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Design and Evaluation of a Fisheries Information Storage and Retrieval System (FISARS) for the State of South Dakota

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DESIGN AND EVALUATION OF A FISHERIES INFORMATION STORAGE AND RETRIEVAL SYSTEM (FISARS) FOR THE STATE OF SOUTH DAKOTA

BY

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This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable as meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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ABSTRACT

Extensive data collected each year from the streams and lakes of South Dakota necessitates a computerized system with which to efficiently utilize the large amount of material. A fisheries related data storage and retrieval system (FISARS) was developed sufficiently to provide cost estimates in creating and maintaining such a system. Detailed descriptions were made to provide information in implementing and utilizing the retrieval system.

A survey was made of state fish and game agencies currently operating storage and retrieval systems. This information along with comments provided by the fisheries personnel in the state of South Dakota was used as a guideline in developing the FISARS System.

The FISARS System is composed of two data bases. One data base contains bibliographic reference material related to fisheries work within the state of South Dakota. The other data base contains specific data about individual bodies of water. The two data bases can operate together or individually.

Estimates were made concerning the cost of coding and transferring data, keypunching and verifying, and building of both data bases. Two computer facilities are available with which the storage and retrieval systems could be used, therefore, estimates of costs in operating the system were made for each facility.

The programs used to build and manipulate the bibliographic data bases were written in COBOL language and access of the data base utilized the VSAM (Virtual Storage Access Method) method. Only the computer programs providing the actual retrievals of the data base containing lake and stream survey information need to be written to make the storage and retrieval system functional.

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INTRODUCTION

The importance and usefulness of computers in the field of fisheries has been well documented. Lackey (1975) enumerated current and potential applications of computers in fisheries science. These range from relatively simple programs which analyse specific data such as age and growth (Gerking 1965) to rather sophisticated data analysis (Hesse 1977); modeling systems (Patten 1969; O'Heeron and Ellis 1975); and extensive storage and retrieval systems (Nixon 1971; Brogden et al 1974; Natch and Weber 1976).

Lake surveys are often an important part of managing a fisheries resource. After years of collecting baseline material and making continuous additions, manual filing systems have become large and inefficient to use. Because of this, along with the need to have quick and accurate access to this material, many states have begun or have in operation computerized data storage and retrieval systems (Clark et al. 1977). These systems may also contain packages for performing various data analyses.

State fish and wildlife agencies often have different needs depending on the quality and quantity of their fisheries resources, money available and human populations. This necessitates designing individual storage systems for each state's particular needs. Large amounts of fisheries data are collected each year in South Dakota. Raw data collected in past years and publications are reports concerning projects and studies on various South Dakota waters are on file. Pursuing these files to compile specific information or to determine the extent of

studies on a particular body of water often requires many hours of searching. A fast and efficient system is needed to handle stored data for maximum benefit. Such a system could save time, money and manpower in performing complicated or tedious data manipulations.

With these criteria, the objectives for this project were:

1. Test and sufficiently develop a storage and retrieval system in order to provide an estimate of cost of such a system including building, yearly operation and updating.
2. Outline the capabilities of the system and project its future use.

MATERIALS AND METHODS

The Fisheries Information Storage and Retrieval System (FISARS) is comprised of two separate data bases, GIVEFISH and BIBFISH. GIVEFISH provides detailed information about individual lakes or rivers in South Dakota and BIBFISH is a bibliographic storage and retrieval system which contains bibliographic references of published and unpublished material concerning the lakes and streams of South Dakota. Both data bases work in conjunction with each other or separately to form the mother system, FISARS.

The computer programs designed to manipulate the two data bases, GIVEFISH and BIBFISH, are similar in theory; therefore only the programs manipulating BIBFISH were completely written and tested. Test data for GIVEFISH was compiled and a data base was built to provide further information concerning cost estimates.

Test data for GIVEFISH was taken from a 13 county area, Region IV, north and east of Beadle County and bounded by North Dakota on the north and Minnesota on the east. This area was ideal for testing a retrieval system because it is near the computer facilities and it has numerous lake and stream records which were on file at Webster, South Dakota, 144 km (90 mi) north of Brookings, South Dakota. Region IV contains 15 permanent (never winterkills or summerkills), 22 semi-permanent (winterkills or summerkills once every ten years), and 97 marginal (winterkills or summerkills once every five years) lakes. As of 1 July 1978, the South Dakota Department of Game, Fish and Parks (GFP) reorganization reduced the number of management regions in the state

from five to four. Although this did not alter the testing of data it must be noted that the Region IV referred to in this text no longer includes the counties of Beadle, Kingsbury and Brookings, but now includes McPherson, Edmunds and Faulk counties. BIBFISH was tested by utilizing references from a collection of North Central Reservoir Investigation studies (1976 Unpublished, North Central Reservoir Investigation, U.S. Fish and Wildlife Service, Pierre, South Dakota).

COMPUTER FACILITIES AND ACCESS METHODS

An IBM 370-148 computer was used to store and retrieve data at South Dakota State University, Brookings, South Dakota. The computer runs on OS/VS1 with one megabyte of storage and six 3340 disc drives.

The data was accessed with VSAM (Virtual Storage Access Method) (IBM 1975). VSAM was chosen because of its efficiency in using files on a disc pac. Files can be accessed both sequentially and randomly. VSAM also utilizes alternate indexes, which provides a unique way to gain access to a related data base set, so it is not necessary to keep multiple copies of the same information organized in different ways for different applications.

BIBFISH DATA BASE DESCRIPTION

Data Base Organization

The problems in maintaining and updating a reference file are numerous. There have been many manual methods devised to handle small reprint libraries (Burns and Mosby 1971), but these become difficult to manipulate on a large scale. Lee, et al. (1971) developed a computerized

system using key words from the title to be used as retrieval categories.

The BIBFISH programs (Appendix A) were developed to coincide with the GIVEFISH data base. The header cards (Columns 6-9) of most GIVEFISH data sheets (Appendix B) provide space for a four digit identification number. This is used when any of the data from each page is taken from a publication and not from a GFP survey. Publications are given numbers sequentially and stored in the BIBFISH data base. Therefore when a FISARS printout indicates that data was obtained from other than GFP surveys, a BIBFISH retrieval will provide a complete listing of the references.

BIBFISH can also be used to retrieve references centering around a specific subject or a specific lake by using the subject index (Appendix C), river codes (Appendix D) or lake codes (Appendix E).

The subject index (Appendix C) was designed to contain all areas expected to be found in the field of fisheries. These were listed in alphabetical order by subject and the sub-headings under each subject were assigned a five digit code number. This index was used to create a key word format (alternate keys) for each bibliographic reference.

Alternate indexes provide a method for organizing a file of references under more than one subject key. In this case the principle key is the individual number given to each bibliographic reference and the ten alternate keys are those describing the content of the reference.

The data base was designed to store up to 5000 (560 characters) references or records and not more than 500 subject replicates. This

means that of the 5000 records, no more than 500 may be of the same subject. Core space allotted for these parameters can be set according to need and can be increased whenever needed. Test data was punched on cards and then read on tape to provide a printout for verification. The corrected tape was then read on disc and the VSAM File built.

Each reference is coded on a date sheet (Fig. 1) and given a five digit bibliographic code (Card 1, Columns 1-5) sequentially as new references are added. This is the primary key for retrieval. The following ten, five digit columns are the alternate indexes. Here the subject codes are placed pertaining to the reference. These spaces can also be used to indicate the code number for a particular body of water. A zero is added to the lake and river codes in order to complete the five digit space. This enables the retrieval of studies from only a specific body of water. Figure 1 presents an example of how these subject codes (Appendix C) would be used. On card one, columns 21-25, the number 16170 is written. This is the code for Lewis and Clark Lake (Appendix E).

The final five cards on the data sheet contain specific information about the reference itself. Column 80 of card three and four are used as stoppers. Should the title fill only one card, a "1" is punched in "stop-1" indicating only one card was used and the remaining two cards are not added to the deck. If two cards are used, then a "2" is placed in "stop-2". This eliminates placing blank cards in the deck to fill the seven card record.

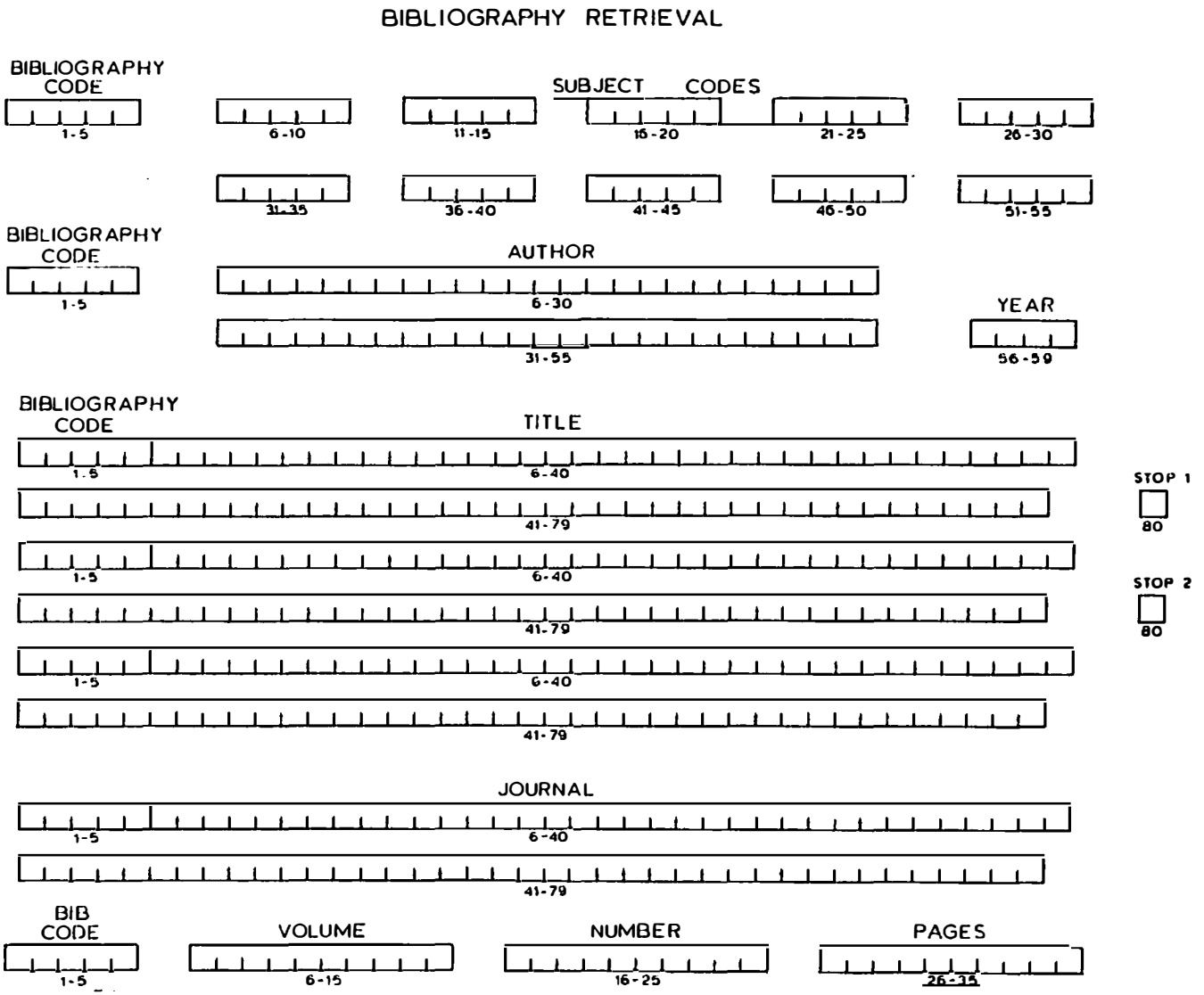


Figure 1. Data sheet for Bibliographies.

BIBFISH Retrievals and Programs

Four COBOL programs were written to set up and use the BIBFISH data base (Appendix A). Both programs 1 and 2 are used to build the data base. Program 1 will read the card file and record it on tape. A printout provides an opportunity to correct any errors before the VSAM disc file is built. Program 2 reads the tape file after all errors have been removed and builds the VSAM file. It does not provide a printout.

The actual retrievals are provided by program 3. BIBFISH retrievals are made by punching the first five columns of a card or on a terminal with the subject code desired to be searched. There is no limit to the number of retrievals per run. The printout (Fig. 2) indicates what is being searched and the accompanying bibliographies. In this example, the first retrieval was for bibliography number "3" or record "3". Immediately following is record number "3". The third search, code number 12001, is for references related to crustaceans. Four references were retrieved.

The final search code '47040' was used as a lake search. In the subject index (Appendix C) number 47040 does not appear, therefore, number 47040 or 4704 relates to Lake Wetonka in McPherson county (Appendix E). Since the data base does not contain any references relating to Lake Wetonka, there were no retrievals.

Program 4 is used to add or correct records. Correcting a record is a matter of reprocessing the complete record with its corrected identification code and the corrected reference. Adding a record is accomplished in the same manner except the identification code must be

RECORD CODE 3

3 17002 17004 17005 10023 0000 0000 0000 0000 0000 0000
NELSON W R N R HINES AND L G BECKMAN 1956
ARTIFIAL PROPAGATION OF SAUGERS AND HYBRIDIZATION WITH WALLEYES

	VOLUME	NUMBER	PAGES
PROGRESSIVE FISH - CULT	27	4	216-218

RECORD CODE 14

14 24003 0000 25001 12002 12000 23003 12000 0000 0000 0000
SWANSON G A 1967
FACTORS INFLUENCING THE DISTRIBUTION AND ABUNDANCE OF HEXAGENIA NYPHS (EPH EMEROPTERA) IN A MISSOURI RIVER RESERVOIR

	VOLUME	NUMBER	PAGES
ECOLOGY	48	2	216-225

SEARCH CODE 12001

7 24003 25005 0000 30004 23003 12001 12000 0000 0000 0000
HUDSON P L AND B C COWELL 1966
DISTRIBUTION AND ABUNDANCE OF PHYTOPLANKTON AND ROTIFERS IN A MAIN STEM MI SSOURI RIVER RESERVOIR

	VOLUME	NUMBER	PAGES
PROC SOUTH DAKOTA ACAD SCI	45		84-106

9 0000 25007 25000 24003 23003 12001 12000 0000 0000 0000
TASH J C G A SWANSON AND R E SIEFERT 1966
REPORT O THE OCCURENCE AND DISTRIBUTION OF CLADOCERA AND COPEPODA IN LEWI S AND CLARK LAKE SOUTH DAKOTA

	VOLUME	NUMBER	PAGES
UNIV OF KANSAS SCI BULL	46	11	425-432

10 0000 10020 10010 23003 12000 12001 0000 0000 0000 0000
WALBURG C H AND W R NELSON 1956
CARP RIVER CARP SUCKER SMALLMOUTH BUFFALO AND BIGMOUTH BUFFALO IN LEWIS AND CLARK LAKE MISSOURI RIVER

	VOLUME	NUMBER	PAGES
U S BUREAU OF SPORT FISHERIES AND WILDLIFE RES REP		69	30

11 25007 25000 0000 30004 23003 12000 12001 0000 0000 0000
COWELL B C 1967
THE COPEPODA AND CLADOCERA OF A MISSOURI RIVER RESERVOIR A COMPARISON OF SAMPLING IN THE RESERVOIR AND THE DISCHARGE

	VOLUME	NUMBER	PAGES
LIMNOL OCEANOG	12	1	125-136

SEARCH CODE 47040

Figure 2. Sample BIBFISH Retrieval.

a number that sequentially follows the last identification code in the file. Adding and deleting should be done only after a back log of corrections and additions are available because this process utilizes a quantity of computer time and is therefore expensive. Adding and deleting should be done on a yearly basis as new material becomes available.

GIVEFISH DATA BASE DESCRIPTION

Data Base Organization

In order to obtain an accurate estimate of costs for building and maintaining a large data base such as GIVEFISH, the test data from Region IV was used to create a trial data base. GIVEFISH was also orgainzed according to the VSAM access method as was BIBFISH. The data records were organized with the lakes or streams numbered sequentially as the primary key. Five alternate - index clusters were established to more efficiently utilize related data sets.

The first alternate index is the lake or river codes (Appendix D and E). The alternate key provides access to each record by this code. The second alternate index is the ecological classification. The alternate keys are Trout, Walleye - Panfish - Bass, Game Fish - Rough Fish, Bullhead and Panfish - Bass. The third alternate index is water description and the alternate keys are Lake, River and Large Reservoirs. The fourth alternate index is status with alternate keys of Permanent, Semi-permanent, Marginal and Waterfowl. Description of these parameters is given in the GFP Lake Survey Manual (1971 Unpublished, South Dakota

Department of Game, Fish and Parks, Pierre, South Dakota). The final alternate index is region. As of 1 July 1978, there were four geographical regions or areas managed by GFP which serve as the alternate keys. The use of these alternate indexes will enable, for example, the accessing of the records of permanent waters under status or only rivers under water description.

To reduce the amount of disc space utilized, information from each water is only the most recent. Older data contained in Forms D, F, G, H, I, J, K, L, N (Appendix B) would be kept on a storage tape. Information on Forms A, B, C, E, M (Appendix B) will only be updated or deleted when needed.

Storage and retrieval programs and data analysis programs are to be written in COBOL. Data will be stored and accessed on a disc with tapes and cards providing a security duplicate of records.

Estimate of Cost

In order to create a retrieval system in which its usefullness would be retroactive, it is necessary to store previously collected data. Data was stored from 1970 to 1976 for several reasons. This was a period in which the South Dakota Department of Game, Fish and Parks (GFP) did their most intensive survey work and recorded data in a form closely resembling the structure of the data sheets prepared for this study.

Choosing these years also guaranteed that at least two years of test netting data was obtained from each water. On lakes where no test

netting was done during this period of time previously collected data was stored. Although this older data could not be considered valuable as a recent population indicator, it was considered useful in relating a lakes possible potential even though more recent information was not available.

To derive an estimate of the cost of storing this backlog of information the time spent transferring the records to the data sheets was recorded. Since Region IV contained the most extensive files of lakes and streams this provided an accurated estimate of the average time needed to record a typical lake. This was then expanded for the entire state.

Coded data, after being checked for errors, was keypunched on 80 column computer cards. Time and cost were recorded for keypunching. Data was then transferred to a VSAM disc for storage. Computer cost was recorded. With these costs calculated and using the total number of lakes and streams managed by GFP, the total cost for storing seven years of data statewide was estimated.

Parameter Selection and Design of Coding Sheets

Lagler (1952) outlined the methods and purposes of lake and stream surveys. This information could be used as the basic data with which a storage and retrieval system could be set up.

Several methods were detailed to ensure that all parameters needed for storage were used. A survey was sent to state wildlife agencies known to have storage and retrieval systems (Clark et al. 1977). These

states were asked for data sheets, costs of operation and uses of their systems. This information was used as a guideline in designing the coding sheets, along with data sheets from the U.S. Environmental Protection Agency's STORET (Nixon 1971) and BIO-STORET (Natch and Weber 1976).

A tentative parameter list was assembled using the GFP Lake Survey manual with necessary additions and deletions. This list was sent to all fisheries personnel and those involved in lake surveys for their comments. Changes were then made to the list and preliminary coding sheets were drawn up. These sheets were to be the basis for the storage and retrieval system. Two meetings were arranged with fisheries personnel to explain and discuss the retrieval system and coding sheets in detail. With information collected at these meetings the final coding sheets were prepared (Appendix B).

Description of Coding Sheets

All data sheets (Appendix B) were organized for information to be coded on 80 column computer cards. The following text provides instructions for completing each coding sheet.

The field map of Lake Kampeska (Fig. 3) gives an example of the form in which all field maps should be prepared. These will be used to locate sampling sites, access areas, dams and other points of interest to coincide with coding sheets using a letter by number designation. A river field map will contain a river mile index rather than letter by number to locate different areas. These maps will help standardize

sampling sites along with locating other important sites for field crews.

Form A - Legal Classification

Each coding sheet contains a similar header card (Card 1 - Columns 1-16) to provide necessary organization of information for storage. Each card contains a lake code and a card code to help with organization, prevent mix ups and card losses.

Form A contains the water name (Card 1, Columns 17-36) and legal classification of that water. Space is provided to contain only the legal classification of waters smaller than the mainstem reservoirs. Room for description of larger waters was left out due to the large amount of space required to create a much larger record with questionable benefit.

The header card (Card 1) contains a lake or stream code (Columns 1-4), which is unique for that water (Appendix D and E). Column 5 is a space provided for an agency code. This enables information other than that collected by GFP to be stored. Since all data in this study was collected by GFP, a number '1' is used to identify that agency. Columns 6-9 are used for an identification number of any data if it was obtained from published material. References are given a five digit code sequentially and are stored and retrieved by BIBFISH. Column 10 is provided for the 'Data Code' (DC), which indicates whether the data is new (N), to be deleted (D) or to be corrected (C). Columns 11-16 are for dates.

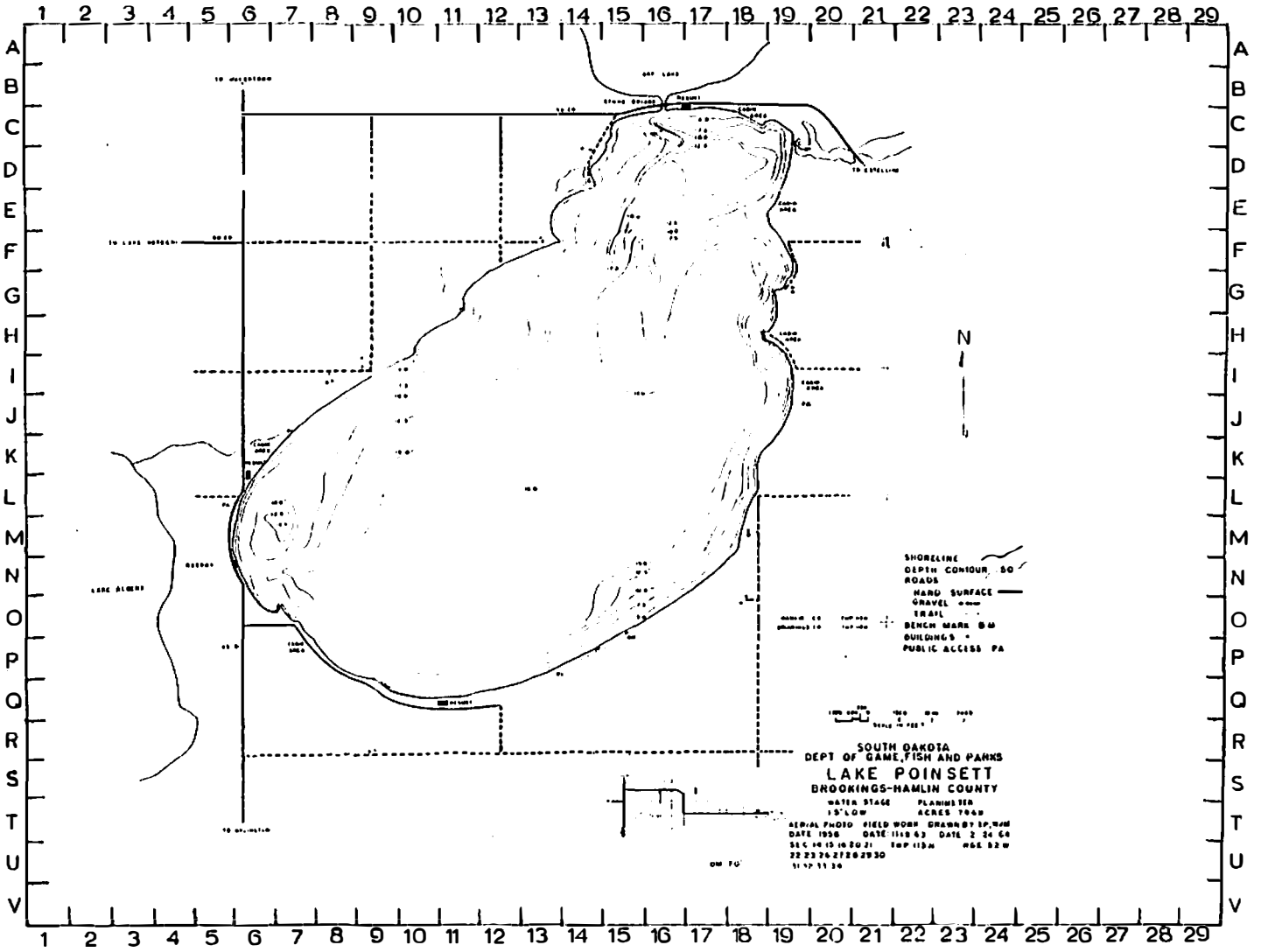


Figure 3. Sample Field Map.

Form B - General Water Descriptions

Form B contains basic information as to water classification, population of surrounding areas, dam or outlet control and physical parameters. Data on this sheet is entered only once and items can be deleted or corrected.

The header card (Card 3) contains additional information not contained on Form A. "Units" (Column 10) will indicate whether data is metric (M) or English (E) units. Retrievals could be obtained in either English or metric units by personal choice. "River Index" (Columns 12-17) will be used to code a specific sampling site or a general area if the data is from a river. Columns 40-51 represent the sequence of water ways where river codes (Appendix D) of a lake drainage can be entered. The first two (four digit) codes are for the immediate waterways and the third indicates the major waterway into which it flows.

Form C - General Water Description

Form C contains several different categories of information. Parameters listed under "River Classification" were used to classify trout streams in the Black Hills of South Dakota (Glover 1975). Other parameters under "Water Resource Use and Development" and "Inlets and Outlets" are described in the GFP Lake Survey Manual. Information on this form is entered once with periodic updates and deletions.

Form D - Water Chemistry

GFP currently takes the listed water quality data during four periods of the year. Therefore, four sheets of Form D can be stored per year. Old data would be kept on tape.

Form E - Organism Abundance and Spawning Habitat

Form E contains relative abundance information of aquatic plants, fishes and other organisms (Appendix F). Card 12 can be repeated four times, enabling up to 72 fish species to be listed.

Evaluation of spawning area (Card 13) contains information on five managed or important species and the locations of their spawning beds. This page will be recorded once with subsequent deletion or update of items.

Form F - Fish Stocking and Removal

Fish stocking information is recorded on Form F (Card 14). This card may be repeated twice to contain up to eight stocked species per year. Cards 15 and 16 may be repeated up to four times each per year to contain all commercial fishing information. Note that commercial species are recorded by total weight removed per year and that game species are recorded by total number. Old data would be stored on tape.

Form G - Natural Reproduction Summary

Form G contains data indicating the success of natural reproduction. This information is usually collected during late summer

or early fall and only the totals of up to 25 species will be recorded. Old data would be stored on tape.

Form H - Netting Summary Sheet

Test netting data provides a rough estimate of the abundance and species composition of fishes present in a water. Form H used to record old data which was recorded in this manner. This form can be duplicated twice per year and old data stored on tape. New data will be recorded on Form N and a program could provide the analysis. Description of sampling methods is discussed in the GFP Lake Survey Manual.

Form I - Length Frequency

Form I coincides with Form H. Test netting information is also utilized on this form by recording length-frequencies of individual fish. Two pages can be used to record up to 12 species. Species lengths can be recorded in either 0.5 inch increments or 1 inch increments. Groups of fish under 12 inches utilize the 0.5 distribution in order to show a smoother length frequency. A duplicate form could be made to code lengths in metric with the appropriate metric increments. Larger fish use the 1 inch distribution. To indicate this, column 8 of card 22 is used to show the distribution chosen. Columns 9-40 are used to indicate the length increment and columns 41-72 are used to record the number of fish in the corresponding increment above. This form is used for old data and can be repeated twice to store up to 12

species' length-frequency distributions per year. New data would be recorded on Form N.

Form J - Age and Growth Distribution

Calculations of age and growth data can be recorded on Form J. Two pages can be recorded to provide information on 16 species. Data is recorded similar to that in the GFP Lake Survey Manual. Card 24 contains the species, total size of sample (Columns 8-11), the size of the subsample taken (Columns 12-13) and the back calculated lengths of fish up to seven years of age. Card 24 will contain the total number of fish in each age-group and the number of fish from which back calculations were actually made. Old data would be recorded on tape.

Form K - Pollution and Survey Data

Card 26 of Form K contains pollution and fish kill estimates. Data can be entered yearly and old data will be stored on tape. Cards 27 through 29 contain information on creel survey and recreational survey data. Column 5 of card 27 and 29 are headed "AC"; this is to indicate how accurate the survey information is.

Only a limited amount of survey information is stored. When more complete information is needed the source of the data, if published, can be located using the "Source I.D." in columns 6-9 of cards 27 and 29. Old data would be stored on tape.

Form L - Water Resource Improvements, Recommendations and Finances

In an effort to provide information for planning future improvements and budgets Form L was created. Specific management and access

recommendations (Appendix G) are listed on this sheet. Columns 17-24 of card 30 will keep track of recommendations that have been completed each year. Card 31 lists new management recommendations, species of fish they will affect, benefit in man-days, year to be completed and an estimate of cost. Card 32 contains access recommendations and information similar to the management recommendations.

Card 33, at the bottom of Form L, was left for any additional information. It was used in the testing to record winterkill dates and management policies. Form L may be repeated twice and old data would be stored on tape.

Form M - Access Facilities

Form M allows a listing to be made of all access areas for each water as well as facilities available. Columns 48-77 of card 35 provide an estimate of the cost of maintenance, facilities and investment at each access site. This information will be used in planning of GFP budgets. Card 35 may be repeated up to 35 times.

Form N - Test Netting Field Sheet

Form N would replace Forms H and I, which were used to transfer old data to the system. All new test netting data would use this form. The header card (36) is the same as in forms H and I. One sheet is used for each species. Data acquired from up to 25 nets can be placed on this sheet. Total weights, numbers and location of each net are recorded on the lower left side of the page, excluding the length and weight of individual fishes. The right

hand side would be used to record the length and weights of up to 100 fishes from a random sample to obtain average length and weight information and length frequencies. Description of the data stored and analysed from this form will be given in the GIVEFISH Retrievals and Programs Section.

Coding Paramenters

Fish

Bailey and Allum (1962) listed 93 species of fish occurring in South Dakota, but several exotics have been introduced since then. Future introductions had to be taken into consideration when creating a coding list; empty spaces were left in families where possible additions were anticipated. Fish were listed in phylogenetic order by family and given a code number starting at 1 and ending at 138 (Appendix F).

Aquatic Plants

The abundance of aquatic plants indicated on Form E (Columns 23-69) is only a subjective listing due to identification difficulties and lack of time needed to obtain a more accurate estimate of aquatic plant abundance.

Van Bruggen (1974) recorded over 190 marsh and aquatic plant species in South Dakota. In order to simplify identification and listing, codes were arranged by general families of aquatic plants and given a number (Appendix F). In some cases, when groups of plants could be easily identified within families, these groups

were assigned more than one code per family; such as the rushes (Cyperaceae) and the pondweeds (Najadaceae).

Management and Access Recommendations

Standard methods used to manage water resources were given codes (Appendix G) to be used on Form L. To simplify this list it was separated into three categories: fish management, habitat management and shore management. Access recommendations used a similar method. Recommendations may be added to the list as they become needed.

Lake and River Codes

Lake and river codes are four digits. The lake codes used were already organized by GFP (Appendix E). In these codes the first two digits signify the county number and the last two digits were given sequentially to the lakes in that county. Rivers and streams were given code numbers beyond the range of the lakes: 0100 thru 6799 (Appendix D).

GIVEFISH Retrievals and Programs

The program building the GIVEFISH data base (Appendix H) was completed to provide estimates of the size and cost of creating the data base. The complete development of the BIBFISH data base and programs has facilitated in making cost estimates for the FISARS System and has acted as an example of how GIVEFISH retrievals could be programmed. Therefore, no further programs were completed to

manipulate the GIVEFISH data base. This section will investigate the possible retrieval programs with which to manipulate the GIVEFISH data base.

The simplest retrieval will be the standard retrieval. This program would simply research for a record and provide a printout. With the use of VSAM different related data sets could be accessed separately. Further refinement of the program would enable only certain segments of each record to be retrieved. Therefore, the use of a partial retrieval would enable, for example, the recovery of all stocking records of the lakes in Region II. The various forms and combinations in which retrievals could be made would be limitless.

One other essential program is for correction and deletions. It is necessary to be able to make corrections or deletions within each record and new records would eventually be added. These operations could be handled in one program such as with the BIBFISH data base.

Several additional sub-programs could be added to the GIVEFISH data base which would perform time saving procedures. Form N (Appendix B) was created to replace the use of Forms H and I after the initial test netting data was stored. Form N would be used to compile the test netting raw data and the sub-program would eliminate the need for additional computations and would store the information in the form of data sheets H and I.

The construction of an additional coding sheet to contain only fish stocking records could be utilized by each region. These coding sheets would take the place of the present stocking record sheets. At the end

of the season, this data would be keypunched and the sub-program would compile all stocking information and store it in the data base. This data could then be used to print out an annual stocking report.

Another sub-program could help maintain the quality of the data base. During the recording of the initial data for testing, it was noted that many areas of the lake records were incomplete or not up to date. This sub-program would search for incomplete sections of each record and provide a print out. It could also retrieve all data older than a preselected date. This would provide information for managers in planning for the upcoming field season and enable them to complete unfinished water records and keep them up to date.

Since all old data would not be stored on a VSAM disc file, access to this data would require a separate program. In all probability this information would not be needed frequently, therefore, it would be most economical to store it on tape. This program, in order to keep it simple, would only provide retrievals of individual records or parts of records.

The complexity and length of programs necessary to manipulate the GIVEFISH data base would only be limited by the needs of the state and by its budget. The use of standard retrievals only, would be the simplest and most economical.

DISCUSSION

COSTS OF DEVELOPING AND OPERATING THE FISARS SYSTEM

The FISARS System could be designed to make use of an on-line or off-line terminal. On-line retrievals are almost instantaneous. With this capability, terminals could be placed at many locations throughout the state. Hard copy terminals cost between $2000.00 and $2500.00. Portable ones are also available which allow use of the system at almost any location that has telephone facilities. Terminals could be used with the Tie Line network throughout the state, therefore there would be no additional telephone costs. GFP at the present time has a terminal at their main office in Pierre.

