35.0

19th ANNUAL MEETING

MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

9-10 April 1987

University of Wisconsin-La Crosse

La Crosse, Wisconsin

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19th Annual Meeting of the Mississippi River Research Consortium, Inc.

1986-87 Board of Directors

Dr. Leslie E. Holland, National Fisheries Research Center, La Crosse, WI

Dr. Michael R. Winfrey, University of Wisconsin-La Crosse, La Crosse, WI

Mr. Hannibal Bolton, U.S. Fish and Wildlife Service, Winona, MN

Exhibits Committee

Mr. Michael R. Dewey, National Fisheries Research Center

Dr. Leslie E. Holland, National Fisheries Research Center

Mr. Michael D. Schueller, National Fisheries Research Center

Liaison with the University of Wisconsin-La Crosse

Ms. Karen L. Curtis, National Fisheries Contaminant Research Center

Preregistration

Ms. Karen L. Curtis, National Fisheries Contaminant Research Center

Ms. Janet H. Beitlich, Fish Disease Control Center

PROGRAM SCHEDULE

MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

19th Annual Meeting

University of Wisconsin - La Crosse

Thursday, 9 April, 1987

WELCOME

8:30 - 8:40 Welcoming Remarks. H. Bolton

SESSION 1: UMRS UPDATES Moderator: M. Winfrey

8:40 - 9:00 The Weaver Bottoms rehabilitation project - an update. K. M. Cheap

9:00 - 9:20 The Mississippi River: Our partner in power production. G. L. Johnston

9:20 - 9:55 Overview of the environmental management program-slide presentation. D. Kennedy

9:55 - 10:25 LTRM Update. J. Scott

10:25 - 10:35 Coffee Break

SESSION 2: FISH AND WILDLIFE SOFTWARE Moderator: L. Holland

10:35 - 10:40 Introduction. L. Holland

10:40 - 10:55 Fisheries software: Back calculation, age-length keys, and population structure indices. R. V. Frie

10:55 - 11:10 Movmodl: A graphic simulation model for large-scale fish population movements. K. S. Lubinski

11:10 - 12:00 Exhibit & Discussions. Including: 30 software packages, above materials and Application of Stella Modeling software to fisheries and aquatic ecological research in large river ecosystems. T. G. Coon

12:00 - 1:00 Lunch

SESSION 3: CONTRIBUTED PAPERS A Moderator: R. Frietsche

1:00 - 1:20 An evaluation of a short term study to determine the effect of a partial side channel closure on the sport fishery of Cassville Slough. M. R. Dewey, L. E. Holland, and J. Rogala.

1:20 - 1:40 The effect of gene flow on genetic relationships of mussel populations from the Mississippi River from mussel populations in the Illinois River. S. D. Johnson, M. A. Romano, and R. V. Anderson

1:40 - 2:00 Alternative solutions for revitalization of Peoria Lake along the Illinois Waterway. M. Demissie and N. G. Bhowmik

2:00 - 2:20 Computer aided analysis of the backwater rehabilitation of Weaver Bottoms (Pool 5, UMR): Impacts on nursery habitat. L. J. Erickson-Eastwood and L. E. Holland

2:20 - 2:40 Assessment of the commercial harvest of freshwater mussels in the Mississippi River bordering Wisconsin. D. J. Heath

2:40 - 3:00 Prairie Du Chien revisited - 10 years after dredging. M. E. Havlik

3:00 - 3:20 Break

SESSION 4: CONTRIBUTED PAPERS B Moderator: T. Jackson

3:20 - 3:40 Sedimentation problems in Quincy Bay along the Mississippi River. J. R. Adams and N. G. Bhowmik

3:40 - 4:00 Benthic invertebrate community structure in relation to sediment characteristics in a backwater lake of the Upper Mississippi River. D. J. Hornbach, B. S. Payne, and A. C. Miller

4:00 - 4:20 The effects of vertebrate predation on the Vallisneria-associated invertebrate community. E. W. Chilton II

4:20 - 4:40 Electrophoretic analysis of the host - parasite relationship between the flathead catfish (Pylodictis olivaris) and the mapleleaf mussel (Quadrula quadrula). D. B. Markillie, M. A. Romano, and R. V. Anderson.

4:40 - 5:00 Determination of fish hosts for the glochidia of the endangered freshwater mussel Lampsilis Higginsi. D. L. Waller and L. E. Holland

Friday, 10 April, 1987

8:30 - 9:00 Business meeting.

SESSION 5: CONTRIBUTED PAPERS Moderator: L. Koch

9:00 - 9:20 Naiad mollusks of the Rock River below Steel Dam, Milan, Illinois. J. A. Frink and M. E. Havlik

9:20 - 9:40 Organic matter transport in Pool 19 and the influences of season and floodplain forests. J. W. Grubaugh and R. V. Anderson

9:40 - 10:00 The interactive effects of chlorine and temperature on Ceriodaphnia reticulata in stream water. T. L. Andersen

10:00 - 10:20 Recurrence of Hexagenia mayflies demonstrates improved water quality in Pool 2 and Lake Pepin, Upper Mississippi River. C. R. Fremling and D. K. Johnson

10:20 - 10:40 Coffee break

10:40 - 11:00 Zooplankton and macroinvertebrate drift in the Mississippi River as influenced by tributary order. R. V. Anderson

11:00 - 11:20 A comparison of physical characteristics and nutrient concentrations of Pool 19, Mississippi River, and ten tributaries. F. S. Dillon and J. W. Grubaugh

11:20 - 11:40 Macroinvertebrate drift: Temporal and spatial variations in Pool 19, Mississippi River. D. M. Day and R. V. Anderson

11:40 - 12:00 Final chance at computer software display.

ACKNOWLEDGMENTS

The following persons and institutions have contributed substantially to the planning, execution, support, and ultimately, the success of the 19th Annual Meeting. The 1986-87 Board of Directors gratefully acknowledges their involvement.

