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# ANALYSIS OF RECREATIONAL BOATING IMPACT ON NAVIGATION LOCK PERFORMANCE





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# ANALYSIS

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# ON

# NAVIGATION LOCK PERFORMANCE

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## ABSTRACT

This study has provided significant information about several aspects of boating conflicts between recreational boaters and commercial tow boat operators on the Illinois River and on the Upper Mississippi River. The first insight gained is that both recreational boat operators and commercial tow boat operators are willing to be interviewed about their attitudes, preferences, and suggestions for improvement. Survey forms were used to personally interview 207 recreational boaters, 21 commercial tow boat operators and 10 Corps of Engineers lock personnel.

The recreational boaters interviewed on the weekends in August and September 1988 represented 20 percent of all recreational boats locking through on these dates. The tow boat operators interviewed represented 22 percent of all commercial tows locking through on these dates. It should be noted that personal interviews were done only during daylight hours on Saturday, Sunday and on Labor Day (Monday). Some commercial tow boat operators scheduled their lock throughs during night time hours to avoid congestion around the locks with recreational boats. Also commercial tow boat operators move up and down the Navigation System 24 hours a day, so many of the lock throughs naturally will occur at night.

Second, it is feasible and productive to interview the recreational boaters while they are locking through (either up or down), and it also does not cause any safety problems due to lack of attention to the locking procedure. Similarly, the interview process with the commercial tow boat operators at the locks went smoothly, and the interview personnel as well as the lock personnel gained some valuable insights from the viewpoints of these commercial pilots. Probably more accurate and more relevant responses were obtained by the personal interviews at the locks than if the interviews had been conducted




elsewhere, such as at marinas, boat launching ramps, state parks or Corps recreation areas.

A high majority of the recreational boaters and commercial tow boat operators were very complimentary of the Corps of Engineers lock personnel. Very few had specific and/or legitimate complaints. On the other hand, recreational boaters did spot some deficiencies such as pull chains for whistles on the lock walls that did not work, or weighted ropes that may cause problems or injuries.

Commercial tow boat operators and most recreational boat operators feel that the time delays waiting to lock through are a natural phenomenon, and they adjust to them. Some recreational boaters avoid congested locks by using their radios to obtain information and/or by using those water areas that avoid use of congested locks. A time delay for recreational boaters was defined as having to wait more than 30 minutes (one-half hour) *after arriving* at the lock before the gates were opened to allow entrance into the lock.

Recreational boat operators did have suggestions for reducing problems caused by locking delays. Most of these "improvement" suggestions related to tie-up locks, protected areas, and beaching areas near the locks. Others suggested restrooms and sanitary pump-outs.

In general, most lock personnel believed that the Corps of Engineers personnel (both at the locks and in District offices) should continue to work with civic organizations, marinas, and/or boat clubs in the local communities telling the navigation message. Visits could be made to civic clubs, high schools, colleges to present talks and films on boating safety, water safety, the proper procedure for locking through a lock (and the potential dangers in a lock). These personnel could set up exhibits, pass out booklets or brochures. The marinas also could be visited and meetings arranged with boat clubs.

Scheduled talks could be presented on Saturdays and Sundays near boat ramps in state parks along the navigation canal. The lock personnel indicated that the recreational boat operators should know they can monitor Channels 16 (emergency or Coast Guard channel) or 14 on their radio, and can call the lock personnel on Channel 14. Some of the communication and/or public relations efforts have been curtailed in recent years due to cut backs in personnel on duty at the locks.

Coast Guard personnel also could be utilized in some of these boating safety education efforts. Marina operators and other boat sales and rental businesses (particularly houseboat rentals) need to be encouraged to provide seminars and/or short courses, including written and actual performance (driving tests) to new boat owners and novice operators who want to rent a boat for the weekend. The interviewers observed too many "novice boat operators" trying to handle houseboats in the lock. On windy days, the boats tended to "sail like kites," and/or continuously spin around in the lock. Many operators were not able to grab the ropes hanging from the walls. These inexperienced recreational boaters cause safety problems not only for themselves and their families, but also for other recreational boaters, and for commercial tow boat operators.

Several tow boat operators and many of the recreational boat operators strongly encouraged driver's license tests for all recreational boat operators, similar to vehicle driving tests; and that licenses be revoked for any operator stopped for reckless boating habits. Operating a boat while under the influence of alcohol probably is more hazardous for the safety of other boaters in the locks than are drunk vehicle drivers on our highways. Stricter enforcement by "State Operated Boat Patrols" as well as more frequent safety inspections by Coast Guard personnel should help improve the open water navigation and locking

through techniques of all recreational boaters. Such actions definitely would reduce conflicts between commercial tow boat operators and recreational boaters. Simultaneously, it would also contribute to higher quality boating experiences for all recreational boaters.

This researcher believes more valid responses are obtained by personal interviews where the "action is" rather than doing "telephone interviewing" or sending out mail questionnaires. It is obvious that on-site interviewing is more expensive than the other two methods and that a combination of all three techniques may be best for other similar studies. An important advantage of on-site interviewing that should be considered is the feeling generated among the interviewees that "someone cares enough to come out and ask us our opinions and actually ask us for suggestions for improvement." Based on this creation of good will, the Corps of Engineers District offices and/or the Institute for Water Resources (IWR) should consider doing periodic personal interviews "on-site" at selected recreational areas and lock and dams each year. Such personal contact creates an "aura of good will" for The Corps of Engineers

A follow-up study is needed to determine willingness to pay for locking through and to do a statistical analysis of the locking through data available in the Performance Monitoring System (PMS). Also, additional on-site personal interviewing should be done at other locks on the inland navigation system throughout the United States. In addition to gathering needed information for improving the commercial and recreational boating experience, such personal contacts provide excellent public relations feedback for the Corps of Engineers. Such studies are money well invested to improve our inland waterway navigation system.

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# INTRODUCTION

This study had as its central objective the analysis of the impact of recreational boating on Corps of Engineers locks and dams on the Illinois River and the Upper Mississippi River (Figure 1). Recreational boating has become increasingly popular in this region of the country, particularly in the summer months. When large volumes of grain were being shipped in the early 1980's via barge on the Mississippi River system, there were many time delays in locking through the locks and also many conflicts between recreational boaters and commercial tow boat operators.

As the volume of grain exports declined in the mid-1980's, some of these conflicts eased; however, the extended drought in 1988, resulting in low water levels on parts of the Mississippi River System, caused navigation problems for commercial tow boat operators and increased tension due to the driving habits and activities of some recreational boat operators.

## Tasks

The major tasks accomplished in this study were:

1. Describe the recreational vessel usage of the system, including determining actual lockage patterns and characteristics, such as how recreational vessels are grouped for lockages, priority of use, and problems presented to commercial navigation and to lock operators who experience high recreational use of the locks.

2. Analyze the operation of selected locks on the Illinois River and the upper Mississippi River through interviews with recreational boaters, commercial tow boat operators, and Corps of Engineers lock personnel;

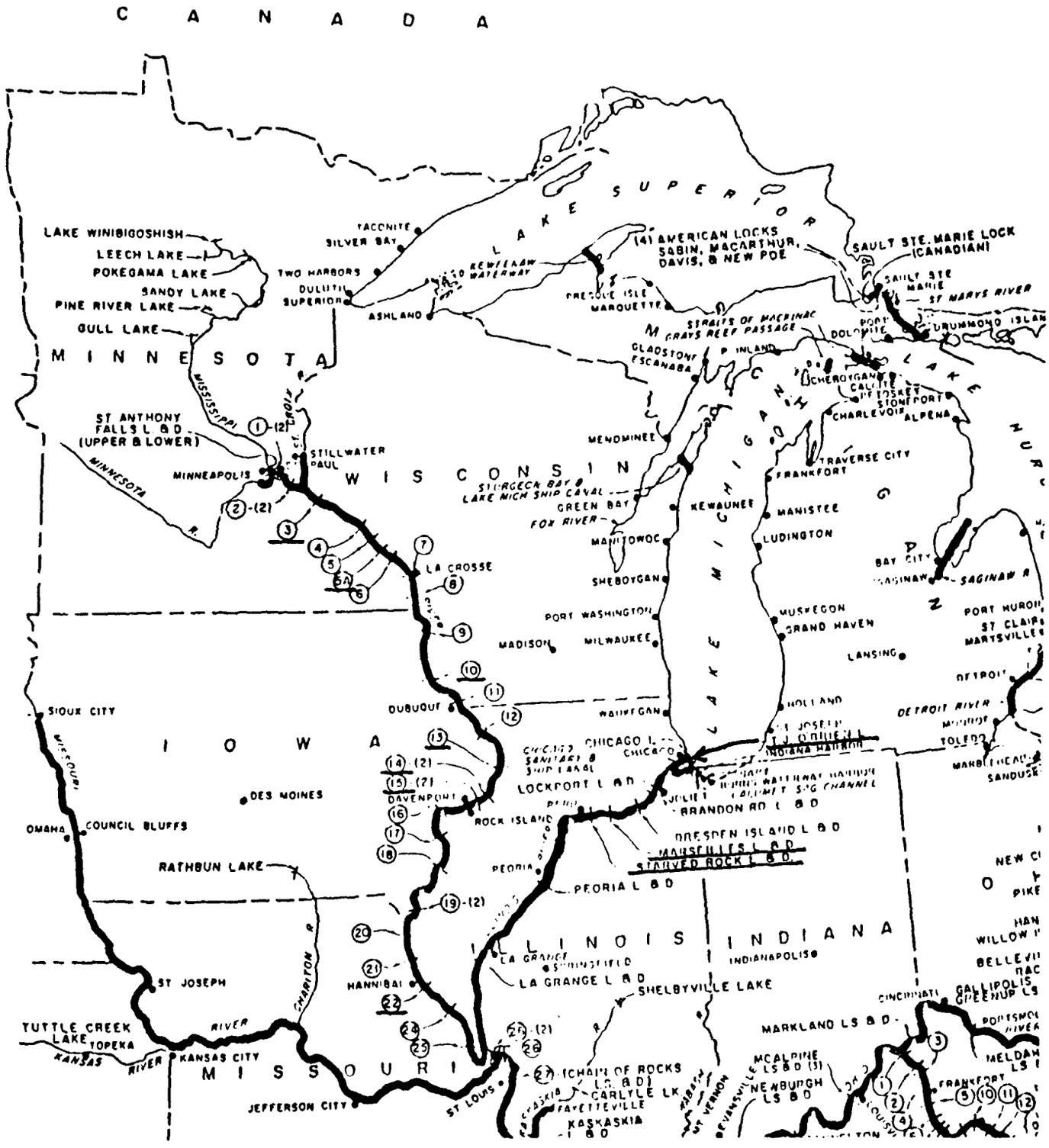


Figure 1. Schematic of the Locks and Dams on the Upper Mississippi River, Including the Illinois River (Locks in Study are Underlined)

determine any problems in locking through, including time delays, and actual or perceived conflicts between recreation boaters and tow boat operators.

3. Make recommendations on resolving some of the conflicts determined in Task 2.

4. Prepare a final report to include recommendations for data collection, and possibilities for improving locking procedures and improving the safety of all users of the Upper Mississippi River Navigation System.

The original proposal for this study included tasks related to statistical analysis of the lockage use data in the Performance Monitoring System (PMS) and an analysis of willingness of recreational boaters to pay for lockages. Due to time constraints and budget constraints, it was not feasible to incorporate these tasks into this preliminary study. Processing of Task Order No. 007 was delayed several times in the review and approval process, and time became a critical factor in accomplishing the primary task of on-site personal interviews during the 1988 summer boating season. Certainly, these other tasks are still important, and should be incorporated in a follow-up study.

## PROCEDURE

The research team visited several of the locks selected for interview on a week long trip in early August 1988. Specifically, we visited L&D 15, 14, 13, 5A, and 3 for familiarization purposes during that trip. Based on visual observations and talks with the Corps of Engineers lock personnel, there appeared to be limited recreational boating occurring during the weekdays, and thus no long time delays (over 30 minutes) for recreational boaters, or serious conflicts among commercial tow boat operators and recreation boaters on weekdays. The congestion and attitudinal behavior problems (primarily caused by "hot dogging" recreational boaters) occurred on weekends (Friday afternoon

through Sunday afternoon). Thus, in consultation with Corps of Engineers personnel in the Rock Island and St. Paul Districts and in the Institute for Water Resources (IWR) at Fort Belvoir, the decision was made to do the on-site personal interviews on weekends beginning in late August. IWR and District personnel selected the following locks for interview purposes: O'Brien, Marseilles and Starved Rock on the Illinois River; and the following on the Upper Mississippi River, Lock and Dams 22, 15, 14 and 13 in the Rock Island District; and Lock and Dams 3, 5A and 10 in the St. Paul District.

