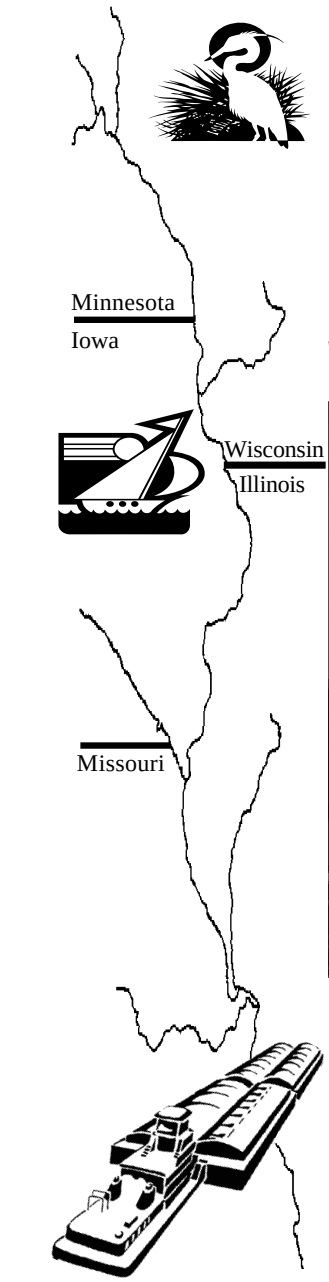
US Army Corps of Engineers

Upper Mississippi River - Illinois Waterway System Navigation Study

UMR-IWW System Navigation Study Newsletter December 1997 Vol. 5 No.1



RIVER HISTORY BROUGHT TO LIFE

Restored films provide more than history lesson for study team

The old silent films, rescued from a dusty vault and preserved through Navigation Study efforts, make for fascinating viewing by any history buff. Steamboats float down the Mississippi in the background as dapper-looking workers in fedoras and white shirts heave gates into place and operate crude machinery.

Photographers work in a photo lab, built in August 1931 in the Rock Island District's Clock Tower Building.

But the 40-some hours of footage, documenting years of lock and dam construction in the 1930s, offer much more than a rare glimpse into the past.

For a study team looking at the feasibility of lock improvements or construction on the Upper Mississippi and Illinois Rivers, the moving pictures have been the next best thing to consulting with the designers and builders of the original 9-foot channel project.

They've been used by engineers to study original construction methods. They've helped Corps historians find buried archeological sites, visible in footage filmed during an early phase of construction. And they've provided some help in determining how many acres of land were disturbed during original lock construction, a critical piece of data for environmentalists working to estimate the impact of potential future construction scenarios.

"They say a picture is worth a thousand words. In this case, having moving visual film really enhances written documentation of lock construction efforts," says Ron Deiss, an archeologist with the Rock Island District of the U.S. Army Corps of Engineers.

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WHAT'S INSIDE

RIVER HISTORY *continued from page 1*

The original 16 mm film footage documents the construction of lock and dams 10 through 22. Most of the 197 reels likely were destined for the cutting room floor, but in a fortuitous move for both historians and the Navigation Study team, the intended movie never was made. The original films recently were cleaned, watched and summarized by Western Illinois University's broadcasting department. They also were copied onto Beta Cam SP tape, standard in today's filming industry, as well as onto optical video discs – the best current way to provide both long-term preservation and easy viewing.

While the 16 mm reels likely will end up in the National Archives in Washington D.C., the copies will continue to aid in engineering and planning efforts, particularly to make sure any new construction, if recommended, maintains or complements the historic character of the current locks and dams built between 1930 and 1940. That is especially important given the fact the locks themselves are more than 50 years old and therefore determined eligible for listing on the National Register of Historic Places (Lock 19 is already on the National Register). The film footage may also be put together with photographs and other documents into a movie or documentary that can better be shared with the general public, Deiss said.

A composite photo highlights the videographers and photographers who documented construction of the original locks and dams.

More and more, state and federal agencies are encouraging the use of film and video as a method of historic preservation, he said. The study team is considering this approach as a method of sharing the river's history, regardless of whether or not improvements are recommended at the lock sites.

The film restoration is one piece of the larger efforts of the Navigation Study's Historic Properties Work Group to both document and preserve the river's history. The group also has recorded archeological sites as well as submerged properties like shipwrecks. The film is complemented by more than 50,000 still photographs of construction that took place within the Corps' Rock Island District. Both photographs and film documented the original construction as well as the types of boats common on the river at the time, ice conditions, floods, concrete mixing operations, and even life-saving training held for workers at YMCA pools, Deiss said.