Meeting Arrangements

Karen L. Curtis, National Fisheries Contaminant Research Center

Mailing List, Newsletters, Program, and Registration

Karen L. Curtis, National Fisheries Contaminant Research Center
Janet H. Beitlich, Fish Disease Control Center
Barbara A. Deml, National Fisheries Research Center
Diane H. Wolfe, Long Term Resource Monitoring
Ann Prochowicz, Upper Mississippi River National Wildlife and Fish Refuge

Technical Session Moderators

Michael R. Winfrey, University of Wisconsin-La Crosse, La Crosse, WI
Leslie E. Holland, National Fisheries Research Center, La Crosse, WI
Richard A. Frietsche, Upper Mississippi River National Wildlife and Fish Refuge, Winona, MN
U. Thomas Jackson, National Fisheries Contaminant Research Center, Field Research Station, La Crosse, WI
Leroy M. Koch, Missouri Department of Conservation, Jefferson City, MO

Assistance with Visual Aids

Dan Conklin, University of Wisconsin-La Crosse
Greg Cope, University of Wisconsin-La Crosse
Gretchen Garber, University of Wisconsin-La Crosse
Linda Husmann, University of Wisconsin-La Crosse
Mike Lauer, University of Wisconsin-La Crosse
Bill Mauer, University of Wisconsin-La Crosse
Cherylynn Munson, University of Wisconsin-La Crosse
Carol Woody, University of Wisconsin-La Crosse

PAST MEETINGS AND OFFICERS OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

Meeting	Year	Place	President
1st	1968	St. Mary's College, Winona	Brother George Pahl
2nd	1969	Wisconsin State University, La Crosse	Dr. Thomas Claflin
3rd	1970	Winona State College, Winona	Dr. Calvin Fremling
4th	1971	St. Cloud State College, St. Cloud	Dr. Joseph Hopwood
5th	1972	Loras College, Dubuque	Dr. Joseph Kapler
6th	1973	Quincy College, Quincy	Rev. John Ostdiek
7th	1974	No Meeting	
8th	1975	Monmouth College, Monmouth	Dr. Jacob Verduin
9th	1976	St. Mary's College, Winona	Mr. Rory Vose
10th	1977	Winona State University, Winona	Dr. Dennis Nielsen
11th	1978	University of Wisconsin-La Crosse	Dr. Ronald Rada
12th	1979	Cancelled	Dr. Edward Cawley
13th	1980	Loras College, Dubuque	Dr. Edward Cawley
14th	1981	Ramada Inn, La Crosse	Mr. Michael Vanderford
			Executive Committee
15th	1982	Radisson Hotel, La Crosse	Dr. Richard V. Anderson Dr. David R. McConville Dr. James G. Wiener
16th	1984	Radisson Hotel, La Crosse	Dr. Kenneth S. Lubinski Ms. Rosalie A. Schnick Dr. Miles M. Smart
17th	1985	Radisson Hotel, La Crosse	Mr. Raymond C. Hubley Dr. John G. Nickum Ms. Pamella A. Thiel
			Board of Directors
18th	1986	Radisson Hotel, La Crosse	Dr. James W. Eckblad Dr. Carl E. Korschgen Dr. James H. Peck
19th	1987	University of Wisconsin-La Crosse	Mr. Hannibal Bolton Dr. Leslie E. Holland Dr. Michael R. Winfrey

CONSTITUTION
OF
MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

ARTICLE I. NAME AND OBJECT

1. This organization shall be named Mississippi River Research Consortium, Inc.

2. The objectives of this organization shall be:

   a. To establish and encourage communication between river scientists and between the scientific community and the public.

   b. To encourage pure and applied research concerning the water and land resources of the Mississippi River and its valley.

   c. To provide an annual meeting where research results can be presented, common problems can be discussed, information can be disseminated, and where river researchers can become acquainted with each other.

   d. To encourage cooperation between institutions and to encourage the sharing of facilities.

   e. To function as an advisory group to other agencies.

   f. To aid in the formation of a concerted and organized research effort on the Mississippi River.

ARTICLE II. ORGANIZATION

1. The organization of the Mississippi River Research Consortium shall be provided for by the enactment of suitable by-laws.

2. The by-laws of this organization shall designate the officers and standing committees, the provisions for the election of the officers, the conduct of meetings and for any other matters which are necessary for the government of this organization.

ARTICLE III. MEMBERSHIP AND DUES

1. The membership of this organization shall consist of any persons who demonstrate an interest in any aspect of the Mississippi River, and who express a desire to join the organization.

ARTICLE IV. AMENDMENTS

1. The constitution or the by-laws of the MRRC may be amended by an affirmative vote of two-thirds of the eligible voting members present at the annual meeting.

BY-LAWS OF MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

ARTICLE I: NAME, PURPOSES AND DUTIES.

1.01 There is hereby established a Board under the name of the Mississippi River Research Consortium, Inc., having the purpose and duties of governing all matters relating to this corporation. These shall be deemed to include the following without limitation:

(a) To have the ultimate decision making authority for any and all affairs of the Mississippi River Research Consortium, Inc. which include but is not limited to the authority to create and terminate the corporation, to determine the budget and expenditure of funds, to manage affairs, to determine the manner, location and extent of services performed by the corporation, to determine the number of, location and job duties of any employees and to do all other and necessary work for the benefit of the corporation.

(b) To formulate all policies necessary for the effective and continuous operation of the corporation.

(c) To coordinate and make decisions regarding priorities of services.

1.02 The purposes of the organization shall be as follows:

(a) To establish and encourage communication between river scientists and between the scientific community and the public.

(b) To encourage pure and applied research concerning the water and land resources of the Mississippi River and its valley.

(c) To provide an annual meeting where research results can be presented, common problems can be discussed, information can be disseminated, and where river researchers can become acquainted with each other.

(d) To encourage cooperation between institutions and to encourage the sharing of facilities.

(e) To function as an advisory group to other agencies.

(f) To aid in the formation of a concerted and organized research effort on the Mississippi River.

ARTICLE 2: OFFICES.

2.01 Principal and Business Offices.

The corporation may have such principal and other offices, either within or without the State of Wisconsin as the Board of Directors may designate or as the business of the corporation may require from time to time.