Three draft survey forms were developed and provided to IWR personnel and to personnel in the two District offices for suggestions and revisions. Comments were received and incorporated into the final survey forms which were then submitted to IWR for official approval. The three survey forms were: Recreational Boat Operators Survey; Commercial Tow Boat Operators Survey; and (Corps of Engineers) Lock Personnel Survey. A copy of each of these surveys is included in Appendixes A, B and C, respectively.

A time schedule was developed to interview the three classes of respondents. The personal interviews were made on Saturdays and Sundays and Labor Day (Monday). The objective was to interview as many recreational boaters as possible during the time period the interviewers were at each lock and dam, to interview a representative sample of tow boat operators, and to interview the Lockmaster or his representative at each of the selected locks and dams.

The actual number of recreational boats and commercial tows locked through each lock during the days we interviewed is presented in Table 1. Also shown is the actual number of personal interviews we made those same days. As indicated, 1,049 recreational boaters and 96 commercial tow boats locked

**TABLE 1: NUMBER OF RECREATIONAL BOATS AND COMMERICAL BARGES LOCKING THROUGH SELECTED LOCKS AND DAMS, UPPER MISSISSIPPI RIVER, ON DAYS OF PERSONAL INTERVIEWS AND ACTUAL INTERVIEWS OBTAINED SUMMER 1988**

| Date | Lock & Dam | Recreational Boats | | Commercial Barge Tows | | Number of Interviews Obtained | |
|---|---|---|---|---|---|---|---|
| | | Locking Up | Locking Down | Locking Up | Locking Down | Recr. Boats | Com. Barge Tows |
| 20 Aug (Sat) | T.J. O'Brien (Chicago, IL) | 120 | 110 | 3 | 6 | 14 | 2 |
| | Marseilles (Ottawa, IL) | N/A | N/A | N/A | N/A | 17 | 2 |
| 21 Aug (Sun) | Starved Rock (Peru, IL) | 28 | 21 | 5 | 8 | 11 | 2 |
| 27 Aug (Sat) | 15 (Rock Island, IL) | N/A | N/A | 5 | 4 | -- | 1 |
| | 15A (Rock Island, IL) | 5 | 34 | N/A | N/A | 11 | -- |
| 28 Aug (Sun) | 14 (LeClaire, IA) | N/A | N/A | 6 | 4 | -- | 0 |
| | 14A (LeClaire, IA) | 68 | 80 | N/A | N/A | 18 | -- |
| 28 Aug (Sun) | 13 (Fulton, IL) | 30 | 34 | 5 | 5 | 20 | 2 |
| 03 Sep (Sat) | 10 (Guttenberg, IA) | 61 | 53 | 3 | 6 | 33 | 2 |
| 04 Sep (Sun) | 5A (Winona, MN) | 53 | 52 | 2 | 3 | 40 | 2 |
| 05 Sep (Mon) | 3 (Redwing, MN) | 198 | 56 | 3 | 4 | 34 | 2 |
| 10 Sep (Sat) | 22 (Hannibal, MO) | 12 | 9 | 4 | 7 | 5 | 2 |
| 11 Sep (Sun) | 22 (Hannibal, MO) | 15 | 10 | 5 | 8 | 4 | 4 |
| **TOTAL** | | 590 | 459 | 41 | 55 | 207 | 21 |

SOURCE: Data obtained from St. Paul and Rock Island Districts

N/A: Data not available, or in cases of L&D 14 and L&D 15, not applicable for recreational boats, since the auxiliary locks were in operation on those days.

through. We actually interviewed 207 recreational boat operators (about 20%) and 21 commercial tow boat operators (about 22%) of those locking through.

## Recreational Boat Operators On-Site Interviews

Four trained interviewers, including the principal investigator, interviewed the recreational boat operators on both the Illinois River and the Upper Mississippi River. A copy of the recreational boat operators survey is in Appendix A. The interviewers pretested the survey form and gained experience in questioning techniques for several days before the official interviewing began. The interviewers wore name tags and always identified themselves, and gave a brief explanation of the purpose of the interview before requesting permission to ask the questions on the survey form. There were no turndowns; all the recreational boat operators were willing to be interviewed. In several cases when the same boat came back through the lock we decided not to interview the operator again, but we did recognize each other and we would ask them if they had had any unique experiences during the day or weekend.

The majority of the interviewing of the recreational boat operators was done while the boats were "tied up" (actually hanging onto ropes) along the walls of the lock. The interview took approximately 10 minutes. We found it was possible to interview the boat operator while the boats were either being locked down or up, that is when the water was either being released from the lock or was filling the lock. It was easier to begin the interview if the boat operators were locking down, since they were physically 8-10 feet higher in the lock, and were within better visual contact and "easier" hearing distance of the interviewer. Then the questions and answers continued as the boat and operator (and other passengers) dropped in the lock. Generally, it took about

10 minutes after the gates were closed to complete the emptying or filling operation and to open the other gates allowing the boats to leave.

If there were many recreational boats waiting to enter the lock, then the process of getting all the boats into the lock (up to 35 or 40 on some busy weekend days) took 10 to 15 minutes. In those cases, each interviewer was able to do two interviews in one locking operation.

At a few of the locks, it was possible to interview one or two recreational boat operators while they were stopped near the end of the guide wall waiting for a barge tow to be locked through. Also, on rainy days and on slow days few recreational boats locked through. The interviewers went to nearby marinas and interviewed some of the recreational boat owners on their boats in the marina.

As mentioned earlier, it was somewhat easier to initiate the interview if the boat was locking down. However, we were able to initiate interviews with boat operators who were locking up, by establishing eye contact, and using a loud voice to ask the questions. In a very few instances, the noise level from powerful boat engines created an impossible situation for interviewing if the boats were being locked up.

Also in a few cases, when only three or four recreational boats entered the lock, some of the operators would maneuver their boats in the middle of the lock and not approach the walls. The principal researcher was able to interview a few of these operators when the noise level was low.

At most of the locks, ropes were dropped down to the boat operator to hold on for stability. At the O'Brien Lock and Dam, ropes were not used; most of the recreational boat operators there had grapple hooks to hook onto the railing along the lock wall. At some of the locks, the recreational boat operators had to grasp the ropes which were hanging down the wall.

On a couple of windy days, where some turbulence existed inside the lock, a few houseboat operators and/or passengers found it impossible to grab the tow ropes to maintain stability of the boat along the lock wall. In those cases, we decided it was best not to interview the recreational boat operator during his or her ordeal. Obviously, some of these house boat operators were novices, and most had never locked through before.

## Commercial Tow Boat Operators

The principal investigator interviewed all the commercial tow boat operators. A copy of the survey form is in Appendix B. Generally, one of the lock personnel would talk to the pilot or captain and ask if he were willing to answer a few questions while waiting to lock through, or while the first cut was in the lock. The answer always was "yes." In some cases, the principal investigator put on a life jacket and boarded the tow boat and interviewed the pilot or captain in the pilot house after the first cut had entered the lock. In several cases, the pilot came out on the bridge or walked down to one of the barges along the wall, so that the interview could proceed.

## Corps of Engineers Lock Personnel

In the Rock Island District, the research team had permission to interview the Lockmaster or the chief lock operator on duty at the time we were at the lock. The principal investigator interviewed these individuals during slack periods when no barges or recreational boats were locking through. A copy of the survey form is in Appendix C.

In the St. Paul District, the District office personnel requested that the Lock Operator survey form be sent to St. Paul. The St. Paul office forwarded these forms to the individual Lockmasters at Locks 3, 5A and 10, where the form

was completed and returned to the St. Paul office. Then the completed forms were returned to the principal investigator. Obviously, some objectivity and/or spontaneity was lost in this process, and more generic or sanitized responses occurred on these survey forms. This researcher would not recommend that this procedure be followed in future studies.

## RECREATIONAL BOAT INTERVIEWS

On the first weekend, 42 recreational boat operators were interviewed on the Illinois River; 14 at O'Brien Lock and Dam on Saturday morning; 17 at Marseilles Lock and Dam on Saturday and Sunday afternoons; and 11 at Starved Rock on Sunday morning.

On the second weekend, 49 recreational boat operators were interviewed on the Upper Mississippi River; 20 at Lock and Dam 13; 18 at Lock and Dam 14; and 11 at Lock and Dam 15. All of the latter were interviewed at Sunset Marina below Lock and Dam 15 in Lock and Dam 16 pool, but in the city limits of Rock Island.

On the third weekend, 107 recreational boat operators were interviewed; 34 at Lock and Dam 3; 40 at Lock and Dam 5A; and 33 at Lock and Dam 10.

On the fourth weekend at Hannibal, Missouri, nine (9) recreational boat operators were interviewed at Lock and Dam 22. This was after Labor Day, and although the weather was sunny and warm, there were very few recreational boats using the lock.

### Illinois River Surveys

On Saturday, August 20, we interviewed the lock personnel and 14 recreational boaters at the T. J. O'Brien Lock and Dam in south Chicago. Recreational boaters indicated that there were no problems with delays at this

lock. The lock is 1000 feet long, which may have something to do with the fact that in 1987, O'Brien Lock had only 170 hours total delay time. This lock locked through 16,000 recreational boats in 1987. No ropes are used at this lock ("free float").

At Marseilles Lock and Dam at Marseilles, Illinois, the lift is 24 feet and the recreational boaters hold on to ropes while locking through. This lock was busy late Saturday afternoon as recreational boaters were heading home for the day. One lockage contained 20-25 boats. Surveys show that at Marseilles, delays are common and many boaters interviewed at Marseilles also mentioned delays occurring at Starved Rock Lock. Facilities at Marseilles were new and very impressive, and the lock personnel there were courteous and willing to provide information.

Recreational boaters at Starved Rock did not start locking through until late Sunday morning because commercial tow boats and barges were using the locks. Starved Rock is unique because of its visitor center. Exhibits and a slide show explain the transportation history and present day operation of the Illinois Waterway. The slide show was informative and very interesting.

## Upper Mississippi River Surveys

The weekend of August 26-28 in the Quad Cities area was rainy and cold. At Lock 15 at Rock Island, Illinois, early Saturday morning, I interviewed one tow boat operator and visited with the lock personnel who provided the locations of the three local marinas. Since it was raining and no recreational boats were using the auxiliary lock at Lock 15, we decided to go to Sunset Marina in Rock Island. Although the weather was miserable, we managed to find people on several boats to interview. We spent four hours at Sunset Marina, then went to the other two marinas and back to Lock 15, but there were

no recreational boaters to interview at the marinas or at the lock Saturday afternoon.

Sunday morning we interviewed at Lock and Dam 13 at Fulton, Illinois, in drizzly weather. Surprisingly, there were a lot of recreational boaters on the river. At this lock, boaters were pleased with the locking through procedures; they had some good suggestions for boaters to improve the safety and quality of the boating experience.

We interviewed recreational boaters at Lock and Dam 14 at LeClaire, Iowa. It had stopped raining but the sky was overcast. There is an auxiliary lock at Lock and Dam 14; thus recreational boaters were experiencing no delays. They were concerned about the late opening time and early closing time of the auxiliary lock during the year and several of the boaters suggested that the auxiliary locks at both Lock 14 and Lock 15 stay open later than Labor Day, as there is still a lot of recreational boat traffic.

Early Saturday, September 3, 1988, we drove from St. Paul, Minnesota to Guttenberg, Iowa, the location of Lock and Dam 10. We spent the rest of the day interviewing boaters and talking to visitors at the overlook about how the lock moves barges up and down the river. Lock and Dam 10 is located in the heart of Guttenberg so many visitors stop by to see the lock working. Two of the interviewers went to the nearby marina and interviewed boaters while a commercial tow was locking through.

We interviewed at Lock and Dam 5A at Winona, Minnesota on Sunday, September 4. Gary Nelson from the St. Paul District Corps of Engineers and his family spent the day with us at the lock. This lock is inaccessible by road so we had to cross the dam by foot to reach it. The lock was very busy throughout the day. Many recreational boaters were complimentary of the lock personnel at Lock and Dam 5A.

On Labor Day, September 5, we interviewed at Lock and Dam 3 at Red Wing, Minnesota. This lock was very busy with many large cruisers and houseboats locking through.

On Saturday morning, September 10, we went to Lock and Dam 22 just south of Hannibal to interview recreational boaters. Saturday traffic was very slow as only two lockages of recreational boaters and a few barge tows went through from 8:00 a.m. to 6:00 p.m. The lock and dam were under renovation; much construction material covered the site. However, the lock personnel were courteous and the surrounding scenery was beautiful. Traffic, or lack of it, was the same on Sunday, September 11. One recreational lockage was a group of several boats that had been through on Saturday. One boater interviewed was from South Dakota and was taking his cruiser (51' yacht) from St. Paul to Corinth, Mississippi, where the boat was to stay for the winter.