Some of the footage shows heroic efforts by workers, who relied on relatively primitive building techniques in the labor-intensive operation, a key source of work during the Great Depression. One of the most valuable sections shows nearly every aspect of lock and dam construction and provides a virtual textbook on early industrial processes and construction efforts, Deiss said.

"It was a tremendous work effort, but the engineering used was very advanced for its time," he said. "It was a unique juxtaposition of building something extremely advanced for its time using the sweat of people's brows." ◆

Small-Scale Navigation Improvements Screened To Eight Possibilities

Eight "small-scale" measures for reducing congestion on the Upper Mississippi and Illinois Rivers have tentatively survived a further cut from a list of 16.

These measures, defined as the low-cost alternatives that don't involve extending any existing locks, will now be examined with a matrix of "large-scale" (new lock construction) measures.

"We'll take these best measures (providing the most benefits at the lowest cost) from the small-scale list and the best from the large-scale. They'll combine and become alternative plans for evaluation," said Brad Thompson, a member of the study management work group who coordinated the screening efforts.

By April 1998, the Corps will develop an initial plan or the combination of improvements that maximizes net economic benefit consistent with protecting the nation's environment. This preliminary plan may still be modified or replaced entirely based on several additional factors, including environmental considerations and public acceptability, before a recommendation is documented in the Feasibility Report and forwarded in December 1999 for processing in Washington D.C.

The eight small-scale contenders tentatively selected for further plan formulation efforts, from an original list of 92 possibilities, are: helper boats; switch boats; industry self-help; congestion tolls; lockage time charges; adjacent moorings; powered ratchets; and approach channel improvements.

Measures eliminated from consideration – either because they didn't save enough lockage time or were too costly – were: excess time charges; publishing of lockage times; scheduling of recreational craft and/or tows; creation of recreation craft landings; extension of guidewalls; requirement that crews have a minimum size and training level; use of powered traveling kevels; and installation of universal couplers.

To understand how the remaining small-scale measures fit in with the project, it is important to first consider the lockage process as a whole, Thompson says. Because many modern tows near 1,200 feet in length and must go through 600-foot locks, they must complete a double-lockage process. During this multi-step process, the tow enters the lock, the barges are divided in half, the first half locks through, the second half locks through, and the barges are reconnected. The process ties up the lock between 100 and 120 minutes, compared to a range of 25-to-40 minutes for a single lockage.

Unlike large-scale measures, which eliminate the need for double lockages, the small-scale measures assume the current double-lockage process will continue. They attempt to reduce congestion by cutting as much time as possible off the most lengthy steps of the process. Some target the tow's approach into a lock, which is often hampered by the outdraft currents above the lock. Others work to speed up the extraction of the first "cut" of unpowered barges out of a lock or to move the reconnection process downstream or upstream so the lock can immediately be made ready for a waiting tow.

An example of the "double lock" process. The first half of the tow is out of the lock awaiting the second half to lock through and remake downstream.

The current cost estimates of the small-scale measures range from a few hundred thousand dollars for the system to as much as $2.6 million a year per site – still well below the cost of a new lock. This type of cost information, as well as associated lockage time saving estimates, will be part of the systems analysis to help evaluate alternative plans for reducing delays to commercial navigation. ◆

Small-Scale Contenders

Following are the remaining small-scale measures, including the estimated average time savings per double-lockage and the average projected annual cost over 20 years unless otherwise stated. Both the cost and time savings benefits are undergoing a final review and may be refined somewhat before use in developing alternative plans. These costs do not include the cost of work that may be needed to avoid, minimize or mitigate environmental impacts because these costs are still being determined.