2.02 Registered Office.

The registered office of the corporation required by the State of Wisconsin corporation law to be maintained in the State of Wisconsin may be, but need not be, identical with the principal office in the State of Wisconsin, and the address of the registered office may be changed from time to time by the Board of Directors or by the Registered Agent. The business office of the registered agent of the corporation shall be identical to such registered office.

ARTICLE 3: BOARD OF DIRECTORS.

3.01 General Powers and Number.

The business and affairs of the corporation shall be managed by its Board of Directors. It shall be the responsibility of the Board to jointly organize, hold and preside over the annual meeting. The Board shall be responsible for the development of a program of technical papers to be presented at the annual meeting. The number of Directors of the corporation shall be not less than three (3) elected members.

3.02 Election and Term of Directors.

Each director shall hold office for a term of one (1) year. The term of the office begins and ends with the annual meeting. The director shall be elected by the membership of the corporation at the annual meeting. At least one director shall be a representative of an academic institution and at least one director shall be a representative of either a state or federal agency. A director may be removed from the office by affirmative vote of a majority of the Board of Directors, taken at a meeting by the Board of Directors for that purpose. A director may resign at any time by filing a written resignation at the registered office.

3.03 Regular Meetings.

The Board of Directors shall meet on the times and dates to be established by them but at least once per year.

3.04 Special Meetings.

Special meetings of the Board of Directors may be called by or at the request of any officer. The president or secretary may fix the place of the meeting and if no other place is designated or fixed the place of the meeting shall be at the principal business office of the corporation in the State of Wisconsin.

3.05 Notice; Waiver.

Notice of such meeting of the Board of Directors shall be given by written notice delivered personally or mailed or given by telegram to each director at his/her home address or at such other address as such director shall have designated in writing with the secretary of the Board of Directors, in each case not less than ten (10) days prior to such meeting. Notices of special meetings must be given not less than two (2) days prior to such meeting. Whenever any notice whatever is required to be given to any director of the

corporation under the Articles of Incorporation or By-Laws or any provision of law, a waiver thereof in writing, signed at any time, whether before or after the time of the meeting, by the director entitled to such notice, shall be deemed equivalent to the giving of such notice. The attendance of a director at a meeting shall constitute a waiver of notice of such meeting, except where a director attends a meeting and objects to the transaction of any business because the meeting is not lawfully called or convened. Neither the business to be transacted at, nor the purpose, or any regular or special meeting of the Board of Directors need be specified in the notice or waiver of notice of such meeting.

3.06 Quorum.

A majority of the elected members of the Board is necessary for the transaction of business at any meeting, and a majority vote of those present shall be sufficient for any decision or election.

3.07 Removal.

Any member of the Board who is absent from three (3) consecutive regular meetings of the Board shall, unless excused by action of the Board, cease to be a member of the Board of Directors and shall be removed forthwith.

3.08 Conduct of Meetings.

The president and in his/her absence a vice-president and in their absence, any director chosen by the directors present shall call meetings of the Board of Directors to order and shall act as the presiding officer of the meetings. The secretary of the corporation shall act as secretary of all of the meetings of the Board of Directors, but in the absence of the Secretary, the presiding officer may appoint any assistant secretary or any director or other person present to act as secretary of the meeting.

3.09 Vacancy.

Any vacancy occurring in the Board of Directors shall be filled as soon as possible by the majority action of the Board.

ARTICLE 4: MEMBERSHIP AND DUES.

4.01 Membership and Eligibility.

Membership to include anyone interested in the research and study of the upper Mississippi River and its valley.

4.02 Membership and Dues.

Membership to be for one (1) year with annual dues determined by the Board of Directors.

ARTICLE 5: OFFICERS.

5.01 Creation of Officers.

The officers of the Board shall consist of a president, vice-president, secretary-treasurer and such additional assistant officers as the Board may elect.

5.02 Executive Director of the Corporation.

The Board may retain and compensate and give directives to an executive officer. Said executive director shall not be considered as a member of the Board of Directors.

5.03 Election of Term of Office.

The officers of the corporation shall be elected by the Board of Directors at the first meeting following the annual meeting to serve as one (1) year term. Each officer shall hold office until his successor shall have been duly elected or until his death, resignation or removal.

5.04 Removal.

Any officer or agent may be removed by the Board of Directors whenever in its judgment the best interests of the corporation shall be served thereby, but such removal shall be made without prejudice to the contract rights if any of any person so removed. Election or appointment shall not of itself create contract rights.

5.05 Vacancies.

A vacancy in any principal office because of death, resignation, removal, disqualification or otherwise, shall be filled by the Board of Directors for the unexpired portion of the term.

5.06 President.

The present shall:

(a) Act as chairperson of the Board and of any executive committee,

(b) Appoint all committees unless otherwise specified by the Board,

(c) Be executive on behalf of the Board of all written instruments except as provided or directed by the Board,

(d) Be responsible for the agenda to be used at the meeting,

(e) Perform all duties incident to the office of a president and such other duties as shall from time to time be assigned to him by the Board.

5.07 Vice-President.

The vice-president, at the request of the president, shall perform the duties and exercise the functions of the president, and when so acting shall have the power of the president and shall perform such other duties as delegated by the president.

5.08 Secretary-Treasurer.

The secretary-treasurer shall:

(a) Keep the minutes of the meetings of the Board,

(b) See to it that all notices are fully given in accordance with the provisions of the By-Laws,

(c) Be custodian of the records of the Board,

(d) Perform all duties incident to the office of the secretary of the Board, and such other duties as from time to time may be assigned by the president of the Board,

(e) Keep all financial records of the Board,

(f) Be responsible for record keeping and assessment of dues as established by the Board of Directors,

(g) Supervise the preparation of the annual budget,

(h) Perform all duties incident to the office of the treasurer of the Board and such other duties as from time to time may be assigned by the president of the Board.

5.09 Other Assistance to Acting Officers.

The Board of Directors shall have the power to appoint any person to act as an assistant to any officer, or agent for the corporation in his stead, or to perform the duties of such officer when for any reason it is impractical for such officer to act personally, and such assistant or acting officer or other agent so appointed by the Board of Directors shall have the power to perform all of the duties of the office to which he is so appointed to be assistant or as to which he is so appointed to act, except as such powers may be otherwise defined or restricted by the Board of Directors.