There are at least two computer facilities available which could potentially use the FISARS System. Both the state facility at Pierre and the facility at South Dakota State University in Brookings utilize VSAM accessing. Each facility offers its functions at varying rates (Table 1).

The Pierre facility utilizes an IBM 370-155 computer with 6 megabytes of storage. They have 3350 and 3330 double density disc drives which have 317 million and 200 million bytes of storage space respectively. Rental is presently $.07 a track (13,000 bytes) per month for on-line storage. The SDSU computer center utilizes 3340 disc drives which will hold 70 million bytes of storage. Current on-line storage cost is $.02 per 1000 bytes per month, but in the near future it will be lowered to $.01.

Table 1. Summary of cost estimates for creating and operating GIVEFISH and BIBFISH data bases at the computer facilities at Pierre, South Dakota and Brookings, South Dakota.

GIVEFISH - Creating (1000 records or 10,000,000 bytes)		
Transferral of data	$5187.00	
Keypunching and verifying	$1591.00	
Building VSAM file	$ 100.00	
GIVEFISH - Operation	Pierre	Brookings
On-line	$646.00/yr	$1200.00/yr
Off-line	$360.00/yr*	$ 600.00/yr*
CPU Minute	$13-$17/min	$ 7.00/min
Updating	$100.00/yr	$100.00/yr
BIBFISH - Creating (5000 records or 5,000,000 bytes)		
Transferral of data	No estimate	
Keypunching and verifying	No estimate	
Building VSAM file	$ 25.00	
BIBFISH - Operation		
On-line	$325.00/yr	$603.00/yr
Updating	$ 25.00/yr	$ 25.00/yr

*Includes cost for BIBFISH and GIVEFISH

Cost of Building the BIBFISH Data Base

The cost of recording the BIBFISH reference material onto coding sheets is difficult to estimate because it is impossible to determine the quantity of reference material available. Much of the cost would depend on how actively old and new material was added to the data base. It would probably be much less than the cost of recording data for the GIVEFISH data base (Table 1) because the volume would be much less.

The projected 5000 records will occupy about 5,030,000 bytes (one byte is equal to one character). Storage costs would be about $132.00 per year at $.07 per tract at the Pierre facility, and $360.00 per year at SDSU (Table 1). A dummy 3000 records were tested and cost of building the VSAM file was less than $20.00. Projected costs of building a VSAM file of 5000 records at either computer facility would be $25.00 (Table 1).

Cost of Building the GIVEFISH Data Base

Storing Old Data

In the testing of the GIVEFISH data base, seven years of data was stored from Region IV for each water. The data for each record varied in completeness due to the classification of each lake (permanent, semi-permanent, marginal and waterfowl) with permanent waters having the most complete information and waterfowl having the least. A total of 15 permanent, 22 semi-permanent, 91 marginal, 30 waterfowl and 7 unclassified lakes were recorded along with 5 streams. This gave a total of 170 water records stored. Time to

transfer this data to coding sheets was 27.6 days or 226.9 man-hours. At a rate of $3.57 per hour, cost of transferring this data to coding sheets was $773.15. This data was keypunched and verified, requiring 63 man-hours. At $4.15 per hour for keypunching and verifying this job amounted to $261.45.

There are 792 lakes in South Dakota (GFP Lake Inventory 1972, Unpublished, South Dakota Department of Game, Fish and Parks, Pierre, South Dakota) which potentially have records, but 237 are classified as "waterfowl lakes". Because "waterfowl lakes" typically have little or no information, the number of lakes having records may be less. In the Region IV test data, of the 103 waterfowl lakes, only 30 had records. Most of these waterfowl lakes do have accesses, therefore, they may warrant a record even though detailed information is not available.

Estimating the potential lotic environments which may have records is difficult because surveys have not been undertaken for many streams other than trout streams. An estimate of 124 was calculated by counting the rivers and streams with a substantial fisheries resource from the Stream Evaluation Map of South Dakota (U.S. Fish and Wildlife Service 1978). The lakes plus the rivers give 916 potential records or approximately 1000.

Using 1000 as an estimate of the total number of water records the statewide cost was extrapolated for transferring and keypunching the test data. It will take approximately 1300 man-hours to code 1000 records. At $4.50 per hour (hourly rate was increased

to account for inflation) this would total $5187.00 minus the $662.94 already spent (Table 1).

Keypunching and verifying would total 370.59 man-hours. At $5.00 per hour (hourly rate was increased to account for inflation) the cost would be $1591.00 minus the $261.45 already spent. The estimated total cost of building a data base would be approximately $6778.00.

There are several bias's in this estimate. Regions with less water may spend more time in completing their lake surveys, therefore the average transferal time may be higher for some regions. Regions having more permanent or wildlife waters would affect the estimate since it requires more time to code permanent water than waterfowl waters. Bias may also occur in areas that have large quantities of stream data such as the Black Hills area. Since the test area (Region IV) was predominantly lakes and ponds with only 5 streams, no accurate estimate could be made for stream transferal time.

Cost of Building the VSAM File

With an estimated 1000 records at 10,000 bytes in size the file would increase the files to approximately 16,004,000 bytes. Much of the CPU (Computer Processing Unit) time and costs in building a VSAM file lies in building the alternate indexes. Building of the 170 test data records took 2.00 CPU minutes at a cost of $7.00. Extrapolating this for 1000 records the cost would be less than $100.00 (Table 1).

Updating Costs

GFP is continuously updating its records. Most of the work done involves test netting, shoreline seining and a few complete surveys. Over the past five years there has been an average of 62 water updates with a low of 58 and a high of 73.

The FISARS System will simplify this process. Transferring data to coding sheets will not be necessary since the coding sheets can be used directly. Therefore, the only additional cost will be keypunching, verifying and the rebuilding costs. This process would be done only once a year; after data for that year has been punched on computer cards. With an average of 62 record updates per year file rebuilding would be less than $100.00 per year. (Table 1).

Storage Costs

To operate on-line the GIVEFISH data base would require an estimated 10,004,000 bytes of storage space. The cost at the Pierre computer center would be about $636.00 per year, while charges at SDSU would be $100.00 per month or $1200.00 per year (Table 1).

One other alternative would be to operate the FISARS System off-line. This would require the rental of an off-line disc pack. The advantage would be economy. Off-line disc rental at Pierre is $30.00 per year at SDSU (Table 1). The disadvantage would be that retrievals would not be instantaneous but would be dependent upon how busy the computer facility was at the time a retrieval

was needed. Another disadvantage would be that there would be wasted space on a disc on which only 16,000,000 bytes (includes BIBFISH and GIVEFISH data bases) was stored. This extra space could be used by other GFP projects. If retrieval time is not the most important consideration and use of the system would not be heavy, operating off-line may be the logical alternative.

Since only the most up-to-date data would be stored on disc, the older information would be stored on tape. Tapes can be purchased for about $17.50 each and can store about 46,000,000 bytes of information. There is no storage cost for tapes, the only cost would be in actual CPU time used in retrieving.

OPERATING THE FISARS SYSTEM

Many of the problems in establishing GIVEFISH would be to acquire a reliable data base. Cost of doing this had been discussed. Most of this work could be done with the help of two or three summer temporaries. This job could be completed in one summer.

Maintaining the file or data base would not require a full time person. Since the initial keypunching and verifying could be contracted, the time keypunching and verifying updated data would be minimal. Major file revisions or updating would probably be done only once a year when a collection of data has been received. A secretary that was trained in keypunching could be in charge of file maintenance.

Cost of maintaining and developing the BIBFISH System is difficult to access as has already been discussed. Costs would depend on how

actively and intensely this area was pursued. The more intense the literature search, the more valuable the system would be. Large amounts of reference material has been compiled in specific areas. All of the Dingle-Johnson projects have been collected in a mineograph by GFP (1978 Unpublished, South Dakota Dept. of Game, Fish and Parks, Pierre, South Dakota). North Central Reservoirs Investigations have a similar summary of their work since 1964. Other institutions which have contributed work to the field of fisheries potentially have similar lists. Much time could be spent in transferring these references to BIBFISH coding sheets and completing the necessary subject codings. Again, use of summer temporaries may provide an economical method for building the initial data base. Successful maintenance of the BIBFISH System would then depend on the cooperation of the institutions working in the areas of fisheries to provide the person in charge of file maintenance with copies of their publications and completion reports on a yearly basis.

Field maps play an important role in the operation of the FISARS System (See 'Description of Coding Sheets'). GFP has been involved in an on-going lake mapping project. Although the maps created to date are not in a field map form, simple revisions would make them so. Addition of letter by number coordinates or in the case of rivers, the use of river mileage and the reduction in size to 21.5 X 28 cm ($8\frac{1}{2}$ X 11 inches) sheets would make functional field maps. Future mapping should include these requirements. Smaller or shallower lakes, not proposed for contour mapping, should have maps drawn from aerial photos or U.S. Geological Survey topographic maps in order to provide descriptions of

important points of reference such as access areas, bench marks, and test net locations.

Only a minimal amount of additional work would be required of field people and managers to keep the FISARS System operational, and in many cases time would be saved. Most lake survey information has been completed and follow up work is routine such as testnetting and shoreline seining. This work would merely require the use of FISARS coding sheets instead of the present lake survey forms. These coding sheets could be kept in a file much as the lake survey forms are kept today.

The ability to retrieve from a record, areas that are not complete, would upgrade the present system and insure that water records are up to date and complete. At the present time there is little effort to complete lake survey information that was not completed in the initial surveys. A scan of the printout would reveal problem areas and these can be concentrated on and completed. Incomplete records would only degrade the efficiency and effectiveness of the FISARS System. It must be noted that each water record would occupy 10,000 bytes or characters whether all the information is there or not, therefore incomplete records are only wasting the space allotted for them.

Additional work would be required in certain other areas of the FISARS System. Field personal responsible for the lakes in a certain county or region must complete the following areas for yearly updates.

Knowing the species of fish occuring in a body of water can often be helpful. Often-times records list only the game species present.

Additional effort when routine shoreline siening is done could provide a specimen collection to be used in completing the section 'Fish Species Know to Occur' (Form E, Card 12).

Winterkill or summerkill is often an important factor used in lake management decision making. The frequency of kills is also essential for the classification scheme of South Dakota water, i.e. permanent, semi-permanent, marginal and waterfowl. Frequently in the test data this information was not present. A yearly record of winterkills must be made for each water and coded on Form K, Card 26. It is often difficult to estimate the severity of winterkill or summerkill in numbers or degrees of completeness but testnetting may help reinforce the estimate.

In order to provide essential information for budget planners Form L 'Water Resource Improvements, Recommendations and Finances' is to be completed yearly on waters where improvements are needed. Form M 'Access Facilities' should be completed for the same reason along with providing important information for access publications. Although information on Form L is more stable it should be checked for yearly changes or additions to keep it up to date. The GFP Lake Inventory contains much of this information but does not contain water front distance, area and cost estimates of maintenance, facilities and land investment. This information would have to be added. The GFP Lake Inventory is not complete with description of private accesses. A survey form could be sent to resort owners and other commercial facilities similar to Form M, excluding the cost estimates, to obtain this information.

Other areas that deserve special attention are water chemistry, fish stocking, commercial fishing and census data. When water samples are sent to a water analysis laboratory, results are returned in a form requiring additional transferal of data before it can be filed or stored. Asking the lab to use the prepared water chemistry sheet (Form D) would increase the efficiency and order of this process.

Fish stocking reports are published yearly by GFP but individual lake records often do not contain a complete record. Use of Form F as a fish stocking record for each water would provide a method of insuring this information is stored in the water record. This information could then be compiled and summarized at the end of each year and provide a printout which would eliminate the need for typing and hand calculating the Fish Stocking Report.

Form F also contains a yearly commercial fishing summary which is taken from the monthly commercial fishing reports. This would require transferring the totals to Form F from the monthly summaries, although this work would not be great in a county or regional basis. There is a problem using the monthly summaries when more than one capture method is used per page. It is impossible to distinquish between total poundage or numbers of a species for each method. Use of one capture method per page would alleviate this. If the work load warranted it, raw data could be analyzed by an additional computer program and compute and store all commercial fishing data, thereby eliminating all work except for the initial coding of raw data.

CAPABILITIES

The capabilities of the GIVEFISH and BIBFISH Systems are limitless. One of its most important attributes is its ability to save time. In this period of funding and personnel cuts, computers are becoming increasingly important in performing routine work more economically than hand calculating. Retrievals of a few seconds, which would take a worker several hours or even days to compile, not only saves time and money but also frees the worker to pursue other work.

This system would also create a systematic and orderly method of maintaining lake and river records. Standard retrievals of data not yet completed would ensure that records become complete and prevent unnecessary repetition of data. More efficient use could then be made of these files.

Some examples of how the system might be used are given below.

1. Currently when lake surveys are completed a full draft is typed and placed in the files. From this a Lake Survey Short Form must be completed and typed which is used in the lake management plans. Often times new surveys are not complete and data such as physical parameters are repeated, since they do not change. The FISARS System would eliminate this work and prevent the repetition of data. Standard retrievals would present this information in a printout which could be directly reproduced for these purposes. Both the complete record or a version similar to the present Lake Survey Short Form could be retrieved containing the newly compiled data

and the parameters that have not changed since the last survey.

2. The FISARS System could be used by management to provide instantaneous answers for management decisions. Retrievals of stocking records, test netting and shoreline seining result and severity of winterkill would be instrumental in planning next years management. Quick and easy access to this data for each water would relieve some of the burden of this work.

3. The geographical distribution or the ecological conditions under which a given species of fish has been found may be quickly determined. Information of this nature is often necessary for developing and evaluating environmental impact statements or determining the need of endangered species.

4. People in research often are presented with the problem of reviewing past data which is useful in designing or planning projects. The FISARS System would provide them with quick access to this material and allow further manipulation of the data for statistical or other analysis. The BIBFISH System would also provide material for a literature review used in planning a research project. References could be found concerning a particular water in the state or a specific subject area.

5. Budget planning is a problem in fisheries resource management due to many factors. The FISARS System, by providing easier

access to the fisheries records, will simplify analysis and summaries of data necessary for budget planning, whether it be lake access improvement, population pressure or pinpointing areas needing the most attention. Although all portions of the FISARS System can be useful, Form L and M (Appendix A) may provide the most useful information for planning if correctly completed.

REDUCTION IN OPERATION COST AND COMPLETION OF THE FISARS SYSTEM

Perhaps the most costly portion of operating the GIVEFISH and BIBFISH System is on-line storage (Table 1). Therefore, the simplest method of decreasing costs would be reduction of the water record size, thereby reducing the total storage space used or by operating off-line.

One area might be that of 'Water Chemistry' (Form D). In the near future the South Dakota Department of Environmental Protection will assume the responsibility of monitoring water quality. They will utilize the STORET System (Nixon 1971) and could provide quick access to this data. Elimination of this information from the FISARS record would reduce it by 604,000 bytes for 1000 lake records.

The FISARS System, as it is designed now, reserves space for old test netting data (Form H and I - Appendix A) and for new data (Form N). Removal of old data in future years, storing this only on tape and utilizing the active file (disc storage) to contain only data analysed from Form N would reduce storage by 3,034,000 bytes.

Test data from Region IV indicated that age and growth data (Form J - Appendix A) was very limited and may not warrant the additional storage space, although much more data could be found by searching special studies done by GFP and other state institutions. Removal of this data would reduce the record size by 1,542,000 bytes.

A final area which could assist in the reduction of storage costs would be by decreasing the number of records. Careful selection of bodies of water to be stored would be one method. Water classified as waterfowl may be eliminated since little or no material is usually available on these waters. Another possibility would be to store the waterfowl lakes in a separate file utilizing a reduced record size listing only the most pertinent information such as; the physical parameters and the access descriptions.

Before the FISARS System is completely functional, several additional programs would have to be written to manipulate the GIVEFISH data base (Table 2). Only the GIVEFISH data base build program was written (Appendix H) to provide information in making cost estimates.

Should South Dakota Department of Game, Fish, and Parks decide to utilize the FISARS System these programs would have to be completed and debugged by a computer programmer. The cost of writing these programs would depend upon the extent of which the data base is to be manipulated as described in 'GIVEFISH Retrievals and Programs' (page 22). This would be a one time expenditure, therefore there would be no additional yearly expenditures other than those already discussed.

Table 2. Work to be completed before FISARS System is functional.

BIBFISH Data Base.
Compile and code reference material to produce a workable data base.
GIVEFISH Data Base
Complete coding and compiling of lake and stream survey data to produce a workable data base.
Write computer program from which retrievals can be made from data base.
Write computer program which would add, delete and update records to the data base.

LITERATURE CITED

Bailey, R. M. and M. O. Allum. 1962. Fishes of South Dakota. Misc. Pub. Museum of Zoology, University of Michigan, Ann Arbor, Michigan. No. 119. 131 pp.

Brogden, W. B., J. J. Cech and C. H. Oppenheimer. 1974. A computerized system for the organized retrieval of life history information. Chespeake Sciences. 15(4):250-254.

Burns, R. W. and H. S. Mosby. 1969. Developing and maintaining a small personal reprint library. Pages 47-51 in Giles, R. H., Jr. 1971 Wildlife management techniques. Edwards Brothers Inc., Ann Arbor, Michigan. 633 pp.

Clark, R. D., Jr., D. L. Garling Jr. and R. T. Lackey. 1977. Computer use in freshwater fisheries management. Fisheries. 2(41):21-23.

Gerking, S. D. 1965. Two computer programs for age and growth studies. Prog. Fish-Cult. 27(2):59-66.

Glover, R. D. 1975. Black Hills watershed inventories, 1969-1974. South Dakota, Study Completion Report. D-J Projest F-15-R-10, Study No. 5, Job 14. Dept. of Game, Fish and Parks. 21 pp.

Hesse, L. W. 1977. FIRE I. Nebr. Tech. Series No. 1. Nebr. Game and Parks Comm. 60 pp.

IBM. 1975. Planning for enhanced VSAM under OS. VS. International Business Machines Corp., San Jose, California. 87 pp.

Lackey, R. T. 1975. Computer applications in fisheries science. Trans. Amer. Fish. Soc. 104(3):589-590.

Lagler, K. F. 1952 Freshwater fishery biology. Wm. C. Brown Co. Publishers, Dubuque, Iowa. 421 pp.

Lee, P. J., J. A. Hansen, and K. E. Marshall. 1971. Storage and retrieval of indexed and annotated bibliographic references. Tech. Rep. No. 209. Fish. Res. Bd. of Canada. 43 pp.

Natch, L. and C. I. Weber. 1976. Biological storage and retrieval system (BIO-STORET). U.S. Envir. Protec. Agency. E.P.A. Contract No. 68-01-1728. Loose-leaf pub. n.p.

Nixon, F. P. 1971. Storage and retrieval of water quality data (STORET) clean water training manual. U.S. Envir. Protec. Agency. Loose-leaf pub. n.p.

O'Heeron, M. K., Jr. and D. B. Ellis. 1975. A comprehensive time series model for studying the effects of reservior management of fish populations. Trans. Amer. Fish. Soc. 104(3):591-595.

Patten, B. C. 1969. Ecological systems analysis and fisheries science. Trans. Amer. Fish. Soc. 98(3):570-581.

U.S. Fish and Wildlife Service. 1978. Stream evaluation map, State of South Dakota. Office of Biological Services, Denver, Colorado. n.p.

Van Bruggen, T. 1974. Marsh and aquatic plants of South Dakota. University of South Dakota, Vermillion, South Dakota. 41 pp.