HELPER BOAT WITH EXTENDED GUIDEWALLS

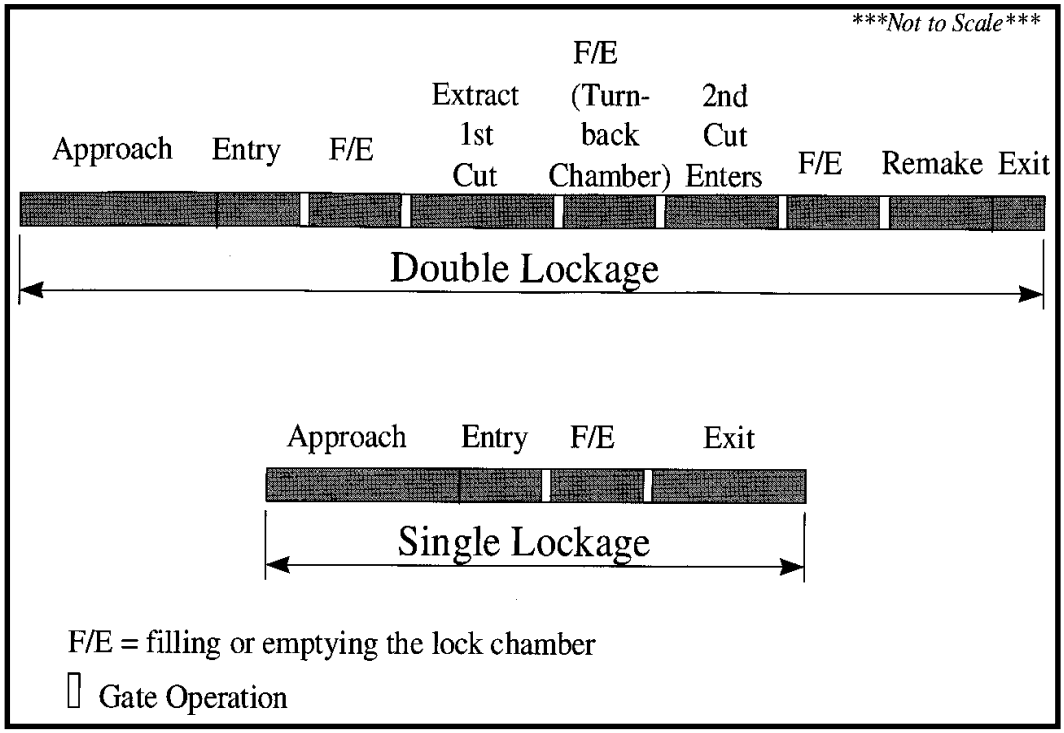
The use of these small towboats to guide a tow heading downstream into a lock chamber would be both a safety and efficiency measure. The helper boat would help counter the effects of the current, getting the tow into the initial lockage procedure more quickly. However, the major additional time savings comes later in the double-lockage process, when the boats could pull the unpowered barges to the end of a guidewall. As part of the measure, a temporary, 600-foot guidewall extension would be constructed using Delong Piers. That allows the helper boat to pull the unpowered barges along the guidewall for reconnecting, freeing the chamber for use by a waiting tow.

Time savings: Estimated at 22 minutes per double lockage for an upbound tow; 27 minutes for a tow heading downstream. The time savings only applies to turn-back lockages where the next tow is heading in the same direction.

Cost: $1.9 million per lock (for two boats and extensions of upper and lower guidewalls).

APPROACH CHANNEL IMPROVEMENTS

This measure includes a variety of possible modifications, including dikes, bank filling, bank excavation and channel relocation – all designed to control channel currents and improve the path of a tow as it enters a lock. Such improvements have been found to reduce approach times and make conditions safer, depending upon the location, combination of improvements and river conditions at the time.



Graphic shows the steps involved in a double and a single lockage.

Time savings: An average of 3 minutes on a typical downbound approach and 2 minutes on an average upbound approach time. Costs vary significantly, however, based upon the individual site and flow conditions.

Cost: $570,000 per site on average for an upper lock approach improvement; a $260,000 per site average for a lower lock improvement.

SWITCHBOATS WITH REMOTE MOORING FACILITIES

These towboats with 1,200-to-2,400 horsepower—more powerful than helper boats — pull the unpowered barges away from the chamber, guidewall and approach path to a remote mooring facility, freeing up the lock for tows waiting in either direction. They can also help tows approach locks during dangerous flow conditions and can move ice and debris out of the way. Their use requires construction of mooring facilities above and below the lock.

Time savings: 22 minutes upbound; 27 minutes downbound.

Cost: $2.6 million per lock (for two boats and upper and lower moorings).

