DESK

41.1
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FINAL REPORT

RESEARCH PROJECT SEGMENT

FEDERAL AID PROJECT NO. F-37-R

OKLAHOMA

DEPARTMENT OF WILDLIFE CONSERVATION

FISH RESEARCH AND SURVEYS FOR OKLAHOMA LAKES AND RESERVOIRS

Job No. 2

STANDARDIZED CREEL SURVEY DEVELOPMENT

November 15, 1978

James B. Mense

FINAL REPORT

STATE: Oklahoma PROJECT NUMBER: F-37-R

PROJECT TITLE: Fish Research and Surveys for Oklahoma Lakes and Reservoirs

JOB TITLE: Standardized Creel Survey Development

PERIOD COVERED: July 1, 1977 to September 30, 1978

OBJECTIVE NUMBER: II JOB NUMBER: 2

ABSTRACT

This report contains a generalized creel survey computer program, with appropriate documentation, suitable to allow a trained computer programmer to schedule a creel survey and analyze the resulting data. The analysis program is a modification of the creel survey program used by the Texas Parks and Wildlife Department. Major modifications include 1) a reduction in length of the creel day to ten hours, 2) eliminating the winter sampling season, and 3) reducing the number of creel clerks needed by 50 percent. Also included is a scheduling program used for the random selection of daylight sampling periods. The latter program is written in Fortran IV, while the data analysis program is written in Statistical Analysis System (SAS, 76.5) language.

I. Objective:

To develop a standardized creel survey method for Oklahoma lakes and reservoirs.

II. Background:

Oklahoma has over 550,000 acres of public water. The Oklahoma Department of Wildlife Conservation (ODWC) has the responsibility of managing the fish populations of most of these waters. To continue this management in the face of increasing costs and an ever increasing surface water base,

efficient, repeatable and statistically reliable estimates of fish harvest, fishing pressure and angler success is needed.

Beginning in 1974, the ODWC entered the computer age with acquisition of an IBM 1400 computer system housed at the Oklahoma Fishery Research Laboratory (OFRL). By 1977, the OFRL had remote terminal access to the University of Oklahoma's IBM 370 system and the pathway to handling large volumes of data was opened. Development of a computerized creel survey method was one of our first goals.

III. Procedures:

After a preliminary review of the literature and contacts with other state conservation agencies, it was decided to modify the creel survey used by the Texas Parks and Wildlife Department.

The Texas survey actually consists of a scheduling program and a data analysis program. Three major modifications of the data analysis program were made as follows: 1) the creel day was reduced to ten hours, 2) the number of creel clerks required was reduced by 50 percent, and 3) data gathering was confined to spring, summer and fall seasons. The first two changes were made to reduce cost. Oklahoma's more severe winter climate along with seasonal data from previous creel surveys (Summers, 1978) dictated the latter modification.

Appropriate field data forms were next developed to provide necessary data for the creel program. These were developed to minimize the potential for error and to facilitate keypunching directly from the forms. Criteria for determining the analyses to be performed were taken from Lambou, 1966.

An initial attempt was made to test the creel survey on Thunderbird Reservoir, however unusually early and prolonged ice cover delayed any evaluation until mid-March, 1978. At that time it was decided to abandon

the test on Thunderbird, and combine the testing with an actual utilization of the creel survey under F-39-R. Results of the use of this creel survey will therefore be included in future reports on that project.

IV. Findings:

Copies of the creel survey analysis program and the program for random selection of sampling periods are included along with program documentation for both. Also included are copies of creel survey forms for use by creel clerks for making estimates of fishing pressure (ODWC, Creel Form 1) and gathering data from fisherman interviews (ODWC, Creel Form 2).

The program for random selection of sampling periods requires the following input from the user:

1. Number of days in each season during which the creel survey is to be conducted.
2. Number of sampling areas to be creeled.
3. Minimum time period required for each creel period.
4. Ratio of weekend days to weekdays sampled.
5. Longitude of body of water to be creeled.
6. A seed value for initiating the random number generator.

In return, this program will provide the user with the following:

1. Randomly selected creel days for each season, stratified by weekday and weekend days.
2. Randomly selected starting times for each creel day selected.
3. Randomly selected time period (over the minimum specified by the user) spent in each area to be creeled.
4. Randomly selected starting direction (i.e. clockwise or counterclockwise) for making each fishing pressure count.