APPENDIX A

BIBFISH Programs

```
/*KRAMER       711635736,'DICK KRAMER',MSGLEVEL=1,TIME=1,CLASS=8
//JOBCAT DD DSN=VSAM.CATALOG.TEMP.FILES,DISP=OLD
//STEP1 EXEC  COBUCLG
//COB.SYSIN  DD   *
       IDENTIFICATION DIVISION.
       PROGRAM-ID. BIBLOGRAPHY-1.
       AUTHOR - KRAMER.
       REMARKS. THIS PROGRAM READS BIBLIOGRAPHIC CITATIONS FROM CARDS
           AND WRITES THEM ON A TAPE FILE.
       REMARKS. LENGTH OF CARD RECORDS CAN BE SHORTENED BY THE
           FOLLOWING METHODS --
           IF THE TITLE OCCUPIES ONLY ONE CARD THEN 'STOP-1'
           (SEE DATA SHEET) IS PUNCHED '1' --  IF THE TITLE OCCUPIES
           2 CARDS, STOP-2 IS PUNCHED '2' -- IF THE TITLE OCCUPIES 3
           CARDS, NOTHING IS PUNCHED -- THIS ELIMINATES THE NEED OF
           ADDING BLANK CARDS TO THE CARD DECK.
      ******************************************************************
       ENVIRONMENT DIVISION.
       CONFIGURATION SECTION.
       SOURCE-COMPUTER. IBM-370.
       OBJECT-COMPUTER. IBM-370.
       INPUT-OUTPUT SECTION.
       FILE-CONTROL.
           SELECT CARD-FILE ASSIGN TO UR-2540R-S-CARDIN.
           SELECT TAPE-FILE ASSIGN TO UT-2400-S-TAPE01.
           SELECT NTAP-FILE ASSIGN TO UT-2400-S-TAPE02.
           SELECT NEWWTAPE    ASSIGN TO UR-2400-S-TAPE03.
      ******************************************************************
       DATA DIVISION.
       FILE SECTION.
       FD  NEWWTAPE
           RECORDING MODE F, LABEL RECORDS ARE OMITTED, RECORD CONTAINS
            560 CHARACTERS, BLOCK CONTAINS 1 RECORDS, DATA RECORD IS
           TAPE-OUT.
       01  TAPE-OUT PIC X(560).
       FD  NTAP-FILE
           RECORDING MODE F, LABEL RECORDS ARE OMITTED, RECORD CONTAINS
            560 CHARACTERS, BLOCK CONTAINS 1 RECORDS, DATA RECORD IS
           NTAP.
       01   NTAP PIC X(560).
       FD  CARD-FILE
           LABEL RECORDS ARE OMITTED, RECORDING MODE F, DATA RECORDS
           IS CARD-REC.
       01   CARD-REC.
           04 F-PART PIC X(79).
           04 STOP-1 PIC X(1).
       FD  TAPE-FILE RECORDING MODE F, LABEL RECORDS ARE OMITTED, RECORD
                CONTAINS 80  CHARACTERS, BLOCK CONTAINS 7 RECORDS, DATA
           RECORD IS TAPE-RECORD.
       01  TAPE-RECORD PIC X(80).
       WORKING-STORAGE SECTION.
       77  INCRD PIC 99.
       77  BLANK-COUNTER PIC S99999 VALUE IS 1.
      ********
      * FORMAT OF THE RECORD
      ********
       01  TAPE-REC.
           04 BIB-CODE PIC 9(5).
           04 SUB-CODED.
           05 SUB-CODE OCCURS 10 TIMES PIC X(5).
```

```
     04 FILLER PIC X(25) VALUE SPACES.
     04 B-CODE-2 PIC 9(5).
     04 AUTHOR PIC X(50).
     04 YR PIC 9999.
         04 FILLER PIC X(21) VALUE SPACES.
     04 B-CODE-3 PIC 9(5).
     04 TITLE-1 PIC X(74).
     04 STOPPER-1 PIC X(1).
     04 B-CODE-4 PIC 9(5).
     04 TITLE-2 PIC X(74).
     04 STOPPER-2 PIC X(1).
     04 B-CODE-5 PIC 9(5).
     04 TITLE-3 PIC X(74).
     04 FILLER PIC X(1) VALUE SPACES.
     04 B-CODE-6 PIC 9(5).
     04 JOURNAL PIC X(75).
     04 B-CODE-7 PIC 9(5).
         04 VOLUME PIC X(10).
         04 NUMB PIC X(10).
         04 PAGES PIC X(10).
     04 FILLER PIC X(45) VALUE SPACES.
*****************************************************************
 PROCEDURE DIVISION.
 BEGIN.
     OPEN  INPUT CARD-FILE, OUTPUT TAPE-FILE.
 READ-1. MOVE SPACES TO TAPE-RECORD.
*********
* DETERMINING TITLE SIZE
*********
     READ CARD-FILE AT END GO TO READ-2.
     IF STOP-1 = 2 GO TO WRIT-2
     ELSE
     IF STOP-1 = 1 GO TO WRIT-1
     ELSE
     WRITE TAPE-RECORD FROM CARD-REC.
      GO TO READ-1.
*********
* CHANGING 80 CHARACTER RECORDS TO 560 CHARACTER RECORDS
*********
 READ-2. CLOSE TAPE-FILE, OPEN INPUT NTAP-FILE,
     OUTPUT NEWWTAPE.
 READ-3. READ NTAP-FILE INTO TAPE-REC AT END GO TO EOJ.
     IF BLANK-COUNTER   500 SUBTRACT 499 FROM BLANK-COUNTER.
*********
  FILLING BLANK ALTERNATE INDEXES WITH BINARY NUMBERS
*********
     PERFORM FILL-BLANK VARYING INCRO FROM 1 BY 1 UNTIL
     INCRO = 11.
     WRITE TAPE-OUT FROM TAPE-REC.
     GO TO READ-3.
 FILL-BLANK. IF SUB-CODE(INCRO)  = SPACES MOVE BLANK-COUNTER TO
     SUB-CODE(INCRO).
     ADD 1 TO BLANK-COUNTER.
 WRIT-2. WRITE TAPE-RECORD FROM CARD-REC.
     MOVE SPACES TO TAPE-RECORD.
     WRITE TAPE-RECORD.
     GO TO READ-1.
 WRIT-1. WRITE TAPE-RECORD FROM CARD-REC.
     MOVE SPACES TO TAPE-RECORD.
     WRITE TAPE-RECORD.
```

```
           MOVE SPACES TO TAPE-RECORD.
           WRITE TAPE-RECORD.
           GO TO READ-1.
       EOJ. CLOSE CARD-FILE, NTAP-FILE, NEWWTAPE.
           STOP RUN.
/*
//GO.SYSOBOUT DD SYSOUT=A
//GO.TAPE01 DD UNIT=TAPE,DISP=(NEW,PASS),
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=560),
// DSNAME=&&TAPE01,
// LABEL=(,NL),VOL=SER=MOE
//GO.TAPE02  DD UNIT=TAPE,DISP=(OLD,PASS),
// DCB=(RECFM=FB,LRECL=560,BLKSIZE=560),
// DSNAME=&&TAPE01,
// LABEL=(,NL),VOL=SER=MOE
//GO.TAPE03  DD UNIT=TAPE,DISP=(OLD,PASS),
// DCB=(RECFM=FB,LRECL=560,BLKSIZE=560),
// DSNAME=&&TAPE03,
// LABEL=(,NL),VOL=SER=SHEP
//GO.PRINT   DD SYSOUT=A
//GO.CARDIN     DD *
/*
```

```
// EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=A
//XCRTCH DD VOL=SER=XCRTCH,UNIT=3340,DISP=OLD
//SYSIN DD *
  /*  ********************************************************************-
      * BIBLIOGRAPHY-2                                                    -
      * AUTHOR - JOHNSON                                                  -
      * THIS PROGRAM WILL READ RECORDS FROM A TAPE (BIBLIOGRAPHY-1) AND-
      * CREATE A VSAM DISK FILE                                           -
      ********************************************************************/
 DEFINE CLUSTER -
   (NAME(VSAM.CLUSTER.FISH)  -
   FILE(XCRTCH) -
   RECORDSIZE(560 560) -
   VOLUME(XCRTCH) -
   KEYS(5 0) -
   UNIQUE) -
 DATA(NAME(VSAM.DATA.FISH) -
   RECORDS (5000))-
 INDEX(NAME(VSAM.INDEX.FISH))
// EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=A
//XCRTCH DD VOL=SER=XCRTCH,UNIT=3340,DISP=OLD
//VSAMOUT DD DSN=VSAM.CLUSTER.FISH,DISP=OLD
//NEWWTAPE DD UNIT=TAPE,DISP=OLD,
// DCB=(RECFM=FB,LRECL=560,BLKSIZE=560),
// DSNAME=TAPE03,
// LABEL=(,NL),VOL=SER=MOE
//SYSIN DD *
 REPRO INFILE(NEWWTAPE) -
   OUTFILE(VSAMOUT)
 DEFINE ALTERNATEINDEX -
 (NAME(VSAM.ACLUSTER.FISH1) -
   RELATE(VSAM.CLUSTER.FISH) -
            RECORDSIZE(35 510) -
   FILE(XCRTCH) -
   VOLUME(XCRTCH) -
   KEYS(5 5) -
   UNIQUE)-
  DATA (NAME(VSAM.ADATA.FISH1) -
   RECORDS(5000)) -
 INDEX(NAME(VSAM.AINDEX.FISH1))
   DEFINE PATH -
   (NAME(VSAM.PATH.FISH1) -
   PATHENTRY(VSAM.ACLUSTER.FISH1))
 DEFINE ALTERNATEINDEX -
   (NAME(VSAM.ACLUSTER.FISH2) -
   RELATE(VSAM.CLUSTER.FISH) -
   MODEL(VSAM.ACLUSTER.FISH1) -
   FILE(XCRTCH) -
   KEYS(5 10)) -
   DATA (NAME(VSAM.ADATA.FISH2)) -
   INDEX(NAME(VSAM.AINDEX.FISH2))
   DEFINE PATH -
   (NAME(VSAM.PATH.FISH2) -
   PATHENTRY(VSAM.ACLUSTER.FISH2))
 DEFINE ALTERNATEINDEX -
   (NAME(VSAM.ACLUSTER.FISH3) -
   RELATE(VSAM.CLUSTER.FISH) -
   MODEL(VSAM.ACLUSTER.FISH1) -
```

```
    FILE(XCRTCH) -
    KEYS(5 15)) -
    DATA (NAME(VSAM.ADATA.FISH3)) -
    INDEX(NAME(VSAM.AINDEX.FISH3))
    DEFINE PATH -
    (NAME(VSAM.PATH.FISH3) -
    PATHENTRY(VSAM.ACLUSTER.FISH3))
  DEFINE ALTERNATEINDEX -
    (NAME(VSAM.ACLUSTER.FISH4) -
    RELATE(VSAM.CLUSTER.FISH) -
    MODEL(VSAM.ACLUSTER.FISH1) -
    FILE(XCRTCH) -
    KEYS(5 20)) -
    DATA (NAME(VSAM.ADATA.FISH4)) -
    INDEX(NAME(VSAM.AINDEX.FISH4))
    DEFINE PATH -
    (NAME(VSAM.PATH.FISH4) -
    PATHENTRY(VSAM.ACLUSTER.FISH4))
  DEFINE ALTERNATEINDEX -
    (NAME(VSAM.ACLUSTER.FISH5) -
    RELATE(VSAM.CLUSTER.FISH) -
    MODEL(VSAM.ACLUSTER.FISH1) -
    FILE(XCRTCH) -
    KEYS(5 25)) -
    DATA (NAME(VSAM.ADATA.FISH5)) -
    INDEX(NAME(VSAM.AINDEX.FISH5))
    DEFINE PATH -
    (NAME(VSAM.PATH.FISH5) -
    PATHENTRY(VSAM.ACLUSTER.FISH5))
  DEFINE ALTERNATEINDEX -
    (NAME(VSAM.ACLUSTER.FISH6) -
    RELATE(VSAM.CLUSTER.FISH) -
    MODEL(VSAM.ACLUSTER.FISH1) -
    FILE(XCRTCH) -
    KEYS(5 30)) -
    DATA (NAME(VSAM.ADATA.FISH6)) -
    INDEX(NAME(VSAM.AINDEX.FISH6))
    DEFINE PATH -
    (NAME(VSAM.PATH.FISH6) -
    PATHENTRY(VSAM.ACLUSTER.FISH6))
  DEFINE ALTERNATEINDEX -
    (NAME(VSAM.ACLUSTER.FISH7) -
    RELATE(VSAM.CLUSTER.FISH) -
    MODEL(VSAM.ACLUSTER.FISH1) -
    FILE(XCRTCH) -
    KEYS(5 35)) -
    DATA (NAME(VSAM.ADATA.FISH7)) -
    INDEX(NAME(VSAM.AINDEX.FISH7))
    DEFINE PATH -
    (NAME(VSAM.PATH.FISH7) -
    PATHENTRY(VSAM.ACLUSTER.FISH7))
  DEFINE ALTERNATEINDEX -
    (NAME(VSAM.ACLUSTER.FISH8) -
    RELATE(VSAM.CLUSTER.FISH) -
    MODEL(VSAM.ACLUSTER.FISH1) -
    FILE(XCRTCH) -
    KEYS(5 40)) -
    DATA (NAME(VSAM.ADATA.FISH8)) -
    INDEX(NAME(VSAM.AINDEX.FISH8))
    DEFINE PATH -
```

```
    (NAME(VSAM.PATH.FISH8) -
    PATHENTRY(VSAM.ACLUSTER.FISH8))
  DEFINE ALTERNATEINDEX -
    (NAME(VSAM.ACLUSTER.FISH9) -
    RELATE(VSAM.CLUSTER.FISH) -
    MODEL(VSAM.ACLUSTER.FISH1) -
    FILE(XCRTCH) -
    KEYS(5 45)) -
    DATA (NAME(VSAM.ADATA.FISH9)) -
    INDEX(NAME(VSAM.AINDEX.FISH9))
    DEFINE PATH -
    (NAME(VSAM.PATH.FISH9) -
    PATHENTRY(VSAM.ACLUSTER.FISH9))
  DEFINE ALTERNATEINDEX -
    (NAME(VSAM.ACLUSTER.FISH10) -
    RELATE(VSAM.CLUSTER.FISH) -
    MODEL(VSAM.ACLUSTER.FISH1) -
    FILE(XCRTCH) -
    KEYS(5 50)) -
    DATA (NAME(VSAM.ADATA.FISH10)) -
    INDEX(NAME(VSAM.AINDEX.FISH10))
    DEFINE PATH -
    (NAME(VSAM.PATH.FISH10) -
    PATHENTRY(VSAM.ACLUSTER.FISH10))
//  EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=A
//XCRTCH DD VOL=SER=XCRTCH,UNIT=3340,DISP=OLD
//VSAMOUT DD DSN=VSAM.CLUSTER.FISH,DISP=OLD
//FISH1  DD DSN=VSAM.ACLUSTER.FISH1,DISP=OLD
//FISH2  DD DSN=VSAM.ACLUSTER.FISH2,DISP=OLD
//FISH3  DD DSN=VSAM.ACLUSTER.FISH3,DISP=OLD
//FISH4  DD DSN=VSAM.ACLUSTER.FISH4,DISP=OLD
//FISH5  DD DSN=VSAM.ACLUSTER.FISH5,DISP=OLD
//FISH6  DD DSN=VSAM.ACLUSTER.FISH6,DISP=OLD
//FISH7  DD DSN=VSAM.ACLUSTER.FISH7,DISP=OLD
//FISH8  DD DSN=VSAM.ACLUSTER.FISH8,DISP=OLD
//FISH9  DD DSN=VSAM.ACLUSTER.FISH9,DISP=OLD
//FISH10 DD DSN=VSAM.ACLUSTER.FISH10,DISP=OLD
//SYSIN DD *
 BLDINDEX -
    INFILE(VSAMOUT) -
    OUTFILE(FISH1 FISH2 FISH3 FISH4 FISH5 FISH6 FISH7 FISH8 FISH9 -
            FISH10)
/*
```

```
/*KRAMER       711635736,'DICK KRAMER',MSGLEVEL=1,TIME=1,CLASS=B
//JOBCAT DD DSN=VSAM.CATALOG.TEMP.FILES,DISP=OLD
//     EXEC   COBUCLG
//COB.SYSIN    DD    *
       IDENTIFICATION DIVISION.
       PROGRAM-ID. BIBLOGRAPHY-3.
       AUTHOR. KRAMER.
       REMARKS. THIS  PROGRAM WILL RETRIEVE REFERENCES BY REQUESTING
           A SUBJECT CODE OR A RECORD CODE.
       REMARKS. REQUESTS FOR REFERENCES CONCERNING A CERTAIN SUBJECT
           MAY BE RETRIEVED BY PUNCHING THE SUBJECT DESIRED IN THE
           FIRST 5 COLUMNS OF A CARD -- AN INDIVIDUAL RECORD RECORD
           CAN BE  RETRIEVED IN A SIMILAR MANNER EXCEPT 'RECORD' MUST
           BE PUNCHED IN COLUMN 6 TO 11.
      ******************************************************************
       ENVIRONMENT DIVISION.
       CONFIGURATION SECTION.
       SOURCE-COMPUTER. IBM-370.
       OBJECT-COMPUTER. IBM-370.
       INPUT-OUTPUT SECTION.
       FILE-CONTROL.
           SELECT CARD-FILE ASSIGN TO UR-2540R-S-CARDIN.
           SELECT PRINT-FILE ASSIGN TO UR-1403-S-PRINT.
           SELECT FISH ASSIGN TO FISHBIB
             ORGANIZATION IS INDEXED  ACCESS IS DYNAMIC
               RECORD KEY IS BIB-CODE
               ALTERNATE RECORD KEY IS BIB1 WITH DUPLICATES
               ALTERNATE RECORD KEY IS BIB2 WITH DUPLICATES
               ALTERNATE RECORD KEY IS BIB3 WITH DUPLICATES
               ALTERNATE RECORD KEY IS BIB4 WITH DUPLICATES
               ALTERNATE RECORD KEY IS BIB5 WITH DUPLICATES
               ALTERNATE RECORD KEY IS BIB6 WITH DUPLICATES
               ALTERNATE RECORD KEY IS BIB7 WITH DUPLICATES
               ALTERNATE RECORD KEY IS BIB8 WITH DUPLICATES
               ALTERNATE RECORD KEY IS BIB9 WITH DUPLICATES
               ALTERNATE RECORD KEY IS BIB10 WITH DUPLICATES
               FILE STATUS IS ERRAT.
      ******************************************************************
       DATA DIVISION.
       FILE SECTION.
       FD  FISH
           RECORD CONTAINS 560 CHARACTERS
           LABEL RECORDS ARE STANDARD
           DATA RECORD IS REF.
       01  REF.
           04 BIB-CODE PIC 9(5).
           04  BIB1 PIC 9(5).
           04  BIB2 PIC 9(5).
           04  BIB3 PIC 9(5).
           04  BIB4 PIC 9(5).
           04  BIB5 PIC 9(5).
           04  BIB6 PIC 9(5).
           04  BIB7 PIC 9(5).
           04  BIB8 PIC 9(5).
           04  BIB9 PIC 9(5).
           04  BIB10 PIC 9(5).
           04 FILLER PIC X(25).
           04 B-CODE-2 PIC 9(5).
           04 AU-THOR PIC X(50).
           04 YR PIC 9999.
```

```
           04 FILLER PIC X(21).
       04 B-CODE-3 PIC 9(5).
       04 TITLE-1 PIC X(74).
       04 STOPPER-1 PIC X(1).
       04 B-CODE-4 PIC 9(5).
       04 TITLE-2 PIC X(74).
       04 STOPPER-2 PIC X(1).
       04 B-CODE-5 PIC 9(5).
       04 TITLE-3 PIC X(74).
       04 FILLER PIC X(1).
       04 B-CODE-6 PIC 9(5).
       04 JOURNAL PIC X(75).
       04 B-CODE-7 PIC 9(5).
           04 VOLUME PIC X(10).
           04 NUMB PIC X(10).
           04 PAGES PIC X(10).
       04 FILLER PIC X(45).
 FD  CARD-FILE
       LABEL RECORDS ARE OMITTED, RECORDING MODE F, DATA RECORDS
       IS CARD-REC.
 01    CARD-REC.
       04 SUB-SEARCH PIC  9(5).
       04 BIB-SEARCH PIC X(6).
       04  FILLER PIC X(69).
 FD   PRINT-FILE
       LABEL RECORDS ARE OMITTED, RECORDING MODE F, DATA RECORDS
       IS PRINT-AREA.
 01  PRINT-AREA PIC X(133).
 WORKING-STORAGE SECTION.
 77      ERRAT  PIC 99  VALUE ZERO.
********
* PRINTOUT FORMAT
********
 01   PRINT-REC.
           04 FILLER PIC X(5) VALUE SPACES.
           04 BIBG PIC 9(5).
           04 FILLER PIC X(5) VALUE SPACES.
       04   SUB1 PIC ZZ9999.
       04   SUB2 PIC ZZ9999.
       04   SUB3 PIC ZZ9999.
       04   SUB4 PIC ZZ9999.
       04   SUB5 PIC ZZ9999.
       04   SUB6 PIC ZZ9999.
       04   SUB7 PIC ZZ9999.
       04   SUB8 PIC ZZ9999.
       04   SUB9 PIC ZZ9999.
       04   SUB10 PIC ZZ9999.
           04 FILLER PIC X(57) VALUE SPACES.
 01   PRINT-REC-2.
           04 FILLER PIC X(5) VALUE SPACES.
           04 THOR PIC X(50).
           04 FILLER PIC X(10) VALUE SPACES.
           04 YEAR PIC 9(4).
           04 FILLER PIC X(63) VALUE SPACES.
 01   PRINT-REC-3.
           04 FILLER PIC X(5) VALUE SPACES.
           04 TITL-1 PIC X(74).
           04 FILLER PIC X(53) VALUE SPACES.
 01   PRINT-REC-4.
           04 FILLER PIC X(5) VALUE SPACES.
```

```
        04 TITL-2 PIC X(74).
        04 FILLER PIC X(53) VALUE SPACES.
)1  PRINT-REC-6.
        04 FILLER PIC X(5) VALUE SPACES.
        04 TITL-3 PIC X(74).
    04  FILLER PIC X(18) VALUE '             VOLUME'.
    04 FILLER PIC X(15) VALUE '          NUMBER'.
    04 FILLER PIC X(12) VALUE '       PAGES'.
    04 FILLER PIC X(8) VALUE SPACES.
)1  PRINT-REC-5.
        04 FILLER PIC X(5) VALUE SPACES.
        04 JOUR PIC X(75).
        04  FILLER PIC X(5) VALUE SPACES.
        04 VOL PIC X(10).
        04 FILLER PIC X(5) VALUE SPACES.
        04 NUM PIC X(10).
        04 FILLER PIC X(5) VALUE SPACES.
        04 PAG  PIC X(10).
        04 FILLER PIC X(7) VALUE SPACES.
)1  HEAD-1.
    04 FILLER PIC X(5) VALUE SPACES.
    04 FILLER PIC X(16) VALUE 'SEARCH CODE     '.
    04 SEARCH-1 PIC 9(5).
    04 FILLER PIC X(106) VALUE SPACES.
 1  HEAD-2.
    04 FILLER PIC X(5) VALUE SPACES.
    04 FILLER PIC X(16) VALUE 'RECORD CODE     '.
    04 SEARCH-2 PIC 9(5).
    04 FILLER PIC X(106) VALUE SPACES.
 ****************************************************************
 ROCEDURE DIVISION.
    OPEN INPUT FISH, CARD-FILE, OUTPUT PRINT-FILE.
    IF ERRAT NOT = ZERO DISPLAY 'EROR ON OPEN' ERRAT
    GO TO EOJ.
 ******
 DETERMINING IF SUBJECT SEARCH OR A RECORD SEARCH
 ******
 EAD-CARD. READ CARD-FILE AT END GO TO EOJ.
    IF BIB-SEARCH = 'RECORD' GO TO FIND-RECORD ELSE
    MOVE SUB-SEARCH TO SEARCH-1.
    WRITE PRINT-AREA FROM HEAD-1 AFTER ADVANCING 5 LINES.
    MOVE SUB-SEARCH TO BIB1.
    START FISH KEY IS = BIB1
    INVALID KEY GO TO KEY-2.
 ******
 SUBJECT SEARCH
 ******
 EAD-DISK-1.
    READ FISH NEXT RECORD AT END GO TO  KEY-2.
    IF ERRAT = 00 PERFORM WRITO, GO    TO  KEY-2.
    IF ERRAT = 02 PERFORM WRITO, GO TO RD1.
    IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
     GO TO EOJ.
 D1. READ FISH NEXT RECORD AT END GO TO KEY-2.
    IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
     GO TO EOJ.
    IF BIB1 NOT = SUB-SEARCH GO TO KEY-2
    ELSE PERFORM WRITO.
    GO TO RD1.
 EY-2.
```

```
    MOVE SUB-SEARCH TO BIB2.
    START FISH KEY IS = BIB2
    INVALID KEY GO TO KEY-3.
    READ FISH NEXT RECORD AT END GO TO  KEY-3.
    IF ERRAT = 00 PERFORM WRITO, GO   TO  KEY-3.
    IF ERRAT = 02 PERFORM WRITO, GO TO RD2.
    IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
     GO TO EOJ.
!D2. READ FISH NEXT RECORD AT END GO TO KEY-3.
    IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
     GO TO EOJ.
    IF BIB2 NOT = SUB-SEARCH GO TO KEY-3
    ELSE PERFORM WRITO.
    GO TO RD2.
:EY-3.
    MOVE SUB-SEARCH TO BIB3.
    START FISH KEY IS = BIB3
    INVALID KEY GO TO KEY-4.
    READ FISH NEXT RECORD AT END GO TO  KEY-4.
    IF ERRAT = 00 PERFORM WRITO, GO   TO  KEY-4.
    IF ERRAT = 02 PERFORM WRITO, GO TO RD3.
    IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
     GO TO EOJ.
 D3. READ FISH NEXT RECORD AT END GO TO KEY-4.
    IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
     GO TO EOJ.
    IF BIB3 NOT = SUB-SEARCH GO TO KEY-4
    ELSE PERFORM WRITO.
    GO TO RD3.
 EY-4.
    MOVE SUB-SEARCH TO BIB4.
    START FISH KEY IS = BIB4
    INVALID KEY GO TO KEY-5.
    READ FISH NEXT RECORD AT END GO TO  KEY-5.
    IF ERRAT = 00 PERFORM WRITO, GO   TO  KEY-5.
    IF ERRAT = 02 PERFORM WRITO, GO TO RD4.
    IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
     GO TO EOJ.
 D4. READ FISH NEXT RECORD AT END GO TO KEY-5.
    IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
     GO TO EOJ.
    IF BIB4 NOT = SUB-SEARCH GO TO KEY-5
    ELSE PERFORM WRITO.
    GO TO RD4.
 EY-5.
    MOVE SUB-SEARCH TO BIB5.
    START FISH KEY IS = BIB5
    INVALID KEY GO TO KEY-6.
    READ FISH NEXT RECORD AT END GO TO  KEY-6.
    IF ERRAT = 00 PERFORM WRITO, GO   TO  KEY-6.
    IF ERRAT = 02 PERFORM WRITO, GO TO RD5.
    IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
     GO TO EOJ.
 D5. READ FISH NEXT RECORD AT END GO TO KEY-6.
    IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
     GO TO EOJ.
    IF BIB5 NOT = SUB-SEARCH GO TO KEY-6
    ELSE PERFORM WRITO.
    GO TO RD5.
 EY-6.
```

```
   MOVE SUB-SEARCH TO B186.
   START FISH KEY IS = B186
   INVALID KEY GO TO KEY-7.
   READ FISH NEXT RECORD AT END GO TO  KEY-7.
   IF ERRAT = 00 PERFORM WRITO, GO    TO  KEY-7.
   IF ERRAT = 02 PERFORM WRITO, GO TO RD6.
   IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
    GO TO EOJ.
06. READ FISH NEXT RECORD AT END GO TO KEY-7.
   IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
    GO TO EOJ.
   IF B186 NOT = SUB-SEARCH GO TO KEY-7
   ELSE PERFORM WRITO.
   GO TO RD6.
EY-7.
   MOVE SUB-SEARCH TO B187.
   START FISH KEY IS = B187
   INVALID KEY GO TO KEY-8.
   READ FISH NEXT RECORD AT END GO TO  KEY-8.
   IF ERRAT = 00 PERFORM WRITO, GO    TO  KEY-8.
   IF ERRAT = 02 PERFORM WRITO, GO TO RD7.
   IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
    GO TO EOJ.
)7. READ FISH NEXT RECORD AT END GO TO KEY-8.
   IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
    GO TO EOJ.
   IF B187 NOT = SUB-SEARCH GO TO KEY-8
   ELSE PERFORM WRITO.
   GO TO RD7.
:Y-8.
   MOVE SUB-SEARCH TO B188.
   START FISH KEY IS = B188
   INVALID KEY GO TO KEY-9.
   READ FISH NEXT RECORD AT END GO TO  KEY-9.
   IF ERRAT = 00 PERFORM WRITO, GO    TO  KEY-9.
   IF ERRAT = 02 PERFORM WRITO, GO TO RD8.
   IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
    GO TO EOJ.
'8. READ FISH NEXT RECORD AT END GO TO KEY-9.
   IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
    GO TO EOJ.
   IF B188 NOT = SUB-SEARCH GO TO KEY-9
   ELSE PERFORM WRITO.
   GO TO RD8.
:Y-9.
   MOVE SUB-SEARCH TO B189.
   START FISH KEY IS = B189
   INVALID KEY GO TO KEY-10.
   READ FISH NEXT RECORD AT END GO TO  KEY-10.
   IF ERRAT = 00 PERFORM WRITO, GO    TO  KEY-10.
   IF ERRAT = 02 PERFORM WRITO, GO TO RD9.
   IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
    GO TO EOJ.
 9. READ FISH NEXT RECORD AT END GO TO KEY-10.
   IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
    GO TO EOJ.
   IF B189 NOT = SUB-SEARCH GO TO KEY-10
   ELSE PERFORM WRITO.
   GO TO RD9.
 Y-10.
```

```
           MOVE SUB-SEARCH TO BIB10.
           START FISH KEY IS = BIB10
           INVALID KEY GO TO  READ-CARD.
           READ FISH NEXT RECORD AT END GO TO EOJ.
           IF ERRAT = 00 PERFORM WRITO, GO TO READ-CARD.
           IF ERRAT = 02 PERFORM WRITO, GO TO RD10.
           IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
            GO TO EOJ.
       RD10. READ FISH NEXT RECORD AT END GO TO READ-CARD.
           IF ERRAT GREATER THAN 02 DISPLAY 'UNSUCCESSFUL READ' ERRAT
            GO TO EOJ.
           IF BIB10 NOT = SUB-SEARCH GO TO RO10
           ELSE PERFORM WRITO.
           GO TO RD10.
      ********
      * RECORD SEARCH
      ********
       FIND-RECORD.
           MOVE SUB-SEARCH TO SEARCH-2.
           WRITE PRINT-AREA FROM HEAD-2 AFTER ADVANCING 5 LINES.
           MOVE SUB-SEARCH TO BIB-CODE.
           READ FISH INVALID KEY GO TO READ-CARD.
            PERFORM WRITO.
           GO TO READ-CARD.
      ********
      * RETRIEVAL PRINTOUT
      ********
       WRITO.
           MOVE BIB-CODE TO BIBG.
           MOVE BIB1 TO SUB1.
           MOVE BIB2 TO SUB2.
           MOVE BIB3 TO SUB3.
           MOVE BIB4 TO SUB4.
           MOVE BIB5 TO SUB5.
           MOVE BIB6 TO SUB6.
           MOVE BIB7 TO SUB7.
           MOVE BIB8 TO SUB8.
           MOVE BIB9 TO SUB9.
           MOVE BIB10 TO SUB10.
           WRITE PRINT-AREA FROM PRINT-REC AFTER ADVANCING 3  LINES.
            MOVE AU-THOR TO THOR.
           MOVE YR TO YEAR.
           WRITE PRINT-AREA FROM PRINT-REC-2 AFTER ADVANCING 1 LINES.
           MOVE TITLE-1 TO TITL-1.
           WRITE PRINT-AREA FROM PRINT-REC-3 AFTER ADVANCING 1 LINES.
           MOVE TITLE-2 TO TITL-2.
           WRITE PRINT-AREA FROM PRINT-REC-4 AFTER ADVANCING 1 LINES.
           MOVE TITLE-3 TO TITL-3.
           WRITE PRINT-AREA FROM PRINT-REC-6  AFTER ADVANCING 1 LINES.
           MOVE JOURNAL TO JOUR.
            MOVE VOLUME TO VOL.
           MOVE NUMB TO NUM.
             MOVE PAGES TO PAG.
           WRITE PRINT-AREA FROM PRINT-REC-5 AFTER ADVANCING 1 LINES.
       EOJ. CLOSE FISH, PRINT-FILE, CARD-FILE.
           STOP RUN.
/*
//GO.SYSOBOUT  DD   SYSOUT=A
//GO.PRINT DD SYSOUT=A
//GO.SYSOUT    DD   SYSOUT=A
```

```
//GO.FISHBIB     DD    DSN=VSAM.CLUSTER.FISH,DISP=OLD
//GO.FISHBIB1   DD   DSN=VSAM.PATH.FISH1,DISP=OLD
//GO.FISHBIB2   DD   DSN=VSAM.PATH.FISH2,DISP=OLD
//GO.FISHBIB3   DD   DSN=VSAM.PATH.FISH3,DISP=OLD
//GO.FISHBIB4   DD   DSN=VSAM.PATH.FISH4,DISP=OLD
//GO.FISHBIB5   DD   DSN=VSAM.PATH.FISH5,DISP=OLD
//GO.FISHBIB6   DD   DSN=VSAM.PATH.FISH6,DISP=OLD
//GO.FISHBIB7   DD   DSN=VSAM.PATH.FISH7,DISP=OLD
//GO.FISHBIB8   DD   DSN=VSAM.PATH.FISH8,DISP=OLD
//GO.FISHBIB9   DD   DSN=VSAM.PATH.FISH9,DISP=OLD
//GO.FISHBIB10  DD   DSN=VSAM.PATH.FISH10,DISP=OLD
//GO.CARDIN DD *
/*
```

```
//     EXEC    COBUCLG
//COB.SYSIN     DD     *
       IDENTIFICATION DIVISION.
       PROGRAM-ID. BIBLIOGRAPHY-4.
       AUTHOR. KRAMER.
       REMARKS. THIS PROGRAM WILL READ REFERENCES FROM 'BIBLIOGRAPHY-1'
           AND USE THEM TO ADD OR UPDATE RECORDS ON THE
           EXISTING VSAM FILE.
      ******************************************************************
       ENVIRONMENT DIVISION.
       CONFIGURATION SECTION.
       SOURCE-COMPUTER. IBM-370.
       OBJECT-COMPUTER. IBM-370.
       INPUT-OUTPUT SECTION.
       FILE-CONTROL.
           SELECT NEWWTAPE ASSIGN TO UT-2400-S-TAPE03.
           SELECT FISH ASSIGN TO FISHBIB
             ORGANIZATION IS INDEXED  ACCESS IS RANDOM
               RECORD KEY IS BIB-CODE
           FILE STATUS IS ERRAT.
      ******************************************************************
       DATA DIVISION.
       FILE SECTION.
       FD  FISH
           RECORD CONTAINS 560 CHARACTERS
           LABEL RECORDS ARE STANDARD
           DATA RECORD IS REF.
       01  REF.
           04 BIB-CODE PIC 9(5).
           04 MAIN-REF PIC X(555).
       FD  NEWWTAPE
           RECORDING MODE F, LABEL RECORDS ARE OMITTED, RECORD CONTAINS
           560 CHARACTERS, BLOCK CONTAINS 1 RECORDS, DATA RECORD IS
           NTAP.
       01  CARD-REC.
           04 ID-IN PIC 9(5).
           04 NEW-REF PIC X(555).
       WORKING-STORAGE SECTION.
       77  ERRAT PIC 99 VALUE ZERO.
       77  SAVE-THE-KEY PIC 9(5).
      ********
      * INITIALIZING COUNTER FOR NUMBER OF RECORD UPDATES
      ********
       77  UPDATE-COUNTER PIC 9(3) VALUE ZERO.
      ********
      * INITIALIZING COUNTER FOR NUMBER OF RECORD ADDITIONS
      ********
       77  ADD-COUNTER PIC 9(3) VALUE ZERO.
      ******************************************************************
       PROCEDURE DIVISION.
       OPENS.
           OPEN INPUT NEWWTAPE,  I-O FISH.
           IF ERRAT NOT = 0 DISPLAY 'ERROR ON OPEN'  ERRAT GO TO EOJ.
       READ-IN.
           READ NEWWTAPE,  AT END GO TO EOJ.
       READ-DSK.
           MOVE ID-IN TO BIB-CODE.
           READ FISH INVALID KEY       GO TO WRITE-NEW.
      ********
      * UPDATE OR REWRITE AN EXISTING RECORD
```

```
      ********
       REWRITE-OLD.
            MOVE CARD-REC TO REF.
            REWRITE REF INVALID KEY EXHIBIT NAMED 'INVALID REWRITE'
            CARD-REC, SAVE-THE-KEY, GO TO READ-IN.
             ADD 1 TO UPDATE-COUNTER.
            GO TO READ-IN.
      ********
      * ADD NEW RECORDS
      ********
       WRITE-NEW.
            MOVE CARD-REC TO REF.
            WRITE REF INVALID KEY EXHIBIT NAMED 'INVALID WRITE'
            CARD-REC, SAVE-THE-KEY, GO TO READ-IN.
            ADD 1 TO ADD-COUNTER.
            GO TO READ-IN.
       EOJ.
            CLOSE NEWWTAPE, FISH.
            EXHIBIT NAMED UPDATE-COUNTER, ADD-COUNTER.
            STOP RUN.
/*
//GO.SYSDBOUT  DD   SYSOUT=A
//GO.SYSOUT    DD   SYSOUT=A
//GO.FISHBIB    DD   DSN=VSAM.CLUSTER.FISH,DISP=OLD
//GO.TAPE03  DD UNIT=TAPE,DISP=(OLD,PASS),
// DCB=(RECFM=FB,LRECL=560,BLKSIZE=560),
// DSNAME=&&TAPE03,
// LABEL=(,NL),VOL=SER=SHEP
/*
```

APPENDIX B

GIVEFISH Data Sheets

LAKE CODE	SOURCE I.D.
1-4	5 6-9

LEGAL CLASSIFICATION
FORM A

DC	DATE
	Y Y M M D D
	10 11 12 13 14 15 16

NAME OF WATER 17-36 REGION 37 38 Card 01 79 80

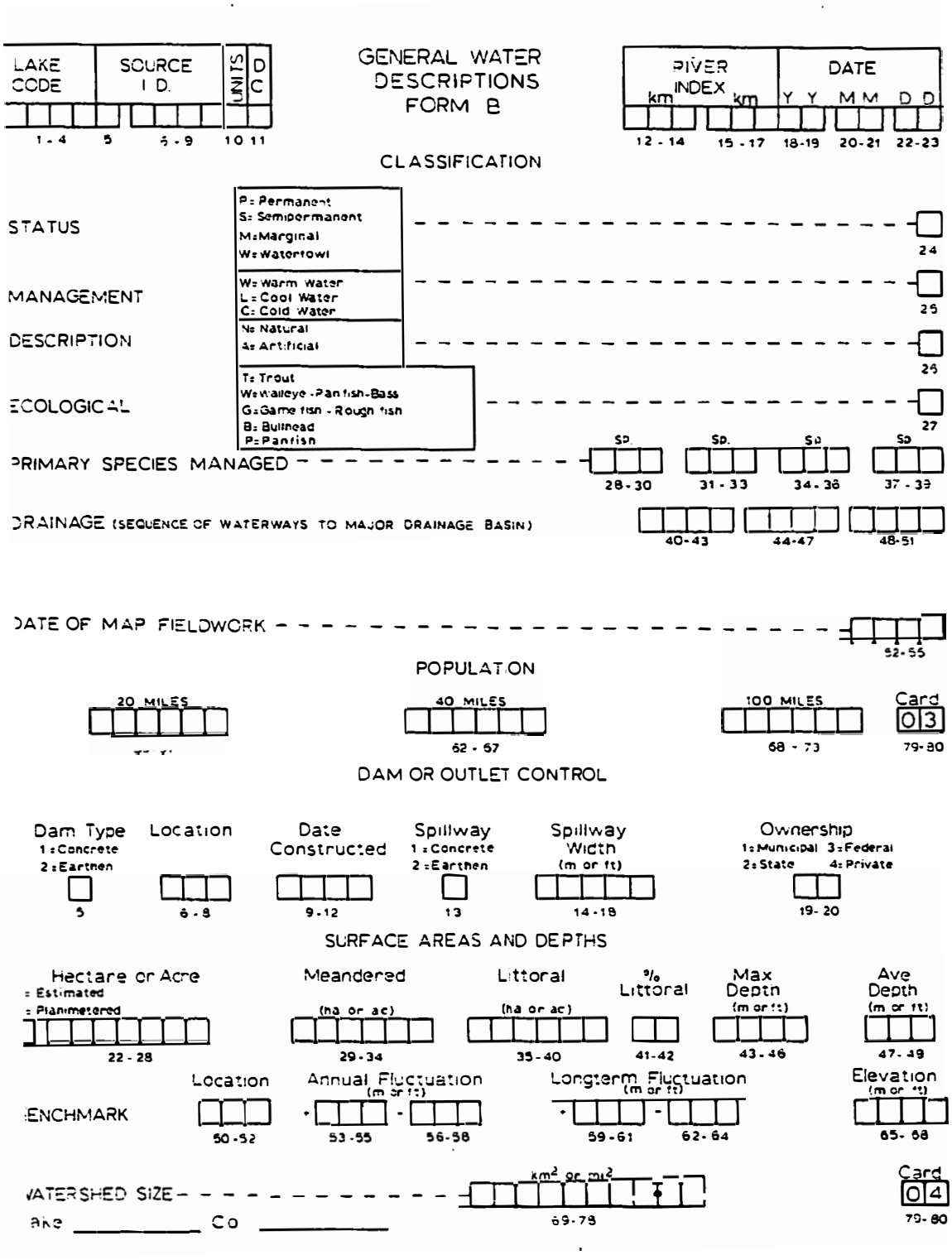
RANGE 5-6 TWN 7-9 SECTION 10-39

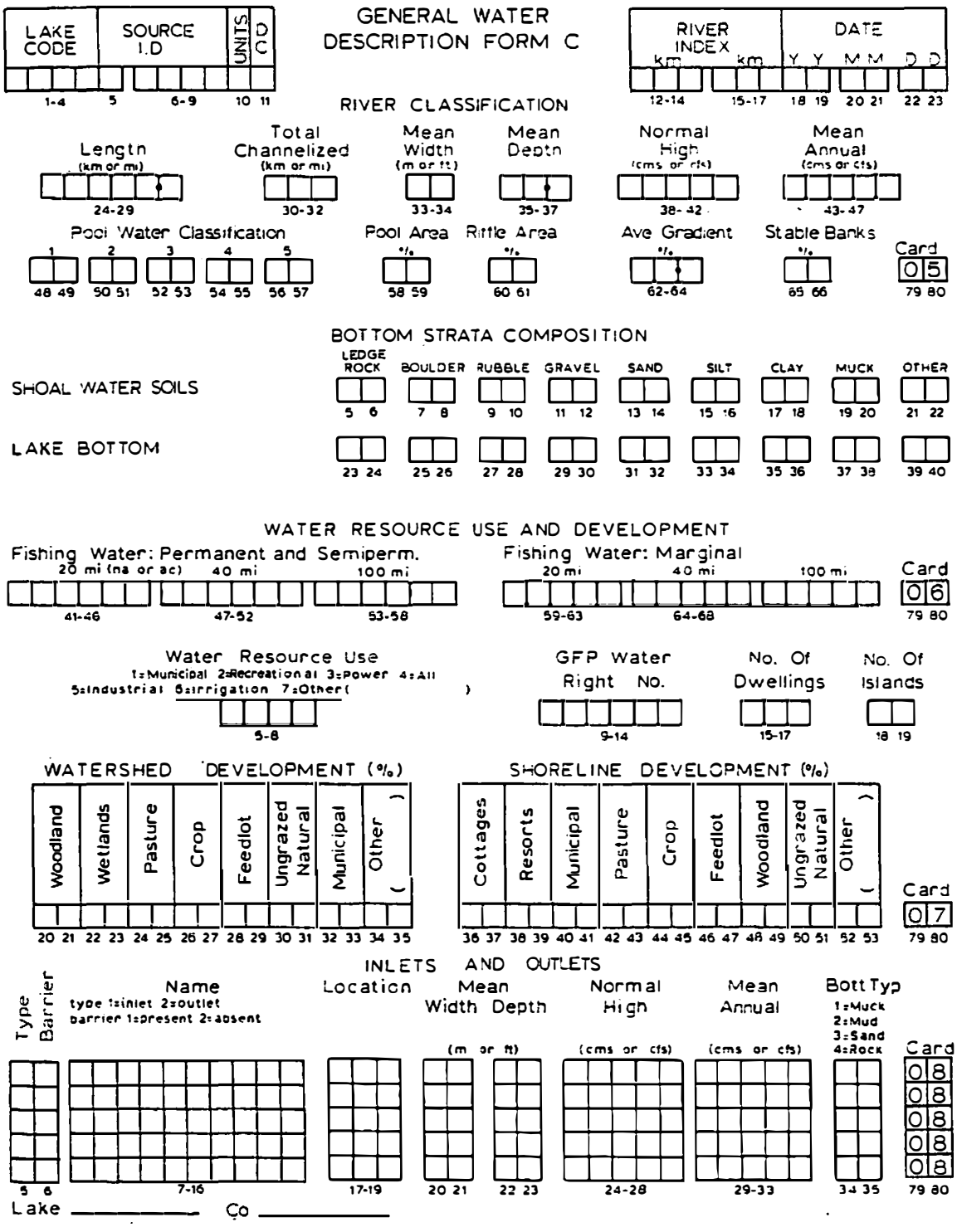
RANGE 40 41 TWN 42-44 SECTION 45-74 Card 02 79 80

RANGE 5 6 TWN 7-9 SECTION 10-39

RANGE 40 41 TWN 42-44 SECTION 45-74 Card 02 79 80

Lake_____ Co_____


LAKE CODE
SOURCE I D.
UNITS
D C
1 - 4
5
6 - 9
10 11
GENERAL WATER DESCRIPTIONS FORM B
RIVER INDEX km km
DATE Y Y M M D D
12 - 14
15 - 17
18-19
20-21
22-23
CLASSIFICATION
STATUS
P = Permanent
S = Semipermanent
M = Marginal
W = Waterfowl
24
MANAGEMENT
W = Warm Water
L = Cool Water
C = Cold Water
25
DESCRIPTION
N = Natural
A = Artificial
26
ECOLOGICAL
T = Trout
W = Walleye - Panfish - Bass
G = Game fish - Rough fish
B = Bullhead
P = Panfish
27
PRIMARY SPECIES MANAGED
Sp.
28 - 30
31 - 33
34 - 36
37 - 39
DRAINAGE (SEQUENCE OF WATERWAYS TO MAJOR DRAINAGE BASIN)
40-43
44-47
48-51
DATE OF MAP FIELDWORK
52-55
POPULATION
20 MILES
40 MILES
100 MILES
62 - 67
68 - 73
Card
03
79-80
DAM OR OUTLET CONTROL
Dam Type
1 = Concrete
2 = Earthen
5
Location
6 - 8
Date Constructed
9-12
Spillway
1 = Concrete
2 = Earthen
13
Spillway Width (m or ft)
14-18
Ownership
1 = Municipal
2 = State
3 = Federal
4 = Private
19- 20
SURFACE AREAS AND DEPTHS
Hectare or Acre
= Estimated
= Planimetered
22 - 28
Meandered (ha or ac)
29-34
Littoral (ha or ac)
35-40
% Littoral
41-42
Max Depth (m or ft)
43-46
Ave Depth (m or ft)
47-49
BENCHMARK
Location
50-52
Annual Fluctuation (m or ft)
53-55
56-58
Longterm Fluctuation (m or ft)
59-61
62-64
Elevation (m or ft)
65-68
WATERSHED SIZE
km² or mi²
69-78
Card
04
79-80
Lake _____ Co _____