ADJACENT MOORINGS

These structures, which provide waiting areas where tows can be tied off during an ongoing lockage, can improve efficiency in two ways. They can provide a waiting area closer to the lock where a tow can safely wait clear of a narrow approach allowing a tow exiting in the opposite direction to pass. By waiting closer, the approach and exit times can be reduced. In addition, when used with a switchboat or an industry self-help process, they provide a place where tows can re-make, making the lock available sooner for the next tow waiting in either direction.

Time savings: 7-13 minutes on exchange approaches (at locks 12, 14, 18, 20, 22, 24, 25, Mel Price and LaGrange).

Cost: $32,000 per buoy; $137,000 per mooring cell.

INDUSTRY SELF HELP

Already used on occasion, this measure relies on navigation industry tows to help one another when there is significant congestion at a lock. When used, a towboat would not just wait in line for its turn to lock; instead, it would act similarly to a switchboat, removing an unpowered cut from the lock and taking it to a remote mooring area, leaving the lock open for the next, waiting tow.

Time savings: 18 minutes upbound; 23 minutes downbound.

Cost: $1.1 million per lock (for three mooring cells above and three below the lock and the fuel cost of assisting boats).

POWER OPERATED RATCHETS

This device, which uses a 4-horsepower gas engine to power a hydraulic drive system, would be stationed on a center barge. It would improve efficiency and cut down on a double lockage time by increasing the speed of the re-coupling process. It also would improve safety and requires less physical labor than the current way the barges are connected again after a double-lockage. Although this measure was not carried forward initially due to the fact the technology did not exist, it has since been introduced on the system.

Time savings: Five minutes, shaved off the estimated average 12 minutes now required to re-attach barges after a double-lockage.

Cost: $600,000 for the system (for one device on each of the 250 tows operating on the system).

CONGESTION TOLLS AND LOCKAGE TIME CHARGES

Congestion tolls could be implemented only if a current federal law prohibiting charging of tolls for watercraft passing through locks is changed. If used, tolls would be collected from tows, and possibly from recreational craft, using congested locks. The goal would be to shift potential traffic to alternative modes of transportation or other inland water systems. While similar to the tolls, the goal of lockage time charges is to offer an incentive to improve efficiency rather than to reduce use of a congested lock. This measure would charge all vessels based on the length of time the lock is in use. Boats would not be charged for lockage elements they can't control such as gate opening and closing.

Time savings: Not currently quantified. A systemwide evaluation is needed to set the appropriate fee levels and to evaluate impacts.

Cost: $280,000 annually for the system. ◆

US Army Corps
of Engineers

December 1997

UPPER MISSISSIPPI RIVER - ILLINOIS WATERWAY SYSTEM NAVIGATION STUDY
COMMENT SHEET

Name _____ Telephone _____

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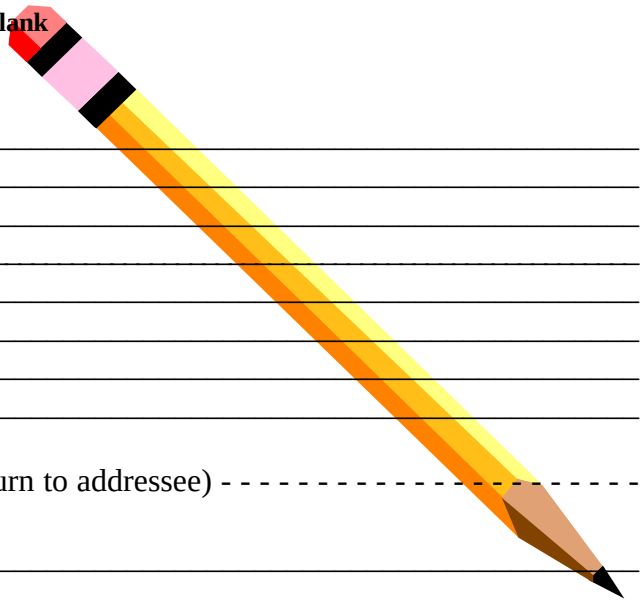

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Please check **ONE** category below that represents your primary interest in the study.

____ Waterborne Industry
____ Other Business/Industry
____ Environmental Group
____ Agriculture
____ Media
____ Federal Government (Congressional)
____ Federal Government (All Other)
____ State Government
____ City/County Government
____ Education
____ Regional Planning
____ Recreation
____ No Particular Affiliations; Personal Interest
____ Other (specify)
_____

What Happens to Comments Made about the Study?