## RESULTS OF RECREATIONAL BOAT OPERATOR INTERVIEWS

A copy of the survey form used to interview recreational boat operators is in Appendix A. The highlights of the basic information obtained are presented in the following tables. Recreational boaters using the Starved Rock Lock and Dam generally travelled a much longer distance to the marina or launching ramp than did boaters locking through O'Brien Lock and Dam and Marseilles Lock and Dam (Table 2). Since we only interviewed on weekends (and one Monday holiday), it is clear that everyone we interviewed (42 on the Illinois River) used their boats on weekends. However, a few older (retired) boaters we interviewed indicated they tried to steer clear of the locks on weekends due to congestion, and generally took their boats through the locks on weekdays. This

**TABLE 2. SURVEY OF RECREATIONAL BOAT OPERATORS, ILLINOIS RIVER, ROCK ISLAND DISTRICT, AUGUST 20-21, 1988**

| | O'Brien L&D (14) | Marseilles L&D (17) | Starved Rock L&D (11) | Total (42) |
|---|---|---|---|---|
| Average Miles Traveled (One Way)[a] | 14 | 40.4 | 71.1 | 41.8 |
| Range of Miles Traveled (One Way)[a] | 2-27 | 0.5-65 | 5-185 | 0.5-185 |
| Type of Boat | | | | |
| Outboard | -- | 1 | 1 | 2 |
| Inboard (Incl. Cruiser) | 12 | 12 | 4 | 28 |
| Houseboat | -- | 3 | 4 | 7 |
| Other (Incl. Yachts) | -- | -- | -- | -- |
| Inboard/Outboard | 2 | 1 | 2 | 5 |
| Average Length of Boat (Feet) | 24.5 | 28.3 | 29.3 | 27.3 |
| Range of Length of Boat (Feet) | 18-33 | 16-47 | 15-44 | 15-47 |
| Use Boat on Weekdays (Yes) | 10 of 14 | 13 of 17 | 8 of 11 | 31 of 42 |
| Use Boat on Weekends (Yes) | 14 of 14 | 17 of 17 | 11 of 11 | 42 of 42 |
| Average % Use on Weekdays | 27.5 | 21.2 | 12.0 | 20.2 |
| Average % Use on Weekends | 72.5 | 78.8 | 88.0 | 79.8 |

[a]Distance from home to marina or boat launch site.

was particularly true of some larger pleasure boats in the Upper Mississippi River.

A high majority of recreational boaters (33 of 42 or 79 percent) interviewed on the Illinois River had experienced delays of 30 minutes or more in locking through the three locks (Table 3). Most of the delays occurred on weekends. Only nine of 42 boaters interviewed had not experienced delays of at least one hour in locking through. Most indicated the delays were caused by commercial barge tows. However, only 21 percent (7 of 33) indicated that they had had problems caused by the delays (got home late at night, ran out of fuel, encountered high winds or storms, etc.). Most of the delays occurred in the afternoons (12:00 noon to 6:00 p.m.).

Suggestions by recreational boaters for improvements to reduce problems in locking through, adjusting to delays, etc., are presented in Table 4. Twenty-eight suggested that tie-up docks could be a big safety improvement. The second most significant response was a protected area (19), followed by suggestions for restrooms and a sanitary pump-out (17 each).

The results of the 107 recreational boater interviews for Locks 3, 5A and 10 on the Upper Mississippi river are shown in Tables 5, 6 and 7. Boaters using Lock and Dam 10 at Guttenberg, Iowa travelled the greatest one-way distance to the marina or boat launching ramp (91 miles). About 70 percent (75 of 107) used their boats on weekdays; however, only about 20 percent of the total use of the boats was on weekdays (Table 5).

Eighty-five of 107 boaters (79 percent) of the boaters had experienced delays in locking through at these three locks (Table 6). Only 18 percent had had such delays on weekdays with 96 percent having delays in locking through on weekends. Over 80 percent of the delays occurred in the afternoons.

**TABLE 3. SURVEY OF RECREATIONAL BOAT OPERATORS, ILLINOIS RIVER, ROCK ISLAND DISTRICT, AUGUST 20-21, 1988**

| | O'Brien L&D (14) | Marseilles L&D (17) | Starved Rock L&D (11) | Total (42) |
|---|---|---|---|---|
| Experienced Delays (No.)[a] | 10 | 15 | 8 | 33 |
| Experienced Delays (%) | 71.4 | 88.2 | 72.7 | 78.6 |
| Delays That Occurred Weekdays (%) | 10.0 | 11.8 | 18.2 | 13.2 |
| Delays That Occurred Weekends (%) | 90.0 | 76.5 | 63.6 | 76.3 |
| Delays That Occurred in Mornings (%) | 40.0 | 26.7 | 26.7 | 27.3 |
| Delays That Occurred in Afternoons (%) | 30.0 | 60.0 | 75.0 | 54.5 |
| Delays That Occurred in Evening (%) | 60.0 | 26.7 | 8.1 | 33.3 |
| Had Problems Caused By the Delays (%) | 20.0 | 13.3 | 37.5 | 21.2 |
| Delays Caused by Recreational Boats | 0 of 14 | 1 of 17 | 1 of 11 | 2 of 42 |
| Delays Caused by Commercial Barge Tows | 10 of 14 | 14 of 17 | 7 of 11 | 28 of 42 |

[a]Delays were defined as waiting over 30 minutes after arriving at the lock before the boater could enter the lock.

**TABLE 4. SUGGESTIONS MADE BY RECREATIONAL BOATERS FOR IMPROVEMENTS, ILLINOIS RIVER, ROCK ISLAND DISTRICT, AUGUST 20-21, 1988**

| | O'Brien L&D (14) | Marseilles L&D (17) | Starved Rock L&D (11) | Total (42) |
|---|---|---|---|---|
| Tie-Up Dock | 7 | 13 | 8 | 28 |
| Beaching Area | 4 | 9 | 2 | 15 |
| Restrooms | 7 | 8 | 2 | 17 |
| Sanitary Pump-Out | 4 | 5 | 2 | 17 |
| Trash Disposal Facilities | 6 | 6 | 2 | 14 |
| Protected Area | 6 | 8 | 5 | 19 |
| Other | 4 | 2 | 3 | 9 |
| None | 3 | 1 | 1 | 5 |

**TABLE 5. SURVEY OF RECREATIONAL BOAT OPERATORS, UPPER MISSISSIPPI RIVER, ST. PAUL DISTRICT, SEPTEMBER 3-5, 1988**

| | L&D 3 (34) | L&D 5A (40) | L&D 10 (33) | Total (107) |
|---|---|---|---|---|
| Average Miles Traveled (One Way)[a] | 24 | 60 | 91 | 59 |
| Range of Miles Traveled (One Way)[a] | 1-90 | 2-175 | 1-200 | 1-200 |
| Type of Boat | | | | |
| Outboard | 1 | 7 | 12 | 20 |
| Inboard (Incl. Cruisers) | 23 | 25 | 13 | 61 |
| Houseboat | 5 | 3 | 3 | 11 |
| Other (Incl. Yachts) | 3 | -- | -- | 3 |
| Inboard/Outboard | 2 | 5 | 5 | 12 |
| Average Length of Boat (Feet) | 29.7 | 25.4 | 23.2 | 26.1 |
| Range of Length of Boat (Feet) | 17-47 | 16-41 | 15--50 | 15-50 |
| Use Boat on Weekdays (Yes) | 23 of 34 | 29 of 40 | 23 of 33 | 75 of 107 |
| Use Boat on Weekends (Yes) | 34 of 34 | 40 of 40 | 33 of 33 | 107 of 107 |
| Average % Use on Weekdays | 19.4 | 23.5 | 18.3 | 20.4 |
| Average % Use on Weekends | 80.6 | 76.5 | 81.7 | 79.6 |

[a]Distance from home to marina or boat launch site.

**TABLE 6. SURVEY OF RECREATIONAL BOAT OPERATORS, UPPER MISSISSIPPI RIVER, ST. PAUL DISTRICT, SEPTEMBER 3-5, 1988**

| | L&D 3 (34) | L&D 5A (40) | L&D 10 (33) | Total (107) |
|---|---|---|---|---|
| Experienced Delays (No.)[a] | 26 | 34 | 25 | 85 |
| Experienced Delays (%) | 76.5 | 85.0 | 75.8 | 79.4 |
| Delays That Occurred Weekdays (%) | 31.8 | 12.5 | 10.0 | 18.1 |
| Delays That Occurred Weekends (%) | 90.9 | 96.9 | 100.0 | 95.9 |
| Delays That Occurred in Mornings (%) | 23.8 | 20.7 | 36.8 | 27.1 |
| Delays That Occurred in Afternoons (%) | 76.2 | 79.3 | 89.5 | 81.7 |
| Delays That Occurred in Evening (%) | 23.8 | 20.7 | 36.8 | 27.1 |
| Had Problems Caused By the Delays (%) | 7.7 | 17.6 | 8.0 | 11.8 |
| Delays Caused by Recreational Boats | 2 of 34[b] | 0 of 40 | 0 of 33 | 2 of 107 |
| Delays Caused by Commercial Barge Tows | 24 of 34 | 33 of 40 | 24 of 33 | 81 of 107 |

[a]Delays were defined as waiting over 30 minutes after arriving at the lock before the boater could enter the lock.

[b]These two boaters also indicated they had delays also caused by commercial tows.

**TABLE 7. SUGGESTIONS MADE BY RECREATIONAL BOATERS FOR IMPROVEMENTS, UPPER MISSISSIPPI RIVER, ST. PAUL DISTRICT, SEPTEMBER 3-5, 1988**

| | L&D 3 (34) | L&D 5A (40) | L&D 10 (33) | Total (107) |
|---|---|---|---|---|
| Tie-Up Dock | 17 | 21 | 18 | 56 |
| Beaching Area | 14 | 12 | 10 | 36 |
| Restrooms | 6 | 14 | 11 | 31 |
| Sanitary Pump-Out | 3 | 9 | 9 | 21 |
| Trash Disposal Facilities | 11 | 16 | 8 | 35 |
| Protected Area | 10 | 16 | 11 | 37 |
| Other | 4 | 3 | 1 | 8 |
| None | 6 | 8 | 10 | 24 |

As indicated in Table 7, a majority of the boaters (56) suggested that tie-up docks at the locks would reduce locking through problems. In addition, 37 mentioned the need for a protected area near the lock, and 36 suggested a beaching area near the lock. Trash dispersal facilities, restrooms, and sanitary pump-out facilities also ranked high in the suggestions made.

The results of the 49 recreational boater interviews at Locks 13, 14 and 15 and the nine interviews at Lock 22 (Hannibal, Missouri) are presented in Tables 8, 9 and 10. Again, due to its relative isolation, recreational boaters locking through Lock and Dam 22 had travelled a greater distance to get to the marina or boat ramp (Table 8). All the interviews at Lock and Dam 15 were taken at Sunset Marina in Rock Island, Illinois; the indication is that many of the boats berthed at that Marina belong to owners living outside the Quad Cities area. Due to the proximity of three of the locks to the Quad Cities area, a slightly higher percentage of use (29 and 28 percent, respectively) occurred on weekdays by those locking through Locks 13 and 14. Again, the majority of total use of the recreational boats was on weekends (almost 75 percent) (Table 8).

As indicated in Table 9, almost 90 percent of the boaters (52 of 58) had experienced delays in locking through these four locks, with 100 percent of those having delays doing so on weekends. Again, most of the delays occur in the afternoons. Only 20 percent had encountered problems due to these delays. Lock 14 has an auxiliary lock open on weekends during the summer months and Lock 15 has an auxiliary lock used by recreational boaters. Thus, the higher percentage of delays caused by other recreational boats at Locks 14 and 15 is due to waiting to use the auxiliary locks.

As was the case with recreational boaters at the other locks, a majority suggested that tie-up docks at the locks would help reduce any problems

**TABLE 8. SURVEY OF RECREATIONAL BOAT OPERATORS, UPPER MISSISSIPPI RIVER, ROCK ISLAND DISTRICT, AUGUST 28-29 AND SEPTEMBER 10-11, 1988**

| | L&D 13 (20) | L&D 14 (18) | L&D 15 (11) | L&D 22 (9) | Total (58) |
|---|---|---|---|---|---|
| Average Miles Traveled (One Way)[a] | 41.3 | 9.0 | 46.5 | 58.0 | 38.7 |
| Range of Miles Traveled (One Way)[a] | 0.5-135 | 0.75-24 | 4-180 | 5-300 | 0.5-300 |
| Type of Boat | | | | | |
| Outboard | 1 | 5 | -- | 1 | 7 |
| Inboard (Incl. Cruiser) | 8 | 9 | 4 | 6 | 27 |
| Houseboat | 9 | -- | 6 | -- | 15 |
| Other (Incl. Yachts) | 1 | 1 | -- | 1 | 3 |
| Inboard/Outboard | 1 | 3 | 1 | 1 | 6 |
| Average Length of Boat (Feet) | 30.4 | 21.2 | 33.9 | 22.8 | 27.1 |
| Range of Length of Boat (Feet) | 18-47 | 16-30 | 25-46 | 16-51 | 16-51 |
| Use Boat on Weekdays (Yes) | 17 of 20 | 12 of 18 | 10 of 11 | 6 of 9 | 45 of 58 |
| Use Boat on Weekends (Yes) | 20 of 20 | 18 of 18 | 11 of 11 | 9 of 9 | 58 of 58 |
| Average % Use on Weekdays | 28.7 | 28.3 | 21.4 | 25.0 | 25.8 |
| Average % Use on Weekends | 71.3 | 71.7 | 78.6 | 75.0 | 74.2 |

[a]Distance from home to marina or boat launch site.