LAKE CODE
SOURCE I.D
UNITS
CD
1-4 5 6-9 10 11
GENERAL WATER DESCRIPTION FORM C
RIVER INDEX km km
DATE Y Y M M D D
12-14 15-17 18 19 20 21 22 23
RIVER CLASSIFICATION
Length (km or mi) 24-29
Total Channelized (km or mi) 30-32
Mean Width (m or ft) 33-34
Mean Depth 35-37
Normal High (cms or cfs) 38-42
Mean Annual (cms or cfs) 43-47
Pool Water Classification 1 2 3 4 5 48 49 50 51 52 53 54 55 56 57
Pool Area % 58 59
Rifle Area % 60 61
Ave Gradient % 62-64
Stable Banks % 65 66
Card 05 79 80
BOTTOM STRATA COMPOSITION
LEDGE ROCK BOULDER RUBBLE GRAVEL SAND SILT CLAY MUCK OTHER
SHOAL WATER SOILS 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
LAKE BOTTOM 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
WATER RESOURCE USE AND DEVELOPMENT
Fishing Water: Permanent and Semiperm. 20 mi (na or ac) 40 mi 100 mi 41-46 47-52 53-58
Fishing Water: Marginal 20 mi 40 mi 100 mi 59-63 64-68
Card 06 79 80
Water Resource Use 1=Municipal 2=Recreational 3=Power 4=All 5=Industrial 6=Irrigation 7=Other( ) 5-8
GFP Water Right No. 9-14
No. Of Dwellings 15-17
No. Of Islands 18 19
WATERSHED DEVELOPMENT (%)
Woodland Wetlands Pasture Crop Feedlot Ungrazed Natural Municipal Other ( ) 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
SHORELINE DEVELOPMENT (%)
Cottages Resorts Municipal Pasture Crop Feedlot Woodland Ungrazed Natural Other ( ) 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53
Card 07 79 80
INLETS AND OUTLETS
Type Barrier
Name type 1=inlet 2=outlet barrier 1=present 2=absent 7-16
Location 17-19
Mean Width (m or ft) 20 21
Mean Depth (m or ft) 22 23
Normal High (cms or cfs) 24-28
Mean Annual (cms or cfs) 29-33
Bott Typ 1=Muck 2=Mud 3=Sand 4=Rock 34 35
Card 08 08 08 08 08 79 80
5 6
Lake _____ Co _____

LAKE CODE (1-4) | SOURCE I.D. (5, 6-9)

WATER CHEMISTRY FORM D

UNITS (10) D/C (11) | DATE Y Y (12 13) M M (14 15) D D (16 17)

Station location ____ (18 19 20)

TURBIDITY AND COLOR

Secchi ____ (m or ft) (21 22 23)

Color (LT = Light, DK = Dark, RD = Red, OR = Orange, YL = Yellow, BL = Blue, GR = Green, BR = Brown, GR = Gray) ____ (24-27)

Cause of color ____ (28)

1 = Dead organic
2 = Algal
3 = Pollution
4 = Other ( )

TEMPERATURE AND DISSOLVED OXYGEN PROFILE

Depth (m or ft)	Temp (C or F)	Diss Oxy
29-32	33 34	35-37
38-41	42 43	44-46
47-50	51 52	53-55
56-59	60 61	62-64
65-68	69 70	71-73

Card 09 (79 80)

Limit of thermocline ____ (m or ft) (5-8) to (m or ft) (9-12)

WATER QUALITY

Field analysis ____

Total Alkalinity	PHTH Alkalinity	MO Alkalinity	pH	CO_2	Total Hardness	Conductivity
13-15	16-18	19-21	22-24	25 26	27-30	31-34

Lab analysis ____

T S Solids	T D Solids	Ortho Phos	Total Phos	Chlorophyll A (mg/m^3)	B
35-38	39-42	43-45	46-48	49-51	52-54

Chloride Ion	Ammonia-Nitrogen	Nitrate Nitrogen	Organic N (Kjeld)	Total Nitrogen
55-58	59-62	63-66	67-70	71-74

Card 10 (79 80)

Lake _____ Co _____

LAKE CODE	SOURCE I.D.	DC
1-4	5	6-9 10

ORGANISM ABUNDANCE AND SPAWNING HABITAT FORM E

RIVER INDEX KM	KM	DATE Y Y	M M	D D
11-13	14-16	17 18	19 20	21 22

STANDING EMERGENTS

% Coverage 23 24

Sp	Ab*	Sp	Ab	Sp	Ab	Sp	Ab	Sp	Ab
25-27	28	29-31	32	33-35	36	37-39	40	41-43	44

SUBMERGED OR FLOATING LEAF

Depth of Growth (m or ft) 45 46 | 47-49

50-52	53	54-56	57	58-60	61	62-64	65	66-68	69

FLOATING PLANTS AND PHYTOPLANKTON

Duckweed	Filamentous	Non-filamentous
70	71	72

TURTLES / FROGS / SALAMANDERS

Soft	Mud	Snap	Bull	Other		Card
73	74	75	76	77	78	1 1
						79 80

FISH SPECIES KNOWN TO OCCUR

Sp	Ab*	Sp	Ab	Sp	Ab	Sp	Ab	Sp	Ab	Sp	Ab	Sp	Ab	Sp	Ab
5-7	8	9-11	12	13-15	16	17-19	20	21-23	24	25-27	28	29-31	32	33-35	36	37-39	40
41-43	44	45-47	48	49-51	52	53-55	56	57-59	60	61-63	64	65-67	68	69-71	72	73-75	76

Card 1 2 (79 80)

Abundance*

0=None 1=Occasional 2=Common
3=Abundant 4=Threatened 5=Endangered

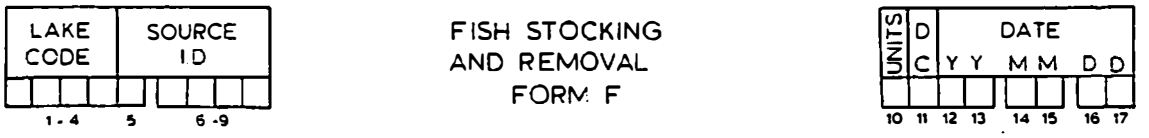
EVALUATION OF SPAWNING AREA

1=Excellent
2=Good
3=Fair
4=Poor
5=None

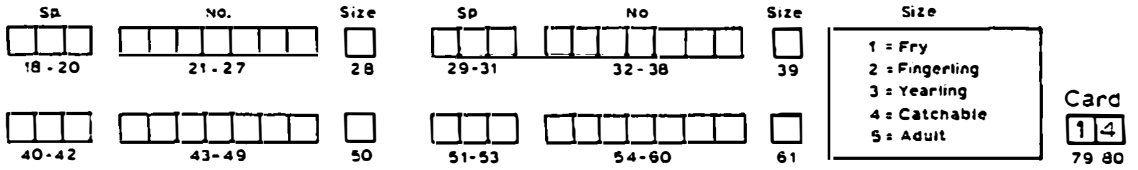
Sp.		Locations		
5-7	8	9-11	12-14	15-17
18-20	21	22-24	25-27	28-30
31-33	34	35-37	38-40	41-43
44-46	47	48-50	51-53	54-56
57-59	60	61-63	64-66	67-69

Card 1 3 (79 80)

Lake _____ Co _____



STOCKING

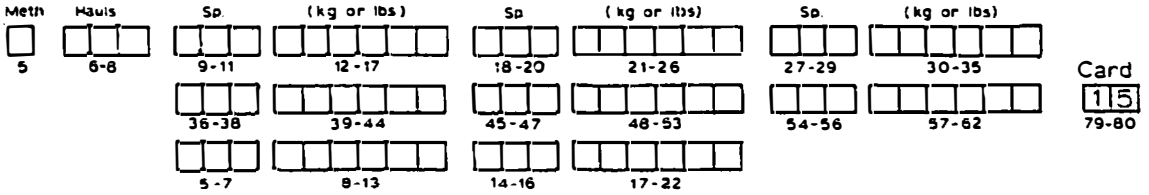


COMMERCIAL FISHING

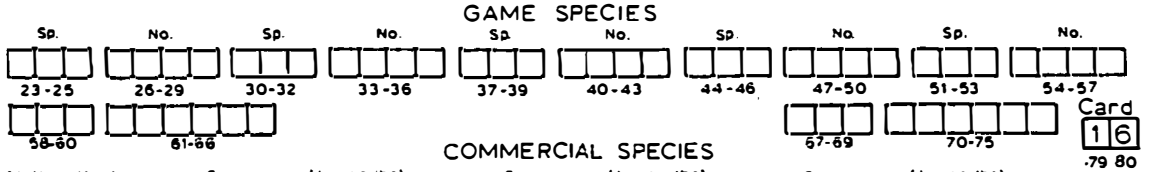
Methods

1 = Pocket Net
2 = Hoop Net
3 = O W Seine
4 = U I Seine
5 = Gillnet
6 = Trap
7 = Weir

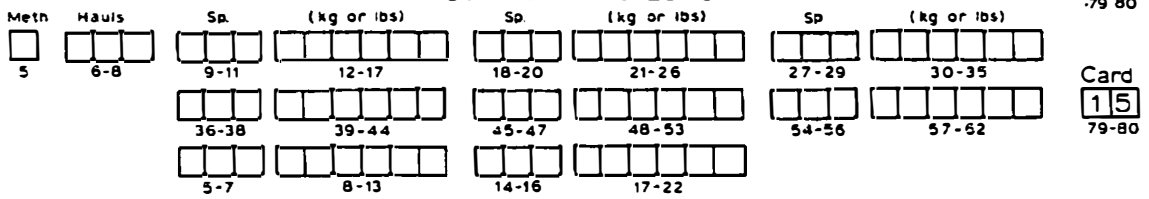
COMMERCIAL SPECIES



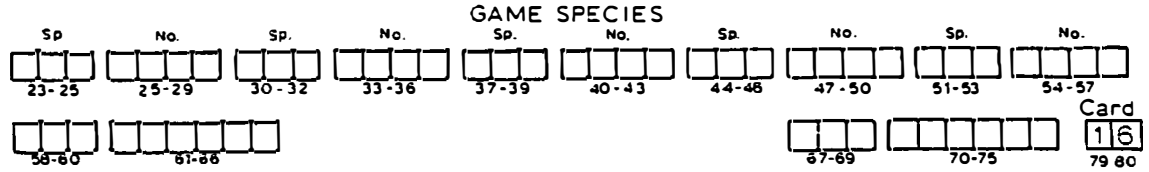
GAME SPECIES



COMMERCIAL SPECIES



GAME SPECIES



Lake _____ Co _____

NATURAL REPRODUCTION SUMMARY
FORM G

LAKE CODE	SOURCE I.D.
1-4	5 6-9

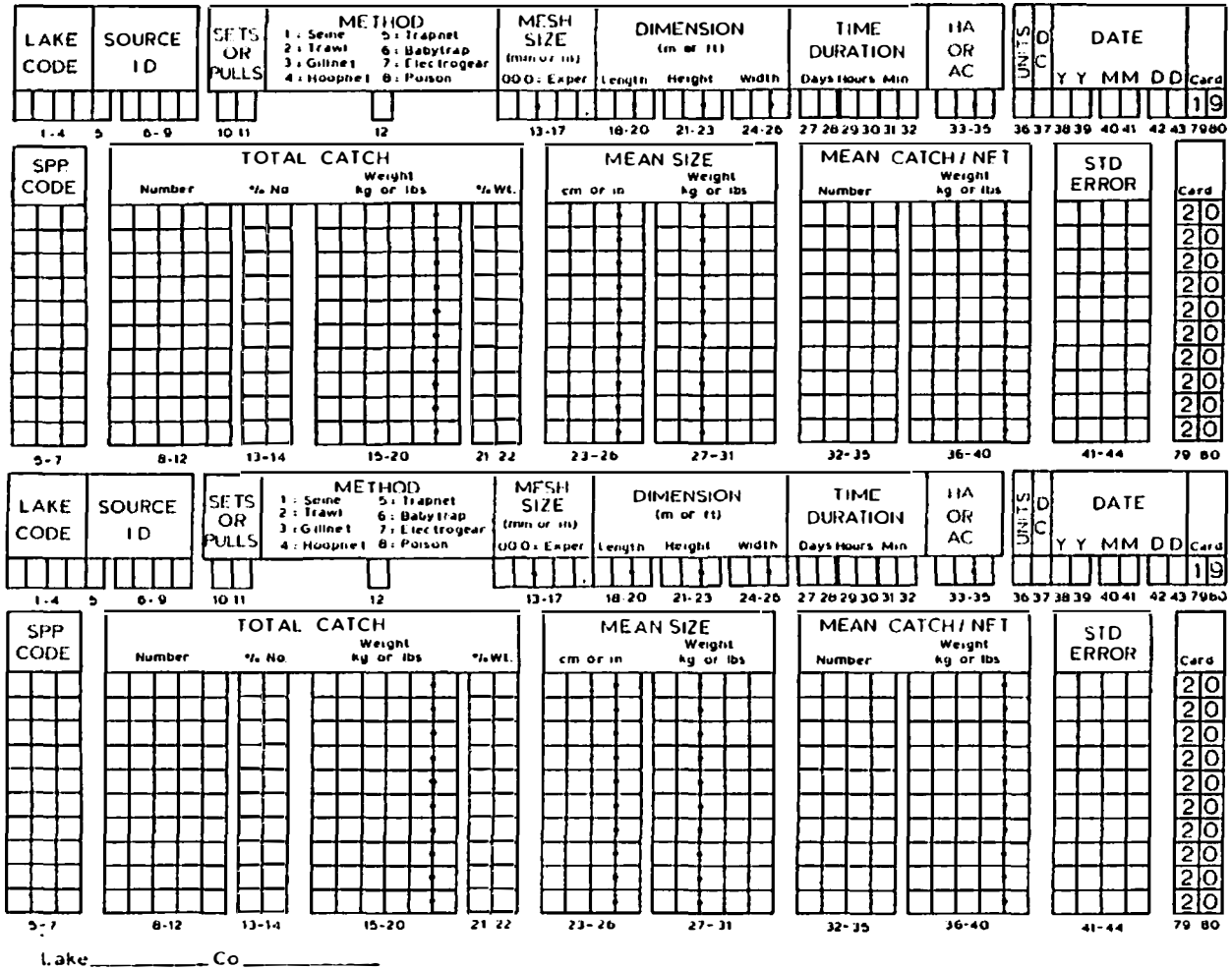
UNITS	DATE
D C	Y Y M M D D
10 11	12 13 14 15 16 17

TOTAL PULLS	METHOD (1=seine 2=trawl)	TIME DURATION hr	TIME DURATION min	SEINE MEASUREMENT LENGTH m or ft	SEINE MEASUREMENT DEPTH m or ft	SEINE MEASUREMENT MESH SIZE cm or in	TOTAL DISTANCE m or ft	AREA ha or ac	CARD
18 19	20	21	22 23	24-26	27 28	29-32	33-36	37-40	1 7
									79 80

SPECIES	TOTAL NUMBER	NO./AREA ha or ac	SPECIES	TOTAL NUMBER	NO./AREA ha or ac	SPECIES	TOTAL NUMBER	NO./AREA ha or ac	CARD
5-7	8-13	14-16	17-19	20-25	26-28	29-31	32-37	38-40	
41-43	44-49	50-52	53-55	56-61	62-64	65-67	68-73	74-76	1 8
									79 80
									CARD 1 8
									CARD 1 8
									CARD 1 8
									CARD 1 8

LAKE _____ CO _____

NETTING SUMMARY SHEET FORM H



Lake _____ Co _____

LENGTH FREQUENCY FORM I

LAKE CODE	SOURCE I.D.	SETS OR PULLS	METHODS 1 = Seine 2 = Trawl 3 = Gillnet 4 = Hoopnet 5 = Trapnet 6 = Babytrap 7 = Electrogear 8 = Poison	MESH SIZE (mm or in) 000 = Exper	DIMENSION (m or ft) Length	Height	Width	TIME DURATION Days Hours Min	HA OR AC	UNITS	D C	DATE Y Y	MM	D D	Card
1-4	5 / 6-9	10 11	12	13-17	18-20	21-23	24-26	27 28 29 30 31 32	33-35	36	37	38 39	40 41	42 43	2 1 (79 80)

DISTRIBUTION

1	TL 1/2" INCR	3.0-3.4	3.5-3.9	4.0-4.4	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	8.5-8.9	9.0-9.4	9.5-9.9	10.0-10.4	10.5-10.9	11.0-11.4	11.5-11.9
2	TL 1" INCR	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9	12.0-12.9	13.0-13.9	14.0-14.9	15.0-15.9	16.0-16.9	17.0-17.9	18.0-18.9	19.0-19.9	20.0-20.9
	FREQ CODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

1	TL 1/2" INCR	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2	TL 1" INCR	21.0-21.9	22.0-22.9	23.0-23.9	24.0-24.9	25.0-25.9	26.0-26.9	27.0-27.9	28.0-28.9	29.0-29.9	30.0-30.9	31.0-31.9	32.0-32.9	33.0-33.9	34.0-34.9	35.0-35.9	36.0-36.9	37.0-37.9
	FREQ CODE	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

FREQUENCY CODE AND NUMBER PER INTERVAL

Species (5 6 7) Distribution (8)

9 10 | 11 12 | 13 14 | 15 16 | 17 18 | 19 20 | 21 22 | 23 24 | 25 26 | 27 28 | 29 30 | 31 32 | 33 34 | 35 36 | 37 38 | 39 40

41 42 | 43 44 | 45 46 | 47 48 | 49 50 | 51 52 | 53 54 | 55 56 | 57 58 | 59 60 | 61 62 | 63 64 | 65 66 | 67 68 | 69 70 | 71 72

TOTAL (73 74 75) CARD 2 2 (79 80)

CARD: 2 2

CARD: 2 2

CARD: 2 2

CARD: 2 2

CARD: 2 2

Lake ________ Co. ________

LAKE CODE	SOURCE ID		
1-4	5	6-9	

AGE AND GROWTH DISTRIBUTION

FORM J

UNITS	D C	DATE Y Y	M M	D D	Card 2 3
10	11	12 13	14 15	16 17	79 80

MEAN TOTAL LENGTH AT AGE GROUP (CM OR IN)

Sp	Size	Sample	0	I	II	III	IV	V	VI	VII	VIII+	Card
5 6 7	8-11	12-14	15-18	19-22	23-26	27-30	31-34	35-38	39-42	43-46	47-50	2 4 (79 80)
			No in Age / Fish Calc	No in Age / Fish Calc	No in Age / Fish Calc	No in Age / Fish Calc	No in Age / Fish Calc	No in Age / Fish Calc	No in Age / Fish Calc	No in Age / Fish Calc	No in Age / Fish Calc	2 5 (79 80)
												2 4
												2 5
												2 4
												2 5
												2 4
												2 5
												2 4
												2 5
												2 4
												2 5
												2 4
												2 5
												2 4
												2 5

Lake ____________ Co____________

LAKE CODE (1-4) | SOURCE I.D (5-9)

POLLUTION AND SURVEY DATA
FORM K

UNITS D C | DATE Y Y M M D D (10 11 12 13 14 15 16 17)

SEDIMENT OR POLLUTION PROBLEMS

0= None
1= Slight
2= Moderate
3= Severe

Bank Erosion	18	Cabin Sewage	24
Watershed Erosion	19	Agri Chemical	25
Thermal	20	Feedlot	26
Mining	21	Livestock Access	27
Industrial	22	Other ( )	28
Municipal Sewage	23		

FISH KILL

Numbers	Duration Of Kill	Cause	Species Affected
1= 1-100 OR 5= Slight 2= 101-1000 6= Moderate 3= 1000-10000 7= Complete 4= + 10000	M M D D M M D D	1= Summerkill 2= Winterkill 3= Pollution 4= Poison 5= Disease	(Enter all zeroes if all species are affected)
29	30 31 32 33 34 35 36 37	38	39-41 42-46 47-49 50-52

CARD 26 (79-80)

CREEL SURVEY

AC	Source ID	YR	M M	M M	Total Hours	Ave Day	Total Weight (kg or lbs)	Total Numbers
5	6-9	10 11	12 13	14 15	15-21	22-24	25-30	31-36

CARD 27 (79-80)

AC
ACCURACY OF SURVEY
1= Extensive study
2= Limited measurements
3= Judgement

Specie	Catch/Hr	Wt/Hr (kg or lb)	Specie	Catch/Hr	Wt/Hr (kg or lb)
5-7	8-10	11-13	14-16	17-19	20-22
22-25	26-28	29-31	32-34	35-37	38-40
41-43	44-46	47-49	50-52	53-55	56-58
59-61	62-64	65-67	68-70	71-73	74-76

CARD 28 (79 80)

RECREATIONAL SURVEY

AC	Source ID	Y R	M M	M M	Total Hours
5	6-9	10-11	12-13	14-15	16-21

	Man-Hours/ ha or ac km or mi		Man-Hours/ ha or ac km or mi
Angling	22-25	Swimming	42-45
Spearing and Archery	26-29	Waterskiing	46-49
Hunting	30-33	Picnicing	50-53
Trapping	34-37	Camping	54-57
Boating and Canoeing	38-41	Snowmobiling	58-61
		Other	62-65

CARD 29 (79 80)

LAKE _____ CO _____

LAKE CODE	SOURCE ID
1-4	5 6-9

WATER RESOURCE IMPROVEMENTS RECOMMENDATIONS AND FINANCES FORM L

DC	DATE					
	Y	Y	M	M	D	D
10	11	12	13	14	15	16

RECOMMENDATIONS COMPLETED THIS YEAR

17 18 | 19 20 | 21 22 | 23 24 | 30 | 79 80

MANAGEMENT RECOMMENDATIONS

Rec	Species Affected		Benefit In Man-Days	Year To Be Completed	Cost	
5-6	7-9	10-12	13-18	19 20	21-26	
27 28	29-31	32-34	35-40	41 42	43-48	31 79 80
5 6	7-9	10-12	13-18	19 20	21-26	
27 28	29-31	32-34	35-40	41 42	43-48	31 79 80
5 6	7-9	10-12	13-18	19 20	21-26	
27 28	29-31	32-34	35-40	41 42	43-48	31 79 80

ACCESS RECOMMENDATIONS

Location	Rec	Benefit	Cost	Rec	Benefit	Cost	
5-7	8 9	10-15	16-20	21 22	23-28	29-33	
34-36	37 38	39-44	45-49	50 51	52-57	58-62	32 79 80
5-7	8 9	10-15	16-20	21 22	23-28	29-33	
34-36	37 38	39-44	45-49	50 51	52-57	58-62	32 79 80
5-7	8 9	10-15	16-20	21 22	23-28	29-33	
34-36	37 38	39-44	45-49	50 51	52-57	58-62	32 79 80

ADDITIONAL INFORMATION

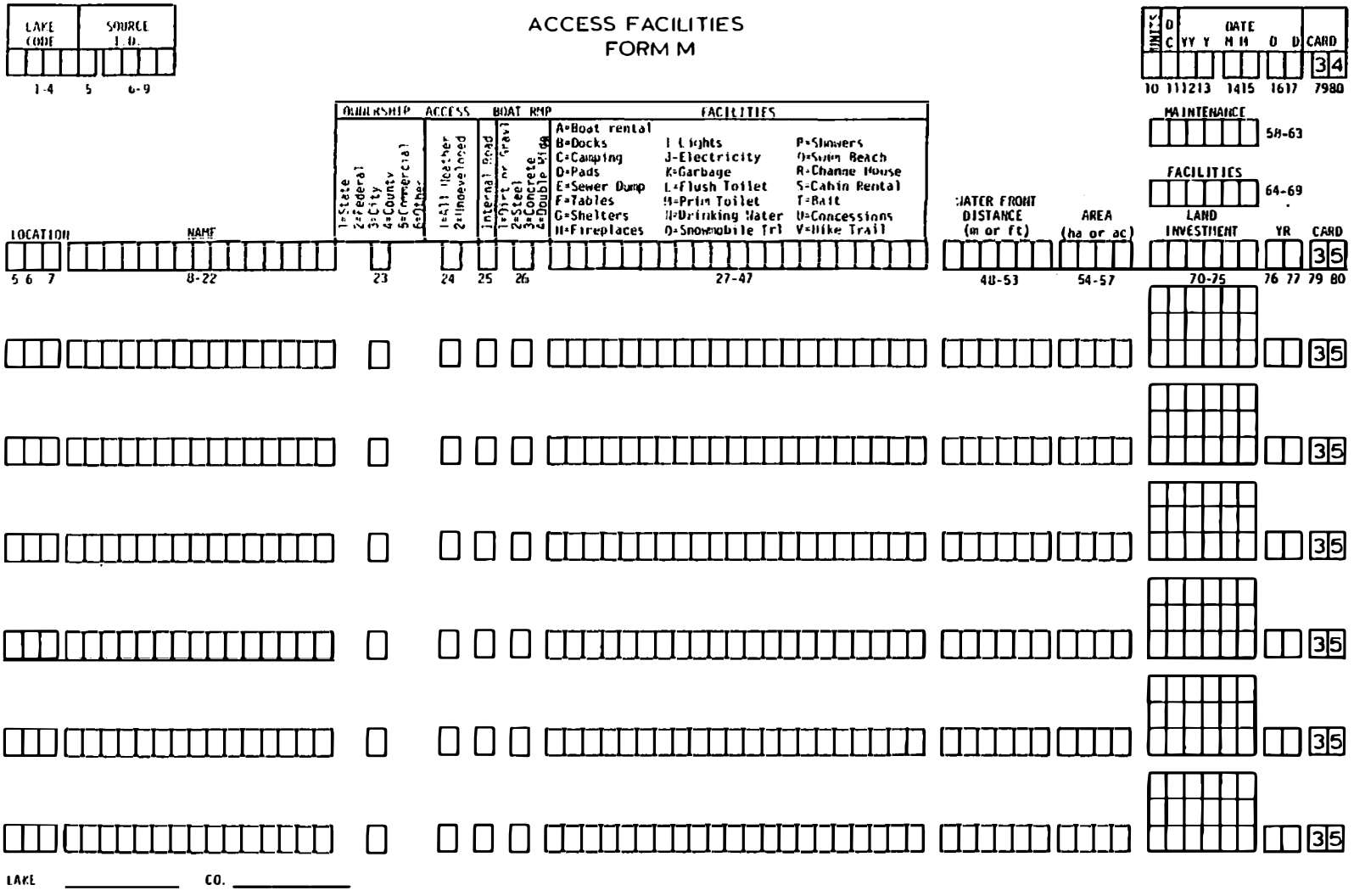
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

33

41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

LAKE _____ CO _____

ACCESS FACILITIES
FORM M



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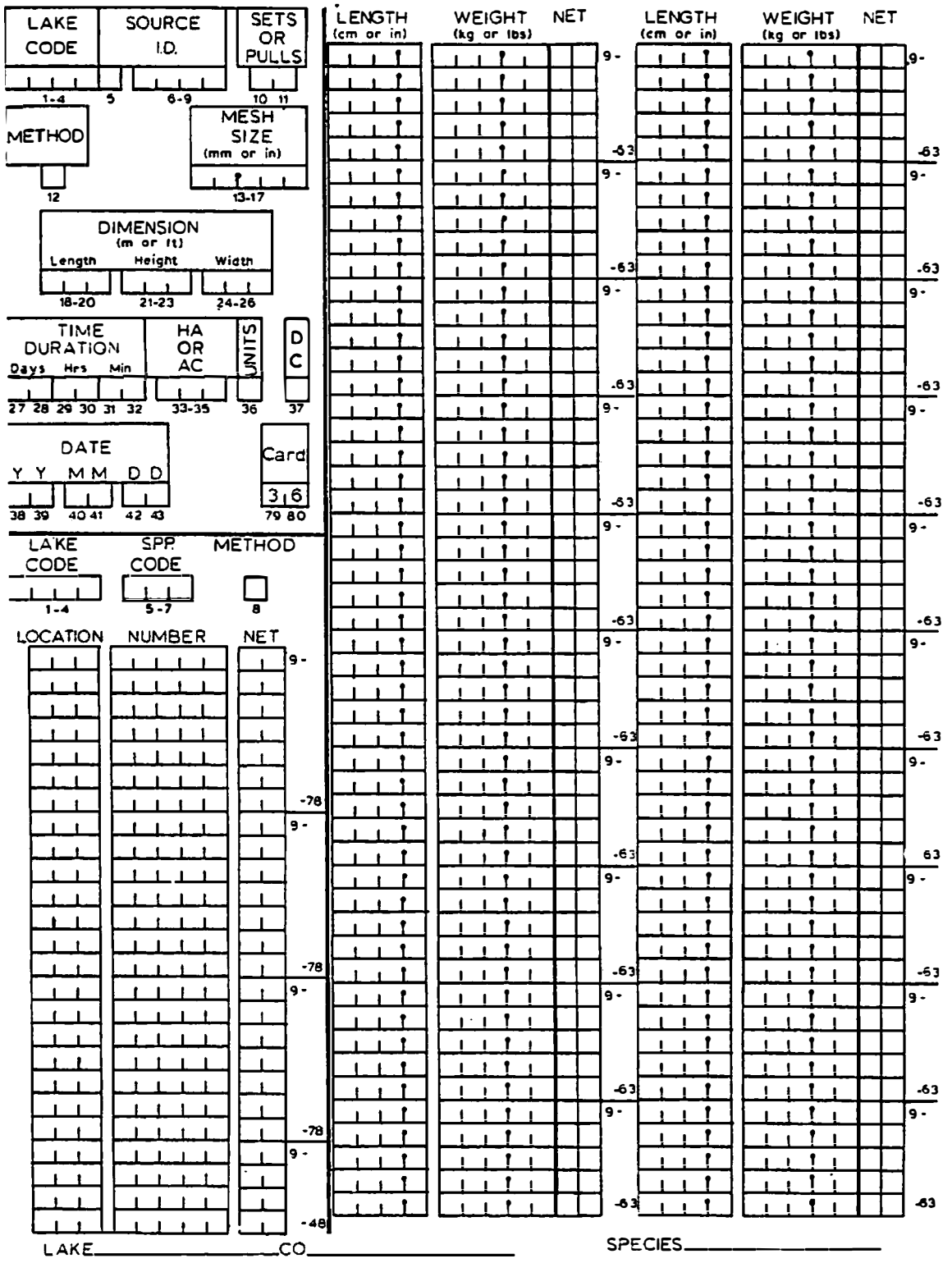

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APPENDIX D

River Codes

6800 Missouri R
6900 Little Missouri R
6901 Boxelder Cr
6902 Sheep Cr
6904 Coal Bank Cr
6905 Humblot Cr
6907 Dogie Cr
6908 Kimble Cr
6909 Dry House Cr
6911 Gallup Cr
6912 Wagon Cr
6913 Slick Cr
6915 Plum Cr
6916 Antelope Cr
6917 Valley Cr
6919 Water Hole Cr
6921 Tie Cr
6922 Forty-eight Mile Cr
6923 Beaver Dam Cr
6925 Black Foot Cr
6950 Crow Head Cr
6975 Spring Cr
7025 Olson Cr
7050 Oak Cr
7100 Grand R
7101 Claymore Cr
7102 Snake Cr
7103 Deep Bank Cr
7105 Little Oak Cr
7106 High Bank Cr
7107 Plum Cr
7109 Rock Cr
7110 Iron Dog Cr
7111 Stink Cr
7113 White Shirt Cr
7114 Hump Cr
7115 Firesteel Cr
7116 Dirt Lodge Cr
7117 Red Willow Cr
7118 Louse Cr
7119 Cottonwood Cr
7121 Meadow Cr
7122 Cedar Bay Cr
7123 Black Horse Butte Cr
7124 Coal Cr
7126 Whitney Cr
7127 Willow Cr
7128 East Branch
7129 West Branch
7131 Thunderhawk Cr

7100 Grand R Cont.
7132 Dog Tooth Cr
7133 Flat Cr
7134 East Flat Cr
7135 North Fork Grand R
7136 Giles Cr
7137 Willow Cr
7138 Wilson Cr
7139 Crooked Cr
7140 South Fork Grand R
7141 Lodge Pole Cr
7142 Butcher Cr
7144 Little Nasty Cr
7145 Duck Cr
7146 Big Nasty Cr
7148 Lems Cr
7149 Middle Cr
7151 Skull Cr
7152 Brush Cr
7153 Horse Cr
7154 Turtle Cr
7156 Coal Cr
7160 Bull Cr
7161 Sheep Pen Draw Cr
7162 Hay Cr
7163 Jack Cr
7164 Dry Cr
7166 Campbell Cr
7167 Middle Cr
7169 Jones Cr
7170 Clarks Fork Cr
7171 Squaw Cr
7172 Box Elder Cr
7174 Sheep Cr
7175 Deadman Cr
7225 Blue Blanket Cr
7250 Little Bear Cr
7300 Moreau R
7301 No Mouth Cr
7302 Du Charme Cr
7303 Virgin Cr
7304 Left Hand Bear Cr
7305 Marshall Cr
7306 Le Beau Cr
7307 Hokshela Cr
7308 Laundry Cr
7309 Beaver Cr
7310 Handboy Cr
7311 Veo Cr
7312 Johnson Cr

7300 Moreau R Cont.
7313 Swan Cr
7314 Jewett Cr
7316 Whitehorse Cr
7317 Little Moreau R
7318 Bull Cr
7319 Cottonwood Cr
7320 Goose Cr
7321 Redwater Cr
7322 Meadow Cr
7323 Green Grass Cr
7324 Red Earth Cr
7325 Bear Cr
7326 Elm Cr
7327 Pretty Cr
7328 Irish Cr
7329 Ash Cr
7331 Sophia Cr
7332 Thunder Butte Cr
7333 Beaver Trap Cr
7334 Knocker Cr
7335 Big Meadow Cr
7336 Knife Cr
7337 Flint Rock Cr
7338 Locate Cr
7339 Badlands Cr
7340 Berry Cr
7341 Mud Cr
7342 Rabbit Cr
7343 Antelope Cr
7344 Deer Cr
7345 Flint Cr
7346 Lilly Cr
7348 Starve Qui Cr
7349 Cabin Cr
7350 Little Cedar Cr
7351 Brushy Cr
7352 Cottonwood Cr
7353 Big Cedar Cr
7354 Mud Cr
7355 Ash Cr
7356 North Fork Moreau R
7357 Sheep Cr
7358 Sand Cr
7359 Cottonwood Cr
7360 Cow Boy Cr
7361 Goose Cr
7362 Duck Cr
7363 Snake Cr
7365 South Fork Moreau R
7366 Trail Cr