Since the Navigation Study began its feasibility phase in April 1993, the Navigation Study team has received approximately 350 comments from returned newsletter comment sheets and from the 800 telephone number. We regret that we are unable to provide a personal response to each comment. However, all comments are being consolidated and addressed in the public involvement appendix in the final report.

Privacy Act Statement:

In accordance with the Privacy Act of 1974 (Authority: Chapter 5, ER 1105-2-100), routine uses of the information obtained from this form include compiling official mailing lists for future informational publications and recording additional views and public participation in studies.

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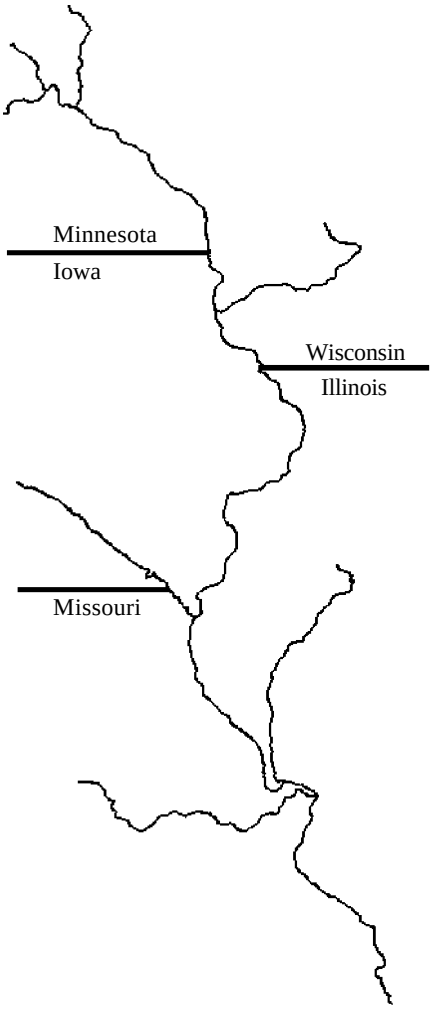
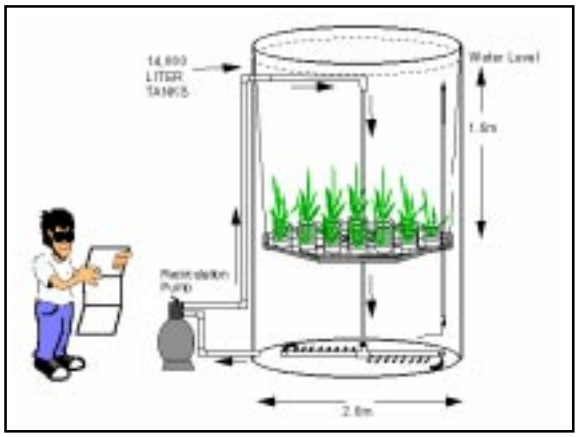


Muddy Water Bad News for Plant Reproduction

Turbid water – water "muddied" with large amounts of suspended sediment – can affect an aquatic plant's ability to grow and reproduce, a recent study has confirmed.

The research was conducted as part of the Navigation Study because where aquatic plants are found in the Upper Mississippi and Illinois Rivers, they are an important food source and cover for fish and waterfowl. They also filter sediment and help clarify the water.

The basic finding that muddy water impacts an aquatic plant's ability to grow came as no surprise to researchers, who are now writing the final report on their study. But there were a few surprises, said Dr. Robert Doyle, the primary investigator.



The above graphic illustrates how the Corps of Engineers is testing turbidity effects on plants

"It's not so much that killing of the adult plants is a problem. It's recruitment (i.e., reproduction) that is of concern," Doyle said. "It's not so much that in muddy water the adult plants are dying. Rather, they are just producing fewer offspring. Then, the ones they do produce have a tougher time growing."

When the report is complete, researchers will use the information to predict the effects of barge-generated turbidity on plant growth in the Upper Mississippi and Illinois River systems. Better identifying how navigation affects turbidity levels will assist the Corps of Engineers in determining whether there are likely to be any negative effects on plants – either direct or indirect – from increased commercial river traffic that could result from potential navigation improvements.

The study was conducted at the Lewisville Aquatic Ecosystem Research Facility in Lewisville, Texas, a field research site of the Corps' Waterways Experiment Station, Vicksburg, Mississippi. Experiments done in outdoor tanks as large as 14,000 liters and in a 1,000 liter greenhouse tank tested different levels of turbidity on various stages of a plant's life cycle. The scientists also used different frequencies of "sediment" to simulate different river traffic conditions.