**TABLE 9. SURVEY OF RECREATIONAL BOAT OPERATORS, UPPER MISSISSIPPI RIVER, ROCK ISLAND DISTRICT, AUGUST 28-29 AND SEPTEMBER 10-11, 1988**

| | L&D 13 (20) | L&D 14 (18) | L&D 15 (11) | L&D 22 (9) | Total (58) |
|---|---|---|---|---|---|
| Experienced Delays (no.)[a] | 19 | 14 | 11 | 8 | 52 |
| Experienced Delays (%)[a] | 95.0 | 77.8 | 100.0 | 88.9 | 89.7 |
| Delays That Occurred Weekdays (%) | 23.5 | 25.0 | 45.5 | 20.0 | 28.5 |
| Delays That Occurred Weekends (%) | 88.2 | 83.3 | 90.9 | 100.0 | 90.6 |
| Delays That Occurred in Mornings (%) | 37.5 | 18.2 | 45.5 | 20.0 | 30.3 |
| Delays That Occurred in Afternoons (%) | 81.3 | 72.7 | 81.8 | 100.0 | 84.0 |
| Delays That Occurred in Evening (%) | 31.3 | 18.2 | 45.5 | 0.0 | 23.7 |
| Had Problems Caused By The Delays (%) | 31.6 | 12.5 | 9.1 | 25.0 | 19.5 |
| Delays Caused by Recreational Boats | 0 of 20 | 5 of 18 | 2 of 11 | 0 of 9 | 7 of 58 |
| Delays Caused by Commercial Barge Tows | 19 of 20 | 9 of 18 | 9 of 11 | 8 of 9 | 45 of 58 |

[a]Delays were defined as waiting over 30 minutes after arriving at the lock before the boater could enter the lock.

**TABLE 10. SUGGESTIONS MADE BY RECREATIONAL BOATERS FOR IMPROVEMENTS, UPPER MISSISSIPPI RIVER, ROCK ISLAND DISTRICT, AUGUST 28-29 AND SEPTEMBER 10-11, 1988**

| | L&D 13 (20) | L&D 14 (18) | L&D 15 (11) | L&D 22 (9) | Total (58) |
|---|---|---|---|---|---|
| Tie-Up Dock | 12 | 8 | 9 | 6 | 35 |
| Beaching Area | 5 | 8 | 4 | 1 | 18 |
| Restrooms | 6 | 12 | 4 | 4 | 26 |
| Sanitary Pump-Out | 5 | 5 | 4 | 0 | 14 |
| Trash Disposal Facilities | 4 | 8 | 4 | 1 | 17 |
| Protected Area | 10 | 6 | 5 | 3 | 24 |
| Other | 5 | 2 | 3 | 0 | 10 |
| None | 2 | 4 | 1 | 1 | 8 |

caused by delays (35 responses) (Table 10). Twenty-six suggested that restrooms would help, while 24 mentioned a protected area and 18 a beaching area.

## COMMENTS BY RECREATIONAL BOATERS AT LOCKS AND DAMS ON THE ILLINOIS RIVER

### O'Brien Lock and Dam

One suggestion which was also brought up by a boater at Marseilles Lock, was that tie-up ropes should be available at this lock. A complaint by two boats was the fact that the commercial barges should have more lights. Apparently some barges are not well lit and recreational boaters seem to have problems with seeing the large craft at night. Another comment, a common one at most locks, was the lack of knowledge of rules by many recreational boaters. Several suggested that Coast Guard Patrols may help to alleviate some of the carelessness caused by this ignorance.

Some recreational boaters had suggestions that they felt may decrease delays caused by commercial barges. These included having a two hour span in the morning and again in the afternoon where only small boaters could use the locks, not always giving the commercial tow the right of way, having specific times for chemical barge lockages, and letting everyone know by a radio announcement when the barge lockage is complete. Compliments were particularly praiseworthy in noting that the personnel at O'Brien Lock were doing a good job. One boater had been to Corps of Engineers recreation areas in Nebraska and other states and thought those facilities were excellent.

## Marseilles Lock and Dam

This lock was deemed as a slow lock by one boater who added that the personnel take their time with procedures. Another comment was that lock operators were abrupt on the radio and inadequate information was being provided by radio. On the brighter side, a number of boaters said that the Corps personnel were very helpful. One boater mentioned going through 32 locks without a delay three years ago. One boater brought up the idea of becoming tougher with compliance of boating standards. A suggestions to cut down on delay time was to have a separate lock for recreational boaters.

## Starved Rock Lock and Dam

Again, remarks pertaining to the ignorance of recreational boaters arose. This time a proposal to educate the pleasure craft about commercial barges and safety tips was suggested. A problem for one boater was the rings on the mooring cells being too high for him to reach. Another problem was the absence of tie-up ropes in locks 25, 26, and 27. Another boater complained of the lack of restrooms in the parks along the Illinois River. A problem that people felt needed to be resolved was the absence of "no wake" signs at gas docks, and between the bridges at Ottawa, Illinois. Apparently speedy boaters tend to create waves that cause problems for small boats in these areas. Suggestions for cutting down delays at locks were to shut down barges for two weekends a month and on holidays and to only allow two commercial barges to lock through instead of three. Boaters at this lock tended to think lock operators were very cooperative and very nice.

## COMMENTS BY RECREATIONAL BOATERS AT LOCKS AND DAMS ON THE UPPER MISSISSIPPI RIVER

### Sunset Marina-Rock Island

Comments here were numerous and contained a lot of thought as boaters had time to talk and think because they were not locking through. Radios were a subject referred to often. Thoughts on these include the need for better communication on the radio to lessen delays, teaching boaters to listen to radio channels before calling in, and the need for a stronger reception of hand radios at the locks. One boater noted that often the lock operators are busy and cannot man the radio all the time.

The previous mentioned subjects of better lighting on the barges and classes on boating were also brought up here. Tie-up ropes seemed to be of great concern. Some felt that the lock personnel need to be aware of problems with catching the ropes and try to be more helpful. Some saw the need for tie-up ropes at all locks, and more authority exerted by lock operators concerning who should tie-up where and boaters obeying the "no wake" signs while exiting the lock. One boater felt the rock pile by Lock 15 caused by barges waiting to lock through poses a danger to pleasure boats. Another complaint was that the auxiliary lock at Lock 14 is not well-manned during the week because too much attention is being given to the main lock. An important topic to these boaters was the water level at Sunset Marina. They believe that Lock and Dam 16 dumps additional water to raise pool 17's level and Sunset Marina is lowered drastically in a very short time. The water level decreased one foot overnight during Labor Day weekend of 1987 and caused problems for a lot of the big boats. One boat owner mentioned that the canal to Rock River is dried up now but that it would be nice to have it for utilization instead of having to use the

main river. These people generally felt that the Corps of Engineers personnel were doing a good job and one group appreciated the lock operator waiting for them when they were in sight of the lock.

## Lock and Dam 14

The main concern at this lock was the time of year in which the auxiliary lock is operated. Many boaters wish that the auxiliary lock would open before Memorial weekend and close later than Labor Day weekend. Apparently, in this area there are still many recreationists on the water throughout October. Some suggested that the auxiliary lock stay open until later hours during the week.

One boater felt that more boaters need to pay greater attention to what they are doing. Another remarked on big boaters' lack of consideration for small boats and they go too fast, creating waves that "swamp" the smaller boats. It was reported that the tie-up ropes in the St. Paul District locks have leaded weights which can cause damage to boats and to individuals' heads. One boat was dented by a lead weight and the owner wrote a complaint to OSHA expressing the possible danger of the leaded ropes.

It was commented by a few boaters that sometimes lock operators will not throw tie-up ropes to boaters in the locks. Negative attitudes by lock personnel at Lock and Dam 12 at Bellevue, Iowa were noted as was the fact that the operator at Lock and Dam 15 took his time and coiled up all the tie-up ropes before opening the lock gates. On the other hand, there were also complimentary remarks relating to the good work performed by operators at Locks 14 and 15.

## Lock and Dam 13

There were a few contradictory statements by recreationists at this lock. One said that Locks 14 and 15 do not always answer the radio but realized that they are short-handed at times. Conversely, one boater mentioned the good luck he has had with radio communication at Locks 14 and 15 but that he had always had problems at Lock 13. Some felt that delays could be shortened through more communication with the locks, but that it is difficult when lock operators do not answer or do not give enough information.

One recommendation was to provide a place for barges to tie up at Locks 13 and 14. Another was to let big boats into the locks first because they can damage the little boats if caution is not exercised by both the large and small boats. One boater saw the need to teach new boat owners courtesy and how to use the locks. New boaters who do not know how to operate their boats in a lock have caused damage to other boats when rafting. Problems have arisen at Locks 4, 5, 7, 8, and 9 when lock operators have not thrown tie-up ropes to the boaters. Recommendations include brighter lighting of barges at night, a tie-up dock on the sand beach at Lock and Dam 11, opening Lock 14 (auxiliary) earlier during the year and closing it later than Labor Day weekend, and more recreational sand bars along the river. One boater felt that the Sabula Railroad bridge operators were somewhat unfriendly towards recreational boaters. However, many commented on the courtesy and helpfulness of the lock personnel and felt that the Corps of Engineers does a great job with navigation on the river.

## Lock and Dam 10

We heard about the difficulty of getting a lock operator on the radio and the shortage of lock personnel. People felt the need for a full crew on auxiliary

locks (such as at L&D 15 and 14), as well as the main locks and the need for more seasonal workers. Impressive to recreationists was the passing out of brochures at Lock 9 on the Mississippi River lock and dams. Some felt the need for dredging the pool above Lock 10 and Bussey Harbor. Others recommended keeping the auxiliary locks at L&D 14 and L&D 15 open longer throughout the year. Additional suggestions were having a sign outside each lock explaining what each of the lights means and clock displaying the time of the next recreational lockage.

**Lock and Dam 5A**

Boaters mentioned implementing a required course on how to lock through. They feel boaters should find out what they are doing before they get on the river and then perhaps damage to boats in locks would be minimized. A boater without a ship-to-shore radio suggested a clock at each lock showing approximately how long the delay will be so that they have an idea of the length of their wait. The need for more crew people at the locks and tie-up areas around the lock was conveyed, as was a published number to call and receive daily water levels on the river. Also, lights on the buoys at night was considered to be a necessity by boaters.

**Lock and Dam 3**

Common comments here were the lock personnel's lack of help given to pleasure boaters and the need for classes to provide information for new boaters on locking through. Some felt the need for a place to tie-up their boats in the upper pool while they are waiting to enter the lock. They feel it is a dangerous place to wait. A recommendation given was to lengthen the "no

wake" areas. Small boats tend to take off in a hurry, thus leaving a wake and complicating things for the other boats attempting to enter or exit the lock.

**Lock and Dam 22**

One boater commented about having a difficult time with radio communication at Lock 24, and another wished to inform the Corps of Engineers of a broken pull-chain at Lock 24. It was also mentioned here that everyone at the locks seem to be really nice.

## COMMERCIAL TOW BOAT OPERATORS ON THE ILLINOIS RIVER

**O'Brien Lock and Dam**

Two commercial tow boat operators (pilots) were interviewed while locking through the O'Brien Lock and Dam in south Chicago. One had 10 years experience as a pilot while the other had three years experience as a pilot. Each had worked on tow boats on the Illinois River for over 10 years. Both tow boats handled tows from south Chicago to Lemont, usually pushing one tow up and one tow down per day. Each tow usually has six to eight barges. Both pilots operate all year round.

Both pilots indicated the greatest time delays in locking through occurred on weekends in the summers. Most delays are only 15 to 20 minutes. The O'Brien Lock is 110 feet wide and 1,000 feet long and can handled an eight barge tow. The Sugarland, owned by ARCO, which operates on the Mississippi River, is 996 feet long, and can lock through O'Brien. It usually hauls liquid fertilizer.

## Marseilles Lock and Dam

Two commercial tow boat operators (pilots) were interviewed while locking through the Marseilles Lock and Dam. One had 12 years experience as a tow boat operator; the other 38 years experience, mostly on the Illinois River, although both also worked on the Upper Mississippi River. The typical round trip was Lemont, Illinois to St. Louis, Missouri for one operator; for the other the typical round trip was Joliet, Illinois to New Orleans, Louisiana. Both pilots operate all year round. Sometimes they are slowed a little by the ice in the locks on the Illinois River.