The data analysis program, after entry of data as shown on creel forms 1 and 2, will provide the user with the following information:

1. Mean number and standard error for boat, bank and tube anglers, stratified by day-type, season, and sampling area.
2. Catch rates (both number and weight) and their standard errors, stratified by season, day-type, and fishing method.
3. Harvest (both number and weight), stratified by season, day-type and fishing method.
4. Fishing pressure, both numerically and expressed as a percentage of the total pressure, for a particular species.
5. Catch rate for anglers releasing fish.
6. Catch rate by species sought.
7. Mean number of anglers per party.
8. Length-frequency of catch in 20 mm length categories by species.
9. Mean lengths and weights of catch, stratified by season, day-type and fishing method.
10. Mean lengths and weights of the catch stratified by those seeking a particular species.

V. Analysis:

The objective of developing a standardized creel survey for Oklahoma lakes and reservoirs has been accomplished. Changes may be necessary after the initial trial presently being conducted under F-39-R is complete, but these changes are expected to be minor.

VI. Recommendations:

The standardized creel survey is presently being used on the following reservoirs in Oklahoma: Arbuckle, Steed, Kaw, Grand, Tenkiller, Texoma and Keystone. It is recommended that the standardized creel survey be used in the future wherever a creel survey is needed in Oklahoma.

VII. Prepared by: Dr. James B. Mense

VIII. Date: November 15, 1978

IX. Approved by: Harold E. Namminga

Dr. Harold E. Namminga - D-J Coordinator

LITERATURE CITED

Lambou, V. W. 1966. Recommended methods of reporting creel survey data for reservoirs. Bulletin No. 4 of the Okla. Fish. Res. Lab. 40 p.

Summers, G. L. 1978. Sportfishing statistics of Oklahoma Reservoirs. Bulletin No. 14 of the Okla. Fish. Res. Lab., Contribution No. 191. 113 p.