What they found, Doyle said, was that a high frequency of periodically high turbidity levels – as might occur from commercial or recreational river traffic – can be as detrimental to plants as a constant period of more moderate turbidity.

"You can make it a little turbid and reduce 30 percent of the light every day all day, or lose 30 percent by having every third day be a really turbid day. The effects seem to be very similar," he said.

It is important to note that turbidity is a natural phenomenon in large rivers, derived from a multitude of sources. In general, the key factor limiting the growth of underwater plants along many parts of the Mississippi River is light. Given other favorable growth conditions, the depth to which underwater plants can grow is related to how clear the water is. In more turbid waters they are limited to very shallow water or are entirely absent. Along much of the upper portion of the river, plants are found in depths up to 1.5 meters, while below about Pool 13 the water is so turbid that virtually no underwater plants can grow.

Study Specifics

This study focused on impacts to three common river species: Vallisneria (wild celery); Sago pondweed; and American pondweed. It found that turbidity had the greatest negative impact on winterbuds or tubers, the buried "potato-like" structures which these plants produce during the summer in order to survive the winter. Since all these plants die back during the winter, the re-growth of the population the next spring depends on these structures. The research has found that under turbid conditions, the parent plants produce fewer tubers and that those tubers have a more difficult time surviving the next spring, though larger tubers fared better than smaller ones, said Dan Wilcox, a technical manager on the study.

The findings showed that more plants were reproduced in clear water and that the threshold for significant reductions in plant growth and survival (in these short-term, shallow-water experiments) was in the 25-to-35 NTU range. NTUs, or Nephelometric Turbidity Units, are the standard unit of turbidity measurement in the water analysis process. If you were standing in water with a turbidity of 30 NTUs, you could see your toes in about a foot of water, Wilcox said. ◆

Habitat Impacts Studied

While the Environmental Work Group still is working to identify the system-wide impacts associated with potential navigation improvements, a study team has completed a major portion of the site specific analysis.

The Habitat Assessment Team has determined what habitats would likely be affected on a site-by-site basis if new lock construction were eventually recommended through the Navigation Study. However, it still is working to determine the cost of compensating for habitat losses.

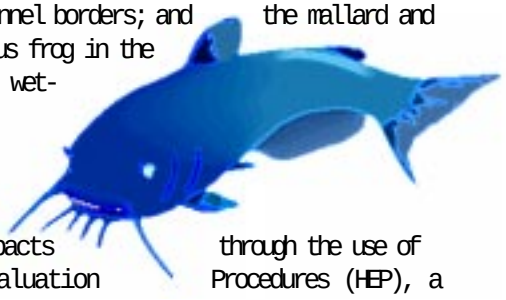
Impacts on fish and wildlife habitats and the cost of replacing the habitats will be an important consideration as the Navigation Study Team evaluates alternative plans.

The evaluations also will consider the losses that can't be given a monetary value because the habitats have a value in and of themselves as well as potential impacts to endangered species and socio-economic effects like the loss of an eagle viewing area or necessary relocation of homes or public landings, said Rich Fristik, leader of the Habitat Assessment Team.

The Navigation Study is looking at the feasibility of navigation improvements on the Upper Mississippi River and Illinois Waterway. The site-specific environmental study focused in detail on locks and dams 20-25 on the Upper Mississippi and the Peoria and LaGrange locks on the Illinois. The analysis looked at the impact of both large-scale (new lock) measures and small-scale measures (efficiency improvements that don't require lock construction). However, most small-scale measures are not likely to result in extensive habitat losses and could possibly provide some minor environmental benefits.

wood duck

The analysis team evaluated a specific set of species to represent these habitats. Some examples are: the pileated woodpecker and wood duck in the bottomland hardwood forests; the channel catfish in the main channel and main channel borders; and the mallard and western chorus frog in the non-forested wetlands.



The study quantified habitat impacts through the use of Habitat Evaluation Procedures (HEP), a well-established technique developed by the U.S. Fish and Wildlife Service. For each of the species being evaluated, habitat quality is evaluated using variables such as water depth and substrate type, Fristik said. Those factors combine to determine a habitat suitability index (a number between 0 and 1, with 1 being 'ideal' habitat). That number is multiplied by the size of an area to determine a habitat unit. Impacts of construction are quantified through a gain or loss of habitat units.