7300 Moreau R Cont.
7365 South Fork Moreau R Cont.
7367 Sand Cr
7368 North Sand Cr
7369 South Sand Cr
7370 Frog Cr
7371 Fourmile Cr
7372 Battle Cr
7373 Antelope Cr
7374 Alkalia Cr
7375 Battle Cr
7400 Swan Cr
7425 Four Bear Cr
7450 Buffalo Cr
7475 Swift Bird Cr
7500 Little Cheyenne Cr
7525 Stove Cr
7550 Artichoke Cr
7575 Willow Cr
7600 No Heart
7625 Tall Prairie Chicken Cr
7650 Fox Cr
7700 Cheyenne R
7701 Rousseau Cr
7702 East Branch
7703 West Branch
7704 Oak Cr
7705 Hosapa Cr
7706 Ninneconjou Cr
7707 Parade Cr
7708 Aeber Cr
7709 Sansarc Cr
7711 Foster Cr
7712 Rudy Cr
7713 Hermaphrodite Cr
7714 Lone Tree Cr
7715 Big Cottonwood Cr
7716 Little Cottonwood Cr
7717 Deep Run Cr
7718 Snake Cr
7719 Plum Cr
7720 Cherry Cr
7721 Ash Cr
7722 East Branch
7723 West Branch
7724 Rattlesnake Cr
7726 Red Coat Cr
7727 Red Scaffold Cr
7728 Bever Cr
7729 Spook Cr
7730 Red Owl Cr

7700 Cheyenne R Cont.
7730 Red Owl Cr
7731 White Owl Cr
7732 Bever Cr
7733 Pine Cr
7734 Sulphur Cr
7736 Camp Cr
7737 North Fork Sulphur
7738 Lonetree Cr
7739 Straighthead Cr
7740 Bull Cr
7741 Beaver Cr
7742 Spotted Bear Cr
7743 Upper Bear Cr
7744 Narcelle Cr
7745 Negro Cr
7746 West Branch Narcel
7747 Ash Cr
7748 Big Timber Cr
7749 Deep Cr
7750 Squaw Cr
7751 Bell Fourche R
7752 Hay Cr
7753 Elm Cr
7754 East Elm Cr
7755 West Elm Cr
7756 Eightmile Cr
7757 Mud Elm Cr
7758 Station Cr
7759 Alkalia Cr
7760 Fourmile Cr
7761 Spring Cr
7762 Bear Bute Cr
7763 Vanocher Cr
7764 Boulder Cr
7765 Two Bit Cr
7767 Willow Cr Lateral
7768 Willow Cr
7769 Deer Cr
7770 Jug Cr
7771 Horse Cr
7772 Lonetree Cr
7773 Indian Cr
7774 Bitter Cr
7776 Hildebrand Cr
7777 North Indian
7778 South Indian
7779 Short Cr
7780 Lonetree Cr
781 Cottonwood Cr
782 Whitewood Cr

7700 Cheyenne R Cont.
7751 Bell Fourche R
7783 Owl Cr
7784 North Canal
7785 Dry North Canal
7786 Todd Lateral
7787 Indian Cr Lateral
7789 Johnson Lateral
7790 Redwater Ditch
7791 South Canal
7792 Meade Lateral
7793 Dry Cr
7794 Wildcat Cr
7795 Salt Cr
7796 Roundout Cr
7797 Bull Cr
7798 Slate Cr
7799 Stinking Water Cr
7801 Maloney Cr
7802 Crow Cr
7803 Boxelder Cr
7804 Redwater R
7805 Hay Cr
7806 Willow Cr
7807 False Bottom Cr
7808 Polo Cr
7809 Miller Cr
7810 Tetro Cr
7811 Spearfish Cr
7812 Little Spearfish Cr
7813 Dry Cr
7814 East Spearfish Cr
7815 Dead Ox Cr
7816 Chicken Cr
7817 Crow Cr
7818 Beaver Cr
7819 Middle Cr
7820 Elk Cr
7821 Antelope Cr
7822 Morris Cr
7823 Little Elk Cr
7824 Meadow Cr
7826 Crooked Cr
7827 North Fork Crooked Cr
7828 South Fork Crooked Cr
7829 Boxelder Cr
7830 Blackhawk Cr
7831 Bogus Jim Cr
7832 Jim Cr
7833 Estes Cr
7834 South Boxelder Cr

7751 Bell Fourche R Cont.
7829 Boxelder Cr Cont.
7835 Middle Boxelder Cr
7836 North Boxelder Cr
7838 Sage Cr
7839 Beaver Cr
7840 Bear Cr
7841 Rapid Cr
7842 Antelope Cr
7843 Dry Cr
7844 Canyon Cr
7845 Victoria Cr
7846 Prairie Cr
7847 Deer Cr
7848 Slate Cr
7849 East Fork Slate Cr
7851 Castle Cr
7852 North Fork Castle
7853 South Fork Castle
7854 Heely Cr
7855 Ditch Cr
7856 Pole Cr
7857 West Grimlet Cr
7858 Silver Cr
7859 South Fork Rapid Cr
7860 North Fork Rapid Cr
7861 Spring Cr
7862 Rockerville Cr
7863 Newton Fork
7864 Negro Cr
7866 Indian Cr
7867 Battle Cr
7868 Murphy Cr
7869 Billover Cr
7870 Grace Coolidge Cr
7871 Spokane Cr
7872 Bear Cr
7873 Iron Cr
7874 Grizzly Cr
7876 Brush Cr
7877 Cedar Cr
7878 Red Shirt Cr
7879 French Cr
7880 South Fork French
7881 Dry Cr
7882 Pass Cr
7883 Little Squaw Cr
7884 Squaw-Humper Cr
7885 Cottonwood Cr
7886 Lame Johnny Cr
7887 Flynn Cr

7751 Bell Fourche R Cont.
7886 Lame Johnny Cr Cont.
7888 South Fork Lame J
7889 North Fork Lame J
7891 Beaver Cr
7892 Cold Spring Cr
7893 Elm Cr
7894 Spring Cr
7895 Fall R
7896 Cold Brook Cr
7897 Cottonwood Springs
7898 Horsehead Cr
7899 Lone Well Cr
7901 Beef Cr
7902 Black Banks Cr
7700 Cheyenne R Cont.
7903 Dry Cr
7904 Bridal Veil Springs
7905 Cascade Cr
7906 Hat Cr
7907 Bitter Cr
7908 Ash Cr
7909 Piney Cr
7910 Long Hollow
7911 Horse Cr
7912 Hay Cr
7913 Plains Cr
7914 Duck Cr
7915 Mule Cr
7916 Long Branch Cr
7917 Short Branch Cr
7919 Plum Cr
7920 Pleasant Valley Cr
7921 Hawkright Cr
7922 East Fork Hawkright
7923 Lightning Cr
7924 Hay Cr
7926 Fourmile Cr
7927 East Fork Hawkright
7928 West Fork Hawkright
7930 Cottonwood Cr
7931 Coal Cr
7932 Fiddle Cr
7933 Alum Cr
7934 Dry Cr
7935 Driftwood Cr
7936 Moss Agate Cr
7937 Griffis Canal
7938 Tubbs Cr
7939 Beaver Cr
7941 Pass Cr

7930 Cottonwood Cr Cont.
7941 Pass Cr Cont.
7941 Coon Cr
7943 Dugout Cr
7944 Bear Spring Cr
7945 Lone Tree Cr
7946 Line Cr
7947 Whoopup Cr
7948 Stockade Beaver Cr
7949 Beaver Cr
7950 Agency Cr
7975 Sully Cr
8025 Okobojo Cr
8026 Spring Cr
8050 Chantier Cr
8100 Bad R
8101 Willow Cr
8102 Powell Cr
8103 Stranger Cr
8104 Ash Cr
8105 War Cr
8106 Lance Cr
8107 Tomahawk Cr
8108 Plum Cr
8109 Cottonwood Cr
8111 Herd Camp Cr
8112 White Clay Cr
8113 Dry Cr
8114 Big Prairie Cr
8115 Little Prairie Dog Cr
8116 Mitchell Cr
8117 Mule Cr
8119 Brave Bull Cr
8120 Indian Cr
8121 Squaw Cr
8122 Buzzard Cr
8124 Medicine Cr
8126 White Willow Cr
8127 Brady Cr
8128 Franklin Cr
8129 Grindstone Cr
8131 North Fork Bad R
8132 Mexican Cr
8133 Dead Mans Cr
8134 Dirty Womans Cr
8135 Poeno Cr
8137 South Fork Bad R
8138 Dry Cr
8139 Lone Tree Cr
8140 Cottonwood Cr
8141 Little Buffalo Cr
8137 South Fork Bad R Cont.
8142 White Water Cr
8143 Big Buffalo Cr
8150 Dry Run Cr
8175 Mush Cr
8225 Antelope Cr
8236 Sand Cr
8242 Timber Cr
8250 Medicine Knoll Cr
8256 Otoza Lake Drainage
8263 South Medicine Cr
8268 North Medicine Cr
8272 Walter Lake Drain
8275 Fort George Cr
8425 Chapelle Cr
8436 South Chapelle Cr
8450 Cedar Cr
8475 Reynolds Cr
8500 Missouri R Cont.
8500 Medicine Cr
8506 Nail Cr
8512 North Fork Medicine Cr
8525 Chaney Rush Cr
8550 Soldier Cr
8575 Campbell Cr
8600 Short Cr
8610 Little Elm Cr
8625 Crow Cr
8636 Little Elm Cr
8642 Smith Cr
8643 Jones Lake Drainage
8644 East Fork Smith Cr
8647 Elm Cr
8648 West Fork Elm Cr
8650 American Cr
8675 American Crow Cr
8680 Big Cr
8700 White R
8701 Waver Tree Cr
8702 Red Butte Cr
8703 Thunder Cr
8704 Bad Cr
8705 No Moccasin Cr
8706 Davis Cr
8707 Old Lodge Cr
8708 Mill Iron Cr
8709 Dog Ear Cr
8710 Owl Cr
8711 Hollow Cr
8712 Mud Cr
8714 Mission Cr

8700 White R Cont.
8715 Cottonwood Cr
8716 Little Dog Cr
8717 Sedlano Cr
8718 Oak Cr
8719 Butte Cr
8720 White Horse Cr
8721 Williams Cr
8722 Louis Cr
8723 Squaw Cr
8724 White Thunder Cr
8726 Bull Cr
8727 Kaiser Cr
8728 Spring Cr
8729 Johnny Cr
8730 Hay Cr
8731 Horse Cr
8732 Ash Cr
8735 Little White R
8736 Pine Cr
8737 North Branch Pine Cr
8738 South Branch Pine Cr
8739 Horse Cr
8740 Horse Head Cr
8742 Cut Meat Cr
8743 Phister Cr
8744 Upper Cut Meat Cr
8745 Ti-Shena-Ze Cr
8746 Soldier Cr
8747 Rosebud Cr
8748 Stinking Water Cr
8751 Cottonwood Cr
8752 O'Donald Cr
8753 Butch Cr
8754 Round-up Cr
8755 Cedar Cr
8756 Yukmi Cr
8757 Runs Close Cr
8758 Larvie Cr
8759 Black Pipe Cr
8760 Porcupine Cr
8761 Simms Cr
8762 Paulmyer Cr
8763 Corn Cr
8765 Plum Cr
8766 Deep Cr
8767 Red Stone Cr
8768 Nancy Harris Cr
8769 Pass Cr
8770 Pearson Cr
8771 Settin Up Cr

8700 White R Cont.
8773 Cottonwood Cr
8774 Fifteen Cr
8776 Long Cr
8777 Craven Cr
8778 Eagle Nest Cr
8779 Rake Cr
8780 Bear-in-the-Lodge Cr
8781 Corn Cr
8782 Spring Cr
8783 Lost Dog Cr
8784 Potatoe Cr
8785 Little Dog Spring
8786 Indian Cr
8787 Bull Cr
8789 Redwater Cr
8790 Cain Cr
8791 Medicine Root Cr
8792 Mud Cr
8793 No Flesh Cr
8794 American Horse Cr
8795 Threemile Cr
8796 Palmer Cr
8797 Clifford Cr
8798 Big Hollow Cr
8799 Wind Cr
8801 Spring Cr
8802 Cottonwood Cr
8803 North Cottonwood Cr
8804 Porcupine Cr
8805 Fog Cr
8806 Wounded Knee Cr
8807 White Horse Cr
8808 Spring Cr
8809 Sand Cr
8810 Grass Cr
8811 East Horse Cr
8812 West Horse Cr
8813 Mule Cr
8814 Willow Cr
8815 West Fork Willow Cr
8816 Middle Fork Willow Cr
8817 East Fork Willow Cr
8818 Cedar Bluff Cr
8819 Blacktail Cr
8820 North Fork Blacktail Cr
8821 South Fork Blacktail Cr
8822 White Clay Cr
8823 Wolf Cr
8824 Slim Butte Cr
8825 Maiden Cr

6800 Missouri R Cont.
8850 Bull Cr
8853 West Branch Bull Cr
8863 East Branch Bull Cr
8875 Waterhole Cr
9025 Nicholas Cr
9050 Nelson Cr
9075 Elm Cr
9125 Dry Cr
9150 Snake Cr
9175 Five Mile Cr
9225 Platte Cr
9229 Castallia Cr
9239 East Fork Platte Cr
9250 Cedar Cr
9275 Whetstone Cr
9279 North Fork Whetstone Cr
9289 South Fork Whetstone Cr
9290 Burnt Rock Cr
9292 Coon Cr
9325 North Scalp Cr
9350 Pease Cr
9375 South Scalp Cr
9425 Joe Days Cr
9450 Andes Cr
9475 Randal Cr
9525 Slaughter Cr
9535 Mosquito Cr
9550 Song Hawk Lake Drainage
9575 Spring Cr
9600 Bull Cr
9625 Choteau Cr
9635 Dry Choteau Cr
9675 Coffee Cr
9700 Minnechaduza R
9701 Dry Cr
9725 Ponca Cr
9726 Willow Cr
9728 Lake Splendor Drainage
9730 Murphy Cr
9750 Keya Paha R
9751 Buffalo Cr
9752 Lute Cr
9753 Cottonwood Cr
9754 Lost Cr
9756 Willow Cr
9757 Sandy Cr
9759 Sand Cr
9761 Eagle Cr
9762 Crazy Hole Cr

6800 Missouri R Cont.
9750 Keya Paha R Cont.
9763 Rock Cr
9764 Lone Tree Cr
9700 Antelope Cr
9775 Indian Cr
9777 Camp Cr
9779 Alkalia Cr
9825 Emanuel Cr
9850 Snatch Cr
9875 Marne Cr
9900 James R
9901 Beaver Cr
9902 Mud Cr
9903 Prairie Cr
9904 Dawson Cr
9905 Lonetree Cr
9906 S Branch Lonetree
9907 Wolf Cr
9908 Plum Cr
9909 Dry Cr
9910 N Branch Dry Cr
9911 S Branch Dry Cr
9912 Twelvemile Cr
9913 Pony Cr
9914 S Fork Twelvemile
9915 Coffee Cr
9916 N Fork Twelvemile
9918 Pierre Cr
9919 Johnson Cr
9920 Enemy Cr
9921 Rock Cr
9922 Firesteel Cr
9923 W Branch Firesteel
9924 Rock Cr
9926 Morris Cr
9927 Jim Cr
9928 Sand Cr
9929 Silver Cr
9930 Redstone Cr
9931 Marsh Cr
9931 Pearl Cr
9933 South Fork Pearl Cr
9934 Middle Fork Pearl Cr
9935 Cain Cr
9936 Stoney Run Cr
9937 Shue Cr
9938 Foster Cr
9939 Snake Cr (L Dudley)
9940 Timber Cr

6800 Missouri R Cont.
9900 James R Cont.
9941 Turtle Cr
9942 Bryant Cr
9943 Medicine Cr
9944 Campbell Cr
9945 Gooder Cr
9946 Wolf Cr
9947 N Wolf Cr
9948 Shaefer Cr
9949 Matter Cr
9950 Ree Cr
9951 Little Wolf Cr
9952 Little Turtle
9953 Snake Cr
9954 Nixon R
9955 Dove Cr
9956 Perry Cr
9958 Mud Cr
9959 Pickeral Cr
9960 Antelope Cr
9961 Moccasin Cr
9962 Foot Cr
9964 Crow Creek Drain Ditch
9966 Elm R
9967 Willow Cr
9968 Maple R
9969 Dry Branch
9970 Dry Run
9975 Vermillion R
9976 Yankton Clay Cr Ditch
9977 Clay Cr Ditch
9978 Turkey Cr
9979 Clay Cr
9980 Baptist Cr
9981 Frog Cr
9983 Ash Cr
9985 Turkey Ridge Cr
9986 Long Cr
9987 Haram Cr
9988 Saddlerock Cr
9989 Snake Cr
9990 Camp Cr
9991 Elce Cr
9992 W Fork Vermillion R
9993 E Fork Vermillion R
9994 Little Vermillion R
0000 Big Sioux R
0001 Brule Cr
0002 Union Cr
0003 W Union Cr

0000 Big Sioux R Cont.
0002 Union Cr Cont.
0004 E Union Cr
0006 Pattee Cr
0007 Beaver Cr
0008 S Fork Beaver Cr
0009 Ninemile Cr
0010 Spring Cr
0011 Beaver Cr
0012 Split Rock Cr
0013 W Pipestone Cr
0014 Pipestone Cr
0015 Skunk Cr
0016 Wall Lake Drainage
0017 Willow Cr
0018 Grass Lake Drainage
0019 W Branch Skunk Cr
0020 Clear Lake Drainage
0022 Silver Cr
0023 Brookfield Cr
0024 Bachelor Cr
0026 Squaw Cr
0027 Flandreau Cr
0028 Mud Cr
0029 Spring Cr
0030 Medary Cr
0031 Deer Cr
0032 Six Mile Cr
0033 N. Deer Cr
0034 Peg Monkey Run
0035 Bullhead Run
0036 Hidewood Cr
0037 L. Poisett Drainage
0038 Stray Horse Cr
0039 Willow Cr
0040 Mud Cr
0041 Gravel Cr
0042 Mahoney Cr
0043 Soo Cr
0044 Lonesome Lake Drainage
0070 Minnesota R
0071 Little Minnesota R
0072 Jorgenson R
0073 Seiche Hollow Cr
0074 Whetstone R
0076 N Fork Whetstone R
0078 S Fork Whetstone R
0079 Yellow Bank R
0080 N Fork Yellow Bank R
0081 S Fork Yellow Bank R
0082 W Branch Lac Qui Parle R

0070 Minnesota R Cont.
0082 W Branch Lac Qui Parle R
0083 Lost Cr
0084 Crow Timber Cr
0086 Monighan Cr
0087 Gary Cr
0088 Florida Cr
0090 Bois de Sioux R
0091 Cottonwood Slough Drainage
0092 Dry Run
0093 Jim Cr
0094 Wild Rice Cr
0096 La Belle Cr
0097 Short Foot Cr

Miscellaneous Drainages
0052 Wild Rice Cr. (Marshall Co)
0059 Hegna Cr. Impassable Marsh (Roberts Co)
0058 Goodwill Cr Impassable Marsh (Roberts Co)
0046 Bates Cr Rush L.-S. Waubay (Day Co)
0047 Webster Sewage Ditch-S. Waubay (Day Co)
0048 Grenville Cr.-Pickerel L. N Waubay (Day Co)
0049 Owens Cr.-Bluedog L. (Day Co)
0053 Dolph Cr.-L. Norden (Hamlin)
0051 Battle Cr.-L. Campbell (Brookings Co)
0060 Preachers Run-S. Scatterwood L. (Faulk Co)
0055 Hiddenwood Cr. (Walworth Co)

APPENDIX E

Lake Codes

Aurora

1001	Wilmarth
1002	Fraizer
1003	Fish
1004	Crystal
1005	Hanson"s
1006	Stickney (old)
1007	Jail Pond (Kids Pond)
1008	Platte
1009	Stoddard
1010	White
1011	Crystal, East
1012	Maine
1013	Nelson or Stockney (new)
1014	Patton
1015	Luxemborg
1016	Pleasant

Beadle

0401	Staum
0402	Ravine
0403	Byron
0404	Stoney Run
0405	Cavour
0406	Mud and Spring
0407	Newcome
0408	Tschetter
0409	Wall
0410	Berger
0411	Bergstrom
0412	Cowboy Park
0413	James River Dam
0414	James Diversion
0415	Perkins

Bennett

1101	Allen
1102	Sharman
1103	Allam
1104	Jacquot
1105	L. White River Dam
1106	Cedar Creek #1
1107	" " #2
1108	" " #3
1109	Bad Hair
1110	LaCreek Refuge Pool #1
1111	" " " #2
1112	" " " #3
1114	" " " #4
1115	" " " #5
1116	" " " #6

Bennett Cont.

1117	LaCreek Refuge Pool #7
1118	" " " #8
1119	" " " #9
1120	" " " #10
1121	" " " #11

Bon Homme

1201	Henry (Scotland)
1202	Tyndall (Kids Pond)
1203	Clear
1204	Kloucek
1205	W. Bucholy
1206	M. Bucholy
1207	Ehresward
1208	Schafer

Brookings

0601	Goldsmith
0602	Oak
0603	Hendricks
0604	Sinai
0605	Campbell
0606	Oakwood, E.
0607	Oakwood, N
0608	Johnson Pond (Interstate)
0609	Mitchell

Brown

0301	Tacoma Park
0302	Lord
0303	Highland (Keuchle)
0304	Frederick City
0305	Elm River #1
0306	" " #2
0307	" " #4
0308	Richmond
0309	Tollefson
0310	Willow Creek
0311	Elm
0312	Pigors
0313	Wiley Park
0314	Sand and Mud

Brule

1301	Wanalain
1302	Sharping
1303	Wells
1304	Jones
1305	Sixteen
1306	Pazour

Bruel Cont.
- 1307 Red
- 1308 Highland
- 1309 Silver
- 1310 Mud
- 1311 American
- 1312 Sobek
- 1313 Coven
- 1314 Auston
- 1315 Norse
- 1316 Willow

Buffalo
- 1401 Bedashosha
- 1402 Cook
- 1403 Ingerson

Butte
- 1501 Orman
- 1502 Newell
- 1503 Newell City Dam
- 1504 Belle Fourche IWLA

Campbell
- 1601 Matze
- 1602 Sand
- 1603 Chester (Boor)
- 1604 Campbell
- 1605 Pocasse
- 1606 Salt
- 1607 East Flat
- 1608 Flat
- 1609 McClarem

Charles Mix
- 1701 Andes, S.
- 1713 Andes, Center
- 1714 Andes, N.
- 1702 Dante
- 1703 Geddes
- 1704 Academy
- 1705 Dowd
- 1706 Platte
- 1707 Wagner
- 1708 Red
- 1709 Bovee
- 1710 Koupal
- 1711 George
- 1712 Song Hawk

Clark
- 1801 Willow
- 1802 Antelope
- 1803 Antelope (Kids Pond)
- 1804 Bailey
- 1805 Clear (Carson's)
- 1806 Fordham
- 1807 Logan (Paine)
- 1808 Round
- 1809 Mud
- 1810 Reid
- 1811 Lone Tree
- 1812 Todd
- 1817 Swan
- 1818 Blackrush

Clay
- 1901 Burbank

Codington
- 0501 Kampeska Pit, W.
- 0502 Kampeska
- 0503 Pelican
- 0504 Punished Woman
- 0505 Round
- 0506 Still (Twin)
- 0507 Bramble Pond
- 0508 Grass
- 0509 Long
- 0510 Nicholson
- 0511 Dry
- 0512 Horseshoe
- 0513 Horseshoe 2E.
- 0514 Cottonwood
- 0515 Kings
- 0516 Warren
- 0517 Medicine
- 0518 McKilligan's
- 0519 Richland
- 0520 Stink
- 0521 Sasse Slough
- 0522 McKilligan's, W.
- 0523 Kampeska Pit, E.

Corson
- 2001 Keller's
- 2002 McGee
- 2003 Mallard
- 2004 Trail City
- 2005 Morristown, W.

Corson Cont.
- 2006 Morristown, E.
- 2007 Pudwell
- 2008 McIntosh, E.
- 2009 McIntosh, W.
- 2010 Tatanka
- 2011 Spring
- 2012 Dugeagle
- 2013 Bohle

Custer
- 2101 Stockade
- 2102 Center
- 2103 Bismark
- 2104 Legion
- 2105 Sylvan
- 2106 Glenn Erin
- 2107 Biltmore
- 2108 Butler
- 2109 Custer Municipal
- 2110 Pilgrim
- 2111 Newton Fork
- 2112 Grace Coolridge Lowheads

Davison
- 0801 Mitchell

Day
- 2201 Amsden
- 2202 Pickerel
- 2203 Pierpont
- 2204 Minnewasta
- 2205 Blue Dog
- 2206 Enemy Swim
- 2207 Antelope
- 2208 Horseshoe
- 2209 Lonesome
- 2210 Lynn
- 2211 Sweetwater
- 2212 Waubay, N.
- 2213 Waubay, S.
- 2214 Rush, N. and S.
- 2215 Campbell Slough
- 2216 Bitter
- 2217 Hillda Brands
- 2218 Aspen Slough
- 2219 Hazelton
- 2220 Anderson
- 2221 Nutley
- 2222 Nutley, E.
- 2223 Stink

Day Cont.
- 2224 Keintz Slough
- 2225 Black Slough
- 2226 Elbo Slough

Deuel
- 2301 Fish
- 2302 Cotteau, S.
- 2303 Clear
- 2304 Alice
- 2305 Cochrane
- 2306 Bullhead
- 2307 Francis
- 2308 Rush
- 2309 Silver
- 2311 Lone Tree
- 2312 Oliver
- 2313 Round
- 2314 School
- 2315 Ketchum
- 2316 Briggs
- 2317 Wingdahl
- 2318 Fox
- 2319 School, S.
- 2320 Coteau, E.
- 2321 Coteau, W.
- 2322 Coteau Island
- 2323 Salt
- 2324 Crystal Springs

Dewey
- 2401 Peach
- 2402 Moreau #2
- 2403 Moreau #1
- 2404 Lantry
- 2405 Glen French #1
- 2406 Glen French #2
- 2407 Eagle Butte
- 2408 Dewbarry
- 2409 Adams
- 2410 Rockcowen
- 2411 Isabel
- 2412 Goose Creek
- 2413 Jewett
- 2414 White Horse
- 2415 Moreau #3
- 2416 Timber
- 2417 Owl Creek
- 2418 Firesteel (Ike)

Douglas
- 2501 Corsica
- 2502 Armour (Kids Pond)
- 2503 Simpson

Edmunds
- 2601 Bowdle Hosmer
- 2602 Loyalton (Stafford)
- 2603 Mina
- 2604 Rosette
- 2605 Picton
- 2606 Scatterwood N.
- 2607 Kraft
- 2608 Grass
- 2609 Alkali

Fall River
- 2701 Angostura
- 2702 Edgemont
- 2703 Cold Brook
- 2704 Sherberth
- 2705 Limestone Butte
- 2706 Cottonwood Springs
- 2707 Williams
- 2708 Fiddle Creek
- 2709 Bochart
- 2710 Ebersol
- 2711 Bowyer
- 2712 Crow
- 2713 Sandoz
- 2714 Ellison
- 2715 Otto's
- 2716 White
- 2717 Ray
- 2718 Sides Dam
- 2719 Coffeen
- 2720 Vandenberg
- 2721 South Indian #1
- 2722 Pioneer #1
- 2723 Pioneer #2
- 2724 Fire Dam
- 2725 Dukes Dam

Faulk
- 2801 Hamak
- 2802 Cresbard
- 2803 Voegler
- 2804 Latham
- 2805 Faulkton
- 2806 Gerkin Refuges

Faulk Cont.
- 2807 Zell
- 2808 Scatterwood S.

Grant
- 2901 Summit
- 2902 Albert
- 2903 Farley (Kids Pond)
- 2904 Labolt
- 2905 Crooked (Troy)
- 2906 Stockholm
- 2907 Twin
- 2908 Blue Cloud Abbey
- 2909 Big Stone
- 2910 Lonesome
- 2911 Lonetree
- 2912 Black Slough
- 2913 Black Slough E.
- 2914 Hagen Slough

Gregory
- 3001 Berry
- 3002 Burke
- 3003 Bonesteel
- 3004 Dixon (Burch)
- 3005 Fairfax
- 3006 Herrick (Spendor)
- 3007 Star
- 3008 Ponca (Indian)
- 3009 Johnson
- 3010 Jerred
- 3011 Dalton
- 3012 Bulow

Haakon
- 3101 Kroetche
- 3102 Ottumwa
- 3103 Sunshine
- 3104 Waggoner

Hamlin
- 3201 Poinsett
- 3202 Norden
- 3203 John
- 3204 Florence
- 3205 Clear
- 3206 Mary
- 3207 Marsh
- 3208 Dry
- 3209 Five Ponds
- 3211 Saarenson Pond

Hand
- 3301 Louise
- 3302 Dako-tah
- 3303 Rosehill
- 3304 Crystal (Kids Pond)
- 3305 Johnston
- 3306 Jones
- 3307 Pearl
- 3308 Spring
- 3309 Wall

Hanson
- 3401 Fulton
- 3402 Hanson
- 3403 Ethan
- 3404 Eli
- 3405 Long
- 3406 Spring
- 3407 Twin, N.
- 3408 Twin, S.
- 3409 Hanson Quarry

Harding
- 3501 Gardner
- 3502 Antelope Range
- 3503 Rabbit Creek
- 3504 Ledger, W.
- 3505 Ledger, E.
- 3506 Vessey
- 3507 Robinson
- 3508 Jacobi

Hughes
- 3601 Woodruff
- 3602 Swanson
- 3603 Arikara

Hutchinson
- 3701 Menno
- 3702 Dimock
- 3703 Silver
- 3704 Tripp

Hyde
- 3801 Chapelle
- 3802 Boehm
- 3803 Quirk
- 3804 Peno
- 3805 Stephan
- 3806 Rezac

Hyde Cont.
- 3807 Rice
- 3808 Holabird

Jackson
- 3901 Kadoka
- 3902 Bashen
- 3903 Belvedere
- 3904 Freeman
- 3905 Andrews
- 3906 Cottonwood Range
- 3907 Brook #1
- 3908 Wheeler #1
- 3909 Wheeler #2

Jerauld
- 4001 Crow
- 4002 Magic Mirror
- 4003 Long
- 4004 Cottonwood
- 4006 Crist
- 4007 Noltensmeir
- 4008 Haugland
- 4009 McDonald
- 4010 Nelson
- 4011 Nesmith
- 4012 Velverndate

Jones
- 4101 Murdo
- 4102 Okaton
- 4103 Draper
- 4104 Murdo R. R.
- 4105 Richland Wildlife

Kingsbury
- 4201 Agnew
- 4202 Spirit
- 4203 Cherry, N.
- 4204 Plum (Cherry, S.)
- 4205 Osceola
- 4206 Iroquois
- 4207 Henry
- 4208 Albert
- 4209 Thistad
- 4210 Badger
- 4211 Arlinton
- 4212 Thomson
- 4213 Preston
- 4214 Whitewood

Kingsbury Cont.
- 4215 Spring
- 4216 Mud
- 4217 Brush (Twin)
- 4218 Spring, E.
- 4219 District 35
- 4220 Silver

Lake
- 4301 Green
- 4302 Herman
- 4303 Brant
- 4304 Madison
- 4305 Badus
- 4306 Long
- 4307 Milwaukee
- 4308 Mud
- 4309 Winfred
- 4310 Henry
- 4311 George
- 4312 Winfred, S.
- 4313 Round

Lawrence
- 0901 Iron Creek
- 0902 Roubaix
- 0903 Reausaw
- 0904 Mirror
- 0905 Coxes
- 0906 Dalton
- 0907 Columbia
- 0908 Strawberry Hill

Lincoln
- 4401 Alvin
- 4402 Lakota

Lyman
- 4501 Brakke
- 4502 Byre
- 4503 Fate
- 4504 Knutson
- 4505 Larson
- 4506 Reliance
- 4507 Dybing
- 4508 Fenenga
- 4509 Hafner
- 4510 Jackson
- 4512 Sweeney
- 4513 Antelope Allotment
- 4514 Kennebec

McCook
- 4601 Bollinger
- 4602 Vermillion
- 4603 Jannsen
- 4604 Lions
- 4605 McCullough
- 4606 Island
- 4607 Tuschens
- 4608 Eli Hofer
- 4609 Schimmels
- 4610 Gross
- 4611 Baureles (Schulz)
- 4612 Forsch
- 4613 Lehrams

McPherson
- 4701 Eureka #1
- 4702 Leola
- 4703 Hillview
- 4704 Wetonka (Compton)
- 4705 Wolff
- 4706 Little Eureka #2
- 4707 Rau
- 4708 Long
- 4709 Twin
- 4710 Heupel

Marshall
- 4801 Red Iron, N.
- 4802 Red Iron, S.
- 4803 Cottonwood
- 4804 Hickman
- 4805 Abraham
- 4806 Almos
- 4807 Bullhead
- 4808 Crystal
- 4809 Dumarce
- 4810 Emma
- 4811 Flat
- 4812 Fort, S.
- 4813 Four Mile
- 4814 Goodbird
- 4815 Grays (Grey)
- 4816 High
- 4817 Hills
- 4818 Hoop
- 4819 Horseshoe
- 4820 Isabella (S. Clear)
- 4821 Island
- 4822 Long
- 4823 Martha

Marshall Cont.
- 4824 Mud
- 4825 Nine Mile
- 4826 Sarah
- 4827 Simons
- 4828 Six Mile
- 4829 Turtlefoot
- 4830 Two Island
- 4831 White
- 4832 Clear
- 4833 Roy
- 4834 Buffalo, S.
- 4835 Buffalo, N.
- 4836 Lost
- 4838 Piyas
- 4839 Stink
- 4840 Stink, E.
- 4841 Goodbird, N.
- 4842 Turtlefoot, N.