ARTICLE 6: COMMITTEES.

6.01 Nominating Committee.

The Board of Directors shall serve as the nominating committee, and file its report with the members at the annual meeting.

6.02 Other Committees.

The Board may by resolution provide for such other committees as it deems advisable and may discontinue the same at its pleasure. Each entity shall have the power and shall perform such duties as may be assigned to it by the Board and shall be appointed and the vacancies filled in the manner determined by the Board. In the absence of other direction, the president shall appoint all committees.

ARTICLE 7: MEETING OF MEMBERSHIP.

7.01 Annual Meeting.

The Annual Meeting of the organization shall be held in La Crosse, Wisconsin, with local arrangements being handled by the membership located in La Crosse, Wisconsin. The time of the meeting shall be established by the Board of Directors within the month approved by a two-thirds (2/3rds) vote of the membership at the previous annual meeting. At the meeting reports of officers and committees shall be delivered. The Board of Directors shall be elected from those individuals nominated by the Nominating Committee and those nominated from the floor with prior consent of the nominee. All persons attending the annual meeting shall be required to pay membership dues for that year and be a member of the organization in order to participate. Notice of the annual meeting shall be sent in writing to all members.

7.02 Special Meetings.

Special Meetings may be called by the president or by a majority of the Board and shall be called by the secretary on request of five (5) members in writing. The time and place of special meetings shall be announced at least two (2) weeks in advance.

7.03 Quorum.

At all meetings the members of the corporation present shall constitute a quorum for the transaction of business.

ARTICLE 8: AMENDMENTS.

8.01 By The Membership.

These By-Laws may also be altered, amended or repealed and new By-Laws may be adopted by the Board of Directors by affirmative vote of two-thirds (2/3rds) of the members present at a meeting at which a quorum is in attendance.

ABSTRACTS FOR TECHNICAL PAPERS

Thursday and Friday

9-10 April 1987

Abstracts are listed in the order of presentation

THE MISSISSIPPI RIVER: OUR PARTNER IN POWER PRODUCTION. G. L. JOHNSTON, DAIRYLAND POWER COOPERATIVE, LA CROSSE, WISCONSIN 54601.

Dairyland Power Cooperative was founded in 1941 through the Federal Rural Electrification Administration and serves 175,000 members through 29 distribution cooperatives in Wisconsin, Minnesota, Iowa, and Illinois.

About 85 percent of the generating capacity is provided at 3 coal burning facilities along the river. A method called once-through cooling is used to convert the steam back to water for reuse. The river water is used in this process to extract the waste heat and discharge it back to the river. Possible impacts can be derived from both the intake process and the heated discharge. WDNR and USEPA have determined that the impacts were acceptable.

Another area of dependence on the river is in the transportation of coal for our facilities. About 1,350,000 tons of barged coal are received annually.

Air quality control and ash disposal present concerns to the environment. Air quality monitoring stations provide continuous monitoring to assure compliance with regulations.

Solid waste sites must be engineered to ensure protection from the contamination of ground-water or surface waters. Much of the ash can be incorporated into concrete mix and used in construction but most is placed in solid waste sites.

Transmission lines must be carefully placed to ensure compatibility with the wildlife refuge concept. Other construction projects are also of concern.

The rail-loop at Alma, Wisconsin is an example of Dairyland Power's commitment to consider the environment in construction projects.

The use of the dams on the river for hydro-power is also a concern to all of us. Dairyland Power Cooperative assessed the feasibility at Genoa, Wisconsin and rejected it on the basis of cost and environmental impacts.

We realize we are but one partner to the river and support the work of all concerned to ensure the multiple use concept on the river.

FISHERIES SOFTWARE: BACK CALCULATION, AGE-LENGTH KEYS, AND POPULATION STRUCTURE INDICES. R. V. Frie, Missouri Department of Conservation, 1110 College Avenue, Columbia, MO 65201, 314 449-3761.

Fishery managers in Missouri have greatly increased their productivity using specialized fishery software and commercial software packages such as dBASE III, Multiplan, and Microsoft Chart. dBASE III is used to store and manipulate all field data. Multiplan is used for tabulating telephone, roving and probability creel census results, and for general row and column manipulations of data. Microsoft Chart is used to graphically display results from Multiplan and other software using a dot matrix printer, color plotter, and 35 mm slidemaker. Specialized BASIC software are DisBcal, FreqAge, and FishCalc. DisBcal is used to measure projections of bony parts with a digitizer, explore the relationship between body length and bony part size, and back-calculate body lengths. FreqAge generates age-length keys, tables of length and age distributions for each sex, and statistics on length. FishCalc computes structural indices such as PSD, RSD, and Wr, and plots vertical bar charts of relative length frequency, catch per unit of effort by length class, and percent deviation of average Wr from 100% for each size class. Individual Wr values are plotted with a line connecting average Wr of each length class. DisBcal and FreqAge run on Apple II and IBM PC compatible computers. FishCalc runs only on IBM PC compatibles. These software packages are available free of charge at the address above.

MOVMOD1: A GRAPHIC SIMULATION MODEL FOR LARGE-SCALE FISH POPULATION MOVEMENTS. K. S. Lubinski, River Science Center, Grafton, IL 62037.

MOVMOD1 is the first stage of a graphic simulation model being developed on a personal computer to learn how environmental and biological factors control the distribution of fish among large river habitats. The model calculates movements (distance and direction) of up to 500 fish in a 1 x 3 km reach at time steps of 6 seconds. Major decisions made for each fish are: whether to move or stay, and if the choice is to move, how far and which way? Tracks of hypothetically "tagged" fish, and positions of non-tagged fish are displayed graphically in two dimensions. Accumulated distance traveled and number of movements are tabulated at selected observation intervals. Results of runs using random movement rules indicate that population mean distance traveled is more successfully estimated by increasing the number of fish observed than by observing over longer periods of time, and that the accuracy of distance traveled estimates decreases dramatically with increasing duration of time between observations. Future stages of the model will add depth, velocity and habitat classification factors into the movement calculations.