For many potential construction locations, the study found, a loss in one habitat area resulted in a corresponding gain in another. At Lock and Dam 25, for example, a lock constructed on the land side of the existing lock ('Location 1') would result in a permanent loss of about 24 acres of bottomland hardwood forest because the forested area would be replaced with the new lock. Most of those acres would become aquatic area, however, resulting in a "gain" in main channel/main channel border acreage, said Fristik. That gain resulted from a loss in other habitats and therefore does not accurately reflect habitat impacts.

If the existing lock were to be extended to 1,200 feet at Lock and Dam 25 ('Location 2'), the loss of bottomland forest habitat units would be much lower than with a Location 1 lock. While the same acreage of bottomland forest would initially be cut down, the land would be used as a staging area for construction – not for the lock itself. The unit loss indicates the forest would eventually grow back over the 50-year life of the project.

Due primarily to the fact that very little non-forested wetland or side channel was found at Lock and Dam 25, impacts to those habitats were small. Of course, each lock and dam is unique, and the results for Lock and Dam 25 are only an illustration of the type of outputs produced by the site-specific analyses. ◆

GLC Update

Two meetings of the Governors' Liaison Committee (GLC) have been held since publication of the August issue of the study newsletter. At a September meeting in St. Paul, the Governor's Liaison Committee was given a study update and an overview of the "Cumulative Impacts Analysis" that is looking at current and future environmental impacts of the 9-foot channel project.

However, most of the discussion centered around how the committee would be involved in the alternative plan formulation and evaluation process for improving river navigation during the April through September 1998 period. That discussion continued at the November meeting in Vicksburg, Miss., where several tentative dates were set for plan formulation meetings.

Following are the tentative dates and locations:

- **Feb. 24, St. Louis**: presentation of available information and discussion of upcoming meetings.
- **April 23, St. Louis**: initial plan presented to GLC.
- **May 13-14, St. Paul; June 25-26 in St. Louis; and Oct. 7 in St. Paul**: plan formulation or "cycle" meetings that will involve four-to-six representatives of each of the study states.
- **late July**: tentative time period for a series of public workshops on alternative plan evaluations. As part of the GLC meeting, the committee members suggested several possible locations for the public workshops.

During the first two plan formulation or cycle meetings, representatives of the states will provide input or feedback on alternative plan evaluations that will be assessed by the economic and environmental models. The study team expects to present its "recommended plan" to the GLC at the Oct. 7 meeting, said Project Manager Mark Gmitro.

In other meeting action

The GLC toured the Corps' Waterways Experiment Station, where several environmental models are now operating. ◆

In Brief...

The Rock Island District has received an initial draft of the Regional Economic Development model that will be used to determine how changes to the navigation system could impact the economies of the five study states. The model also will show impacts to the lower Mississippi region, the Western United States and the Eastern United States. It will evaluate the income and employment benefits resulting from transportation rate savings, construction expenditures and water compelled rate savings. Contractor Dennis Robinson of the Institute for Water Resources also is working to include an analysis of recreational expenditures and related jobs, income and sales in the Regional Economic Development Analysis portion of the Navigation Study.

❍ A report describing the impact of water transportation on rail rates was released to the Economics Coordinating Committee members in early October. The report, "Rail Rates and the Availability of Water Transportation: The Upper Mississippi Basin" shows that barge transportation effectively constrains or keeps down railroad pricing for commodities that could also move by barge. The overall effect of barge transportation on rail rates is estimated at more than $1 billion a year. These lower rates are considered to be regional benefits. The executive summary is available on the Internet at: **http://www.mvr.usace.army.mil/pdw/nav_study/econ_reports/railrate.htm**.

❍ Data from the larval and adult fish field studies, which concluded in UMR Pool 26 in September, is now being analyzed and summarized to provide additional information on the distribution, abundance, and potential impacts of navigation on the system's fish species. Summary reports also are being developed from the lab testing of the impacts of propellers, pressure and other forces on larval fish. The findings will be combined with physical effects data on tow passage to determine the probable biological impacts. Studies on fish spawning and overwintering will be conducted this winter. ◆

We Want Your Feedback

A series of public workshops scheduled to be held in July 1998 will be a key way for the general public to learn about initial study findings and then to provide comments or concerns. The workshops are planned for seven locations along the Mississippi River from St. Paul to St. Louis and one along the Illinois Waterway.