Meade
- 4901 Durkee
- 4902 Tisdale
- 4903 Bear Butte
- 4904 Opal
- 4905 Curlew
- 4906 Maurine
- 4907 Lundren
- 4908 Mud Butte
- 4909 Red Owl
- 4910 Pinnacle
- 4911 Bonita
- 4912 Herford
- 4913 Fort Meade
- 4914 Follet
- 4915 Sulphur
- 4916 Choate
- 4917 Lake Dam
- 4918 Fort Meade VA
- 4919 Maurine #2

Mellette
- 5001 White River (Putranek)
- 5002 Dice
- 5003 Rohloff
- 5004 Sinclair
- 5005 Blackpipe

Miner
- 5101 Twin
- 5102 Carthage

Miner Cont.
- 5103 Chain (Twins)
- 5104 Silver, S.
- 5105 Morris
- 5106 Bitter
- 5107 Silver
- 5108 Belview
- 5110 Long
- 5111 Center

Minnehaha
- 0101 Wall
- 0102 Lost
- 0103 Clear
- 0104 Beaver
- 0105 Grass
- 0106 Baltic
- 0107 Covell
- 0108 Dell Rapids
- 0109 Garretson
- 0110 Loss
- 0111 Clear, E.
- 0112 Lost, S.
- 0113 Huntimer
- 0114 Huntimer
- 0115 Huntimer, W.

Moody
- 5201 Flandreau
- 5202 Poison
- 5203 Allen

Pennington
- 0201 New Underwood
- 0202 Bruce
- 0203 Wall (Old)
- 0204 Wicksville
- 0205 Canyon
- 0206 Pactola
- 0207 Deerfield
- 0208 Slate Cr. Dam
- 0209 Sheridan
- 0210 Mitchell
- 0211 Major
- 0212 Bloom
- 0213 Casper
- 0214 Cement Plant
- 0215 Deer Cr. Dam
- 0216 Farmingdale
- 0217 Farmingdale NGL
- 0218 Gage

Pennington Cont.
- 0219 Hamann
- 0220 Hoffman
- 0221 Horsethief
- 0222 Kellam
- 0223 Mako Sica
- 0224 Newton Fork
- 0225 Pierce
- 0226 Quinn, N.
- 0227 Quinn, S.
- 0228 Rapid City Dam
- 0229 Schulte
- 0230 Shyne
- 0231 Sinykin
- 0232 Smith
- 0233 Table 71
- 0234 Tennyson
- 0235 Teuber
- 0236 USDA Trout Dam
- 0237 Victoria
- 0238 Wall (New)
- 0239 White
- 0240 Conata #2
- 0241 Hanlon
- 0242 Imly
- 0243 Johnson
- 0244 Koopman
- 0245 Owanka
- 0246 Richardson
- 0247 Rush
- 0248 Scanlon
- 0249 Schroeder
- 0250 Big Foot
- 0251 Pike Pond
- 0252 Missle Allotment
- 0253 N. White Water
- 0254 Haynes
- 0255 Roosevelt Pond

Perkins
- 5301 Shadehill
- 5302 Lemmon State
- 5303 Vobedja
- 5304 Flat Creek
- 5305 Sorum
- 5306 Coal Springs
- 5307 Johnson
- 5308 Owen
- 5309 Cole
- 5310 Ada
- 5311 Jensen

Perkins Cont.
- 5312 Lewton
- 5313 73 Dam
- 5314 Meadow
- 5315 Imogene
- 5316 Whitehill
- 5317 Bowhotham

Potter
- 5401 Simon
- 5402 Corman
- 5403 Hurley
- 5404 Potts
- 5405 Green

Roberts
- 5501 Traverse
- 5502 Hurricane
- 5503 Bullhead
- 5504 One Road
- 5505 Mud
- 5506 Tehana
- 5507 N. Cottonwood
- 5508 Whitestone
- 5509 Drywood, N.
- 5510 Drywood, S.
- 5511 Big Stone
- 5512 Garfield
- 5513 One Road, N.
- 5514 Long Hollow
- 5515 Sather Slough
- 5516 Lien
- 5517 Hammer
- 5518 Hammer, S.
- 5519 Hammer, N.
- 5520 Hurricane, N.
- 5521 Bdesake
- 5522 Clubhouse
- 5523 Owl
- 5524 Old Agency Pond (Agency Dam)
- 5525 Takawitha Dam
- 5526 E. Ortley
- 5527 W. Ortley

Sanborn
- 5601 Twin
- 5602 Letcher (Kids Pond)
- 5603 Prior (Kids Pond)
- 5604 Rifle-Calahan
- 5605 Long Lake
- 5606 McCoy

Shannon
- 6501 Oglala Res.
- 6502 White Clay
- 6503 Kyle
- 6504 Derby
- 6505 Wolf Creek
- 6506 Big Alkali
- 6507 Pine Ridge

Spink
- 5701 Dudley
- 5702 Twin
- 5703 Cottonwood
- 5704 Redfield
- 5705 Timber Creek
- 5706 Mirage
- 5707 Turtle
- 5708 Northville
- 5709 Bierman (Mansfield)

Stanley
- 5801 Red Plum
- 5802 Hayes
- 5803 Trout Pond
- 5804 50-50 Allotment

Sully
- 5901 Cottonwood
- 5902 Sully
- 5903 Fuller
- 5904 Okobojo
- 5905 Mundt
- 5906 Post
- 5907 Stone
- 5908 Walker
- 5909 Fisher
- 5910 Troy

Todd
- 6601 Boarding School
- 6602 He Dog
- 6603 Mission
- 6604 Hidden Timber
- 6605 White
- 6606 Beads Creek
- 6607 Rosebud
- 6608 Ghost Hawk
- 6609 Sharps
- 6610 Chases Woman
- 6611 Spotted Tail
- 6612 Eagle Feather

Todd Cont.
- 6613 Iron Wood
- 6614 Swift Bear
- 6615 Heifer
- 6616 Enemy Woman
- 6617 Omaha Boy
- 6618 Mervin Colombe

Tripp
- 6001 Roosevelt
- 6002 Sully
- 6003 Irwin
- 6004 Beauliau
- 6005 Bloom
- 6006 Carter
- 6007 Covey
- 6008 Big Dog Ear
- 6009 King
- 6010 McLaughlin
- 6011 Rahn
- 6012 Snow
- 6013 Sundahl
- 6014 Woolheizer
- 6015 Witten
- 6016 Sinkler
- 6017 Hamill
- 6018 Lone Tree

Turner
- 6101 Swan
- 6102 Mud
- 6103 Marion

Union
- 6201 McCook
- 6202 Norweigan
- 6203 Sargent (Nison)
- 6204 Cole

Walworth
- 6301 Hiddenwood
- 6302 Spring
- 6303 Molstad
- 6304 Swan

Washabaugh
- 6701 May
- 6702 Dithmer
- 6703 Poor Bear

Yankton
- 0701 Marindahl
- 0702 Beaver (State)
- 0703 Westside
- 0705 Yankton (Cottonwood)

Ziebach
- 6401 Bednor
- 6402 Glad Valley
- 6403 Matter
- 6404 Miller
- 6405 Trent
- 6406 Buffalo
- 6407 Rattle Snake

Mainstem Reservoirs
- 1610 Oahe
- 1611 Oahe Tailwaters
- 1612 Sharpe
- 1613 Sharpe Tailwaters
- 1614 Frances Case
- 1615 Francis Case Tailwaters
- 1616 Missouri R. To Running W.
- 1617 Lewis and Clark
- 1618 Lewis and Clark Tailwaters
- 1619 Missouri R. to Sioux City

APPENDIX F

Organism Codes

FISH
MASTER SPECIES
LIST

Petromyzontidae
1. Ichthyomyzon unicuspis - silver lamprey

Acipenseridae
2. Scaphirhynchus platorynchus - pallid sturgeon
3. S. albus - shovelnose sturgeon
4.

Polyodontidae
5. Polyodon spathula - paddlefish

Lepisosteidae
6. Lepisosteus platostomus - shortnose gar
7. L. osseus - longnose gar

Amiidae
8. Amia calva - bowfin

Anguillidae
9. Anguilla rostrata - Americal eel

Clupeidae
10. Alosa chrysochloris - skipjack herring
11. Dorosoma cepedianum - grizzard shad
12.
13.

Hiodontidae
14. Hiodon alosoides - goldeye
15. H. tergisus - mooneye

Salmonidae
16. Salmo trutta - brown trout
17. S. gairdneri - rainbow trout
18. Salvelinus fontinalis - brook trout
19. S. namycush - lake trout
20. Oncorhynchus nerka - kokanee
21. O. kisutch - coho salmon
22. Prosopium gemmiferum - Bonneville cisco
23. Coregonus clupeaformis - Lake whitefish
24.
25.
26.
27.
28.

Osmeridae
29. Osmerus mordox - rainbow smelt

Umbridae
30. Umbra limi - central mudminnow

Esocidae
31. Esox lucius - northern pike
32. Esox masquinongy - muskie
33.
34.

Cyprinidae

35. Ctenopharyngodon idella - grass carp
36. Cyprinus carpio - carp
37. Carrassius auratus - goldfish
38. Notemigonus crysoleucas - golden shiner
39. Semotilus margarita - pearl dace
40. S. atromaculatus - creekchub
41. Phoxinus eos - northern redbelly dace
42. P. ncogaeus - finescale dace
43. Couesius plumbeus - lake chub
44. Hybopsis gracilis - flathead chub
45. H. storeriana - silver chub
46. H. gelida - sturgeon chub
47. H. meeki - sicklefin chub
48. Nocomis biguttatus - hornyhead chub
49. Rhinichthys atratulus - blacknose dace
50. R. cataractae - longnose dace
51. Phenacobius mirabilis - suckermouth minnow
52. Notropis atherinoides - emerald shiner
53. N. rubellus - rosyface shiner
54. N. shumardi - silverband shiner
55. N. cornutus - common shiner
56. N. heterodon - blackchin shiner
57. N. hudsonius - spottail shiner
58. N. blennius - river shiner
59. N. dorsalis - bigmouth shiner
60. N. lutrensis - red shiner
61. N. stramineus - sand shiner
62. N. topeka - Topeka shiner
63. N. heterolepis - blacknose shiner
64. Hybognathus hankinsoni - brassy minnow
65. H. placitus - plains minnow
66. H. nuchalis - silvery minnow
67. Pimephales notatus - bluntnose minnow
68. P. promelas - fathead minnow
69. Campostoma anomalum - stoneroller
70.
71.
72.
73.
74.
75. minnow

Catostomidae

76. Cycleptus elongatus - blue sucker
77. Ictiobus cyprinellus - bigmouth buffalo
78. I. bubalus - smallmouth buffalo
79. I. niger - black buffalo
80. Carpiodes cyprinus - quillback
81. C. carpio - river carpsucker
82. Hypentelium nigricans - northern hog sucker

Castostomidae Cont.

83. Moxostoma erythrurum - golden redhorse
84. M. Macrolepidotum - shorthead redhorse
85. Catostomus commersoni - white sucker
86. C. catostomus - longnose sucker
87. C. platyrhunchus - mountain sucker
88.
89. Buffalo
90. Sucker

Ictaluride

91. Ictalurus melas - black bullhead
92. I. nebulosus - brown bullhead
93. I. natalis - yellow bullhead
94. I. punctatus - channel catfish
95. I. furcatus - blue catfish
96. Noturus gyrinus - tadpole madtom
97. N. exilis - slender madtom
98. Pylodictis olivaris - flathead catfish
99. Noturus flavus - Stonecat
100.
101.

Percopsidae

102. Percopsis omiscomaycus - trout-perch

Gadidae

103. Lota lota - burbot

Cyprinodontidae

104. Fundulus diaphanus - banded killifish
105. F. kansae - plains killifish
106. F. sciadicus - plains topminnow
107.

Gasterosteidae

108. Culaea inconstans - brook stickleback

Percichthyidae

109. Morone chrysops - white bas
110.
111.

Centrarchidae

112. Micropterus dolomieui - smallmouth bass
113. M. salmoides - largemouth bass
114. Lepomis cyanellus - green sunfish
115. L. gibbosus - pumpkinseed
116. L. macrochirus - bluegill
117. L. humilis - orangesptted sunfish
118. Ambloplites rupestris - rock bass
119. Pomoxis annularis - white crappie
120. P. nigromaculatus - black crappie
121.
122. Crappie
123. Sunfish

AQUATIC MACROPHYTES

Family Poaceae (Gramineae)

1.	Alopecurus	Foxtail
2.	Beckmannia	Slough grass
3.	Spartina	Cordgrass
4.	Glyceria	Mannagrass
5.	Phragmites	Plume reed grass
6.	Leersia	Rice cut-grass
7.	Phalaris	Reed canary grass
8.	Zizania	Wild rice

Family Cyperaceae

9.	Carex	Sedge
10.	Cyperus	Nut sedge
11.	Eleocharis	Spike rush
12.	Scirpus	Roundstem bullrush
13.	Scirpus	Bullrush

Family Juncaceae

14.	Juncus	Rush

Family Lemnaceae

15.	Lemna	Duckweed

Family Araceae

16.	Acorus	Sweetflag

Family Hydrocaritaceae

17.	Elodea (Anacharis)	Waterweed
18.	Vallisneria	Wild celery

Family Najadaceae

19.	Najas	
20.	Potamogeten	Narrowleaf pondweed (Sago and curlyleaf)
21.	Potamogeten	Variableleaf pondweed (Floating leaf)
22.	Ruppia	Widgeon grass

Family Typhaceae

23.	Typha	Cattail

Family Sparganaceae

24.	Sparganium	Burreed

Family Alismataceae

25.	Alisma	Water plantain

Family Ceratophllaccae

26.	Ceratophyllum	Coontail

Family Compositae
27. Bidens — Beggers lice

Family Haloragidaceae
28. Myriophyllum — Water millfoil

Family Nymphaceae
29. Nuphar — Yellow water lily
30. Nymphea — White water lily

Family Polygonaceae
31. Polygonum — Smartweed

Family Ranunculaceae
32. Ranunculus — Crowfoot

Family Cruciferae
33. Nasturtium — Water cress

APPENDIX G

Management And Access Recommendations

MANAGEMENT RECOMMENDATIONS

FISH MANAGEMENT

1. Control - Biological
2. Control - Chemical
3. Control - Physical
4. Forage - Increase
5. Intro other food organism
6. Mapping
7. Special regulations
8. Special study
9. Species change (Stocking)
10. Stocking - Decrease
11. Stocking - Increase
12. Stocking size change
13. Survey

HABITAT MANAGEMENT

20. Aerate to prevent fishkill
21. Deep water siphon
22. Dredging
23. Fertilization
24. Fish barrier - Install
25. Fish barrier - Remove
26. Fish structure - Install
27. Nursery areas - Improve
28. Nutrient control
29. Pollution abatement
30. Repair dam or dike
31. Spawning improvement
32. Waterlevel - Lower
33. Waterlevel - Raise
34. Waterlevel - Stabilize
35. Vegetation control - Algae
36. Vegetation control - Macrophytes
37. Manage for waterfowl

SHORE MANAGEMENT

40. Access - Aquire
41. Access - Improve
42. Access - Limit
43. Clearing - Obstructions
44. Fencing
45. Plantings
46. Sediment control
47. Shore stabilization
48. Shore vegetation cover
49. Watershed restoration
50. Limit livestock access
60. Other

ACCESS RECOMMENDATIONS

1. Aquire land access
2. Camping pads
3. Change house
4. Docks
5. Electricity
6. Fencing
7. Fireplaces
8. Garbage cans
9. Lights
10. Parking areas
11. Picnic tables
12. Posting
13. Ramp - Concrete
14. Ramp - Double-wide
15. Ramp - Gravel or dirt
16. Ramp - Steel
17. Roads - All weather
18. Roads - Internal
19. Roads - Gravel
20. Sewer dump
21. Shelters
22. Showers
23. Swimming beach
24. Trails - Hiking
25. Trails - Snowmobile
26. Tree planting
27. Toilets - Flush
28. Toilets - Primitive
29. Weed control
30. Well