CREEL SURVEY

ANALYSIS PROGRAM

```
MACRO CR
PROC SORT; ZA;
PROC MEANS SUM NOPRINT; ZA; VAR NO; OUTPUT OUT=DR
SUM=NUMBER;
DATA D1;SET DR; N2=NUMBER*NUMBER/N;
H2=HOURS*HOURS/N; HN=NUMBER*HOURS/N;
PROC SORT;YA;
PROC MEANS SUM NOPRINT DATA=D1;VAR NUMBER;YA;OUTPUT OUT=DC SUM=NUMBER;
PROC MEANS SUM NOPRINT DATA=D1;VAR N HOURS N2 H2 HN;
YB;
OUTPUT OUT=D2  SUM=N HOURS N2 H2 HN;
DATA TEMP; SET D2;
DROP HOURS;
DATA D2;  MERGE  D2 DC;YB;
DATA D2;SET D2;PCR=NUMBER/HOURS;
IF N NE 1 THEN
VARIANCE=(N2+(PCR*PCR*H2)-(2*PCR*HN))/(H2*(N-1)/N);
SE_PCR=SQRT(OF VARIANCE);
DROP N2 H2 HN VARIANCE  ;
%
 MACRO QW
IF MO=1 THEN JUL=DAY;
IF MO=2 THEN JUL=31+DAY;
IF MO=3 THEN JUL=59+DAY;
IF MO=4 THEN JUL=90 + DAY;
IF MO=5 THEN JUL=120 + DAY;
IF MO=6 THEN JUL= 151 + DAY;
IF MO=7 THEN JUL= 181 + DAY;
IF MO=8 THEN JUL= 221 + DAY;
IF MO=9 THEN JUL= 243 + DAY;
IF MO=10 THEN JUL= 273 + DAY;
IF MO=11 THEN JUL= 304 + DAY;
IF MO=12 THEN JUL= 334 + DAY;
YEAR=1900 + YEAR; YR=YEAR/4; Y=CEIL (YR);
IF YR=Y AND MO GT 2 THEN JUL=JUL+1;
IF JUL GE 1 THEN
DAYLIGHT=602.351962+.611357*JUL +.015917*(JUL**2);
IF JUL GT 30 THEN
DAYLIGHT= 585.751837+1.542857*JUL +.002857*(JUL**2);
IF JUL GT 90 THEN
DAYLIGHT=492.942857+3.490714*JUL-.0075*(JUL**2);
IF JUL GT 140 THEN
DAYLIGHT=214.588025+7.393616*JUL-.021213*(JUL**2);
IF JUL GT 175 THEN
DAYLIGHT=459.5+4.842308*JUL-.014615*(JUL**2);
IF JUL GT 210 THEN
DAYLIGHT=994.685707+.049286*(JUL)-.003929*(JUL**2);
IF JUL GT 260 THEN
DAYLIGHT=1448.399994-3.365*JUL +.0025*(JUL**2);
IF JUL GT 310 THEN
DAYLIGHT=2934.371428-12.915714* JUL+.017857*(JUL**2);
IF JUL GT 349 THEN
DAYLIGHT=602;
DAYLIGHT=DAYLIGHT/60;
IF 3 LE MO LE 5 THEN SEASON='SPRING';
IF 6 LE MO LE 8 THEN SEASON='SUMMER';
IF 9 LE MO LE 11 THEN SEASON='AUTUMN';
JUL=JUL+YR*1000;
%
```

```
MACRO ZA BY  LAKE  SEASON DAYLIGHT DAYTYPE TYPE  SECTION N HOURS          00000600
 FINISHED SOUGHT RETURNED SERIAL SPECIES;%                                00000610
PROC FORMAT ; VALUE $LA                                                   00000620
ALBANY=ALBANY                                                             00000630
ALTUS='ALTUS LUGERT'                                                      00000640
AMHORS=AMERICAN HORSE                                                     00000650
ARBUCK=ARBUCKLE                                                           00000660
ARCADI=ARCADIA                                                            00000670
ATOKA=ATOKA                                                               00000680
BIRCH=BIRCH                                                               00000690
BLUEST=BLUESTEM                                                           00000700
BRBOW='BROKEN BOW'                                                        00000710
BROWN=BROWN                                                               00000720
BURTSC=BURTSCHI                                                           00000730
CANDY=CANDY                                                               00000740
CANTON=CANTON                                                             00000750
BLACK='CARL BLACKWELL'                                                    00000760
CHAMBE=CHAMBERS                                                           00000770
CHICKA='CHICKASHA CITY'                                                   00000780
CHOUTE=CHOUTEAU                                                           00000790
CLAYTO=CLAYTON                                                            00000800
CLEAR='CLEAR CREEK'                                                       00000810
COMANC=COMANCHE                                                           00000820
COPAN=COPAN                                                               00000830
DAHLGR=DAHLGREN                                                           00000840
DRAPER=DRAPER                                                             00000850
DRSPGS='DRIPPING SPRINGS'                                                 00000860
ELLSWO=ELLSWORTH                                                          00000870
ETLING=ETLING                                                             00000880
EUCHA=EUCHA                                                               00000890
EUFAULA=EUFAULA                                                           00000900
FAIRFA=FAIRFAX                                                            00000910
FTCOBB='FORT COBB'                                                        00000920
FTGIB='FORT GIBSON'                                                       00000930
FTSUPP='FORT SUPPLY'                                                      00000940
FOSS=FOSS                                                                 00000950
FRANCE=FRANCES                                                            00000960
FUQUA=FUQUA                                                               00000970
GEARY=GEARY                                                               00000980
GRAND=GRAND                                                               00000990
GRSALT='GREAT SALT PLAINS'                                                00001000
GREENL=GREENLEAF                                                          00001010
HALL=HALL                                                                 00001020