The operator pushing tows between Lemont and St. Louis indicated that delays in locking through occurred most often at Marseilles, with Lockport Lock and Dam also a bottleneck sometimes. The problem at Marseilles is that there is not enough room for two tows to pass downstream from the lock; one tow has to wait a long way from the lock until the tow being locked down clears the lock and moves downstream. The canal is not wide enough near the lock; it is silted in. The operators indicated that they could not tie up at the cells below Marseilles Lock and Dam because they would be in the way of the other tow. One operator suggested the cells be removed and the concrete walls on the upper level extended so they could tie to the wall and then slide down the wall to the lock. Both operators indicated the canal should be widened below and above the lock. A study of the Marseilles canal is underway.

The tow boat operator pushing tows between Joliet, Illinois and New Orleans indicated the biggest time delays in locking through occur at Lock and Dam 26 (Altom, Illinois), and Lock and Dam 15 at Rock Island, Illinois on the Mississippi River, and at Lockport on the Illinois River. His longest time delay was four days at Lock and Dam 26 in October 1984.

Both operators indicated that other commercial tows were the primary cause of time delays, and not recreational boats. However, one of the pilots indicated that water skiers were major hazards to commercial barges as they cut across the path of commercial tows below the line of sight of the pilot. Recreational boaters and particularly those pulling skiers should be told that the pilot cannot see their boat or skier in front of the lead barges in the tow. Both pilots indicated that recreational boat operators should be required to take a course in boating safety, including how to handle their boats in the locks, where to wait until the lock is clear, and how to avoid problems with commercial tows.

## Starved Rock Lock and Dam

Two commercial tow boat operators (pilots) were interviewed while locking through the Starved Rock Lock and Dam. One had 38 years experience on the Mississippi River Navigation system with 33 years experience as a pilot; the other had 17 years experience as a tow boat operator. The typical run was Lemont, Illinois to St. Louis, Missouri for one and Lemont to Peoria, Illinois for the other. The Lemont to St. Louis operator typically handled 15 barge tows while the Lemont to Peoria operator typically handled 7 to 9 barge tows.

One pilot mentioned only normal delays that are to be expected in locking through. The other indicated fewer delays in July and August and more after the grain harvest in the fall and in the "ice" months (January-March) when problems were encountered on the rivers and in the locks due to ice floes and ice clogging.

The "Lemont to St. Louis run" pilot indicated the greatest delays in locking through at Lockport, Brandon, Marseilles, Starved Rock, and Dresden in that order. Recreational boat traffic is not a major problem; the time delays are due to other commercial tows. One pilot indicated that breakdowns

(malfunctions) at locks cause delays sometimes; that pilot also indicated that lock regulations (and the lack of consistency in enforcing such regulations) cause communication problems between the commercial tow boat operators and lock personnel. He indicated that some of the lock personnel could have a better or more positive attitude, and be more pleasant when giving instructions. This could help speed up the locking through operation.

The pilot with 38 years of navigation experience indicated that at Marseilles, the canal is too narrow and that the "mooring" cells were in the way of barges entering and leaving the locks. He specifically mentioned the right descending cells above the Marseilles lock and the left descending cells below the same lock. He stated that the majority of the pilots he talked to thought those cells should be removed.

A recreational boat related problem occurs at one of the boat ramps at Stratton State Park where there is usually a "queque" line of boats waiting to use the ramp to take the boats out of the rivers. The operators stay in the main river channel in the way of commercial tow boats. The commercial pilot had to stop the tow and blow his whistle several times to get the recreational boats to move out of the main channel.

Both pilots indicated the need for 'driving' or safety lessons on the part of the recreational boat operators. The front of the barges have red and green lights with a flashing amber light in the middle. The pilot house has red and green lights also. However, recreational boat operators do not know the significance of these lights. Recreational boat operators need to take the same tests as commercial tow boat operators.

A related safety factor, at least in the summer of 1988, is that many of the lights on the bridges are burned out and/or need to be repaired. Trying to move

under (through) some of the bridges on the Illinois River is very dangerous at night.

The channel below the Starved Rock Lock also is too narrow and needs to be widened if possible. Commercial tows coming up river have to wait one-half mile downstream and pull over to the sand bar so down-bound tows can pass by on the turn. This takes about 10 minutes after the tow leaves the lock. Then the upbound tow has to back off into the main channel and take 15-20 minutes to move up into the lock. So there is a 30 minute delay for upbound traffic due to the narrow channel in the Starved Rock lower pool.

## COMMERICAL TOW BOAT OPERATORS ON THE UPPER MISSISSIPPI RIVER LOCK AND DAMS 13-15

One commercial tow boat operator was interviewed at Lock and Dam 15 at Rock Island, Illinois and two pilots were interviewed at Lock and Dam 13. The experience of the pilots was seven years, 12 years, and 45 years.

The standard run for the pilot interviewed at Lock and Dam 15 was from Buffalo to Clinton, Iowa. For that pilot, the greatest time delays were at Locks 15 and 17, with fewer delays at Locks 16 and 13. He normally operates from mid-February to mid-December with a typical tow of six barges. He indicated that the low water in the river resulted in fewer places to pass other tows, causing additional time delays. He also indicated that the Corps of Engineers lock personnel usually are very courteous and helpful, and he had no suggestions on how to reduce the time delays and/or how to improve commercial navigation on the Upper Mississippi River.

The standard run for the two pilots interviewed at Lock and Dam 13 was Prairie du Chien to St. Louis, and St. Paul to St. Louis. They generally operate all year except when the river is frozen over. Both operators normally handle 15

barge tows which requires a cut or two lockages at most locks. One pilot indicated most of his time delays in locking through occurred at Lock and Dam 15, followed by Lock and Dam 21; the other pilot indicated most of his time delay problems occurred from Lock and Dam 21 on down to Lock and Dam 26.

Both pilots indicated that due to the shallow water and narrow channel, there was not place to "hole up" in between Locks 14 and 15, so that other tows could pass. One operator indicated that the Corps had dredged some to try to widen the pool just below Lock and Dam 14 but that it really did not help the passing situation, and it is still dangerous to navigate in that area.

The other pilot suggested that when water levels are low and channels are shallow, it would be best for the commercial tow boat operators (i.e., would save time overall) if the Corps would lock the tows in groups. He explained this concept. When there is a lot of traffic, lock three tows up, and then three tows down. The second tow up or down could move on into position and tie to the wall behind the second cut after the second cut moves into the lock. This would save time. He also indicated that Lock and Dam 15 does lock in groups when that lock gets a lot of congestion. This pilot indicated that most recreational boats did not cause too many safety related problems; that fishing boats anchored or drifting in the main channel were a bigger problem, particularly when the fishing boat operator had trouble starting the engine as the commercial tow was bearing down on him and could not stop.

This pilot also indicated that when there is high water in the spring, loaded south bound barges at Lock and Dam 13 have problems during high winds getting in to the lock. The current takes the tow to the dam. He indicated it takes up to one hour to get into the lock in high water periods. Even worse are empty barges in high winds, since they "act just like a sail boat." He indicated that the cell added above Lock and Dam 13 about four years ago has helped a

lot and suggested that more cells are needed on the Upper Mississippi River if they were placed in the proper location. He also suggested that the locking through times could be greatly reduced in high water periods, if the Corps of Engineers had a tug at the lock to help put the tow on the wall.

Finally, this operator suggested that marina operators and/or boat clubs need to take on the responsibility of educating recreational boat operators on safety regulations and the courtesy rules for navigation. If all recreational boat operators followed such rules, both time delays and boating accidents would be reduced.

Following the suggestion of the lock personnel at Lock and Dam 13, the pilot (captain) of a commercial passenger boat, the Julia Belle Swain, was interviewed while waiting to lock through that lock. The passenger boat's normal run is from LeClaire, Iowa to Galena, Illinois. It is a two day cruise with an overnight stay in Galena. The boat makes two lockings a day or four lockings in the two day trip. A highlight for many of the passengers is the locking operation.

The pilot indicated he received good cooperation from the lock personnel at Lock and Dam 13, but previously had encountered problems with personnel at Lock and Dam 12 in locking through. Evidently, that situation has been resolved. He indicated that the passenger vessel procedure is not a well-defined policy in Corps of Engineers regulations. An informal interview with another commercial passenger vessel captain that same day did not reveal any problems with locking through policies for commercial passenger vessels.

## Lock and Dam 10

Two commercial tow boat operators were interviewed while locking through Lock and Dam 10 at Guttenberg, Iowa. The typical run for one pilot with

eight years experience is McGregor, Iowa to St. Louis, Missouri, usually pushing 15 barges downstream and six to eight barges upstream. The standard run for the other pilot, who had 27 years experience, was from St. Paul, Minnesota to St. Louis, Missouri, pushing 15 barges down and 15 barges up, but generally dropping off six to eight on the way up before reaching Lock and Dam 10.

One pilot indicated most of his time delay problems occurred at Locks 14 and 15 in that order. He stated that a critical problem is that after locking down at Lock and Dam 14, there is a shallow area after the barge tow makes a left turn into the straightaway. The other pilot indicated the greatest time delays at Lock and Dam 15, followed by Lock and Dam 20 and then 21. Generally, all the tow boat operators mentioned the greatest time delays at Lock and Dam 26, which is still under construction.

Another general concensus among all the barge operators was that other commercial tows cause most of the time delays in locking through the lock on the Upper Mississippi River system and not recreational boats.

A particular problem with recreational boat operators occurred in the Lock and Dam 15 pool earlier in the summer (in August) when a sail boat race was held. The Regatta officials wanted all commercial barge traffic stopped while the race was being run. There were no Coast Guard officials in the Lock and Dam 15 pool to supervise the race and/or to resolve problems for commercial barge operators.

Both of these commercial pilots stated that the Corps of Engineers personnel are doing an excellent job at the various locks; one pilot indicated that the lock operations were slowed down sometimes because there was a shortage of personnel ("short-handed").

The major complaints about recreational boat operators were that they cut in front of the barges and below the line of sight of the pilot house. If the recreational boat engine fails, the people in the boat are "dead-meat." Also, when recreational boat operators see a commercial barge tow approaching a lock, the recreational boats "make a mad dash" for the lock trying to get into the lock ahead of the commercial tow.

## Lock and Dam 5A

Two commercial tow boat operators were interviewed at Lock and Dam 5A near Winona, Minnesota; one had been a pilot for 13 years, the other only had six months experience. The typical run is from St. Paul, Minnesota to St. Louis, Missouri, pushing 15 barges upstream and 15 barges downstream. They both operate all months when the Upper Mississippi River is not iced over; then they move to the Lower Mississippi River. Both pilots indicated they had the greatest time delays in locking through at Lock and Dam 15, followed by 14. One of the more experienced pilots indicated the third most important bottleneck for him was Lock and Dam 22.

The more experienced pilot on the Upper Mississippi indicated that because of the rock cut below Lock and Dam 14, the channel simply was not wide enough to wait in the pool below that lock, which caused additional delays for upbound tows after the downbound tow cleared the lock. The other pilot indicated there was no place to wait on either side of the lock at Locks 14, 15 and 22. One pilot indicated that he had to wait about three miles downstream of Lock and Dam 15 for down bound traffic to pass.

Again, the suggestion was made to do some kind of grouping of the commercial tows, such as locking three up and then three down if the traffic is

heavy. This would reduce passing time by two-thirds and save the commercial towing companies diesel fuel costs and reduce other costs as well.

Both pilots were concerned for the safety of recreational boats and skiers. One mentioned that a recreational boat was hit by a barge tow a week ago (late August) at Lock and Dam 8 and the operator was killed. Both pilots suggested an educational program should be implemented for recreational boat operators, and that if those operators are going to use a commercial river for pleasure, then they should take a "rules of the road" test and be required to watch a film on navigation and "locking through." Both pilots indicated there should be a licensing program for recreational boat owners and operators.

## Lock and Dam 3

Two commercial tow boat operators were interviewed at Lock and Dam 3 at Red Wing, Minnesota, one while locking through and the other while waiting to lock down. One operator had five years' experience as a pilot and the other had 33 years experience. The standard run is from St. Paul to St. Louis for one pilot and St. Paul to Rock Island, Illinois for the other. The standard tow is 15 or 16 barges, although one of the pilots was pushing eight (petroleum) barges on this trip. The petroleum barge is 54 feet wide and 195 feet long.

One pilot mentioned the greatest time delays in locking through occurred at Lock and Dam 14, followed by 15 and 16 in that order. He stated there were fewer time delays above Dubuque (Lock and Dam 11) than below that point. The other pilot indicated the time delays were about the same at all the locks from St. Paul to Rock Island, his standard run. On some trips, the longest delays are at one lock; the next trip at another lock.

One pilot suggested that 1200 foot locks are needed on the entire system to reduce delays, but realized the high cost of implementing that project. The

other pilot indicated some cells were needed below Locks 11, 14, 15 and 20. Below Lock and Dam 15, he thought a cell was needed between the bridges. He mentioned the time delay problem in locking up through Lock and Dam 15, because the upstream tow has to wait below the Crescent railroad bridge for the down bound tow to pass.