The focus of the workshops will be to collect public feedback on the draft plan(s) that will be released after they are formulated in the spring of 1998. The public will be able to comment on various aspects of any proposed plan during the workshops. Upcoming issues of this newsletter will provide specific workshop dates and locations as well as information on draft plans.

If you are planning to attend a workshop, we will ask you to return an RSVP form to ensure we have adequate facilities and staff present. An RSVP mail-back form will be included in the next newsletter. We encourage anyone who wants to attend a workshop to fill out the form and return it to the

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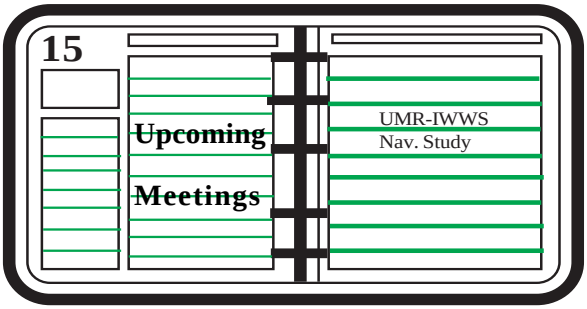
Upcoming Meetings



Economics Coordinating Committee
February 24, 1998 - St. Louis Airport Hilton
St. Louis, Mo.
Noon - 3 p.m.

Governors' Liaison Committee
February 24, 1998 - St. Louis Airport Hilton
St. Louis, Mo.
3:30 p.m. - 6:30 p.m.

Navigation Environmental Coordination Committee
March 11-12 - Holiday Inn
Moline, Ill.
11 a.m. - 5 p.m. on the 11th; 8 a.m. - 5 p.m. on the 12th

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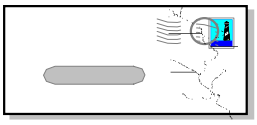

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If we do not receive a response, we will continue sending you a newsletter at the current address on our database. ◆

FEEDBACK *continued from page 9*

Corps before June 1998; however, you may attend a workshop without returning the form.

The Public Involvement Work Group will consolidate the comments received at the July 1998 public workshops. The comments will be reviewed by the study team and incorporated into the plan formulation process. A special edition newsletter will be prepared following the public workshops. The focus of the newsletter will be to broadcast the results of the workshops and summarize the findings to date of the plan formulation process.

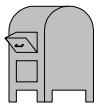
The special edition newsletter will also discuss the steps the Navigation Study Team will take to complete the plan formulation process and compile a draft report. Once the draft report is released, a public comment period will provide a formal opportunity for comments on any plans that the Corps has evaluated during the study. After the review period, the comments will be addressed and incorporated into the final report. The final report will be forwarded by the Division Commander to submit to our headquarters for processing and ultimate submittal to Congress for authorization decision. ◆

Questions?

❍ For general study information, call Mark Gmitro project manager, at 309/794-5279 or write to the address below, ATTN: CEMVR-PP-M or visit our home page at: **http://www.mvr.usace.army.mil/pdw/nav_study.htm**

❍ For information on Public Involvement meetings, call the toll-free telephone number, 800/USA(872)-8822. Meeting announcements will be in the Public Involvement menu. Or call Kevin Bluhm, public involvement coordinator, at 612/290-5247, or write to the address below, ATTN: CEMVR-PD-C.

❍ To be added to the mailing list for future newsletters, study updates, and meeting announcements, write to the address below, ATTN: CEMVR-PD-C, or call the toll-free telephone number and leave your information in the Public Involvement menu.



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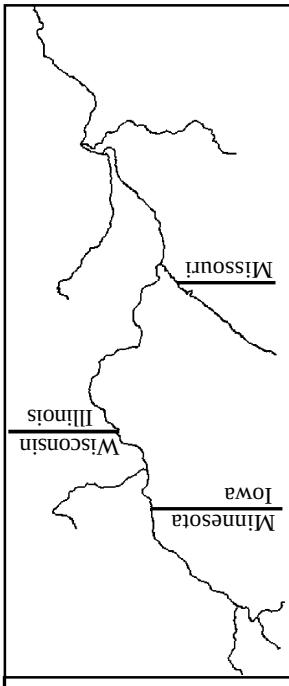

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