HEFNER=HEFNER                                                             00001030
HENRY=HENRYETTA                                                           00001040
HEYBUR=HEYBURN                                                            00001050
HOLDEN=HOLDENVILLE                                                        00001060
HUDSON=HUDSON                                                             00001070
HUGO=HUGO                                                                 00001080
HULAH=HULAH                                                               00001090
HUMPHR=HUMPHREYS                                                          00001100
JAPBEA='JAP BEAVER'                                                       00001110
KAW=KAW                                                                   00001120
KEYSTO=KEYSTONE                                                           00001130
KONAWA=KONAWA                                                             00001140
LAWTON=LAWTONKA                                                           00001150
MCALES=MCALESTER                                                          00001160
MCGEE=MCGEE CREEK                                                         00001170
MURRAY=MURRAY                                                             00001180
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```
NWAIYA='NANIH WAIYA'
GRAHAM='NEWT GRAHAM'
OKEMAH=OKEMAH
OKMULG=OKMULGEE
OOLOGA=OOLOGAH
OPTIMA=OPTIMA
OVERHO=OVERHOLSER
OZCOBB='OZZIE COBB'
PARKER=PARKER
PVALLY='PAULS VALLEY'
LPAYNE=PAYNE
PCREEK='PINE CREEK'
PONCA='PONCA CITY'
KERR='ROBERT S. KERR'
SAND=SAND
SHAWNE='SHAWNEE TWIN'
SHELLC='SHELL CREEK'
SHIDLE=SHIDLER
SKIATO=SKIATOCK
SOONER=SOONER
SPAVIN=SPAVINAW
TENKIL=TENKILLER
TEXOMA=TEXOMA
THBIRD=THUNDERBIRD
STEED='TOM STEED'
TUSKAH=TUSKAHOMA
VANDER=VANDERWORK
VINCEN=VINCENT
WATONG=WATONGA
WAURIK=WAURIKA
WAYWAL='WAYNE WALLACE'
WDMAYO='W.D. MAYO'
WFALLS='WEBBERS FALLS'
WISTER=WISTER;
PROC FORMAT; VALUE P
 .='NOT LENGTHED'
1='0-20' 2='21-40' 3='41-60' 4='61-80' 5='81-100'
6='101-120' 7='121-140'
 8='141-160' 9='161-180' 10='181-200'
11='201-220' 12='221-240'
13='241-260' 14='261-280' 15='281-300'
16='301-320' 17='321-340'
 18='341-360' 19='361-380' 20='381-400'
21='401-420' 22='421-440' 23='441-460' 24='461-480' 25='481-500'
26='501-520' 27='521-540' 28='541-560' 29='561-580' 30='581-600'
31='601-620' 32='621-640' 33='641-660' 34='661-680' 35='681-700'
36='701-720' 37='721-740' 38='741-760' 39='761-780' 40='781-800'
41='801-820' 42='821-840' 43='841-860' 44='861-880' 45='881-900'
46='901-920' 47='921-940' 48='941-960' 49='960-980' 50='981-1000'
51='1001-1020' 52='1021-1040' 53='1041-1060' 54='1061-1080'
55='1081-1100' 56='1101-1120' 57='1121-1140' 58='1141-1160'
59='1162-1180' 60='1181-1200' 61='1201-1220' 62='1221-1240'
63='1241-1260' 64='1261-1280' 65='1281-1300'
66='1301-1320'
67='1321-1340' 68='1341-1360' 69='1361-1380' 70='1381-1400'
;
PROC FORMAT;
VALUE KIND
.='OTHER SPECIES'
```

```
101='LARGEMOUTH BASS'                                  00001780
102='FLORIDA LARGEMOUTH BASS'                          00001790
103='FLORIDA X LARGEMOUTH BASS HYBRID'                 00001800
104='SPOTTED BASS'                                     00001810
105='SMALLMOUTH BASS'                                  00001820
106='WHITE CRAPPIE'                                    00001830
107='BLACK CRAPPIE'                                    00001840
 108=CRAPPIE(COMBINED)                                 00001850
109='WHITE BASS'                                       00001860
110='STRIPED BASS'                                     00001870
111='STRIPED BASS X WHITE BASS HYBRID'                 00001880
112=WALLEYE                                            00001890
113=SAUGER                                             00001900
114='CHANNEL CATFISH'                                  00001910
 115='BLUE CATFISH'                                    00001920
116='NORTHERN PIKE'                                    00001930
117='GRASS PICKEREL'                                   00001940
118='CHAIN PICKEREL'                                   00001950
119=MUSKELLUNGE                                        00001960
120='RAINBOW TROUT'                                    00001970
121='NORTHERN LARGEMOUTH BASS'                         00001980
122='ALBINO CATFISH'                                   00001990
125='PREDATORY GAME FISH'                              00002000
201=BLUEGILL                                           00002010
202='LONGEAR SUNFISH'                                  00002020
203='ORANGESPOTTED SUNFISH'                            00002030
  204=REDEAR                                           00002040
205='GREEN SUNFISH'                                    00002050
206='ROCK BASS'                                        00002060
207=WARMOUTH                                           00002070
208='REDBREAST SUNFISH'                                00002080
209='HYBRID SUNFISH'                                   00002090
210='SUNFISH SP.'                                      00002100
215='NON-PREDATORY GAME FISH'                          00002110
301=CARP                                               00002120