Concerning problems with recreational boats, those operators should be told to keep the wheel house (pilot house) in view at all times so they are reasonably sure they are in line of sight of the commercial tow boat pilot. The most critical problems arise with line of sight when the tow boat is pushing empty barges; these ride high in the water and the line of sight from the pilot house increases considerably. One pilot interviewed at Lock and Dam 22 indicated the line of sight in front of empty barges is about 800 feet from his pilot house.

## Lock and Dam 22

Six commercial tow boat operators were interviewed while locking through at Lock and Dam 22 at Hannibal, Missouri. Three of the pilots had standard runs from St. Paul, Minnesota to St. Louis, Missouri; one from St. Paul to Cairo, Illinois; one from East St. Louis to Bettendorf, Iowa; and one from St. Louis to Quincy, Illinois. The years of service as a pilot were: 12, 15, 17, 20, 31, and 33. Most pushed 15 barges upbound and 15 barges downbound, although this varied; some pushed fewer petroleum barges (six generally) at times.

The greatest time delays in locking through occurred as follows:

| Pilot | Order of Locks With Greatest Time Delays<br>First | Second | Third |
|---|---|---|---|
| 1 | 15 | 14 | 20 on down |
| 2 | 21 | 15 | 25 |
| 3 | 22 | 15 | 14 |
| 4 | 14 | 15 | 12 |
| 5 | 15 | 14 | 21 |
| 6 | 21 | 14 | 15 |

Five of the six commercial tow operators mentioned that the major cause of the time delays in locking through were other commercial tows; only one indicated that recreational boats and other commercial tows together contributed to the time delays.

One pilot indicated that a second cell is needed up above Lock and Dam 22 so waiting tows can tie to two cells; when tied to only one cell, the tow has a tendency to drift out into the river channel. Another pilot mentioned that mooring cells are needed in both the upper and lower pools at Lock and Dam 22; this would save 30 minutes at least for each tow in each lock through, if the tows could tie to cells closer to the lock. This pilot had just waited 3/4 miles downstream for a downbound tow (the AETNA) to lock down and pass him in the channel before he could move up into the lock.

Lock and Dam 22 was being rebuilt when we were interviewing; all of the pilots indicated the Corps of Engineers lock personnel were doing a good job with what they had to work with in outdated locks and equipment. One pilot mentioned the water is too shallow by the cell above Lock and Dam 22 and his tow gets stuck; even when the water is higher than now, the current builds an eddy by the cell and it still causes problems for loaded tows.

Several pilots also mentioned that the abandoned railroad bridge near Winona, Minnesota is dangerous as the clearance width is only 156 feet. They thought the bridge should be removed.

Several of the pilots mentioned safety problems related to skiers in particular, and recreational boats in general. One pilot related he saw a young woman skiing, with no life jacket, and holding a small child in her arms. She came very close to his tow while trying to "control" the ski rope. One pilot indicated that other commercial tow boat operators with his company had inadvertently run over three recreational boats so far in 1988.

Several pilots mentioned excessive drinking by the recreational boat operators and too many drunks driving "pleasure craft" in the navigation channel in front of or alongside the commercial tows. Most of the pilots believed that recreational boat operators must be of legal age and should be licensed; that they should have to take a test. One suggested that all recreational boat operators should be required to watch a film showing the dangers of boating from the perspective of the tow boat operator.

One of the pilots interviewed (he had 31 years experience) ran over an 18-19 foot recreational boat with three people in it in the Lock and Dam 4 pool. All three survived; however, their boat was destroyed. They were all drunk and maneuvered their boat just in front of the lead barge when their engine cut off. The pilot could not see the boat. He was going downstream with empty barges moving about 5 miles per hour. This happened during broad daylight on a Sunday morning.

## RESULTS OF SURVEY OF LOCK PERSONNEL

### Illinois River in Rock Island District

As indicated earlier, the author personally interviewed either the Lockmaster (if he was on duty) or the head lock and dam operator on duty at each of the locks and dams in the Rock Island District. This included the three locks and dams on the Illinois River (O'Brien, Marseilles and Starved Rock) and four locks and dams on the Upper Mississippi River (13, 14, 15, and 22). In the St. Paul District, the survey forms were completed by the Lockmasters at the three locks and dams (10, 5A and 3) and mailed back to the author of this report from the St. Paul District office.

Commercial tows move all year through each of the locks and dams on the Illinois River, while the busiest time for recreational boats is May through September. At Starved Rock, the head lock and dam operator indicated recreational boats remained active until about mid-October.

At O'Brien and Starved Rock, the lock personnel indicated that about 75 percent of the recreational boats locked through on weekends (Friday afternoon through Sunday evening) and about 25 percent on weekdays during the summer months. At Marseilles Lock and Dam, the estimated locking through by recreational boats is 90 percent on weekends and 10 percent on weekdays.

The enforced locking policy is not to lock recreational boats with any flammable, hazardous boats (any commercial barge tow that has a "posted" sign - red metal flag - indicating chemicals or other hazardous materials). Also no recreational boats are locked through with any government boats - Coast Guard vessels, Corps of Engineers tugs, or other government vessels.

The recognized policy or priority procedure for locking through is as follows: first are government vessels, followed by passenger or excursion

vessels, commercial tows, and then recreational boats. Some of the Lockmasters will lock recreational boats between the first and second cuts of a tow if the pool is right (depending on whether locking up or down and in which pool the recreational boats are waiting). Sometimes, if there is a small second cut, and/or the regular commercial tow does not take up the entire lock, recreational boats may be locked through with a "non-posted" commercial tow, such as a knock out single. However, most lock personnel do not like to lock through commercial tows with recreational boats because of the danger of accidents and resulting liability if a recreational boat is crushed against the wall.

The lock personnel interviewed were asked about any major conflicts among the different types of vessels, such as lining up for locking, waiting in the upper or lower pool, waiting time, etc. In general, the lock personnel indicated no major problems. At O'Brien, there is about 2,000 feet of guide wall with tie ups on the wall on both the upper and lower pools. This helps with high winds. This river is wide enough at both ends of the lock so tows can pass each other and recreational boats also have room to wait.

The O'Brien Lock and Dam gets very few visitors, since it is hard to find, and any visitor has to drive over a dirt road part of the way; one must also drive through a city of Chicago landfill operation and through a forest preserve operated by the State of Illinois.

The lock personnel at Marseilles Lock and Dam felt the major problem with commercial tow lock through operations was "green hands" or inexperienced crewman. In recent years because of slow traffic, there have been layoffs and when barge towing companies do hire back, they may have a green crew.

The major problem with recreational boat operators is their lack of knowledge of hazards in the river and lack of knowledge of locking through

procedures. Many recreational boats do not have radios. so cannot call the lock to determine locking times for commercial tows (thus waiting times). Some recreational boats with radios do not know which channel to turn on to obtain needed information.

In extreme ice conditions in the winter when the walls are icing, the tows are restricted to 70 feet wide, so the tows may be limited to two barges wide and four barges long.

## Locks 13, 14, 15 and 22 on the Upper Mississippi River (Rock Island District)

On the Upper Mississippi River, little if any navigation occurs in late December, January and February. There are some exceptions due to mild winters. Commercial barge traffic usually begins in early March with the volume depending on the movement of grain. In years when the government is selling a lot of grain, there is a lot of down bound traffic. This was the case in 1986 and 1987. Coal is being moved in both directions on the Upper Mississippi.

Recreational boating lock throughs are heaviest from May through September at Lock and Dam 13, from June through September at Lock and Dam 14 (at the auxiliary lock) and from June through August at Lock and Dam 15. Both Lock and Dam 15 and 14 have auxiliary locks for recreational boats. The auxiliary lock at Lock and Dam 14 is open from Memorial Day weekend until just after Labor Day, and operates from Friday afternoon to Sunday night.

The auxiliary lock at Lock and Dam 15 is 110 feet wide and 350 feet long and is used primarily for recreational boats; at times small single cut commercial tows also use the auxiliary lock. The lock personnel at Lock and Dam 15 indicated that with the auxiliary lock, recreational boats seldom have more than a 15 to 20 minute delay locking either up or down.

The recreational boating use of the locks varies; at Lock and Dam 13 about 65 percent of the use by recreational boats occurs on weekends and 35 percent during the week. At Lock and Dam 14, the ratio is 60-40 weekend to weekday use; at Lock and Dam 15, the indicated use of the locks is 80 percent on weekends and only 20 percent on weekdays by the recreational boats. At Lock and Dam 22, 90 percent of the recreational boat lock throughs occur on weekends. After Labor Day weekend, Lock and Dam 22 gets very little recreational boat traffic.

There are no major conflicts between recreational boats and commercial tows at Lock and Dam 13. There is a big problem with the wind affecting north bound (upbound) traffic, particularly those tows with empty barges riding high in the water. The tow boats cannot get the empty barges off the wall without a lot of difficulty. At Lock and Dam 13, the outdraft is not bad. The lock personnel mentioned that Lock and Dam 11 near Dubuque, Iowa has a swirling outdraft that causes problems for commercial tows; that lock does not have an extra wall to stabilize the outdraft.

Lock personnel at Lock and Dam 14 indicated a problem exists in the lower pool below Lock 14 in that the channel is too shallow and barge tows are having trouble passing each other (upbound and southbound). The same problem was mentioned by the lock personnel at Lock and Dam 15. Above the bridge in the upper pool, the navigation channel cuts through rock; the rock cut is too narrow. In the lower pool, the low water has restricted the navigable channel, requiring upbound waiting tows to hold up too far downstream from the lock.

Some of the problems at Lock and Dam 15 in trying to hold the barge tow to the wall (so they can tie to the wall) arise because of underpowered tow

boats. The smaller tow boats simply do not have enough draft to move the barges to the wall.

At Lock and Dam 22, there is a cell in the upper pool that barge tows can tie off on to wait. There also is a cell by the lower gates; this cell helps keep the tow lined up since there is a bad outdraft on the lower wall.

The general consensus of the lock personnel was that recreational boats with radios need to learn how to monitor traffic on Channel 16 (the emergency or Coast Guard channel) as well as on Channel 14. Some recreational boat operators that do monitor traffic on Channel 16 do not know that they can talk to the lock personnel on Channel 14. In a few cases, recreational boat operators could learn what they need to know by monitoring other traffic rather than calling in every few minutes about lock through time for a double cut, etc.

## Locks 3, 5A and 10 on Upper Mississippi River

The Lockmasters at these locks indicated that there generally is no traffic in January and February due to ice conditions on the river. Commercial barge traffic is heaviest from May through October at Lock and Dam 3 (Red Wing, Minnesota) and Lock and Dam 5A (Winona, Minnesota) and from April through October at Lock and Dam 10 (Guttenberg, Iowa). Recreational boat traffic is heaviest from May through August at Lock 3, from June through August at Lock 5A, and from June through September at Lock 10.

At Locks 3 and 5A, about 70 percent of the recreational boat lock throughs occur on weekends and only 30 percent on weekdays. At Lock 10, the ratio is 90-10, comparing weekend to weekday lock throughs of recreational boats.

At Lock and Dam 5A, the down bound tows take a longer period of time lining up to get into the lock. This holds up other traffic longer than usual. There

are very few places for tows to pass when one tow is leaving the lock and another is entering the lock. If the navigation channel (river) could be straightened upstream from Lock 5A, the tows would have more room to meet and pass. Once a bigger and better bubbler system is installed at Lock 5A during rehabilitation, this will help improve lockages during ice conditions.

A general consensus for all lock personnel is that more educational programs for recreational boaters and better communication for all classes of boats would help reduce congestion problems at the locks during busy locking times.

## OTHER SUGGESTIONS VOLUNTEERED BY RECREATIONAL BOATERS

The following comments were volunteered by recreational boaters when they were asked if they had any suggestions on improving the locking through operations and/or any other comments about boating on the Mississippi River Navigation System. The number in parentheses indicates the number of boaters making that statement (if more than one such response).

### Lock and Dam 3

Better communication between lock personnel and boat operators.

Need place to tie up in upper pool

Longer "no-wake" area (2).

Throwing rope is helpful.

Tie-up at locks (2).

"Help" classes for new boaters (3).

Penalize those who don't follow "no-wake."

**Lock and Dam 5A**

Require "locking through" course for all recreational boaters (2).

Provide clock telling when next recreational boat lockage will be (2).

Need more crew people at locks.

Tie-up place around the locks.

**Lock and Dam 10**

More beaches.

Make it easier to get lock personnel on radio.

Clock telling approximately when next recreational boat lockage will be.

Dredge Bussey Harbor.

Seasonal workers are a good idea.

Dredge pool above Lock 10.

Operate Auxiliary locks longer during year.

**Lock and Dam 13**

Need to teach new boaters how to lock through and to be courteous.

Auxiliary lock to stay open before Memorial Day and after Labor Day.

Drop lines at locks (2).

Need better lighting on barges.

More recreation sand bars for boats to pull onto.