APPLICATION OF STELLA MODELING SOFTWARE TO FISHERIES AND AQUATIC ECOLOGICAL RESEARCH IN LARGE RIVER ECOSYSTEMS. T.G. Coon, School of Forestry, Fisheries & Wildlife, University of Missouri, Columbia, MO 65211.

Simulation modeling offers ecologists the opportunity to develop their understanding of complex ecosystems and to evaluate the dynamics of ecosystems under changing conditions. STELLA is a software package developed by High Performance Systems, Inc. for use in learning modeling techniques. The primary value of this software is that it allows users to develop modeling skills without being overwhelmed by the intricacies of translating a model to a computer language. It is extremely easy to learn and is adaptable to particular modeling problems encountered by aquatic and fishery ecologists. For example, age-structured fish populations with stochastically-varying recruitment and varying harvest can be modeled to evaluate the relative importance of different harvest techniques. In this presentation, the STELLA system will be introduced and demonstrated with several previously designed models. Participants will be guided through the model construction process to develop a model of an ecosystem of their choice to answer particular questions related to their ecosystem.

AN EVALUATION OF A SHORT TERM STUDY TO DETERMINE THE EFFECT OF A PARTIAL SIDE CHANNEL CLOSURE ON THE SPORT FISHERY OF CASSVILLE SLOUGH. Michael R. Dewey, Leslie E. Holland and James Rogala. National Fisheries Research Center, P.O. Box 818, La Crosse, Wisconsin 54602.

In 1984, as a result of recommendations from GREAT II studies, a partial closure was constructed at Ackerman's Cut in Pool 11 to reduce the sediment load entering Cassville Slough and to decrease the need for dredging in the main channel by increasing sand transport capacity. This was expected to benefit both fishery habitat and fish harvest in the slough. A pre-closure creel survey was conducted in 1977 by Iowa biologists to quantify sport and commercial fish harvest with a pre-closure geomorphological study completed in 1983 by University of Iowa research personnel. A post closure creel survey was begun in July, 1986, and will continue through June, 1987, to attempt an evaluation of the impact of the project on the fishery resources. A stratified, randomized design using a roving creel survey was used in both fishery studies.

Analyses indicate that number of fishermen, harvest, and catch rate were generally lower in 1986 than in 1977. This apparent decline in the use and harvest in Cassville Slough is, however, not believed to be a result of the Ackerman's Cut closure but rather a function of non-comparability of water years.

In summarizing the data for the ten year period from 1977 through 1986, the two years in which the creel surveys were conducted represented the extremes in both river discharge and pool elevation. It is impossible to relate differences in sport fish harvests to possible effects of the partial closure because of the extreme difference in river discharge and stage between the two test years. Therefore, with the annual fluctuations in hydrologic conditions occurring in the upper Mississippi River, the need for longer term studies to monitor the effects of habitat modification projects needs to be evaluated.

THE EFFECT OF GENE FLOW ON GENETIC RELATIONSHIPS OF MUSSEL POPULATIONS FROM THE MISSISSIPPI RIVER FROM MUSSEL POPULATIONS IN THE ILLINOIS RIVER. S. D. Johnson, M. A. Romano, and R. V. Anderson, Department of Biological Sciences, Western Illinois University, Macomb, IL 61455

Electrophoretic data not only provides an assessment of similarities between different mussel populations, but also allows for estimates of population size and gene flow. Representative samples from Amblema plicata, Quadrula quadrula, and Q. nodulata were collected on the Illinois River at the River Research Laboratory, Grafton, Illinois and on the eastern and western shores of Pool 26 on the Mississippi River below the Illinois River confluence. Electrophoretic data from these populations were compared to data collected previously from Mississippi River, Pool 19. These three mussel species were chosen due to their high densities in both rivers. The genetic data were utilized to determine the population structure of these species in order to draw ecological conclusions regarding the effect of the Illinois River on mussel populations below the confluence. Our preliminary data suggests that the two rivers do differ in population structure and the possible consequences will be discussed.

ALTERNATIVE SOLUTIONS FOR REVITALIZATION OF PEORIA LAKE ALONG THE ILLINOIS WATERWAY. M. Demissie and Nani G. Bhowmik, Illinois State Water Survey, 2204 Griffith Dr., Champaign, IL 61820.

Peoria Lake is the largest and deepest bottomland lake in the Illinois River Valley. It is located between River Miles 162 and 182 on the Illinois River. As of 1985 the lake has lost 68 percent of its original volume. The situation is even worse when the navigation channel, defined as that part of the lake which is 9 feet or deeper, is excluded from the lake volume. Outside of the navigation channel, Peoria Lake has lost 77 percent of its original volume. The average depth of the lake is only 2.6 feet, and the average depth of Upper Peoria Lake is only about 2 feet.

Excessive sedimentation not only reduces the lake volume and depth but also impacts water quality, aquatic habitat, navigation, recreation, real estate values, and tourism. Thus it can be said that sedimentation poses the most serious problem to Peoria Lake since it negatively impacts all of the beneficial uses of the lake.

After evaluating all possible alternatives, a comprehensive management plan has been recommended including selective dredging, creation of artificial islands and marshy areas, raising of the Peoria Dam and sediment input control from the watershed.

Erickson-Eastwood, L. J. and L. E. Holland. Missouri Department of Conservation and National Fishery Research Laboratory, La Crosse, Wisconsin

COMPUTER AIDED ANALYSIS OF THE BACKWATER REHABILITATION OF WEAVER BOTTOMS (POOL 5, UMR): IMPACTS ON NURSERY HABITAT

Much of the productive backwater habitats of the Upper Mississippi River will be lost in the next 50 years due to sedimentation. Weaver Bottoms (Pool 5) was a productive backwater but has become a shallow, turbid, wind-swept riverine lake. A multi-agency rehabilitation project was begun in 1986. If successful, Weaver Bottoms will be used as a model for rehabilitation of riverine backwaters. Little data are available to evaluate the effects of the proposed modifications on nursery habitat. A study was designed to identify the nursery habitats within Weaver Bottoms and to apply computer modeling techniques to predict the impacts of the modification. Twenty-four sampling sites were established. Samples were collected every other week from May to August 1984-1985 by a towed plankton net. Species composition was typical of other backwaters in the area; eighteen species were collected. Gizzard shad and emerald shinners constituted nearly 68% of the total catch for both years. The Map Overlay/Statistical System of the Geographic Information System was used to produce a series of computer modeling maps. Present depth, current and larval distribution maps were created from actual field data. Post-modification habitat was predicted based on future depth and current patterns. Overlayed present and predictive maps showed at least a 30% gain in overall "critical" habitat resulting from the construction. This approach provides management with a semi-quantitative method to evaluate proposed backwater mitigation plans.