302='FRESHWATER DRUM'                                  00002130
303='SMALLMOUTH BUFFALO'                               00002140
304='BIGMOUTH BUFFALO'                                 00002150
305='BLACK BUFFALO'                                    00002160
306='RIVER CARPSUCKER'                                 00002170
307='HIGHFIN CARPSUCKER'                               00002180
308= 'YELLOW BULLHEAD'                                 00002190
309='BROWN BULLHEAD'                                   00002200
310='BLACK BULLHEAD'                                   00002210
311='WHITE SUCKER'                                     00002220
312='BLUE SUCKER'                                      00002230
313='CREEK CHUBSUCKER'                                 00002240
314='NORTHERN HOG SUCKER'                              00002250
315='SPOTTED SUCKER'                                   00002260
316='RIVER REDHORSE'                                   00002270
317='BLACK REDHORSE'                                   00002280
318='GOLDEN REDHORSE'                                  00002290
319='SHORTHEAD REDHORSE'                               00002300
320= PADDLEFISH                                        00002310
321='SHOVELNOSE STURGEON'                              00002320
322='TALIPIA SP.'                                      00002330
323='WHITE AMUR'                                       00002340
325='NON-PREDATORY FOODFISH'                           00002350
401='FLATHEAD CATFISH'                                 00002360
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402='LONGNOSE GAR'                                00002370
404='SPOTTED GAR'                                 00002380
403='SHORTNOSE GAR'                               00002390
405='ALLIGATOR GAR'                               00002400
406= BOWFIN                                       00002410
407='GAR SP.'                                     00002420
410='PREDATORY FOOD FISH'                         00002430
501='GIZZARD SHAD'                                00002440
502='THREADFIN SHAD'                              00002450
503= GOLDEYE                                      00002460
504= GOLDFISH                                     00002470
505='MISSISSIPPI SILVERSIDE'                      00002480
506='BROOK SILVERSIDE'                            00002490
507='GOLDEN SHINER'                               00002500
508='BLUNTNOSE MINNOW'                            00002510
509='FATHEAD MINNOW'                              00002520
510='BULLHEAD MINNOW'                             00002530
511='PLAINS KILLIFISH'                            00002540
512='BLACKSTRIPE TOPMINNOW'                       00002550
513='BLACKSPOTTED TOPMINNOW'                      00002560
514='PLAINS TOPMINNOW'                            00002570
515='MOSQUITO FISH'                               00002580
516='BANDED SCULPIN'                              00002590
517=LOGPERCH                                      00002600
518='SCALY SAND DARTER'                           00002610
519='CHRYSTAL DARTER'                             00002620
520='GREENSIDE DARTER'                            00002630
521='BLUNTNOSE DARTER'                            00002640
522='ARKANSAS DARTER'                             00002650
523='FANTAIL DARTER'                              00002660
524='SLOUTH DARTER'                               00002670
525='LEAST DARTER'                                00002680
526='JOHNNY DARTER'                               00002690
527='CYPRESS DARTER'                              00002700
528='STIPPLED DARTER'                             00002710
529='ORANGEBELLY DARTER'                          00002720
530='ORANGETHROAT DARTER'                         00002730
531='SPECKLED DARTER'                             00002740
532='REDFIN DARTER'                               00002750
533='BANDED DARTER'                               00002760
534='CHANNEL DARTER'                              00002770
535='BLACKSIDE DARTER'                            00002780
536='LONGNOSE DARTER'                             00002790
537='LEOPARD DARTER'                              00002800
538='SLENDERHEAD DARTER'                          00002810
539='DUSKY DARTER'                                00002820
540='RIVER DARTER'                                00002830
541= STONEROLLER                                  00002840
542='OZARK MINNOW'                                00002850
543='SILVERY MINNOW'                              00002860
544='PLAINS MINNOW'                               00002870
545='SPECKLED CHUB'                               00002880
546='BIGEYE CHUB'                                 00002890
547='FLATHEAD CHUB'                               00002900
548='SILVER CHUB'                                 00002910
549='REDSPOT CHUB'                                00002920
550='CREEK CHUB'                                  00002930
551='PALLID SHINER'                               00002940
552='EMERALD SHINER'                              00002950
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553='BLACKSPOT SHINER'                                                  00002960
554='RED RIVER SHINER'                                                  00002970
555='RIVER SHINER'                                                      00002980