Let big boats in first at locks to minimize risk of damage to small boats.

**Lock and Dam 14**

Glad to see someone is asking questions.

Open earlier and close later for auxiliary lock (2).

Weights on ropes cause damage to boats.

**Lock and Dam 15**

Better lighting of locks.

Classes for recreational boat operators should be required.

Radios need to be equipped for longer distance.

Leave water level of pool alone because it has adverse effects on Sunset Marina. (3)

More beaches.

Help boaters with ropes at locks and lock personnel should exert more authority (3).

Big boats should enter lock first.

**Lock and Dam 22**

Fix pull chains at Lock and Dam 24.

**O'Brien Lock and Dam**

Barges need better lighting at night (2).

Better communication with locks on radios.

**Marseilles Lock and Dam**

Better communication with lock operators (more information while on radios).

Personnel at locks need to be tougher with boating regulations.

Courtesy lines at O'Brien L&D.

**Starved Rock Lock and Dam**

Tie-ups around lock (pollards) (2).

Should be a pleasure craft class to teach boating safety.

"No-wake" signs at all gas docks and between bridges at Ottawa, Illinois.

# SUMMARY AND CONCLUSIONS

This study on recreational boating at selected locks and dams on the Illinois River and the Upper Mississippi River was initiated in the summer of 1988. The major tasks were:

1. Describe the recreational vessel usage of the system, including determining actual lockage patterns and characteristics, such as how recreational vessels are grouped for lockages, priority of use, and problems presented to commercial navigation and to lock operators who experience high recreational use of the locks.

2. Analyze the operation of selected locks on the Illinois River and the upper Mississippi River through interviews with recreational boaters, commercial tow boat operators, and Corps of Engineers lock personnel; determine any problems in locking through, including time delays, and actual or perceived conflicts between recreation boaters and tow boat operators.

3. Make recommendations on resolving some of the conflicts determined in Task 2.

4. Prepare a final report to include recommendations for data collection, and possibilities for improving locking procedures and improving the safety of all users of the Upper Mississippi River Navigation System.

The original plans were to obtain the actual number of recreational boat lock throughs occurring on summer weekdays and weekends at each of the selected locks, and then to determine a statistically valid sample for interview in each of the summer months (June, July, August, and September). After several unavoidable delays in developing the Scope of Work and obtaining approval for the study, the time frame for actual on-site interviewing of recreational boat operators "telescoped" into a one month period (mid-August to mid-September). Based on a week long familiarization tour of most of the selected locks on the

Upper Mississippi River (not on the Illinois River) and after visiting with Corps of Engineers personnel in the District Offices in Rock Island and St. Paul, it was decided to do the personal interviews only on weekends and on Labor Day. There were not sufficient recreational boat lock throughs on weekdays to justify the interviewing expense. Also, any delays and other conflicts between recreational boaters and commercial tow boat operators were more likely to occur on weekends, not during weekdays.

Three survey instruments were developed, revised, and approved for personal interview purposes: 1) Recreational Boat Operators Survey; 2) Commercial Tow Boat Operators Survey; and 3) Lock Personnel Survey. Concern was expressed that it would be difficult to interview recreational boaters during the locking through operation and perhaps that doing personal interviews during that operation would be distracting to the boat operator and cause safety problems. Fortunately, these concerns were unwarranted. It was relatively easy to ask questions, receive answers and comments, and make the appropriate responses on the survey form while the recreational boat was "docked" along the wall or sitting in the water near the wall.

This researcher believes more valid responses are obtained by personal interviews where the "action is" rather than doing "telephone interviewing" or sending out mail questionnaires. It is obvious that on-site interviewing is more expensive than the other two methods and that a combination of all three techniques may be best for other similar studies. An important advantage of on-site interviewing that should be considered is the feeling generated among the interviewees that "someone cares enough to come out and ask us our opinions and actually ask us for suggestions for improvement." Based on this creation of good will, the Corps of Engineers District offices and/or the Institute for Water Resources (IWR) should consider doing periodic personal interviews "on-site" at

selected recreational areas and lock and dams each year. Such personal contact creates an "aura of good will" and/or good feelings that "our taxpayer dollars are being used to benefit the recreationists."

Over four weekend periods during the locking through operation, 207 recreational boaters and 21 commercial tow boat operators were interviewed. Also interviews were obtained from either the Lockmaster and/or other lock personnel for all 10 locks: O'Brien, Marseilles and Starved Rock on the Illinois Rivers; and Locks and Dams 3, 5A, 10, 13, 14, 15, and 22 on the Upper Mississippi River. In the St. Paul District, the Lockmasters at Locks and Dams 3, 5A and 10 submitted written responses for the lock personnel survey; for the other locks, the principal researcher personally interviewed the lock personnel.

If the weather had not been bad (rainy and low temperatures) on the weekend at Locks and Dams 13, 14 and 15, we likely would have obtained another 50 recreational boater surveys. Similarly, if we could have interviewed at L&D 22 (Hannibal) earlier in the season, rather then the weekend after the Labor Day holiday, we could have obtained an additional 20 or 30 recreational boater surveys.

All in all, given the time constraints, and the one rainy weekend, the number of interviews obtained is respectable and represents a valid sample for analysis and confidence level purposes in drawing conclusions and making recommendations. We interviewed 207 of 1,049 recreational boaters locking through on the days we interviewed, a 20 percent sample. We interviewed 21 of 96 commercial tow boat operators locking through on those days, a 22 percent sample. Based on informal conversations with lock personnel, recreational boaters, commercial tow boat operators and marina operators, we are confident that the boating patterns and any congestion and delay problems that occurred on the weekends we interviewed were typical of any other

weekends for the 1988 summer boating season in the Upper Mississippi River and the Illinois River (May to September).

Major findings are presented in the report. Locking through time delays of one-half hour or more did occur for a high majority of recreational boaters. However, for most of these boaters, the time delays caused no major problems, and many of the boaters conveyed the opinion that the time delays became just another part of the recreational experience. This means that many of them continued partying, talking, relaxing, or whatever, while waiting for the lock to open for their use.

There are some valid suggestions in the report for improving the locking through performance and for improving the boating safety and quality of life experience of boating on the Navigation System. Some of these suggestions are physically or financially impossible to implement. Other suggestions can be implemented at fairly reasonable cost in time, money, and/or manpower. Some of the "complaints" or gripes emanated from the fact that due to federal budget restrictions or reductions in recent years, the locking operations have fewer seasonal and permanent personnel on duty, particularly on weekends, when recreational boating traffic is highest.

In general, the recreational boaters do not have significant problems with the locking through procedures and/or policies. Most understand that commercial tow boats have priority for locking through. Those recreational boat operators who remain "sane and sober" had few complaints about the lock personnel and/or about the locking through delays. Some of the more belligerent recreational boat operators who threatened "to call their Congressman" (and do in a few instances!) had obviously been drinking something stronger than soda pop!

On balance, both the commercial tow boat operators and the recreational boat operators were very complimentary of the Corps of Engineers lock personnel and most were appreciative of the opportunity to boat on the Navigation System. For some new recreational boaters, the locking through operation was a novel recreational experience to be enjoyed. For some inexperienced rental houseboat operators, it was a hazardous undertaking with the potential for a costly accident.

A major recommendation is that state governments implement river patrols and that both the Coast Guard and Corps of Engineers personnel become more strict in enforcing safety regulations, banning drunk boat operators from the river, and requiring driving tests and driver's licenses for boat operators. Marinas and boat rental and sales businesses should implement boating safety and locking through courses or seminars. Civic Clubs and other local organizations should be encouraged to sponsor boating safety programs. Boating safety should be stressed through TV and radio programs and newspaper articles. Booklets and leaflets on safe boating and locking through procedures and how to avoid conflicts with commercial tows should be distributed in high schools, through libraries, through marinas and boat sales and rental firms, and at the locks. One lock (L&D 9) was innovative in developing a "throw or drop" pack of safety instructions which the lock personnel pitched into the boats being locked through.

There is increased concern about drunk driving on our nation's highways and the accidents and deaths caused by drunk drivers. We must become increasingly vigilant and do something to control the excessive use of alcohol by boat operators on our nation's waterways. State operated lake and river patrols, and increased budgets for the Coast Guard are needed to provide more boating safety inspections and to detect more drunk boat operators. Violators

should have their licenses pulled, be fined, and have restrictions imposed on future use of the Navigation System. A "get tough" attitude must be implemented on our nation's waterways before the alcohol-boat driving syndrome becomes even more of a crisis.

Additional statistical data on the boating season for the selected locks and dams are presented in Tables 11, 12 and 13. The typical boating season for the vast majority of boaters begins in April or May and ends in September or October. The recreational boaters also volunteered their major boating areas on the rivers and lakes; this information is presented in Table 14. In Table 15, data are presented on the number of years experience in locking through. Thirty-two of the 207 recreational boaters interviewed had almost no experience (less than one year). For about 10 boaters in this group, that particular lock through was their first.

A follow-up study is needed to determine willingness to pay for locking through and to do a statistical analysis of the locking through data available in the Performance Monitoring System (PMS). Also, additional on-site personal interviewing should be done at other locks on the inland navigation system throughout the United States. In addition to gathering needed information for improving the commercial and recreational boating experience, such personal contacts provide excellent public relations feedback for the Corps of Engineers. Such studies are money well invested to improve our inland waterway navigation system.

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# APPENDIXES

# APPENDIX A

# RECREATIONAL BOATERS SURVEY

OMB #0702-0116
EXPIRES 31 OCT 89

CONFIDENTIAL

# SURVEY OF RECREATIONAL BOAT OPERATORS AT CORPS OF ENGINEERS LOCKS AND DAMS UPPER MISSISSIPPI RIVER AND ILLINOIS RIVER

## SUMMER 1988

1. Location_____Marina or Lock & Dam_____Date_____Time_____
2. Hometown_____State_____
3. Name of Marina or Launching Site_____
4. Distance from home to launching site or to marina_____
5. Type of Boat: Inboard_____Outboard_____Houseboat_____Other_____
   Length____FT _____Motor HP
6. How often do you use your boat? (number of times per month)
   JAN_____FEB_____MAR_____
   APR_____MAY_____JUN_____
   JUL_____AUG_____SEP_____
   OCT_____NOV_____DEC_____
7. Do you use your boat % of total time
   on weekdays? yes_____no_____ _____%
   on weekends? yes_____no_____ _____%
8. Does this vary by month of the year? Yes_____No_____
   If yes, please explain_____

_____

_____

9. On which rivers or lakes do you normally recreate with your boat?

_____

10. Do you lock through any locks and dams? Yes_____No_____
    If yes, which locks and dams? 1. L & D_____ 2. L & D_____
    (List in order of importance) 3. L & D_____ 4. L & D_____
11. When did you first lock through a lock and dam with your boat?
    (Month and Year)_____

12. How many times have you locked through each lock and dam this year?

| | | | |
|---|---|---|---|
| L & D #_____ | _____ | _____ | _____ |
| | no. of times | When (month) | When (month) |
| L & D #_____ | _____ | _____ | _____ |
| | no. of times | When (month) | When (month) |
| L & D #_____ | _____ | _____ | _____ |
| | no. of times | When (month) | When (month) |

13. Have you experienced any time delays in locking through a lock?
Yes_____ No_____ At which locks?_____
If yes, when was the first time?_____(Month & Year on each lock involved)

_____

At which lock has this delay been most frequent?_____
Was it on a weekday or weekend?(mention each lock) weekday____weekend____
What time of the day did the delay occur: Morning_____Afternoon_____Evening____

14. What do you do during these time delays (fish, relax, etc.)?_____

_____

15. Have these time delays caused any specific problems for you? Yes_____No_____
Or, do you consider the delay just a part of your recreational experience?
Explain_____

_____

16. Do you feel that the major cause of the delays are from:
other recreational boats only_____
commercial barge tows only_____
a combination of commercial barge tows and recreational boats_____

17. Does this vary by time of year? Yes_____No_____
Explain_____

_____

18. What recommendation do you have for how these time delays may be avoided?

_____

_____

19. What problems, if any, have you encountered at either the upper pool or lower pool, while waiting to lock through?

| | Upper Pool | Lower Pool |
|---|---|---|
| None | _____ | _____ |
| Bad weather | _____ | _____ |
| Need for Restroom | _____ | _____ |
| Other | _____(specify) | _____(specify) |

20. Did these delay problems cause you to change your recreational boating patterns? Yes_____ No_____
If yes, in what ways?_____

21. What facilities and/or services, if any, would you like to have provided by either the private sector or the Corps of Engineers, at a "parking area", while waiting to lock through?