APPENDIX H

GIVEFISH Build Program

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000010 IDENTIFICATION DIVISION.
000020 PROGRAM-ID. GIVEFISH BUILD PROGRAM.
000030 REMARKS. GIVEFISH BUILDS GIVEFISH DATA BASE.
000035 AUTHOR. WARREN HOVLAND.
000040 DATE WRITTEN. 1979.
000050 ENVIRONMENT DIVISION.
000060 CONFIGURATION SECTION.
000070 SOURCE-COMPUTER. IBM-370.
000080 OBJECT-COMPUTER. IBM-370.
000090 INPUT-OUTPUT SECTION.
000100 FILE-CONTROL.
000110     SELECT TAPEIN-FILE ASSIGN TO DA-2314-S-TAPEIN.
000120     SELECT TAPEOUT-FILE ASSIGN TO DA-2314-S-TAPEOUT.
000130     SELECT TEMP-FILE ASSIGN TO DA-2314-S-TEMP.
000131     SELECT SORT-FILE ASSIGN TO DA-2314-S-SORTTEMP.
000140 DATA DIVISION.
000150 FILE SECTION.
000151 FD  TAPEIN-FILE
000152     RECORDING MODE F, RECORD CONTAINS 80 CHARACTERS,
000153     LABEL RECORDS ARE OMITTED, DATA RECORD IS TAPEIN-REC.
000154 01  TAPEIN-REC.
000155     02  LAKE-CODE-IN              PIC X(4).
000156     02  CARD-INFO-IN              PIC X(74).
000157     02  CARD-CODE-IN              PIC X(2).
000160 SD  SORT-FILE
000220     DATA RECORD IS SORT-REC.
000252 01  SORT-REC.
000254     02  SORT-LAKE-CODE            PIC X(4).
000256     02  SORT-CARD-INFO            PIC X(74).
000258     02  SORT-CARD-CODE            PIC X(2).
000260 FD  TAPEOUT-FILE
000270     RECORDING MODE F, LABEL RECORDS ARE OMITTED,
000280     RECORD CONTAINS 9292 CHARACTERS, BLOCK CONTAINS 1 RECORDS,
000290     DATA RECORD IS TAPEOUT-RECORD.
000300 01  TAPEOUT-RECORD                PIC X(9292).
000310 FD  TEMP-FILE
000320     RECORDING MODE F, LABEL RECORDS ARE OMITTED,
000330     RECORD CONTAINS 80 CHARACTERS, BLOCK CONTAINS 10 RECORDS,
000340     DATA RECORDS ARE CARD-1-INPUT, CARD-2-INPUT, CARD-3-INPUT,
000350     CARD-4-INPUT, CARD-5-INPUT, CARD-6-INPUT, CARD-7-INPUT,
000360     CARD-8-INPUT, CARD-9-INPUT, CARD-10-INPUT, CARD-11-INPUT,
000370     CARD-12-INPUT, CARD-13-INPUT, CARD-14-INPUT, CARD-15-INPUT,
000380     CARD-16-INPUT, CARD-17-INPUT, CARD-18-INPUT, CARD-19-INPUT,
000390     CARD-20-INPUT, CARD-21-INPUT, CARD-22-INPUT, CARD-23-INPUT,
000400     CARD-24-INPUT, CARD-25-INPUT, CARD-26-INPUT, CARD-27-INPUT,
000410     CARD-28-INPUT, CARD-29-INPUT, CARD-30-INPUT, CARD-31-INPUT,
000420     CARD-32-INPUT, CARD-33-INPUT, CARD-34-INPUT, CARD-35-INPUT,
000430     TEMP-REC.
000440 01  TEMP-REC.
000450     02  TEMP-LAKE-CODE  PIC X(4).
000460     02  FILLER              PIC X(74).
000470     02  TEMP-CARD-CODE  PIC 99.
000510 01  CARD-1-INPUT.
000520     02  LAKE-CODE           PIC 9(5).
000530     02  SOURCE-1            PIC 9(5).
000540     02  DATE-1              PIC X(6).
000550     02  DATA-1              PIC X(22).
000560     02  FILLER              PIC X(40).
000570     02  CARD-NUMBER         PIC 99.
000580 01  CARD-2-INPUT.
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000590      02  LAKE-CODE              PIC 9(4).
000600      02  DATA-2                 PIC X(70).
000610      02  FILLER                 PIC X(4).
000620      02  CARD-NUMBER            PIC 99.
000630 01  CARD-3-INPUT.
000640      02  LAKE-CODE              PIC 9(4).
000650      02  SOURCE-3               PIC 9(5).
000660      02  UNITS                  PIC X.
000670      02  ACTION-CODE            PIC X.
000680      02  RIVER-3                OCCURS 2 TIMES.
000685          03  RIVER-3-DATA         PIC 9(3).
000690      02  DATE-3                 PIC 9(6).
000700      02  DATA-3                 PIC X(4).
000710      02  SPECIES-3              OCCURS 4 TIMES.
000715          03  SPECIES-3-DATA       PIC 9(3).
000720      02  DRAINAGE-3                 OCCURS 3 TIMES.
000725          03  DRAINAGE-3-DATA      PIC 9(4).
000730      02  MAP-DATE-3             PIC X(4).
000740      02  POPULATE-3             OCCURS 3 TIMES.
000745          03  POPULATE-3-DATA    PIC 9(6).
000750      02  FILLER                 PIC X(5).
000760      02  CARD-NUMBER            PIC 99.
000770 01  CARD-4-INPUT.
000780      02  LAKE-CODE              PIC 9(4).
000790      02  TYPE-4                 PIC X.
000800      02  LOCATION-4             PIC 9(3).
000810      02  CONST-DATE-4           PIC 9(4).
000820      02  SPILLWAY-4             PIC X.
000830      02  WIDTH-4                  PIC 9(5).
000840      02  OWNER-4                PIC XX.
000850      02  PLAN-ESTIM             PIC X.
000860      02  AREA-4                 PIC 9(7).
000870      02  MEANDERED              PIC 9(6).
000880      02  LITTORAL               PIC 9(6).
000890      02  PERCENT-LT             PIC XX.
000900      02  MAX-DEPTH-4            PIC 9(4).
000910      02  AVE-DEPTH-4            PIC 9(3).
000920      02  BENCHMARK              PIC 9(3).
000930      02  ANN-FLUC-HIGH          PIC 9(3).
000940      02  ANN-FLUC-LOW           PIC 9(3).
000950      02  LT-FLUC-HIGH           PIC 9(3).
000960      02  LT-FLUC-LOW            PIC 9(3).
000970      02  ELEVATION-4            PIC 9(4).
000980      02  WATERSHED-4            PIC 9(8)V99.
000990      02  CARD-NUMBER            PIC 99.
001000 01  CARD-5-INPUT.
001010      02  LAKE-CODE              PIC 9(4).
001020      02  UNITS                  PIC X.
001030      02  ACTION-CODE            PIC X.
001040      02  SOURCE-5               PIC 9(5).
001050      02  RIVER1-5                 PIC 9(3).
001055      02  RIVER2-5                   PIC 9(3).
001060      02  DATE-5                 PIC X(6).
001070      02  LENGTH-5               PIC 9(5)V9.
001080      02  CHANNEL-5              PIC 9(3).
001090      02  WIDTH-5                PIC XX.
001100      02  DEPTH-5                PIC 9(2)V9.
001110      02  NORMAL-HIGH            PIC S9(5).
001120      02  MEAN-ANNUAL            PIC S9(5).
001130      02  POOL-WATER             PIC X(14).
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001140      02  AVE-GRADIENT          PIC 99V9.
001150      02  STABLE-BANK           PIC XX.
001160      02  FILLER                PIC X(12).
001170      02  CARD-NUMBER           PIC 99.
001180 01  CARD-6-INPUT.
001190      02  LAKE-CODE             PIC 9(4).
001200      02  BOTTOM-STRATA         PIC X(36).
001210      02  FISHING-WATER1        OCCURS 3 TIMES.
001215          03  FISHING-WATER1-DATA     PIC 9(6).
001220      02  FISHING-WATER2        OCCURS 3 TIMES.
001225          03  FISHING-WATER2-DATA     PIC 9(5).
001230      02  FILLER                PIC X(5).
001240      02  CARD-NUMBER           PIC 99.
001250 01  CARD-7-INPUT.
001260      02  LAKE-CODE             PIC 9(4).
001270      02  RESOURCE-USE          PIC 9(4).
001280      02  WATER-RIGHT           PIC 9(6).
001290      02  DWELLINGS             PIC 9(3).
001300      02  ISLANDS               PIC XX.
001310      02  DEVELOPMENT           PIC X(34).
001320      02  FILLER                PIC X(25).
001330      02  CARD-NUMBER           PIC 99.
001340 01  CARD-8-INPUT.
001350      02  LAKE-CODE             PIC 9(4).
001360      02  TYPE-8                PIC X(2).
001370      02  NAME-8                PIC X(10).
001380      02  LOCATION-8            PIC 9(3).
001390      02  DEPTH-8               PIC X(4).
001400      02  HIGH-8                PIC 9(5).
001410      02  ANNUAL-8              PIC 9(5).
001420      02  BOTTOM-8              PIC XX.
001430      02  FILLER                PIC X(43).
001440      02  CARD-NUMBER           PIC 99.
001450 01  CARD-9-INPUT.
001460      02  LAKE-CODE             PIC 9(4).
001470      02  SOURCE-9              PIC 9(5).
001480      02  UNITS                 PIC X.
001490      02  ACTION-CODE           PIC X.
001500      02  DATE-9                PIC X(6).
001510      02  LOCATION-9            PIC 9(3).
001520      02  SECCHI                PIC 9(3).
001530      02  COLOR                 PIC X(5).
001540      02  TEMP-OXY              OCCURS 5 TIMES.
001550          03  DEPTH-9               PIC 9(3)V9.
001560          03  TEMP                  PIC XX.
001570          03  DISS-OXY              PIC 9(2)V9.
001580      02  FILLER                PIC X(5).
001590      02  CARD-NUMBER           PIC 99.
001600 01  CARD-10-INPUT.
001610      02  LAKE-CODE             PIC 9(4).
001620      02  THERMO-LOW            PIC 9(3)V9.
001630      02  THERMO-HIGH           PIC 9(3)V9.
001640      02  ALKALINITY            OCCURS 3 TIMES.
001645          03  ALKALINITY-DATA       PIC 9(3).
001650      02  PH-10                 PIC 9(2)V9.
001660      02  CC2                   PIC XX.
001670      02  HARDNESS              PIC 9(4).
001672      02  CONDUCTIVITY            PIC 9(4).
001674      02  SOLIDS                OCCURS 2 TIMES.
001677          03  SOLIDS-DATA       PIC 9(4).
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001680      02  PHOS                  OCCURS 2 TIMES.
001685          03  PHOS-DATA       PIC 9V99.
001690      02  CHLOROPHYLL           CCCURS 2 TIMES.
001695          03  CHLOROPHYLL-DATA          PIC 9(3).
001700      02  CHLORIDE-ION          PIC 9(4).
001710      02  NITROGEN              CCCURS 4 TIMES.
001715          03  NITROGEN-DATA       PIC 99V99.
001720      02  DATE-LC               PIC X(4).
001730      02  CARD-NUMBER           PIC 99.
001740 01  CARD-11-INPUT.
001750      02  LAKE-CODE             PIC 9(4).
001760      02  SOURCE-11              PIC 9(5).
001770      02  ACTION-CODE           PIC X.
001780      C2  RIVER-11               CCCURS 2 TIMES.
001785          03  RIVER-11-DATA      PIC 9(3).
001790      02  DATE-11               PIC X(6).
001800      02  COVERAGE-1            PIC XX.
001810      02  STANDING-EMERG        CCCURS 5 TIMES.
001820          03  SPECIES1-11           PIC 9(3).
001830          03  ABUND1-11             PIC X.
001840      02  COVERAGE-2            PIC XX.
001850      02  GROWTH-11             PIC 9(3).
001860      02  SUBMERGED             OCCURS 5 TIMES.
001870          03  SPECIES2-11           PIC 9(3).
001880          03  ABUND2-11             PIC X.
001890      02  OTHER-LIFE            PIC X(9).
001900      02  CARD-NUMBER           PIC 99.
001910 01  CARD-12-INPUT.
001920      C2  LAKE-CODE              PIC 9(4).
001930      C2  SPECIES-12             OCCURS 18 TIMES.
001940          03  SPECIES1-12           PIC 9(3).
001950          03  ABUND1-12             PIC X.
001960      02  FILLER                PIC XX.
001970      02  CARD-NUMBER           PIC 99.
001980 01  CARD-13-INPUT.
001990      02  LAKE-CODE             PIC 9(4).
002000      02  SPAWNING-AREA         CCCURS 5 TIMES.
002010          03  SPECIES-13            PIC 9(3).
002020          03  EVALUATION            PIC X.
002030          03  LOCATION-13           CCCURS 3 TIMES PIC 9(3).
002040      02  FILLER                PIC X(9).
002050      02  CARD-NUMBER           PIC 99.
002060 01  CARD-14-INPUT.
002070      02  LAKE-CODE             PIC 9(4).
002080      02  SOURCE-14             PIC 9(5).
002090      02  UNITS                 PIC X.
002100      02  ACTICN-CCDE           PIC X.
002110      02  DATE-14               PIC X(6).
002120      02  STOCKING              CCCURS 4 TIMES.
002130          03  SPECIES-14            PIC 9(3).
002140          03  NUMBER-14             PIC 9(7).
002150          03  SIZE-14               PIC X.
002160      02  FILLER                PIC X(17).
002170      02  CARD-NUMBER           PIC 99.
002180 01  CARD-15-INPUT.
002190      02  LAKE-CODE             PIC 9(4).
002200      02  METHOD                PIC X.
002210      02  HAULS                 PIC 9(3).
002220      C2  COMMERCIAL             CCCURS 6 TIMES.
002230          03  SPECIES-15            PIC 9(3).
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002240          03  WEIGHT-15          PIC 9(6).
002250      02  FILLER                 PIC X(14).
002260      02  YEAR-15                PIC XX.
002270      02  CARD-NUMBER            PIC 99.
002280 01  CARD-16-INPUT.
002290      02  LAKE-CODE              PIC 9(4).
002300      02  COMM-16                OCCURS 2 TIMES.
002310          03  SPECIES1-16            PIC 9(3).
002320          03  WEIGHT1-16             PIC 9(6).
002330      02  GAME1-16               OCCURS 5 TIMES.
002340          03  SPECIES2-16            PIC 9(3).
002350          03  NUMBER2-16             PIC 9(4).
002360      02   GAME2-16              OCCURS 2 TIMES.
002370          03  SPECIES3-16            PIC 9(3).
002380          03  NUMBER3-16             PIC 9(6).
002390      02  FILLER                 PIC X.
002400      02  YEAR-16                PIC XX.
002410      02  CARD-NUMBER            PIC 99.
002420 01  CARD-17-INPUT.
002430      02  LAKE-CODE              PIC 9(4).
002440      02  SOURCE-17              PIC 9(5).
002450      02  UNITS                  PIC X.
002460      02  ACTION-CODE            PIC X.
002470      02  DATE-17                PIC X(6).
002480      02  PULLS-17               PIC X(6).
002490      02  LENGTH-17              PIC 9(3).
002500      02  DEPTH-17               PIC XX.
002510      02  MESH-17                PIC 9V9(3).
002520      02  DISTANCE-17            PIC 9(4).
002530      02  AREA-17                PIC 9(3)V9.
002540      02  FILLER                 PIC X(38).
002550      02  CARD-NUMBER            PIC 99.
002560 01  CARD-18-INPUT.
002570      02  LAKE-CODE              PIC 9(4).
002580      02  DATA-18                OCCURS 6 TIMES.
002590          03  SPECIES-18             PIC 9(3).
002600          03  NUMBER-18              PIC 9(6).
002610          03  FILLER                 PIC X(3).
002620      02  FILLER-2               PIC XX.
002630      02  CARD-NUMBER            PIC 99.
002640 01  CARD-19-INPUT.
002650      02  LAKE-CODE              PIC 9(4).
002660      02  SOURCE-19              PIC 9(5).
002670      02  METHOD-19              PIC XXX.
002680      02  MESH-19                PIC 99V9(3).
002690      02  LENGTH-19              PIC 99V9.
002700      02  HEIGHT-19              PIC 99V9.
002710      02  WIDTH-19               PIC 99V9.
002720      02  DURATION-19            PIC X(6).
002730      02  AREA-19                PIC 99V9.
002740      02  UNITS-19               PIC X.
002750      02  ACTION-CODE            PIC X.
002760      02  DATE-19                PIC X(6).
002770      02  FILLER                 PIC X(35).
002780      02  CARD-NUMBER            PIC 99.
002790 01  CARD-20-INPUT.
002800      02  LAKE-CODE              PIC 9(4).
002810      02  SPECIES-20             PIC 9(3).
002820      02  TOTAL-20               PIC 9(5).
002830      02  PCT-NUM-20             PIC XX.
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002840      02  TOTAL-WT-20          PIC 9(5)V9.
002850      02  PCT-WT-20            PIC XX.
002860      02  MEAN-LENGTH-20       PIC 9(3)V9.
002870      02  MEAN-WT-20           PIC 99V9(3).
002880      02  NET-NUM-20           PIC 9(4).
002890      02  NET-WT-20            PIC 9(4)V9.
002900      02  FILLER               PIC X(36).
002905      02  YEAR-20              PIC XX.
002910      02  CARD-NUMBER          PIC 99.
002920 01  CARD-21-INPUT.
002930      02  LAKE-CODE            PIC 9(4).
002940      02  SOURCE-21            PIC 9(5).
002950      02  METHOD-21            PIC X(3).
002960      02  MESH-21              PIC 99V9(3).
002970      02  LENGTH-21            PIC 99V9.
002980      02  HEIGHT-21            PIC 99V9.
002990      02  WIDTH-21             PIC 99V9.
003000      02  DURATION-21          PIC X(6).
003010      02  AREA-21              PIC 99V9.
003020      02  UNITS-21             PIC X.
003030      02  ACTION-CODE          PIC X.
003040      02  DATE-21              PIC X(6).
003050      02  FILLER               PIC X(35).
003060      02  CARD-NUMBER          PIC 99.
003070 01  CARD-22-INPUT.
003080      02  LAKE-CODE            PIC 9(4).
003090      02  SPECIES-22           PIC 9(3).
003100      02  DATA-22              PIC X(65).
003110      02  TOTAL-22             PIC 9(3).
003120      02  FILLER               PIC X.
003130      02  YEAR-22              PIC XX.
003140      02  CARD-NUMBER          PIC 99.
003150 01  CARD-23-INPUT.
003160      02  LAKE-CODE            PIC 9(4).
003170      02  SOURCE-23            PIC 9(5).
003180      02  UNITS-23             PIC X.
003190      02  ACTION-CODE-23       PIC X.
003200      02  DATE-23              PIC X(6).
003210      02  FILLER               PIC X(61).
003220      02  CARD-NUMBER          PIC 99.
003230 01  CARD-24-INPUT.
003240      02  LAKE-CODE            PIC 9(4).
003250      02  SPECIES-24           PIC 9(3).
003260      02  SIZE-24              PIC 9(4).
003270      02  SAMPLE-24            PIC 9(3).
003280      02  AGE-GROUP-24         OCCURS 9 TIMES.
003285          03  AGE-GROUP-24-DATA     PIC 9(3)V9.
003290      02  FILLER               PIC X(28).
003300      02  CARD-NUMBER          PIC 99.
003310 01  CARD-25-INPUT.
003320      02  LAKE-CODE            PIC 9(4).
003330      02  AGE-GROUP-25         PIC X(36).
003340      02  FILLER               PIC X(38).
003350      02  CARD-NUMBER          PIC 99.
003360 01  CARD-26-INPUT.
003370      02  LAKE-CODE            PIC 9(4).
003380      02  SOURCE-26            PIC 9(5).
003390      02  UNITS-26             PIC X.
003400      02  ACTION-CODE-26       PIC X.
003410      02  DATE-26              PIC X(6).
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003420      02  DATA-26              PIC X(21).
003430      02  SPECIES-26           OCCURS 4 TIMES.
003435          03  SPECIES-26-DATA      PIC 9(3).
003440      02  FILLER               PIC X(28).
003450      02  CARD-NUMBER          PIC 99.
003460 01  CARD-27-INPUT.
003470      02  LAKE-CODE            PIC 9(4).
003480      02  ACCURACY-27          PIC X.
003490      02  SOURCE-27            PIC 9(4).
003500      02  DATE-27              PIC X(6).
003510      02  HOURS-27             PIC 9(6).
003520      02  AVE-DAY-27           PIC 99V9.
003530      02  WEIGHT-27            PIC 9(6).
003540      02  NUMBER-27            PIC 9(6).
003550      02  FILLER               PIC X(42).
003560      02  CARD-NUMBER          PIC 99.
003570 01  CARD-28-INPUT.
003580      02  LAKE-CODE            PIC 9(4).
003590      02  DATA-28              OCCURS 8 TIMES.
003600          03  SPECIES-28           PIC 9(3).
003610          03  CATCH-HR-28          PIC 9(3).
003620          03  WT-HR-28             PIC 9V99.
003630      02  FILLER               PIC XX.
003640      02  CARD-NUMBER          PIC 99.
003650 01  CARD-29-INPUT.
003660      02  LAKE-CODE            PIC 9(4).
003670      02  SOURCE-29            PIC 9(5).
003690      02  DATE-29              PIC X(6).
003700      02  HOURS-29             PIC 9(6).
003710      02  ACTIVS-29            OCCURS 11 TIMES.
003715          03  ACTIVS-29-DATA       PIC 9(4).
003720      02  FILLER               PIC X(13).
003730      02  CARD-NUMBER          PIC 99.
003740 01  CARD-30-INPUT.
003750      02  LAKE-CODE            PIC 9(4).
003760      02  SOURCE-30            PIC 9(5).
003770      02  ACTION-CODE          PIC X.
003780      02  DATE-30              PIC X(6).
003790      02  RECS-30              PIC X(8).
003800      02  FILLER               PIC X(54).
003810      02  CARD-NUMBER          PIC 99.
003820 01  CARD-31-INPUT.
003830      02  LAKE-CODE            PIC 9(4).
003840      02  DATA-31              OCCURS 2 TIMES.
003850          03  REC-31               PIC XX.
003860          03  SPECIES1-31          PIC 9(3).
003870          03  SPECIES2-31          PIC 9(3).
003880          03  BENEFIT-31           PIC 9(6).
003890          03  YEAR-COMPLETE        PIC XX.
003900          03  COST-31              PIC 9(6).
003910      02  FILLER               PIC X(28).
003920      02  YEAR-31              PIC XX.
003930      02  CARD-NUMBER          PIC 99.
003940 01  CARD-32-INPUT.
003950      02  LAKE-CODE            PIC 9(4).
003960      02  DATA-32              OCCURS 2 TIMES.
003970          03  LOCATION-32          PIC 9(3).
003980          03  REC-32               PIC XX.
003990          03  BENEFIT-32           PIC 9(6).
004000          03  COST-32              PIC 9(5).
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004010          03  REC2-32            PIC XX.
004020          03  BENEFIT2-32        PIC 9(6).
004030          03  COST2-32           PIC 9(5).
004040      02  FILLER             PIC X(14).
004050      02  YEAR-32            PIC XX.
004060      02  CARD-NUMBER        PIC 99.
004070 01  CARD-33-INPUT.
004080      02  LAKE-CODE            PIC 9(4).
004090      02  CARD-33-INFO       PIC X(74).
004100      02  CARD-NUMBER        PIC 99.
004110 01  CARD-34-INPUT.
004120      02  LAKE-CODE          PIC 9(4).
004130      02  SOURCE-34          PIC 9(5).
004140      02  UNITS-34           PIC X.
004150      02  ACTION-CODE-34     PIC X.
004160      02  DATE-34            PIC X(6).
004170      02  FILLER             PIC X(61).
004180      02  CARD-NUMBER        PIC 99.
004190 01  CARD-35-INPUT.
004200      02  LAKE-CODE          PIC 9(4).
004210      02  LOCATION-35        PIC 9(3).
004220      02  NAME-35            PIC X(15).
004230      02  FACILITIES-35      PIC X(25).
004240      02  WATERFRONT-35      PIC 9(6).
004250      02  AREA-35            PIC 9(4).
004260      02  MAINTENANCE-35     PIC 9(6).
004270      02  FACIL-35           PIC 9(6).
004280      02  INVEST-35          PIC 9(6).
004290      02  YEAR-35            PIC XX.
004300      02  FILLER             PIC X.
004310      02  CARD-NUMBER        PIC 99.
004320 WORKING-STORAGE SECTION.
004330 77  OLD-LAKE-CODE                PIC 9(4).
004335 77  ISUB            PIC 99.
004335 77  JSUB            PIC 99.
004340 01  TAPEOUT-REC.
004350      02  CARD-1-NUM         PIC 9.
004360      02  CARD-1-DATA        OCCURS 1 TIMES.
004370          03  SOURCE-1           PIC S9(5) COMP-3.
004380          03  DATE-1             PIC X(6).
004390          03  DATA-1             PIC X(22).
004400      02  CARD-2-NUM         PIC 9.
004410      02  CARD-2-DATA        OCCURS 2 TIMES.
004415           03  DATA-2       PIC X(70).
004420      02  CARD-3-NUM         PIC 9.
004430      02  CARD-3-DATA       OCCURS 1 TIMES.
004440          03  SOURCE-3           PIC S9(5) COMP-3.
004450          03  RIVER-3            OCCURS 2 TIMES.
004455              04  RIVER-3-DATA     PIC S9(3) COMP-3.
004460          03  DATE-3             PIC S9(6) COMP-3.
004470          03  DATA-3             PIC X(4).
004480          03  SPECIES-3          OCCURS 4 TIMES.
004485              04  SPECIES-3-DATA   PIC S9(3) COMP-3.
004490          03  DRAINAGE-3         OCCURS 3 TIMES.
004495              04  DRAINAGE-3-DATA   PIC S9(4) COMP-3.
004500          03  MAP-DATE-3         PIC S9(4) COMP-3.
004510          03  POPULATE-3         OCCURS 3 TIMES.
004515              04  POPULATE-3-DATA   PIC S9(6) COMP-3.
004520      02  CARD-4-NUM         PIC 9.
004530      02  CARD-4-DATA          OCCURS 1 TIMES.
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004540          03  TYPE-4                 PIC X.
004550          03  LOCATION-4             PIC S9(3) COMP-3.
004560          03  CONST-DATE-4           PIC X(4).
004570          03  SPILLWAY-4             PIC X.
004580          03  WIDTH-4                PIC S9(5) COMP-3.
004590          03  OWNER-4                PIC XX.
004600          03  PLAN-ESTIM             PIC X.
004610          03  AREA-4                 PIC S9(9) COMP-3.
004620          03  MEANDERED              PIC S9(6) COMP-3.
004630          03  LITTORAL               PIC S9(6) COMP-3.
004640          03  PERCENT-LT             PIC XX.
004650          03  MAX-DEPTH-4             PIC S9(4) COMP-3.
004660          03  AVE-DEPTH-4            PIC S9(4) COMP-3.
004670          03  BENCHMARK              PIC S9(3) COMP-3.
004680          03  ANN-FLUC-HIGH          PIC S9(3) COMP-3.
004690          03  ANN-FLUC-LOW           PIC S9(3) COMP-3.
004700          03  LT-FLUC-HIGH           PIC S9(3) COMP-3.
004710          03  LT-FLUC-LOW            PIC S9(3) COMP-3.
004720          03  ELEVATION-4            PIC S9(4) COMP-3.
004730          03  WATERSHED-4            PIC S9(8)V9(2) COMP-3.
004740      02  CARD-5-NUM             PIC 9.
004750      02  CARD-5-DATA        OCCURS 1 TIMES.
004760          03  SOURCE-5               PIC S9(5) COMP-3.
004770          03  RIVER1-5               PIC S9(3) COMP-3.
004775          03  RIVER2-5               PIC S9(3) COMP-3.
004780          03  DATE-5                 PIC X(6).
004790          03  LENGTH-5               PIC S9(5)V9 COMP-3.
004800          03  CHANNEL-5              PIC S9(3) COMP-3.
004810          03  WIDTH-5                PIC XX.
004820          03  DEPTH-5                PIC S9(2)V9 COMP-3.
004830          03  NORMAL-HIGH            PIC S9(5) COMP-3.
004840          03  MEAN-ANNUAL            PIC S9(5) COMP-3.
004850          03  POOL-WATER             PIC X(14).
004860          03  AVE-GRADIENT           PIC S9(2)V9 COMP-3.
004870          03  STABLE-BANK            PIC XX.
004880      02  CARD-6-NUM             PIC 9.
004890      02  CARD-6-DATA        OCCURS 1 TIMES.
004900          03  BOTTOM-STRATA          PIC X(36).
004910          03  FISHING-WATER1     OCCURS 3 TIMES.
004915              04  FISHING-WATER1-DATA     PIC S9(6) COMP-3.
004920          03  FISHING-WATER2     OCCURS 3 TIMES.
004925              04  FISHING-WATER2-DATA     PIC S9(5) COMP-3.
004930      02  CARD-7-NUM             PIC 9.
004940      02  CARD-7-DATA        OCCURS 1 TIMES.
004950          03  RESOURCE-USE           PIC S9(4) COMP-3.
004960          03  WATER-RIGHT            PIC S9(6) COMP-3.
004970          03  DWELLINGS              PIC S9(3) COMP-3.
004980          03  ISLANDS                PIC XX.
004990          03  DEVELOPMENT            PIC X(34).
005000      02  CARD-8-NUM             PIC 9.
005010      02  CARD-8-DATA            OCCURS 5 TIMES.
005020          03  TYPE-8                 PIC XX.
005030          03  NAME-8                 PIC X(10).
005040          03  LOCATION-8             PIC S9(3) COMP-3.
005050          03  DEPTH-8                PIC X(4).
005060          03  HIGH-8                 PIC S9(5) COMP-3.
005070          03  ANNUAL-8               PIC S9(5) COMP-3.
005080          03  BOTTOM-8               PIC XX.
005090      02  CARD-9-NUM             PIC 9.
005100      02  CARD-9-DATA            OCCURS 4 TIMES.
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005110          03  SOURCE-9              PIC S9(5) COMP-3.
005120          03  DATE-9                PIC X(6).
005130          03  LOCATION-9            PIC S9(3) COMP-3.
005140          03  SECCHI                PIC S9(2)V9 COMP-3.
005150          03  COLOR                 PIC X(5).
005160          03  TEMP-OXY              OCCURS 5 TIMES.
005170          04  DEPTH-9               PIC S9(3)V9 COMP-3.
005180          04  TEMP                  PIC XX.
005190          04  DISS-OXY              PIC S9(2)V9 COMP-3.
005200      02  CARD-10-NUM          PIC 9.
005210      02  CARD-10-DATA         OCCURS 4 TIMES.
005220          03  THERMO-LOW            PIC S9(3)V9 COMP-3.
005230          03  THERMO-HIGH           PIC S9(3)V9 COMP-3.
005240          03  ALKALINITY            OCCURS 3 TIMES.
005245              04  ALKALINITY-DATA      PIC S9(3) COMP-3.
005250          03  PH-10                 PIC S9(2)V9 COMP-3.
005260          03  CO2                   PIC XX.
005270          03  HARDNESS              PIC S9(4) COMP-3.
005280          03  CONDUCTIVITY           PIC S9(4) COMP-3.
005290          03  SOLIDS                OCCURS 2 TIMES.
005295              04  SOLIDS-DATA       PIC S9(4) COMP-3.
005300          03  PHOS                  OCCURS 2 TIMES.
005305              04  PHOS-DATA         PIC S9V9(2) COMP-3.
005310          03  CHLOROPHYLL           OCCURS 2 TIMES.
005315              04  CHLOROPHYLL-DATA      PIC S9(3) COMP-3.
005320          03  CHLORIDE-ION          PIC S9(4) COMP-3.
005330          03  NITROGEN              OCCURS 4 TIMES.
005335              04  NITROGEN-DATA     PIC S99V99 COMP-3.
005340          03  DATE-10               PIC X(4).
005350      02  CARD-11-NUM          PIC 9.
005360      02  CARD-11-DATA           OCCURS 1 TIMES.
005370          03  SOURCE-11             PIC S9(5) COMP-3.
005380          03  RIVER-11              OCCURS 2 TIMES.
005385              04  RIVER-11-DATA     PIC S9(3) COMP-3.
005390          03  DATE-11               PIC X(6).
005400          03  COVERAGE-1            PIC XX.
005410          03  STANDING-EMERG        OCCURS 5 TIMES.
005420          04  SPECIES1-11           PIC S9(3) COMP-3.
005430          04  ABUND1-11             PIC X.
005440          03  COVERAGE-2            PIC XX.
005450          03  GROWTH-11             PIC S9(3) COMP-3.
005460          03  SUBMERGED             OCCURS 5 TIMES.
005470          04  SPECIES2-11           PIC S9(3) COMP-3.
005480          04  ABUND2-11             PIC X.
005490          03  OTHER-LIFE            PIC X(9).
005500      02  CARD-12-NUM          PIC 9.
005510      02  CARD-12-DATA         OCCURS 4 TIMES.
005520          03  SPECIES-12            OCCURS 18 TIMES.
005530          04  SPECIES1-12           PIC S9(3) COMP-3.
005540          04  ABUND1-12             PIC X.
005550      02  CARD-13-NUM          PIC 9.
005560      02  CARD-13-DATA           OCCURS 1 TIMES.
005570          03  SPAWNING-AREA         OCCURS 5 TIMES.
005580          04  SPECIES-13            PIC S9(3) COMP-3.
005590          04  EVALUATION            PIC X.
005600          04  LOCATION-13           OCCURS 3 TIMES PIC S9(3) COMP-3.
005610      02  CARD-14-NUM          PIC 9.
005620      02  CARD-14-DATA           OCCURS 1 TIMES.
005625          03  SOURCE-14             PIC S9(5) COMP-3.
005630          03  DATE-14               PIC X(6).
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005640          03  STOCKING              OCCURS 4 TIMES.
005650          04  SPECIES-14             PIC S9(3) COMP-3.
005660          04  NUMBER-14              PIC S9(7) COMP-3.
005670          04  SIZE-14                PIC X.
005680      02  CARD-15-NUM            PIC 9.
005690      02  CARD-15-DATA           OCCURS 2 TIMES.
005700          03  METHOD                 PIC X.
005710          03  HAULS                  PIC S9(3) COMP-3.
005720          03  COMMERCIAL             OCCURS 6 TIMES.
005730          04  SPECIES-15             PIC S9(3) COMP-3.
005740          04  WEIGHT-15              PIC S9(6) COMP-3.
005750          03  YEAR-15                PIC XX.
005760      02  CARD-16-NUM            PIC 9.
005770      02  CARD-16-DATA           OCCURS 2 TIMES.
005780          03  COMM-16                OCCURS 2 TIMES.
005790              04  SPECIES1-16            PIC S9(3) COMP-3.
005800              04  WEIGHT1-16             PIC S9(6) COMP-3.
005810          03  GAME1-16               OCCURS 5 TIMES.
005820          04  SPECIES2-16            PIC S9(3) COMP-3.
005830          04  NUMBER2-16             PIC S9(4) COMP-3.
005840          03  GAME2-16               OCCURS 2 TIMES.
005850          04  SPECIES3-16            PIC S9(3) COMP-3.
005860          04  NUMBER3-16             PIC S9(6) COMP-3.
005870          03  YEAR-16                PIC XX.
005880      02  CARD-17-NUM            PIC 9.
005890      02  CARD-17-DATA             OCCURS 1 TIMES.
005900          03  SOURCE-17              PIC S9(5) COMP-3.
005910          03  DATE-17                PIC X(6).
005920          03  PULLS-17               PIC X(6).
005930          03  LENGTH-17              PIC S9(3) COMP-3.
005940          03  DEPTH-17               PIC XX.
005950          03  MESH-17                 PIC S9V9(3) COMP-3.
005960          03  DISTANCE-17            PIC S9(4) COMP-3.
005970          03  AREA-17                PIC S9(3)V9 COMP-3.
005980      02  CARD-18-NUM            PIC 9.
005990      02  CARD-18-DATA           OCCURS 5 TIMES.
006000          03  DATA-18                OCCURS 6 TIMES.
006010          04  SPECIES-18             PIC S9(3) COMP-3.
006020          04  NUMBER-18              PIC S9(6) COMP-3.
006030      02  CARD-19-NUM            PIC 9.
006040      02  CARD-19-DATA           OCCURS 4 TIMES.
006050          03  SOURCE-19              PIC S9(5) COMP-3.
006060          03  METHOD-19              PIC X(3).
006070          03  MESH-19                PIC S9(2)V9(3) COMP-3.
006080          03  LENGTH-19              PIC S9(2)V9 COMP-3.
006090          03  HEIGHT-19              PIC S9(2)V9 COMP-3.
006100          03  WIDTH-19               PIC S9(2)V9 COMP-3.
006110          03  DURATION-19            PIC X(6).
006120          03  AREA-19                PIC S9(2)V9 COMP-3.
006130          03  DATE-19                PIC X(6).
006140      02  CARD-20-NUM            PIC 99.
006150      02  CARD-20-DATA           OCCURS 40 TIMES.
006160          03  SPECIES-20             PIC S9(3) COMP-3.
006170          03  TOTAL-20               PIC S9(5) COMP-3.
006180          03  PCT-NUM-20             PIC XX.
006190          03  TOTAL-WT-20            PIC S9(5)V9 COMP-3.
006200          03  PCT-WT-20              PIC XX.
006210          03  MEAN-LENGTH-20         PIC S9(3)V9 COMP-3.
006220          03  MEAN-WT-20             PIC S9(2)V9(3) COMP-3.
006230          03  NET-NUM-20             PIC S9(4) COMP-3.
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006240          03  NET-WT-20              PIC S9(4)V9 COMP-3.
006290          03  YEAR-20                PIC XX.
006300      02  CARD-21-NUM            PIC 9.
006310      02  CARD-21-DATA           OCCURS 2 TIMES.
006320          03  SOURCE-21              PIC S9(5) COMP-3.
006330          03  METHOD-21              PIC X(3).
006340          03  MESH-21                PIC S9(2)V9(3) COMP-3.
006350          03  LENGTH-21              PIC S9(2)V9 COMP-3.
006360          03  HEIGHT-21              PIC S9(2)V9 COMP-3.
006370          03  WIDTH-21               PIC S9(2)V9 COMP-3.
006380          03  DURATION-21            PIC X(6).
006390          03  AREA-21                PIC S9(2)V9 COMP-3.
006400          03  DATE-21                PIC X(6).
006410      02  CARD-22-NUM            PIC 99.
006420      02  CARD-22-DATA           OCCURS 10 TIMES.
006430          03  SPECIES-22             PIC S9(3) COMP-3.
006440          03  DATA-22                PIC X(65).
006450          03  TOTAL-22               PIC S9(3) COMP-3.
006460          03  YEAR-22                PIC XX.
006470      02  CARD-23-NUM            PIC 9.
006480      02  CARD-23-DATA           OCCURS 2 TIMES.
006490          03  SOURCE-23              PIC S9(5) COMP-3.
006500          03  DATE-23                PIC X(6).
006510      02  CARD-24-NUM            PIC 99.
006520      02  CARD-24-DATA           OCCURS 16 TIMES.
006530          03  SPECIES-24             PIC S9(3) COMP-3.
006540          03  SIZE-24                PIC S9(4) COMP-3.
006550          03  SAMPLE-24              PIC S9(3) COMP-3.
006560          03  AGE-GROUP-24           OCCURS 9 TIMES.
006565              04  AGE-GROUP-24-DATA      PIC S9(3)V9 COMP-3.
006570      02  CARD-25-NUM            PIC 99.
006580      02  CARD-25-DATA           OCCURS 16 TIMES.
006590          03  AGE-GROUP-25           PIC X(36).
006600      02  CARD-26-NUM            PIC 9.
006610      02  CARD-26-DATA             OCCURS 1 TIMES.
006620          03  DATE-26                  PIC X(6).
006630          03  DATA-26                  PIC X(21).
006640          03  SPECIES-26               OCCURS 4 TIMES.
006645              04  SPECIES-26-DATA      PIC S9(3) COMP-3.
006650      02  CARD-27-NUM            PIC 9.
006660      02  CARD-27-DATA             OCCURS 1 TIMES.
006670          03  ACCURACY-27              PIC X.
006680          03  SOURCE-27                PIC S9(4) COMP-3.
006690          03  DATE-27                  PIC X(6).
006700          03  HOURS-27                 PIC S9(6) COMP-3.
006710          03  AVE-DAY-27               PIC S9(2)V9 COMP-3.
006720          03  WEIGHT-27                PIC S9(6) COMP-3.
006730          03  NUMBER-27                PIC S9(6) COMP-3.
006740      02  CARD-28-NUM            PIC 9.
006750      02  CARD-28-DATA             OCCURS 1 TIMES.
006760          03  DATA-28                  OCCURS 8 TIMES.
006770          04  SPECIES-28               PIC S9(3) COMP-3.
006780          04  CATCH-HR-28              PIC S9(3) COMP-3.
006790          04  WT-HR-28                 PIC S9V9(2) COMP-3.
006800      02  CARD-29-NUM            PIC 9.
006810      02  CARD-29-DATA             OCCURS 1 TIMES.
006820          03  SOURCE-29                PIC S9(5) COMP-3.
006830          03  DATE-29                  PIC X(6).
006840          03  HOURS-29                 PIC S9(6) COMP-3.
006850          03  ACTIVS-29                OCCURS 11 TIMES.
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006855              04  ACTIVS-29-DATA      PIC S9(4) COMP-3.
006860      02  CARD-30-NUM          PIC 9.
006870      02  CARD-30-DATA         OCCURS 2 TIMES.
006880          03  SOURCE-30            PIC S9(5) COMP-3.
006890          03  DATE-30              PIC X(6).
006900          03  RECS-30              PIC X(8).
006910      02  CARD-31-NUM          PIC 9.
006920      02  CARD-31-DATA         OCCURS 6 TIMES.
006930          03  DATA-31              OCCURS 2 TIMES.
006940          04  REC-31               PIC XX.
006950          04  SPECIES1-31          PIC S9(3) COMP-3.
006960          04  SPECIES2-31          PIC S9(3) COMP-3.
006970          04  BENEFIT-31           PIC S9(6) COMP-3.
006980          04  YEAR-COMPLETE        PIC XX.
006990          04  COST-31              PIC S9(6) COMP-3.
006995          03  YEAR-31              PIC XX.
007000      02  CARD-32-NUM          PIC 9.
007010      02  CARD-32-DATA         OCCURS 6 TIMES.
007020          03  DATA-32              OCCURS 2 TIMES.
007030          04  LOCATION-32          PIC S9(3) COMP-3.
007040          04  REC-32               PIC XX.
007050          04  BENEFIT-32           PIC S9(6) COMP-3.
007060          04  COST-32              PIC S9(5) COMP-3.
007070          04  REC2-32              PIC XX.
007080          04  BENEFIT2-32          PIC S9(6) COMP-3.
007090          04  COST2-32             PIC S9(5) COMP-3.
007100          03  YEAR-32              PIC XX.
007110      02  CARD-33-NUM          PIC 9.
007120      02  CARD-33-DATA         OCCURS 2 TIMES.
007125          03  CARD-33-INFO           PIC X(74).
007130      02  CARD-34-NUM          PIC 9.
007140      02  CARD-34-DATA         OCCURS 7 TIMES.
007150          03  SOURCE-34            PIC S9(5) COMP-3.
007160          03  DATE-34              PIC X(6).
007170      02  CARD-35-NUM          PIC 99.
007180      02  CARD-35-DATA         OCCURS 49 TIMES.
007190          03  LOCATION-35          PIC S9(3) COMP-3.
007200          03  NAME-35              PIC X(15).
007210          03  FACILITIES-35        PIC X(25).
007220          03  WATERFRONT-35        PIC S9(6) COMP-3.
007230          03  AREA-35              PIC S9(4) COMP-3.
007240          03  MAINTENANCE-35       PIC S9(6) COMP-3.
007250          03  FACIL-35             PIC S9(6) COMP-3.
007260          03  INVEST-35            PIC S9(6) COMP-3.
007270          03  YEAR-35              PIC XX.
007280 PROCEDURE DIVISION.
007290 SORT-DATA SECTION.
007300      SORT SORT-FILE
007310          ASCENDING KEY SORT-LAKE-CODE
007320          ASCENDING KEY SORT-CARD-CODE
007330          INPUT PROCEDURE SORT-PREP
007340          GIVING TEMP-FILE.
007350 BUILD-RECORD.
007360      OPEN INPUT TEMP-FILE OUTPUT TAPEOUT-FILE.
007365      MOVE SPACES TO TAPEOUT-REC.
007370      READ TEMP-FILE.
007380      MOVE TEMP-LAKE-CODE TO OLD-LAKE-CODE.
007390      GO TO BRANCH.
007400 READ-TAPE.
007410      READ TEMP-FILE AT END GO TO NO-MORE-DATA.
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007420      IF TEMP-LAKE-CODE IS NCT EQUAL TO OLD-LAKE-CODE PERFORM
007430      WRITE-LAKE-RECORD.
007435 BRANCH.
007440      GO TO CARD-1, CARD-2, CARD-3, CARD-4, CARD-5, CARD-6, CARD-7,
007450      CARD-8, CARD-9, CARD-1C, CARD-11, CARD-12, CARD-13, CARD-14,
007460      CARD-15, CARD-16, CARD-17, CARD-18, CARD-19, CARD-20, CARD-21,
007470      CARD-22, CARD-23, CARD-24, CARD-25, CARD-26, CARD-27, CARD-28,
007480      CARD-29, CARD-30, CARD-31, CARD-32, CARD-33, CARD-34, CARD-35
007490      DEPENDING ON TEMP-CARD-CODE.
007500      DISPLAY 'BAD RECORD--LAKE CODE ', TEMP-LAKE-CODE,
007510      ', CARD CODE ', TEMP-CARD-CODE  .
007520      GO TO READ-TAPE.
007530 CARD-1.
007540      IF CARD-1-NUM IS NOT NUMERIC COMPUTE CARD-1-NUM = 0.
007550      IF CARD-1-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
007560      GO TO READ-TAPE.
007580      COMPUTE CARD-1-NUM = CARD-1-NUM + 1.
007590      MOVE CORRESPONDING CARD-1-INPUT TO CARD-1-DATA(CARD-1-NUM).
007600      GO TO READ-TAPE.
007610 CARD-2.
007620      IF CARD-2-NUM IS NCT NUMERIC COMPUTE CARD-2-NUM = 0.
007630      IF CARD-2-NUM IS GREATER THAN 1 PERFORM CARD-ERROR
007640      GO TO READ-TAPE.
007660      COMPUTE CARD-2-NUM = CARD-2-NUM + 1.
007670      MOVE CORRESPONDING CARD-2-INPUT TO CARD-2-DATA(CARD-2-NUM).
007680      GO TO READ-TAPE.
007690 CARD-3.
007700      IF CARD-3-NUM IS NCT NUMERIC COMPUTE CARD-3-NUM = 0.
007710      IF CARD-3-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
007720      GO TO READ-TAPE.
007730      COMPUTE CARD-3-NUM = CARD-3-NUM + 1.
007740      PERFORM MOVE-CARD-3.
007750      GO TO READ-TAPE.
007760 CARD-4.
007770      IF CARD-4-NUM IS NOT NUMERIC COMPUTE CARD-4-NUM = 0.
007780      IF CARD-4-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
007790      GO TO READ-TAPE.
007800      COMPUTE CARD-4-NUM = CARD-4-NUM + 1.
007810      MOVE CORRESPONDING CARD-4-INPUT TO CARD-4-DATA(CARD-4-NUM).
007820      GO TO READ-TAPE.
007830 CARD-5.
007840      IF CARD-5-NUM IS NCT NUMERIC COMPUTE CARD-5-NUM = 0.
007850      IF CARD-5-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
007860      GO TO READ-TAPE.
007870      COMPUTE CARD-5-NUM = CARD-5-NUM + 1.
007880      MOVE CORRESPONDING CARD-5-INPUT TO CARD-5-DATA(CARD-5-NUM).
007890      GO TO READ-TAPE.
007900 CARD-6.
007910      IF CARD-6-NUM IS NCT NUMERIC COMPUTE CARD-6-NUM = 0.
007920      IF CARD-6-NUM IS GREATER THAN C PERFORM CARD-ERROR
007930      GO TO READ-TAPE.
007940      COMPUTE CARD-6-NUM = CARD-6-NUM + 1.
007950      PERFORM MOVE-CARD-6.
007960      GO TO READ-TAPE.
007970 CARD-7.
007980      IF CARD-7-NUM IS NOT NUMERIC COMPUTE CARD-7-NUM = 0.
007990      IF CARD-7-NUM IS GREATER THAN C PERFORM CARD-ERROR
008000      GO TO READ-TAPE.
008010      COMPUTE CARD-7-NUM = CARD-7-NUM + 1.
008020      MOVE CORRESPONDING CARD-7-INPUT TO CARD-7-DATA(CARD-7-NUM).
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008030      GO TO READ-TAPE.
008040 CARD-8.
008050      IF CARD-8-NUM IS NOT NUMERIC COMPUTE CARD-8-NUM = 0.
008060      IF CARD-8-NUM IS GREATER THAN 4 PERFORM CARD-ERROR
008070      GO TO READ-TAPE.
008080      COMPUTE CARD-8-NUM = CARD-8-NUM + 1.
008090      MOVE CORRESPONDING CARD-8-INPUT TO CARD-8-DATA(CARD-8-NUM)
008100      GO TO READ-TAPE.
008110 CARD-9.
008120      IF CARD-9-NUM IS NOT NUMERIC COMPUTE CARD-9-NUM = 0.
008130      IF CARD-9-NUM IS GREATER THAN 3 PERFORM CARD-ERROR
008140      GO TO READ-TAPE.
008150      COMPUTE CARD-9-NUM = CARD-9-NUM + 1.
008160      PERFORM MOVE-CARD-9.
008170      GO TO READ-TAPE.
008180 CARD-10.
008190      IF CARD-10-NUM IS NOT NUMERIC COMPUTE CARD-10-NUM = 0.
008200      IF CARD-10-NUM IS GREATER THAN 3 PERFORM CARD-ERROR
008210      GO TO READ-TAPE.
008220      COMPUTE CARD-10-NUM = CARD-10-NUM + 1.
008230      PERFORM MOVE-CARD-10.
008240      GO TO READ-TAPE.
008250 CARD-11.
008260      IF CARD-11-NUM IS NOT NUMERIC COMPUTE CARD-11-NUM = 0.
008270      IF CARD-11-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
008280      GO TO READ-TAPE.
008290      COMPUTE CARD-11-NUM = CARD-11-NUM + 1.
008300      PERFORM MOVE-CARD-11.
008310      GO TO READ-TAPE.
008320 CARD-12.
008330      IF CARD-12-NUM IS NOT NUMERIC COMPUTE CARD-12-NUM = 0.
008340      IF CARD-12-NUM IS GREATER THAN 3 PERFORM CARD-ERROR
008350      GO TO READ-TAPE.
008360      COMPUTE CARD-12-NUM = CARD-12-NUM + 1.
008370      PERFORM MOVE-CARD-12.
008380      GO TO READ-TAPE.
008390 CARD-13.
008400      IF CARD-13-NUM IS NOT NUMERIC COMPUTE CARD-13-NUM = 0.
008410      IF CARD-13-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
008420      GO TO READ-TAPE.
008430      COMPUTE CARD-13-NUM = CARD-13-NUM + 1.
008440      PERFORM MOVE-CARD-13.
008450      GO TO READ-TAPE.