ASSESSMENT OF THE COMMERCIAL HARVEST OF FRESHWATER MUSSELS IN THE MISSISSIPPI R. BORDERING WISCONSIN. D. J. Heath, Wisconsin Department of Natural Resources, La Crosse, WI 54601.

During the fall of 1986, sampling was conducted by SCUBA diving at four prime commercially harvested mussel beds in Pools 9 and 10 to determine post season population estimates of the two major species harvested, washboard (Magnonaias nervosa) and three ridge (Amblema p. plicata). Mussel samples were taken from April 1986 through March 1987 to determine the period of gravidity and age of sexual maturation. Gravid washboard females were found from 25 August to 19 November with the youngest being six years old. Under new legislation, shellers and buyers were required to submit reports to the department on their transactions and activities. Additional harvest information was obtained from sheller interviews conducted by the WDNR at the three shell buyers at Prairie du Chien, WI. The estimated harvest of both living and dead mussels from 1 June to 30 September was about 500 tons. Total mortality of washboards was estimated to be 11% and estimated recruitment into the present legal size limit was 5% of the whole population. Population structures and exploitation rates were estimated.

PRAIRIE DU CHIEN REVISITED - 10 YEARS AFTER DREDGING. Marian E. Havlik, Malacological Consultants, 1603 Mississippi St., La Crosse, Wisconsin 54601

In July 1976 104,000 cu yds were dredged from the East Channel, Mississippi River, Prairie du Chien, WI. Since then over 175 Lampsilis higginsi have been recovered from the dredge disposal site. Over 1/2 of these specimens were likely alive at the time of the dredging. Since 1976 the area has seen increased pressures from many sources. In 1978 less than 50 barges a year were unloaded. In 1984 over 500 barges were handled at one facility; the number at the city harbor remained around 25. Scraped and broken living naiades have been observed in navigable areas. Scraped naiades have also been observed at the edge of the navigation channel suggesting that prop wash may deposit naiades at some distance away from their original site. Fleeting has occurred in several shallow areas causing damage to the substrate, shoreline and naiades living in this area including L. higginsi; several dying gravid females have washed up at the water's edge apparently unable to reestablish themselves in the substrate after being impacted by commercial navigation. Collections of 1575 empty shells have added to the taxonomic understanding of this variable species but these problems cannot be solved without adequate numbers with preserved soft parts (to date 74 seen briefly, plus 35 preserved). Commercial clamming pressures have greatly increased over the past several years, and this fact combined with a naiad die-off of unknown causes since 1982 further stresses the largest known population of L. higginsi. In 1985 larger numbers than usual of fresh-dead shells were found in several areas.

SEDIMENTATION PROBLEMS IN QUINCY BAY ALONG THE MISSISSIPPI RIVER. J. Rodger Adams and Nani G. Bhowmik, Illinois State Water Survey, 2204 Griffith Dr., Champaign, IL 61820.

Quincy Bay is a backwater area along the upper Mississippi River near Quincy, Illinois. In the past it has provided fish and waterfowl habitats. However this has been altered because of the changes caused by human activities. In 1969 a small boat access channel was dredged to connect the bay to the Mississippi River about 3.2 km upstream of the historical bay outlet. The changes in circulation and the rapid scouring of the access channel accelerated sedimentation in several parts of the bay.

Three areas illustrate recent changes in habitat: 1) lower Broad Lake which has been directly affected by the access channel, 2) Triangle Lake which has been used as a sediment trap since 1956, and 3) the middle main bay which has been a popular boating area. Lower Broad Lake occupied about 26.3 hectares with an average depth of 6 m after it was dredged for sand to build a railroad embankment in the late 1950s. In 1985 the water area was 16.6 hectares and the average depth was 1.2 m, with much of the area shallower than 0.5 m. Triangle Lake was about 1.7 m deep in 1956, but was only 0.1 m in average depth in 1985 for the 62 percent of the original water area that still exists at normal pool level. The middle main bay had been 2.2 m deep when Lock and Dam 21 was put in operation in 1939 but in 1985, it was about 0.75 m deep.

Sediment budgets are developed for the entire bay and for each of the three problem areas mentioned above. Flooding by the Mississippi River is the largest source of sediment and, on the average, deposits about 24 mm of sediment per year on the entire bay area. Based on this analyses, a management plan has been developed and recommended for implementation.

BENTHIC INVERTEBRATE COMMUNITY STRUCTURE IN RELATION TO SEDIMENT CHARACTERISTICS IN A BACKWATER LAKE OF THE UPPER MISSISSIPPI RIVER. Daniel J. Hornbach, Macalester College, St. Paul, MN 55105 and Barry S. Payne and Andrew C. Miller, U.S. Army Engineer Waterways Experiment Station, P.O. Box 631 Vicksburg, MS 39180.

It is often claimed that sedimentation (mainly of fine sediments) in Upper Mississippi River backwaters is influencing the biotic structure of these highly productive areas. In this study benthic and sediment samples were taken from River Lake (River Mile 825-826) to investigate the relationship between sediment type and benthic invertebrate abundance and diversity. At each of 18 stations (6 sites along each of 3 transects) a benthic sample was taken with a multiple-core sampler consisting of three, 3-inch PVC pipes. These 54 samples were sieved in the field (0.5 mm opening) and fixed in 50% alcohol. Subsequently all organisms were removed, identified and the dry weight of each taxon in each sample was determined. Sediment samples were also taken at each of the 18 stations and the % organic matter and sediment particle size distribution was ascertained. A total of 21 species of organisms were obtained with an average of 3155 individuals/m^2. The dipteran Cryptochironomus was dominate in terms of numbers while the mayfly Hexagenia dominated in terms of biomass. Species diversity was lowest in the transect with the smallest average sediment particle size whereas diversity was greatest in the transect with the greatest average sediment particle size and lowest organic matter content. Multivariate statistical analyses were used to examine the effects of sediment characteristics on the benthic community structure.