None_____

| | | |
|---|---|---|
| Tie Up Dock | Yes_____ | No_____ |
| Beaching Area | Yes_____ | No_____ |
| Restroom Facilities | Yes_____ | No_____ |
| Sanitary Pump Out | Yes_____ | No_____ |
| Trash Disposal Facilities | Yes_____ | No_____ |
| Protected Area | Yes_____ | No_____(with dike or breakwater) |
| Other | _____ | (specify) |

22. Do you have any other suggestions or recommendations on improving the locking through of commercial barges and/or recreational boats?_____

THANK YOU FOR YOUR ASSISTANCE ON THIS SURVEY

DDB/klk
8/18/88

# APPENDIX B

# COMMERCIAL TOW BOAT OPERATORS SURVEY

OMB #0702-0116
EXPIRES 31 OCT 89

CONFIDENTIAL

# SURVEY OF COMMERCIAL TOW BOAT OPERATORS AT CORPS OF ENGINEERS LOCKS AND DAMS UPPER MISSISSIPPI RIVER AND ILLINOIS RIVER

SUMMER 1988

1. Location_____ Date_____ Time_____
   (name or L & D no.)
2. Name_____ Hometown and State_____
3. Name of Towboat_____ Owner_____
   Owner's Hometown & State_____
4. How long have you been a towboat operator?_____Years
5. What is your normal work schedule? (Days on and days off/month)_____
6. How long have you pushed tows on the upper Mississippi river system (Illinois River)?_____Years
7. What size tow do you usually handle? no. of barges_____ HP of towboat_____
8. How many tows do you normally handle per year (by month)?

   JAN_____ FEB_____ MAR_____
   APR_____ MAY_____ JUN_____
   JUL_____ AUG_____ SEP_____
   OCT_____ NOV_____ DEC_____

9. How many tows have you handled in 1988?_____
10. How long does it normally take to move a tow from one location to another? (specify two typical ports for origin and destination)

    _____ _____
    port of origin port of destination

11. Have you experienced any delays in locking through any of the locks an dams on the upper Mississippi River? Yes_____ No_____
    If Yes, when? (what months)_____
    What days of the week?_____
    On which locks and dams (rank in order of most delays first)

    1._____ 2._____ 3._____
    4._____ 5._____ 6._____
    7._____ 8._____ 9._____

12. In your experience, at which lock and dam have the time delays in locking through been worst (longest)?_____
13. How long have these delays typically been?_____(Hours or Days)
14. What has been the longest delay that you have had before locking through?
_____(Hours or Days)
15. When did this longest delay occur (Day, Month, and Year)?_____
16. Do you feel that the major cause of the delays are from:
    Other commercial tows?_____
    Recreational boats?_____
    A combination of both?_____
    Other? (specify)_____

_____

_____

17. Do you have any suggestions or recommendations on how to overcome these time delays?_____

_____

_____

THANK YOU FOR YOUR ASSISTANCE ON THIS SURVEY

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8/18/88

# APPENDIX C

# LOCK PERSONNEL SURVEY

CONFIDENTIAL

# SURVEY OF LOCK PERSONNEL
# LOCKS AND DAMS
# AT CORPS OF ENGINEERS
# UPPER MISSISSIPPI RIVER
# AND ILLINOIS RIVER

## SUMMER 1988

1. Name of Lockperson_____Title_____
2. Lock & Dam (Name or No.)_____Date_____
3. Navigation system or river_____
4. Number of years with Corps of Engineers_____Seasonal_____Full-Time_____
5. Number of years working on navigation systems_____
6. Number of years on this navigation system_____
   at this lock & dam_____
   at other locks & dams_____
   where_____

---

7. Locking through by type of boat (for general information only)
   (write in code: RB = Recreational Boats ; CV = Commercial Vessels)

| | Very Few | Moderate | Heavy Use |
|---|---|---|---|
| JAN | | | |
| FEB | | | |
| MAR | | | |
| APR | | | |
| MAY | | | |
| JUNE | | | |
| JULY | | | |
| AUG | | | |
| SEPT | | | |
| OCT | | | |
| NOV | | | |
| DEC | | | |

8. Weekend versus weekday use:

| | % of weekend | % of weekday |
|---|---|---|
| Commercial Vessels | | |
| Recreational Boats | | |

9.

| | CV (% of 100) | RB (% of 100) |
|---|---|---|
| Midnight to 6:00 AM | | |
| 6:00 AM to 12 Noon | | |
| 12:00 Noon to 6:00 PM | | |
| 6:00 PM to Midnight | | |

10. Does this vary by season of the year? Yes_____No_____

If Yes, please explain_____

11. Locking through policies for this lock & dam

12. Does Locking Policy vary or change by season of the year?

Yes_____No_____If Yes, explain how_____

13. Approximate wait time by commercial vessels (CV) and Recreational Boats (RB)

| | Minutes by CV | Minutes by RB |
|---|---|---|
| JAN TO MAR | | |
| APR TO MAY | | |
| JUN | | |
| JUL | | |
| AUG | | |
| SEPT | | |
| OCT TO NOV | | |

14. What are major conflicts among different types of vessels? (Space, Lining up for Locking, Waiting Time, etc.)_____

_____

_____

_____

15. When are these conflicts most prevalent (time of year, time of day, weekday versus weekend, etc.)?_____

_____

16. What are your recommendations for resolving some or all of these conflicts (Identify type of conflict)?_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR ASSISTANCE ON THIS SURVEY

DDB/klk
8/18/88

## APPENDIX D

## TABLES 11-13: SEASONAL USE OF RIVER

## TABLE 14: AREAS RECREATED ON RIVER

## TABLE 15: YEARS EXPERIENCE LOCKING THROUGH

**TABLE 11. BOATING SEASON FOR LOCK AND DAMS 3, 5A AND 10**

| Month | L&D 3 | L&D 5A | L&D 10 | Total |
|---|---|---|---|---|
| WHEN BOATERS BEGIN RECREATING ON THE RIVER | | | | |
| February | -- | 1 | -- | 1 |
| March | -- | -- | 1 | 1 |
| April | 19 | 20 | 13 | 52 |
| May | 12 | 17 | 13 | 42 |
| June | 2 | 1 | 3 | 6 |
| July | 1 | -- | 1 | 2 |
| August | -- | -- | 1 | 1 |
| WHEN THE BOATING SEASON TYPICALLY TERMINATES | | | | |
| July | 1 | -- | -- | 1 |
| August | 1 | 3 | 2 | 6 |
| September | 9 | 10 | 12 | 31 |
| October | 23 | 21 | 17 | 61 |
| November | -- | 5 | 1 | 6 |

**TABLE 12. BOATING SEASON FOR LOCK AND DAMS 13, 14, 15 AND 22**

| Month | L&D 13 | L&D 14 | L&D 15 | L&D 22 | Total |
|---|---|---|---|---|---|
| WHEN BOATERS BEGIN RECREATING ON THE RIVER | | | | | |
| March | 1 | -- | 1 | -- | 2 |
| April | 7 | 8 | 7 | 4 | 26 |
| May | 7 | 7 | 2 | 3 | 19 |
| June | 2 | 2 | 1 | -- | 5 |
| July | 2 | 1 | -- | -- | 3 |
| WHEN THE BOATING SEASON TYPICALLY TERMINATES | | | | | |
| August | 1 | 4 | 1 | -- | 6 |
| September | 2 | 2 | 2 | 2 | 8 |
| October | 10 | 11 | 8 | 5 | 34 |
| November | 6 | 1 | -- | -- | 7 |

**TABLE 13. BOATING SEASON FOR ILLINOIS RIVER LOCKS AND DAMS**

| Month | O'Brien L&D | Marseilles L&D | Starved Rock L&D | Total |
|---|---|---|---|---|
| WHEN BOATERS BEGIN RECREATING ON THE RIVER | | | | |
| February | -- | 1 | -- | 1 |
| March | -- | 2 | 2 | 4 |
| April | 3 | 8 | 5 | 16 |
| May | 6 | 5 | 3 | 14 |
| June | 2 | -- | -- | 2 |
| July | 2 | -- | -- | 2 |
| WHEN THE BOATING SEASON TYPICALLY TERMINATES | | | | |
| August | 3 | -- | -- | 3 |
| September | 1 | 5 | 3 | 9 |
| October | 8 | 7 | 4 | 19 |
| November | 1 | 3 | 3 | 7 |
| December | -- | 1 | -- | 1 |

## TABLE 14. AREAS NORMALLY RECREATED WITH BOAT

| | TOTAL |
|---|---|
| LOCK AND DAM 3 | |
| Mississippi River | 32 |
| St. Croix | 30 |
| Lake Pepin | 3 |
| Lake Michigan | 3 |
| Lake Hudson | 1 |
| Minnesota | 1 |
| LOCK AND DAM 5A | |
| Mississippi River | 38 |
| St. Croix | 7 |
| Lake Michigan | 7 |
| Lake Winebago | 4 |
| Fox River | 2 |
| Black River | 1 |
| Lake Green | 1 |
| Florida | 1 |
| Lake Manoa (Madison) | 1 |
| Lake Superior | 1 |
| Wisconsin River | 1 |
| Wolf River | 1 |
| LOCK AND DAM 10 | |
| Mississippi River | 33 |
| Lake Michigan | 4 |
| St. Croix | 3 |
| Lake Buelah | 2 |
| Rock River | 2 |
| Coralville Reservoir | 2 |
| Clear Lake | 1 |
| Green Bay | 1 |
| Illinois River | 1 |
| Lake La Belle | 1 |
| Milwaukee River | 1 |
| LOCK AND DAM 13 | |
| Mississippi River | 20 |
| Fox River | 1 |
| Lake Michigan | 1 |
| Lake Erie | 1 |
| LOCK AND DAM 14 | |
| Mississippi River | 15 |
| Green Bay | 1 |
| Illinois River | 1 |
| Lake Michigan | 1 |
| St. Croix | 1 |

**TABLE 14 (Continued)**

| | TOTAL |
|---|---|
| LOCK AND DAM 15 | |
| Mississippi River | 11 |
| St. Croix | 2 |
| Lake Michigan | 1 |
| Illinois River | 1 |
| LOCK AND DAM 22 | |
| Mississippi River | 5 |
| Lake of the Ozarks | 4 |
| Mark Twain Lake | 3 |
| Missouri River | 2 |
| Illinois River | 1 |
| Ohio River | 1 |
| Tennessee River | 1 |
| Table Rock Lake | 1 |
| O'BRIEN LOCK AND DAM | |
| Lake Michigan | 11 |
| Chicago River | 7 |
| Cal-Sag Channel | 6 |
| Calumet River | 2 |
| Illinois River | 1 |
| Mississippi River | 1 |
| MARSEILLES LOCK AND DAM | |
| Illinois River | 16 |
| Lake Michigan | 5 |
| Mississippi River | 3 |
| Des Plaines | 1 |
| Kankakee River | 1 |
| Missouri River | 1 |
| Table Rock Lake | 1 |
| STARVED ROCK LOCK AND DAM | |
| Illinois River | 11 |
| Lake Michigan | 3 |
| Mississippi River | 3 |
| Ohio River | 2 |
| Arkansas River | 1 |
| Cumberland | 1 |
| Henry Harbor | 1 |
| Kentucky Lake | 1 |
| Kankakee River | 1 |
| Peoria | 1 |

## TABLE 15. NUMBER OF YEARS EXPERIENCE IN LOCKING THROUGH

| Years | L&D3 | L&D5A | L&D10 | Total |
|---|---|---|---|---|
| 0-1 | 1 | 4 | 9 | 14 |
| 2-5 | 10 | 8 | 7 | 25 |
| 6-10 | 8 | 9 | 9 | 26 |
| 11-20 | 11 | 7 | 3 | 21 |
| >20 | 4 | 8 | 5 | 17 |
| Range | <1yr-49yrs | 1st time-32yrs | 1st time-30yrs | 1st time-49yrs |
| Average | 11.6 yrs | 12.0 yrs | 8.2 yrs | 10.6 yrs |

| Years | L&D13 | L&D14 | L&D15 | L&D22 | Total |
|---|---|---|---|---|---|
| 0-1 | 1 | 2 | 2 | 1 | 6 |
| 2-5 | 6 | 4 | 1 | 2 | 13 |
| 6-10 | 2 | 3 | 4 | 1 | 10 |
| 11-20 | 3 | 4 | 2 | 2 | 11 |
| >20 | 8 | 5 | 2 | 1 | 16 |
| Range | 1mo-42yrs | 1mo-35yrs | 1yrs-34yrs | 1st time-28yrs | 1st time-42yrs |
| Average | 18.3 yrs | 13.7 yrs | 11.5 yrs | 11.2 yrs | 13.7 yrs |

| Years | O'Brien L&D | Marseilles L&D | Starved Rock L&D | Total |
|---|---|---|---|---|
| 0-1 | 9 | 2 | 1 | 12 |
| 2-5 | 2 | 8 | 1 | 11 |
| 6-10 | 2 | 3 | 1 | 6 |
| 11-20 | 1 | 2 | 5 | 8 |
| >20 | -- | 2 | 3 | 5 |
| Range | 1mo-14yrs | 1mo-28yrs | 1yr-47yrs | 1mo-47yrs |
| Average | 2.8 yrs | 7.9 yrs | 18.8 yrs | 9.8 yrs |

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