement of breakwaters and to avoid impacts

Jon Duyvejonck: seems we are having minor effects on plants, mussels, larval fish. Systemically what are we talking for mitigation as far as cost. Does anyone have a feeling for the scale (scope) of this project site specific

Ken Barr: wait until we see what lights up and extrapolate to the systemic effects. Effects to mussels and plants will be spotty and site specific while fish will likely be more difficult to predict or assess.

Jon Duyvejonck: We are still not accounting for the cumulative effects.

Ken Barr: we tried to identify many of these in the cumulative impacts report. This report will serve as a backdrop to look at these site specific model outputs.

Dan Wilcox: Compensatory reserve and inter-annual variation increase the uncertainty and reduce the predictability.

Jon Duyvejonck: Adaptive approach to mitigation. Look at certainties and uncertainties that our decisions are based on.

Jon Duyvejonck: Would rather like to see more focused research. Money would be better spent on research than providing mitigation

Bill Bertrand: Is it possible to delay mitigation until we can collect additional information areas of uncertainty?

Ken Barr: I think that it is possible to reduce the uncertainty, need to identify significant effects and develop avoid/minimize actions. We will need some dollar figure before we can approach the funding aspect. Similar to engineering feasibility and design studies, We need to get that marker set for allocation of money.

Bill Bertrand: Then we are best to identify all the possible mitigation alternatives up front.

Dan Wilcox: Delaying the implementation to a later date once a design has been evaluated adaptive mitigation should also look that predicted impacts are actually coming to fruition and are the mitigation alternative actually working.

Ken Barr: Before 2000 we need to have some idea of an order of magnitude and the cost compensation for the various environmental components. These costs may push the economic cost:benefit ratio over the limit. Once the NED plan is released we will have some idea of the timeline for improvements and mitigation

Al Fenedick: Until you are able to nail down the significance question, it will be difficult to assess the impact, loss or what needs to be compensated for. This will leave you open for criticism.

Rick Nelson: Where will the funding for mitigation come from (i.e. CG)? How do you think this will occur?

Ken Barr: Traditionally mitigation costs are part of the first costs of construction. The funds would be cost shared between the Inland Waterways Trust Fund and Construction General (CG) provided by Congress to the Corps of Engineers.

Rick Nelson: We would like to see a trust fund established for conducting studies to refine models and mitigation alternatives? Will that money be available right away or will it be deferred to the start of construction?

Ken Barr: Planning Engineering and Design (PED) phase money could be used for Mitigation design. Construction funds could be used for implementation of mitigation measures.

Bill Bertrand: How will we see systemic mitigation approached since it cannot be tied to a specific construction project?

Ken Barr: It will be tied to the entire proposed system improvement package. Any traffic changes will be tied to a package of improvements not a single measure.

13. Scott Whitney – Navigation Study Env. Reports

Scott provided an updated list on the status of the ITR process for the Nav. Study reports (*Attachment 10*). Encouraged NECC representatives to provide their report comments using the electronic reporting form. This makes it easier for the author to respond to comments when they are sequentially numbered. At his point, nine of the 43 Env. reports have been published and distributed. Hopefully within the next month the remaining ITR reviews will be completed and most of the reports can be passed along to the publisher. The publishing process is taking from 3 to 6 months depending on the size of the report whether it is photo-ready when it reaches them. Those reports coming out of WES take nearly twice as long as those from private contractors. NECC representatives can expect at least six more Env. reports to review this summer. Two that will be of most interest are Guttreuters' main channel fish study and the Cumulative Impacts report.

Public Meetings for the Navigation feasibility Study will be held at seven locations in the UMRS from 26 July – first week of August. The meetings will be held in the following cities: St. Louis, Quincy, Peoria, Bettendorf, Des Moines, La Crosse, and St. Paul.

14. Next Meeting

The 26th meeting of the NECC will be held at the Holiday Inn, Moline on 20 July 1999. A block of 15 sleeping rooms is reserved for the night of 19 July at a rate of \$59 + 11% tax. Cutoff date is 9 July. When making reservations, please ask your meeting attendees to identify their group as U.S. Army Corps of Engineers/NECC Meeting.