THE EFFECTS OF VERTEBRATE PREDATION ON THE VALLISNERIA--ASSOCIATED INVERTEBRATE COMMUNITY. E. W. Chilton II. National Fisheries Research Center, P.O. Box 818, La Crosse, WI, 54601-0818.

Vertebrate predation often influences the abundance and composition of invertebrate communities. I tested the effects of vertebrate predation on an aquatic macrophyte (Vallisneria americana) invertebrate community through a series of enclosure/exclosure experiments conducted in Lake Onalaska. Four treatments were used: open controls, cage-effect controls (partially enclosed cages), and enclosures (cages stocked with a known density of bluegills). Predation by stocked bluegills (Lepomis macrochirus) was unable to depress the Vallisneria-associated invertebrate community. Surprisingly, invertebrate abundance (number per g dry plant weight) increased in both enclosures and exclosures. I hypothesize that the exclusion of other, unknown predators from both treatments was responsible for decreased vertebrate predation pressure, allowing an increase in invertebrate abundance.

ELECTROPHORETIC ANALYSIS OF THE HOST - PARASITE RELATIONSHIP BETWEEN THE FLATHEAD CATFISH (PYLODICTIS OLIVARIS) AND THE MAPLELEAF MUSSEL (QUADRULA QUADRULA). D. B. Markillie, M. A. Romano, and R. V. Anderson, Department of Biological Sciences, Western Illinois University, Macomb, IL 61455.

The only reported fish host for the glochidial stage of the mapleleaf mussel, Q. quadrula, is the flathead catfish, Pylodictis olivaris. Sample sites for this study were chosen from different areas of pools 19 and 20 of the Mississippi river. The density and distribution of samples taken were similar from different sites within the two pools. Electrophoretic analysis provides data on the gene flow of the populations of mapleleaf mussel and flathead catfish within and between the two pools of the river. Gene flow among the mapleleaf populations tends to be high within the pools while being lower between the pools separated by lock and dam 19. By studying these results, an indication of mussel migration can be obtained and a determination made on the role of the host fish for movement of glochidia larvae. Preliminary data suggest that the flathead catfish is not the only host fish for the mapleleaf glochidia. However, additional analyses of systematic relationships among populations of both species will be provided. A comparison of the patterns of relationship may indicate whether the flathead catfish is the predominant host. Populations of flathead catfish and their relationship to the gene flow among populations of mapleleaf mussels will be discussed.

DETERMINATION OF FISH HOSTS FOR THE GLOCHIDIA OF THE ENDANGERED FRESHWATER MUSSEL LAMPSILIS HIGGINSI. D.L. Waller and L.E. Holland, National Fishery Research Laboratory, P.O. Box 818, La Crosse, WI 54601.

Host specificity information on the endangered freshwater mussel Lampsilis higginsi is based largely on observations of natural infections. We tested the suitability of 15 species of fishes as hosts for the glochidia of L. higginsi by artificial infection of fish in the laboratory. Fish were infected either by placing individuals in a 15-cm wide fingerbowl that contained glochidia for 30 sec or by pipetting a drop of glochidia onto one gill. Tank bottoms were siphoned daily and the material was examined to detect detached glochidia and juveniles.

Infection trials indicate that largemouth bass, smallmouth bass, walleye yellow perch and brook stickleback are good hosts for the glochidia of L. higginsi. Green sunfish also produced juveniles although some individuals sloughed their infections. Bluegill and northern pike were marginal hosts, producing only one juvenile per tank. Johny darter produced no juveniles but retained glochidia for up to eight days. Common carp, fathead minnow, emerald shiner, long-nose gar, logperch, and sand darter sloughed all glochidia in the first 48 h of the infection.

NAIAD MOLLUSKS OF THE ROCK RIVER BELOW STEEL DAM, MILAN, IL. James A. Frink, 1539-10th Ave., Rock Island, IL 61201 and Marian E. Havlik, Malacological Consultants, 1603 Mississippi St., La Crosse, WI 54601

Previous studies of the naiad fauna of the Rock River, IL were reported by Baker (1928, 31 species) and Miller (1972, 21 species). Apparently no one has studied the area below Steel Dam near Milan, IL, 4 3/4 miles from the mouth of the Rock River at Rock Island, IL. Since August 1985 the senior author has collected 21 live species, 5 recent dead species, and 6 sub-fossil species within one mile downstream of the dam. Water depths ranged from 1 to 4 ft. with a swift current and mostly a rock substratum with scattered patches of mud. Four of the live species, Anodonta suborbiculata, Arcidens confragosus, Magnonaias nervosa, and Quadrula nodulata have not been reported from the Rock River previously. Four species not found alive in by the Miller study were found alive: Potamilus alatus, Obliquaria reflexa, Ellipsaria lineolata, and Obovaria olivaria. One recent dead of each Lampsilis higginsi, Actinonaias l. carinata and Tritogonia verrucosa were found. The fresh-dead L. higginsi specimen adds another recent Mississippi River tributary record (total 3) for this endangered species. Sub-fossil specimens found included Alasmidonta marginata, Elliptio dilatata, Cyclonaias tuberculata, Plethobasus cyphyus, Fusconaia ebena, and Lampsilis t. anodontoides. Five species found alive by Baker but not found in this study were Lampsilis r. luteola, Toxolasma parvus, Lasmigona costata, Pleurobema sintoxia, and Lampsilis t. teres. The lower Rock River has an impressive resource, 32 naiad species within a limited area. The site needs sanctuary status and special concern from state and federal permitting agencies.

ORGANIC MATTER TRANSPORT IN POOL 19 AND THE INFLUENCES OF SEASON AND FLOODPLAIN FORESTS. J.W. Grubaugh[1] and R.V. Anderson[2]. [1]River Research Lab, Illinois Natural History Survey, Havana, IL. [2]Biological Sciences, Western Illinois University, Macomb, IL.