008460 CARD-14.
008470      IF CARD-14-NUM IS NOT NUMERIC COMPUTE CARD-14-NUM = 0.
008480      IF CARD-14-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
008490      GO TO READ-TAPE.
008500      COMPUTE CARD-14-NUM = CARD-14-NUM + 1.
008510       PERFORM MOVE-CARD-14.
008520      GO TO READ-TAPE.
008530 CARD-15.
008540      IF CARD-15-NUM IS NOT NUMERIC COMPUTE CARD-15-NUM = 0.
008550      IF CARD-15-NUM IS GREATER THAN 1 PERFORM CARD-ERROR
008560      GO TO READ-TAPE.
008570      COMPUTE CARD-15-NUM = CARD-15-NUM + 1.
008580       PERFORM MOVE-CARD-15.
008590      GO TO READ-TAPE.
008600 CARD-16.
008610      IF CARD-16-NUM IS NOT NUMERIC COMPUTE CARD-16-NUM = 0.
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008620      IF CARD-16-NUM IS GREATER THAN 1 PERFORM CARD-ERROR
008630      GO TO READ-TAPE.
008640      COMPUTE CARD-16-NUM = CARD-16-NUM + 1.
008650       PERFORM MOVE-CARD-16.
008660      GO TO READ-TAPE.
008670 CARD-17.
008680      IF CARD-17-NUM IS NOT NUMERIC COMPUTE CARD-17-NUM = 0.
008690      IF CARD-17-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
008700      GO TO READ-TAPE.
008710      COMPUTE CARD-17-NUM = CARD-17-NUM + 1.
008720      MOVE CORRESPONDING CARD-17-INPUT TO CARD-17-DATA(CARD-17-NUM).
008730      GO TO READ-TAPE.
008740 CARD-18.
008750      IF CARD-18-NUM IS NOT NUMERIC COMPUTE CARD-18-NUM = 0.
008760      IF CARD-18-NUM IS GREATER THAN 6 PERFORM CARD-ERROR
008770      GO TO READ-TAPE.
008780      COMPUTE CARD-18-NUM = CARD-18-NUM + 1.
008790      PERFORM MOVE-CARD-18.
008800      GO TO READ-TAPE.
008810 CARD-19.
008820      IF CARD-19-NUM IS NOT NUMERIC COMPUTE CARD-19-NUM = 0.
008830      IF CARD-19-NUM IS GREATER THAN 3 PERFORM CARD-ERROR
008840      GO TO READ-TAPE.
008850      COMPUTE CARD-19-NUM = CARD-19-NUM + 1.
008860      MOVE CORRESPONDING CARD-19-INPUT TO CARD-19-DATA(CARD-19-NUM).
008870      GO TO READ-TAPE.
008880 CARD-20.
008890      IF CARD-20-NUM IS NOT NUMERIC COMPUTE CARD-20-NUM = 0.
008900      IF CARD-20-NUM IS GREATER THAN 39 PERFORM CARD-ERROR
008910      GO TO READ-TAPE.
008920      COMPUTE CARD-20-NUM = CARD-20-NUM + 1.
008930      MOVE CORRESPONDING CARD-20-INPUT TO CARD-20-DATA(CARD-20-NUM).
008940      GO TO READ-TAPE.
008950 CARD-21.
008960      IF CARD-21-NUM IS NOT NUMERIC COMPUTE CARD-21-NUM = 0.
008970      IF CARD-21-NUM IS GREATER THAN 1 PERFORM CARD-ERROR
008980      GO TO READ-TAPE.
008990      COMPUTE CARD-21-NUM = CARD-21-NUM + 1.
009000      MOVE CORRESPONDING CARD-21-INPUT TO CARD-21-DATA(CARD-21-NUM).
009010      GO TO READ-TAPE.
009020 CARD-22.
009030      IF CARD-22-NUM IS NOT NUMERIC COMPUTE CARD-22-NUM = 0.
009040      IF CARD-22-NUM IS GREATER THAN 9 PERFORM CARD-ERROR
009050      GO TO READ-TAPE.
009060      COMPUTE CARD-22-NUM = CARD-22-NUM + 1.
009070      MOVE CORRESPONDING CARD-22-INPUT TO CARD-22-DATA(CARD-22-NUM).
009080      GO TO READ-TAPE.
009090 CARD-23.
009100      IF CARD-23-NUM IS NOT NUMERIC COMPUTE CARD-23-NUM = 0.
009110      IF CARD-23-NUM IS GREATER THAN 1 PERFORM CARD-ERROR
009120      GO TO READ-TAPE.
009130      COMPUTE CARD-23-NUM = CARD-23-NUM + 1.
009140      MOVE CORRESPONDING CARD-23-INPUT TO CARD-23-DATA(CARD-23-NUM).
009150      GO TO READ-TAPE.
009160 CARD-24.
009170      IF CARD-24-NUM IS NOT NUMERIC COMPUTE CARD-24-NUM = 0.
009180      IF CARD-24-NUM IS GREATER THAN 15 PERFORM CARD-ERROR
009190      GO TO READ-TAPE.
009200      COMPUTE CARD-24-NUM = CARD-24-NUM + 1.
009210       PERFORM MOVE-CARD-24.
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009220      GO TO READ-TAPE.
009230 CARD-25.
009240      IF CARD-25-NUM IS NOT NUMERIC COMPUTE CARD-25-NUM = 0.
009250      IF CARD-25-NUM IS GREATER THAN 15 PERFORM CARD-ERROR
009260      GO TO READ-TAPE.
009270      COMPUTE CARD-25-NUM = CARD-25-NUM + 1.
009280      MOVE CORRESPONDING CARD-25-INPUT TO CARD-25-DATA(CARD-25-NUM).
009290      GO TO READ-TAPE.
009300 CARD-26.
009310      IF CARD-26-NUM IS NOT NUMERIC COMPUTE CARD-26-NUM = 0.
009320      IF CARD-26-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
009330      GO TO READ-TAPE.
009340      COMPUTE CARD-26-NUM = CARD-26-NUM + 1.
009350       PERFORM MOVE-CARD-26.
009360      GO TO READ-TAPE.
009370 CARD-27.
009380      IF CARD-27-NUM IS NOT NUMERIC COMPUTE CARD-27-NUM = 0.
009390      IF CARD-27-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
009400      GO TO READ-TAPE.
009410      COMPUTE CARD-27-NUM = CARD-27-NUM + 1.
009420      MOVE CORRESPONDING CARD-27-INPUT TO CARD-27-DATA(CARD-27-NUM).
009430      GO TO READ-TAPE.
009440 CARD-28.
009450      IF CARD-28-NUM IS NOT NUMERIC COMPUTE CARD-28-NUM = 0.
009460      IF CARD-28-NUM IS GREATER THAN 7 PERFORM CARD-ERROR
009470      GO TO READ-TAPE.
009480      COMPUTE CARD-28-NUM = CARD-28-NUM + 1.
009490       PERFORM MOVE-CARD-28.
009500      GO TO READ-TAPE.
009510 CARD-29.
009520      IF CARD-29-NUM IS NOT NUMERIC COMPUTE CARD-29-NUM = 0.
009530      IF CARD-29-NUM IS GREATER THAN 0 PERFORM CARD-ERROR
009540      GO TO READ-TAPE.
009550      COMPUTE CARD-29-NUM = CARD-29-NUM + 1.
009560       PERFORM MOVE-CARD-29.
009570      GO TO READ-TAPE.
009580 CARD-30.
009590      IF CARD-30-NUM IS NOT NUMERIC COMPUTE CARD-30-NUM = 0.
009600      IF CARD-30-NUM IS GREATER THAN 1 PERFORM CARD-ERROR
009610      GO TO READ-TAPE.
009620      COMPUTE CARD-30-NUM = CARD-30-NUM + 1.
009630      MOVE CORRESPONDING CARD-30-INPUT TO CARD-30-DATA(CARD-30-NUM).
009640      GO TO READ-TAPE.
009650 CARD-31.
009660      IF CARD-31-NUM IS NOT NUMERIC COMPUTE CARD-31-NUM = 0.
009670      IF CARD-31-NUM IS GREATER THAN 5 PERFORM CARD-ERROR
009680      GO TO READ-TAPE.
009690      COMPUTE CARD-31-NUM = CARD-31-NUM + 1.
009700       PERFORM MOVE-CARD-31.
009710      GO TO READ-TAPE.
009720 CARD-32.
009730      IF CARD-32-NUM IS NOT NUMERIC COMPUTE CARD-32-NUM = 0.
009740      IF CARD-32-NUM IS GREATER THAN 5 PERFORM CARD-ERROR
009750      GO TO READ-TAPE.
009760      COMPUTE CARD-32-NUM = CARD-32-NUM + 1.
009770      PERFORM MOVE-CARD-32.
009780      GO TO READ-TAPE.
009790 CARD-33.
009800      IF CARD-33-NUM IS NOT NUMERIC COMPUTE CARD-33-NUM = 0.
009810      IF CARD-33-NUM IS GREATER THAN 1 PERFORM CARD-ERROR
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009820      GO TO READ-TAPE.
009830      COMPUTE CARD-33-NUM = CARD-33-NUM + 1.
009840      MOVE CORRESPONDING CARD-33-INPUT TO CARD-33-DATA(CARD-33-NUM).
009850      GO TO READ-TAPE.
009860 CARD-34.
009870      IF CARD-34-NUM IS NOT NUMERIC COMPUTE CARD-34-NUM = 0.
009880      IF CARD-34-NUM IS GREATER THAN 6 PERFORM CARD-ERROR
009890      GO TO READ-TAPE.
009900      COMPUTE CARD-34-NUM = CARD-34-NUM + 1.
009910      MOVE CORRESPONDING CARD-34-INPUT TO CARD-34-DATA(CARD-34-NUM).
009920      GO TO READ-TAPE.
009930 CARD-35.
009940      IF CARD-35-NUM IS NOT NUMERIC COMPUTE CARD-35-NUM = 0.
009950      IF CARD-35-NUM IS GREATER THAN 48 PERFORM CARD-ERROR
009960      GO TO READ-TAPE.
009970      COMPUTE CARD-35-NUM = CARD-35-NUM + 1.
009980      MOVE CORRESPONDING CARD-35-INPUT TO CARD-35-DATA(CARD-35-NUM).
009990      GO TO READ-TAPE.
010000 CARD-ERROR.
010010      DISPLAY 'TOO MANY RECORDS--LAKE CODE ', TEMP-LAKE-CODE,
010020      ', CARD CODE ', TEMP-CARD-CODE.
010030 WRITE-LAKE-RECORD.
010040      WRITE TAPEOUT-RECORD FROM TAPEOUT-REC.
010050      MOVE SPACES TO TAPEOUT-REC.
010055      MOVE TEMP-LAKE-CODE TO OLD-LAKE-CODE.
010060 SORT-PREP SECTION.
010070 READ-SORT.
010080      OPEN INPUT TAPEIN-FILE.
010090 READ-NEXT-CARD.
010100      READ TAPEIN-FILE AT END GO TO READ-SORT-END.
010110      IF CARD-CODE-IN = SPACES OR LAKE-CODE-IN = SPACES
010120      DISPLAY CARD-CODE-IN, CARD-INFO-IN, LAKE-CODE-IN
010130      ELSE MOVE TAPEIN-REC TO SORT-REC RELEASE SORT-REC.
010135      DISPLAY SORT-LAKE-CODE, SORT-CARD-CODE.
010140      GO TO READ-NEXT-CARD.
010150 READ-SORT-END.
010160      CLOSE TAPEIN-FILE.
010165 READ-SORT-EXIT.
010170      EXIT.
010099 MOVE-CARD SECTION.
010100 MOVE-CARD-3.
010110      MOVE SOURCE-3 OF CARD-3-INPUT TO SOURCE-3 OF CARD-3-DATA
010120      (CARD-3-NUM).
010130      PERFORM MOVE-RIVER-3 VARYING ISUB FROM 1 BY 1 UNTIL
010140      ISUB IS GREATER THAN 2.
010150      MOVE DATE-3 OF CARD-3-INPUT TO DATE-3 OF CARD-3-DATA
010160      (CARD-3-NUM).
010170      MOVE DATA-3 OF CARD-3-INPUT TO DATA-3 OF CARD-3-DATA
010180      (CARD-3-NUM).
010190      PERFORM MOVE-SPECIES-3 VARYING ISUB FROM 1 BY 1 UNTIL
010200      ISUB IS GREATER THAN 4.
010210      PERFORM MOVE-DRAINAGE-3 VARYING ISUB FROM 1 BY 1 UNTIL
010220      ISUB IS GREATER THAN 3.
010230      MOVE MAP-DATE-3 OF CARD-3-INPUT TO MAP-DATE-3 OF
010240      CARD-3-DATA(CARD-3-NUM).
010250      PERFORM MOVE-POPULATE-3 VARYING ISUB FROM 1 BY 1 UNTIL
010260      ISUB IS GREATER THAN 3.
010270 MOVE-RIVER-3.
010280      MOVE RIVER-3-DATA OF CARD-3-INPUT(ISUB) TO RIVER-3-DATA
010290      OF TAPEOUT-REC(CARD-3-NUM, ISUB).
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010300 MOVE-SPECIES-3.
010310     MOVE SPECIES-3-DATA OF CARD-3-INPUT(ISUB) TO
010320     SPECIES-3-DATA OF TAPEOUT-REC(CARD-3-NUM, ISUB).
010330 MOVE-DRAINAGE-3.
010340     MOVE DRAINAGE-3-DATA OF CARD-3-INPUT(ISUB) TO
010350     DRAINAGE-3-DATA OF TAPEOUT-REC(CARD-3-NUM, ISUB).
010360 MOVE-POPULATE-3.
010370     MOVE POPULATE-3-DATA OF CARD-3-INPUT(ISUB) TO
010380     POPULATE-3-DATA OF TAPEOUT-REC(CARD-3-NUM, ISUB).
010390 MOVE-CARD-6.
010400     MOVE BOTTOM-STRATA OF CARD-6-INPUT TO BOTTOM-STRATA OF
010410     CARD-6-DATA(CARD-6-NUM).
010420     PERFORM MOVE-FISHING-WATER-6 VARYING ISUB FROM 1 BY 1
010430     UNTIL ISUB IS GREATER THAN 3.
010440 MOVE-FISHING-WATER-6.
010450     MOVE FISHING-WATER1-DATA OF CARD-6-INPUT(ISUB) TO
010460     FISHING-WATER1-DATA OF TAPEOUT-REC(CARD-6-NUM, ISUB).
010470     MOVE FISHING-WATER2-DATA OF CARD-6-INPUT(ISUB) TO
010480     FISHING-WATER2-DATA OF TAPEOUT-REC(CARD-6-NUM, ISUB).
010490 MOVE-CARD-9.
010500     MOVE SOURCE-9 OF CARD-9-INPUT TO SOURCE-9 OF
010510     CARD-9-DATA(CARD-9-NUM).
010520     MOVE DATE-9 OF CARD-9-INPUT TO DATE-9 OF CARD-9-DATA
010530     (CARD-9-NUM).
010540     MOVE LOCATION-9 OF CARD-9-INPUT TO LOCATION-9 OF
010550     CARD-9-DATA(CARD-9-NUM).
010560     MOVE SECCHI OF CARD-9-INPUT TO SECCHI OF CARD-9-DATA
010570     (CARD-9-NUM).
010580     MOVE COLOR OF CARD-9-INPUT TO COLOR OF CARD-9-DATA
010590     (CARD-9-NUM).
010600     PERFORM MOVE-TEMP-OXY-9 VARYING ISUB FROM 1 BY 1 UNTIL
010610     ISUB IS GREATER THAN 5.
010620 MOVE-TEMP-OXY-9.
010630     MOVE DEPTH-9 OF CARD-9-INPUT(ISUB) TO DEPTH-9
010640     OF TAPEOUT-REC(CARD-9-NUM, ISUB).
010630     MOVE TEMP OF CARD-9-INPUT(ISUB) TO TEMP
010640     OF TAPEOUT-REC(CARD-9-NUM, ISUB).
010630     MOVE DISS-OXY OF CARD-9-INPUT(ISUB) TO DISS-OXY
010640     OF TAPEOUT-REC(CARD-9-NUM, ISUB).
010690 MOVE-CARD-10.
010700     MOVE THERMO-LOW OF CARD-10-INPUT TO THERMO-LOW OF
010710     CARD-10-DATA(CARD-10-NUM).
010720     MOVE THERMO-HIGH OF CARD-10-INPUT TO THERMO-HIGH OF
010730     CARD-10-DATA(CARD-10-NUM).
010740     PERFORM MOVE-CARD-10-ALKALINITY VARYING ISUB FROM 1 BY 1
010750     UNTIL ISUB IS GREATER THAN 3.
010760     MOVE PH-10 OF CARD-10-INPUT TO PH-10 OF CARD-10-DATA
010770     (CARD-10-NUM).
010780     MOVE CO2 OF CARD-10-INPUT TO CO2 OF CARD-10-DATA
010790     (CARD-10-NUM).
010800     MOVE HARDNESS OF CARD-10-INPUT TO HARDNESS OF
010810     CARD-10-DATA(CARD-10-NUM).
010820     MOVE CONDUCTIVITY OF CARD-10-INPUT TO CONDUCTIVITY OF
010830     CARD-10-DATA(CARD-10-NUM).
010840     PERFORM MOVE-SPC-CARD-10 VARYING ISUB FROM 1 BY 1 UNTIL
010850     ISUB IS GREATER THAN 2.
010860     MOVE CHLORIDE-ION OF CARD-10-INPUT TO CHLORIDE-ION OF
010870     CARD-10-DATA(CARD-10-NUM).
010880     PERFORM MOVE-NITROGEN-10 VARYING ISUB FROM 1 BY 1 UNTIL
010890     ISUB IS GREATER THAN 4.
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010900      MOVE DATE-10 OF CARD-10-INPUT TO DATE-10 OF CARD-10-DATA
010910      (CARD-10-NUM).
010920 MOVE-CARD-10-ALKALINITY.
010930      MOVE ALKALINITY-DATA OF CARD-10-INPUT(ISUB) TO
010940      ALKALINITY-DATA OF TAPEOUT-REC(CARD-10-NUM, ISUB).
010950 MOVE-SPC-CARD-10.
010960      MOVE SOLIDS-DATA OF CARD-10-INPUT(ISUB) TO
010970      SOLIDS-DATA OF TAPEOUT-REC(CARD-10-NUM, ISUB).
010980      MOVE PHOS-DATA OF CARD-10-INPUT(ISUB) TO PHOS-DATA OF
010990      TAPEOUT-REC(CARD-10-NUM, ISUB).
011000      MOVE CHLOROPHYLL-DATA OF CARD-10-INPUT(ISUB) TO
011010      CHLOROPHYLL-DATA OF TAPEOUT-REC(CARD-10-NUM, ISUB).
011020 MOVE-NITROGEN-10.
011030      MOVE NITROGEN-DATA OF CARD-10-INPUT(ISUB) TO
011040      NITROGEN-DATA OF TAPEOUT-REC(CARD-10-NUM, ISUB).
011050 MOVE-CARD-11.
011060      MOVE SOURCE-11 OF CARD-11-INPUT TO SOURCE-11 OF
011070      CARD-11-DATA(CARD-11-NUM).
011080      PERFORM MOVE-RIVER-11 VARYING ISUB FROM 1 BY 1 UNTIL ISUB
011090      IS GREATER THAN 2.
011100      MOVE DATE-11 OF CARD-11-INPUT TO DATE-11 OF CARD-11-DATA
011110      (CARD-11-NUM).
011120      MOVE COVERAGE-1 OF CARD-11-INPUT TO COVERAGE-1 OF
011130      CARD-11-DATA(CARD-11-NUM).
011140      PERFORM MOVE-STAND-SUBMERG-11 VARYING ISUB FROM 1 BY 1
011150      UNTIL ISUB IS GREATER THAN 5.
011160      MOVE COVERAGE-2 OF CARD-11-INPUT TO COVERAGE-2 OF
011170      CARD-11-DATA(CARD-11-NUM).
011180      MOVE GROWTH-11 OF CARD-11-INPUT TO GROWTH-11 OF
011190      CARD-11-DATA(CARD-11-NUM).
011200      MOVE OTHER-LIFE OF CARD-11-INPUT TO OTHER-LIFE OF
011210      CARD-11-DATA(CARD-11-NUM).
011220 MOVE-RIVER-11.
011230      MOVE RIVER-11-DATA OF CARD-11-INPUT(ISUB) TO
011240      RIVER-11-DATA OF TAPEOUT-REC(CARD-11-NUM, ISUB).
011250 MOVE-STAND-SUBMERG-11.
011260      MOVE SPECIES1-11 OF CARD-11-INPUT(ISUB) TO SPECIES1-11
011270      OF TAPEOUT-REC(CARD-11-NUM, ISUB).
011280      MOVE ABUND1-11 OF CARD-11-INPUT(ISUB) TO ABUND1-11
011290      OF TAPEOUT-REC(CARD-11-NUM, ISUB).
011280      MOVE SPECIES2-11 OF CARD-11-INPUT(ISUB) TO
011290      SPECIES2-11 OF TAPEOUT-REC(CARD-11-NUM, ISUB).
011291      MOVE ABUND2-11 OF CARD-11-INPUT(ISUB) TO
011292      ABUND2-11 OF TAPEOUT-REC(CARD-11-NUM, ISUB).
011300 MOVE-CARD-12.
011310      PERFORM MOVE-SPECIES-12 VARYING ISUB FROM 1 BY 1 UNTIL
011320      ISUB IS GREATER THAN 18.
011330 MOVE-SPECIES-12.
011380      MOVE SPECIES1-12 OF CARD-12-INPUT(ISUB) TO SPECIES1-12
011390      OF TAPEOUT-REC(CARD-12-NUM, ISUB).
011391      MOVE ABUND1-12 OF CARD-12-INPUT(ISUB) TO ABUND1-12
011392      OF TAPEOUT-REC(CARD-12-NUM, ISUB).
011420 MOVE-CARD-13.
011430      PERFORM MOVE-SPECIES-13 VARYING ISUB FROM 1 BY 1 UNTIL
011440      ISUB IS GREATER THAN 5.
011450 MOVE-SPECIES-13.
011460      MOVE SPECIES-13 OF CARD-13-INPUT(ISUB) TO
011470      SPECIES-13 OF TAPEOUT-REC(CARD-13-NUM, ISUB).
011480      MOVE EVALUATION OF CARD-13-INPUT(ISUB) TO
011490      EVALUATION OF TAPEOUT-REC(CARD-13-NUM, ISUB).
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011491      PERFORM MOVE-LOCATION-13 VARYING JSUB FROM 1 BY 1 UNTIL
011492      JSUB IS GREATER THAN 3.
011493 MOVE-LOCATION-13.
011500      MOVE LOCATION-13 OF CARD-13-INPUT(ISUB, JSUB) TO
011510      LOCATION-13 OF TAPEOUT-REC(CARD-13-NUM, ISUB, JSUB).
011520 MOVE-CARD-14.
011530      MOVE DATE-14 OF CARD-14-INPUT TO DATE-14 OF CARD-14-DATA
011540      (CARD-14-NUM).
011550      PERFORM MOVE-STOCKING-14 VARYING ISUB FROM 1 BY 1 UNTIL
011560      ISUB IS GREATER THAN 4.
011570 MOVE-STOCKING-14.
011573      MOVE SOURCE-14 OF CARD-14-INPUT TO SOURCE-14 OF
011574      CARD-14-DATA(CARD-14-NUM).
011580      MOVE SPECIES-14 OF CARD-14-INPUT(ISUB) TO
011590      SPECIES-14 OF TAPEOUT-REC(CARD-14-NUM, ISUB).
011591      MOVE NUMBER-14 OF CARD-14-INPUT(ISUB) TO
011592      NUMBER-14 OF TAPEOUT-REC(CARD-14-NUM, ISUB).
011593      MOVE SIZE-14 OF CARD-14-INPUT(ISUB) TO
011594      SIZE-14 OF TAPEOUT-REC(CARD-14-NUM, ISUB).
011640 MOVE-CARD-15.
011650      MOVE METHOD OF CARD-15-INPUT TO METHOD OF CARD-15-DATA
011660      (CARD-15-NUM).
011670      MOVE HAULS OF CARD-15-INPUT TO HAULS OF CARD-15-DATA
011680      (CARD-15-NUM).
011690      PERFORM MOVE-COMMERCIAL-15 VARYING ISUB FROM 1 BY 1 UNTIL
011700      ISUB IS GREATER THAN 6.
011710 MOVE-COMMERCIAL-15.
011720      MOVE SPECIES-15 OF CARD-15-INPUT(ISUB) TO
011730      SPECIES-15 OF TAPECUT-REC(CARD-15-NUM, ISUB).
011731      MOVE WEIGHT-15 OF CARD-15-INPUT(ISUB) TO
011732      WEIGHT-15 OF TAPECUT-REC(CARD-15-NUM, ISUB).
011733      MOVE YEAR-15 OF CARD-15-INPUT TO
011734      YEAR-15 OF TAPEOUT-REC(CARD-15-NUM).
011780 MOVE-CARD-16.
011790      PERFORM MOVE-COMM-16 VARYING ISUB FROM 1 BY 1 UNTIL ISUB
011800      IS GREATER THAN 2.
011850      PERFORM MOVE-GAME1-16 VARYING ISUB FROM 1 BY 1 UNTIL ISUB
011860      IS GREATER THAN 5.
011870      PERFORM MOVE-GAME2-16 VARYING ISUB FROM 1 BY 1 UNTIL ISUB
011880      IS GREATER THAN 2.
011890      MOVE YEAR-16 OF CARD-16-INPUT TO YEAR-16 OF CARD-16-DATA
011900      (CARD-16-NUM).
011902 MOVE-COMM-16.
011904      MOVE SPECIES1-16 OF CARD-16-INPUT(ISUB) TO
011906      SPECIES1-16 OF TAPECUT-REC(CARD-16-NUM, ISUB).
011907      MOVE WEIGHT1-16 OF CARD-16-INPUT(ISUB) TO
011908      WEIGHT1-16 OF TAPECUT-REC(CARD-16-NUM, ISUB).
011910 MOVE-GAME1-16.
011920      MOVE SPECIES2-16 OF CARD-16-INPUT(ISUB) TO
011930      SPECIES2-16 OF TAPEOUT-REC(CARD-16-NUM, ISUB).
011940      MOVE NUMBER2-16 OF CARD-16-INPUT(ISUB) TO
011950      NUMBER2-16 OF TAPEOUT-REC(CARD-16-NUM, ISUB).
011960 MOVE-GAME2-16.
011970      MOVE SPECIES3-16 OF CARD-16-INPUT(ISUB) TO
011980      SPECIES3-16 OF TAPECUT-REC(CARD-16-NUM, ISUB).
011990      MOVE NUMBER3-16 OF CARD-16-INPUT(ISUB) TO
012000      NUMBER3-16 OF TAPECUT-REC(CARD-16-NUM, ISUB).
012010 MOVE-CARD-18.
012020      PERFORM MOVE-DATA-18 VARYING ISUB FROM 1 BY 1 UNTIL ISUB
012030      IS GREATER THAN 6.
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012040 MOVE-DATA-18.
012050     MOVE SPECIES-18 OF CARD-18-INPUT(ISUB) TO
012060     SPECIES-18 OF TAPEOUT-REC(CARD-18-NUM, ISUB).
012070     MOVE NUMBER-18 OF CARD-18-INPUT(ISUB) TO
012080     NUMBER-18 OF TAPEOUT-REC(CARD-18-NUM, ISUB).
012090 MOVE-CARD-24.
012100     MOVE SPECIES-24 OF CARD-24-INPUT TO SPECIES-24 OF
012110     CARD-24-DATA(CARD-24-NUM).
012120     MOVE SIZE-24 OF CARD-24-INPUT TO SIZE-24 OF CARD-24-DATA
012130     (CARD-24-NUM).
012140     MOVE SAMPLE-24 OF CARD-24-INPUT TO SAMPLE-24 OF CARD-24-DATA
012150     (CARD-24-NUM).
012160     PERFORM MOVE-AGE-GROUP-24 VARYING ISUB FROM 1 BY 1 UNTIL
012170     ISUB IS GREATER THAN 9.
012180 MOVE-AGE-GROUP-24.
012190     MOVE AGE-GROUP-24-DATA OF CARD-24-INPUT(ISUB) TO
012200     AGE-GROUP-24-DATA OF TAPEOUT-REC(CARD-24-NUM, ISUB).
012210 MOVE-CARD-26.
012220     MOVE DATE-26 OF CARD-26-INPUT TO DATE-26 OF CARD-26-DATA
012230     (CARD-26-NUM).
012240     MOVE DATA-26 OF CARD-26-INPUT TO DATA-26 OF CARD-26-DATA
012250     (CARD-26-NUM).
012260     PERFORM MOVE-SPECIES-26 VARYING ISUB FROM 1 BY 1 UNTIL ISUB
012270     IS GREATER THAN 4.
012280 MOVE-SPECIES-26.
012290     MOVE SPECIES-26-DATA OF CARD-26-INPUT(ISUB) TO
012300     SPECIES-26-DATA OF TAPEOUT-REC(CARD-26-NUM, ISUB).
012310 MOVE-CARD-28.
012320     PERFORM MOVE-DATA-28 VARYING ISUB FROM 1 BY 1 UNTIL ISUB
012330     IS GREATER THAN 8.
012340 MOVE-DATA-28.
012350     MOVE SPECIES-28 OF CARD-28-INPUT(ISUB) TO
012360     SPECIES-28 OF TAPEOUT-REC(CARD-28-NUM, ISUB).
012370     MOVE CATCH-HR-28 OF CARD-28-INPUT(ISUB) TO
012380     CATCH-HR-28 OF TAPEOUT-REC(CARD-28-NUM, ISUB).
012390     MOVE WT-HR-28 OF CARD-28-INPUT(ISUB) TO
012400     WT-HR-28 OF TAPEOUT-REC(CARD-28-NUM, ISUB).
012410 MOVE-CARD-29.
012420     MOVE SOURCE-29 OF CARD-29-INPUT TO SOURCE-29 OF CARD-29-DATA
012430     (CARD-29-NUM).
012440     MOVE DATE-29 OF CARD-29-INPUT TO DATE-29 OF CARD-29-DATA
012450     (CARD-29-NUM).
012460     MOVE HOURS-29 OF CARD-29-INPUT TO HOURS-29 OF CARD-29-DATA
012470     (CARD-29-NUM).
012480     PERFORM MOVE-ACTIVS-29 VARYING ISUB FROM 1 BY 1 UNTIL ISUB
012490     IS GREATER THAN 11.
012500 MOVE-ACTIVS-29.
012510     MOVE ACTIVS-29-DATA OF CARD-29-INPUT(ISUB) TO
012520     ACTIVS-29-DATA OF TAPEOUT-REC(CARD-29-NUM, ISUB).
012530 MOVE-CARD-31.
012540     PERFORM MOVE-DATA-31 VARYING ISUB FROM 1 BY 1 UNTIL ISUB
012550     IS GREATER THAN 2.
012560 MOVE-DATA-31.
012570     MOVE REC-31 OF CARD-31-INPUT(ISUB) TO
012580     REC-31 OF TAPEOUT-REC(CARD-31-NUM, ISUB).
012590     MOVE SPECIES1-31 OF CARD-31-INPUT(ISUB) TO
012600     SPECIES1-31 OF TAPEOUT-REC(CARD-31-NUM, ISUB).
012610     MOVE SPECIES2-31 OF CARD-31-INPUT(ISUB) TO
012620     SPECIES2-31 OF TAPEOUT-REC(CARD-31-NUM, ISUB).
012630     MOVE BENEFIT-31 OF CARD-31-INPUT(ISUB) TO
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012640      BENEFIT-31 OF TAPEOUT-REC(CARD-31-NUM, ISUB).
012650      MOVE YEAR-COMPLETE OF CARD-31-INPUT(ISUB) TO
012660      YEAR-COMPLETE OF TAPEOUT-REC(CARD-31-NUM, ISUB).
012670      MOVE COST-31 OF CARD-31-INPUT(ISUB) TO
012680      COST-31 OF TAPEOUT-REC(CARD-31-NUM, ISUB).
012690 MOVE-CARD-32.
012700      PERFORM MOVE-DATA-32 VARYING ISUB FROM 1 BY 1 UNTIL ISUB
012710      IS GREATER THAN 2.
012720      MOVE YEAR-32 OF CARD-32-INPUT TO YEAR-32 OF CARD-32-DATA
012730      (CARD-32-NUM).
012740 MOVE-DATA-32.
012750      MOVE LOCATION-32 OF CARD-32-INPUT(ISUB) TO
012760      LOCATION-32 OF TAPEOUT-REC(CARD-32-NUM, ISUB).
012790      MOVE REC-32 OF CARD-32-INPUT(ISUB) TO
012800      REC-32 OF TAPEOUT-REC(CARD-32-NUM, ISUB).
012810      MOVE BENEFIT-32 OF CARD-32-INPUT(ISUB) TO
012820      BENEFIT-32 OF TAPEOUT-REC(CARD-32-NUM, ISUB).
012830      MOVE COST-32 OF CARD-32-INPUT(ISUB) TO
012840      COST-32 OF TAPEOUT-REC(CARD-32-NUM, ISUB).
012860      MOVE REC2-32 OF CARD-32-INPUT(ISUB) TO
012870      REC2-32 OF TAPEOUT-REC(CARD-32-NUM, ISUB).
012880      MOVE BENEFIT2-32 OF CARD-32-INPUT(ISUB) TO
012890      BENEFIT2-32 OF TAPEOUT-REC(CARD-32-NUM, ISUB).
012900      MOVE COST2-32 OF CARD-32-INPUT(ISUB) TO
012910      COST2-32 OF TAPEOUT-REC(CARD-32-NUM, ISUB).
012850 NO-MORE-DATA.
012860      CLOSE TEMP-FILE.
012870      STOP RUN.
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