Carbon transport, an indicator of energy dynamics in most ecosystems, remains relatively undescribed in large temperate rivers. Concentrations and loads of dissolved (DOC) and fine-particulate organic carbon (FPOC) were measured from fall, 1985, to summer, 1986, above and below the floodplain forests of Burlington Island. Greatest DOC load was recorded during fall; FPOC load was highest during rising spring flood. Loads of DOC generally increased downstream following floodplain involvement; during fall FPOC load increased by 28% after floodplain involvement. Findings suggest riparian vegetation functions seasonally as an important source of organic carbon to the upper Mississippi River.

THE INTERACTIVE EFFECTS OF CHLORINE AND TEMPERATURE ON CERIODAPHNIA RETICULATA IN STREAM WATER. T.L. Andersen. Dept. of Ecology and Behavioral Biology, Univ. of Minnesota, Minneapolis, MN 55455

Toxicity studies involving chlorine and zooplankton indicate low tolerance by these organisms. However, few investigators have explored the interactive effect of temperature and chlorine on zooplankton. This study examines chlorine toxicity to Ceriodaphnia reticulata in lifetable experiments set up to simulate conditions in streams at the Monticello Ecological Research Station (USEPA). C. reticulata clones were subjected to concentrations of 0, 15, 50, and 150 ug/l total residual chlorine at temperatures of 12, 16, 20, and 24°C for 30 days. Reproduction, mortality, and growth responses were determined.

Temperature and chlorine were significant as main effects and interactions between these parameters were synergistic to some degree. Toxicity of chlorine to C. reticulata may be affected over a temperature range of 12 to 24°C. Direct counts from stream samples over a similar spectrum of chlorine concentrations support laboratory findings.

RECURRENCE OF HEXAGENIA MAYFLIES DEMONSTRATES IMPROVED WATER QUALITY IN POOL 2 AND LAKE PEPIN, UPPER MISSISSIPPI RIVER. C.R. Fremling, Department of Biology, Winona State University, Winona, MN 55987 and D.K. Johnson, Metropolitan Waste Control Commission, St. Paul, MN 55101.

Hexagenia mayflies are good indicators of general water quality because they have long life cycles and because their burrowing nymphs, which are unable to tolerate anaerobic conditions or swim long distances, live in sediments where toxins tend to accumulate. While chemical tests only describe water quality in terms of specific parameters and times, Hexagenia distribution indicates synergistic effects of many toxins, anoxia and other stresses throughout the year. Over 1,400 collections of imagoes and subimagoes along the Upper Mississippi River in 1957-1968, 1976 showed that most of the 29 navigation pools supported large populations, as did impoundments upstream from Minneapolis-St. Paul. Populations were non-existant or meager in Pool 2 and Lake Pepin, however, due to metro pollution. Collections made in 1986 showed that recent pollution abatement measures have enabled Hexagenia to attain nuisance levels in the two areas, thus demonstrating that mayfly distribution can be utilized to assess the well-being of a river which is so large that it is difficult to monitor effectively or economically by standard methods.

ZOOPLANKTON AND MACROINVERTEBRATE DRIFT IN THE MISSISSIPPI RIVER AS INFLUENCED BY TRIBUTARY ORDER. R. V. Anderson, Dept. of Biological Sciences, Western Illinois University, Macomb, IL 61455.

Replicate zooplankton and macroinvertebrate drift samples were collected in small streams of different order and above and below their confluences with the Mississippi River. A nonparametric Wilcox paired analysis was used to compared samples from 1st to 9th order tributaries. Streams of different order showed no consistent trend along an order continuum in density or community composition of zooplankton or macroinvertebrates. Only tributaries greater than 5th order had any effect on the Mississippi River. Shallow channel border areas of the Mississippi River showed an increased in diversity with tributary input. In contrast streams of similar order entering channel habitat had no effect. Only higher order rivers, 7th order, had any effect on the channel increasing drift density. Drainage basin characteristics of tributaries had little effect on zooplankton and drift input.

A COMPARISON OF PHYSICAL CHARACTERISTICS AND NUTRIENT CONCENTRATIONS OF POOL 19, MISSISSIPPI RIVER, AND TEN TRIBUTARIES. Frank S. Dillon[1] and Jack W. Grubaugh[2]. [1]Illinois State Water Survey, 2204 Griffith Dr., Champaign, IL 61820; [2]Illinois Natural History Survey, River Research Lab, Havana, IL 62644.

Physical (geomorphic and hydrological) characteristics and nutrient concentrations from Pool 19 and ten of its tributaries were sampled for two years to compare streams of differing order from the same region. Dendrograms based on Horn's Index of Similarity indicated strong adherence to stream-order classification when physical parameters were considered. The addition of nutrient information to the Index and analysis of nutrient data alone showed systems to be more similar to each other with less distinction due to stream order. These findings, coupled with benthic macroinvertebrate data, suggest nutrient parameters exert a stronger influence on biotic composition than geomorphic and hydrological characteristics in the lotic systems of Pool 19 and its tributaries.

MACROINVERTEBRATE DRIFT: TEMPORAL AND SPATIAL VARIATIONS IN POOL 19, MISSISSIPPI RIVER. David M. Day and Richard V. Anderson, Dept. of Biological Sciences, Western Illinois University, Macomb, IL 61455.

Macroinvertebrate drift was collected during five periods from March to October of 1985. Sampling sites were located in the upper, typically riverine reach and the lower lacustrine-type area of Pool 19, Mississippi River. Samples were collected using a replicate drift net system, which were integrated through the water column. Burrowing mayflies (Hexagenia spp.) and Potamyia flava were dominant throughout the study except during summer low flow and their post-emergence period. They usually account for approximately 60% of all drift. Drift density was greatest, approximately 1.8/m^3, during the high flow periods of March and October. Based upon Simpson's's index, diversity in the main channel habitat, was lowest during early March, the period of highest density. In the main channel border, side channel and backwater habitats, diversity was generally lower than the main channel, but the differences were not usually significant. With the exception of backwaters, Horn's index of overlap showed significant overlap in the communities found in the upper reach of the pool. Drift communities in backwaters, in both the upper and lower pool appear to be unique in relation to the other habitats.