556='BIGEYE SHINER'                                                     00002990
557='GHOST SHINER'                                                      00003000
558='BLUNT FACE SHINER'                                                 00003010
559='COMMON SHINER'                                                     00003020
560='PUGNOSE MINNOW'                                                    00003030
561='RIBBON SHINER'                                                     00003040
562='ARKANSAS RIVER SHINER'                                             00003050
563='WEDGESPOT SHINER'                                                  00003060
564='RED SHINER'                                                        00003070
565='KIAMICHI SHINER'                                                   00003080
566='DUSKYSTRIPE SHINER'                                                00003090
567='CHUB SHINER'                                                       00003100
568='ROSYFACE SHINER'                                                   00003110
569='SPOTFIN SHINER'                                                    00003120
570='SAND SHINER'                                                       00003130
571='REDFIN SHINER'                                                     00003140
572='BLACKTAIL SHINER'                                                  00003150
573='MIMIC SHINER'                                                      00003160
574='STEELCOLOR SHINER'                                                 00003170
575='SUCKERMOUTH MINNOW'                                                00003180
576='HYBOGNATHUS SP.'                                                   00003190
577='HYBOPSIS SP.'                                                      00003200
578='NOTROPIS SP.'                                                      00003210
579='PIMEPHALES SP.'                                                    00003220
580='ETHEOSTOMA SP.'                                                    00003230
581='SHAD SP.'                                                          00003240
582='MINNOW SP.'                                                        00003250
590='PREY FISH AND MINNOWS';                                            00003260
PROC FORMAT; VALUE $DA                                                  00003270
DD=WEEKDAY                                                              00003280
DE='WEEKEND DAY'                                                        00003290
ND=WEEKNIGHT                                                            00003300
NE='WEEKEND NIGHT';                                                     00003310
MACRO QD FORMAT LAKE $LA. DAYTYPE $DA. SPECIES KIND.; %                 00003320
* INTERVIEW;                                                            00003330
DATA ONE;                                                               00003340
INFILE CB1;                                                             00003350
INPUT LAKE$ 1-6 SECTION 8-9 MO 11-12 DAY 13-14                          00003360
YEAR 15-16 DAYTYPE$ 18-19 TYPE$ 20-23                                   00003370
N 25-26 HRS 28-29 MINS 30-31                                            00003380
HRF 33-34 MINF 35-36 FINISHED$ 38                                       00003390
SOUGHT 40-42 RETURNED 44-45 SERIAL 47-51                                00003400
SPECIES 53-55 NO 57-59 LENGTH 61-65;                                    00003410
IF HRS=. THEN DELETE;                                                   00003411
IF RETURNED=. THEN RETURNED=0;                                          00003420
IF SPECIES=. THEN SPECIES=SOUGHT;                                       00003430
IF NO=. THEN NO=0;                                                      00003440
IF HRS LE HRF  THEN WARN=0;                                             00003450
IF HRS GT HRF THEN WARN=1;                                              00003460
IF WARN=0 THEN                                                          00003470
HOURS= HRF-HRS +(MINF-MINS) /60;                                        00003480
IF WARN=1 THEN                                                          00003490
HOURS= 23-HRS + 1-MINS/60                                               00003500
+ HRF + MINF /60;                                                       00003510
HOURS=N * HOURS;                                                        00003520
QW;                                                                     00003530
```

```
MACRO YA  BY LAKE SEASON TYPE DAYTYPE SPECIES; %
MACRO YB BY LAKE SEASON TYPE DAYTYPE ;%
PROC SORT DATA=ONE; YA; CR;
DATA FOURA;SET D2;
DATA QER;SET TEMP; KEEP LAKE  SEASON TYPE  DAYTYPE N ;
DATA DRE; SET DR;
DATA SIX;SET ONE; DROP NO;
IF SPECIES=101 AND
 LAKE='THBIRD' THEN BETA_0=-5.336345548;IF LAKE='THBIRD' AND SPECIES=101
 THEN BETA_1=3.187792308;
IF SPECIES=101 AND
 LAKE='KAW' THEN BETA_0=-5.41997;IF SPECIES=101 AND LAKE='KAW' THEN
 BETA_1=3.23317; IF SPECIES=101 AND
 LAKE='ARBUCK' THEN BETA_0=-5.693629851;IF SPECIES=101 AND LAKE='ARBUCK'
  THEN  BETA_1=3.316946741;IF SPECIES=101 AND
 LAKE='GRAND' THEN BETA_0=-5.473941082; IF SPECIES=101 AND LAKE='GRAND'
 THEN BETA_1=3.261095672; IF SPECIES=101 AND
 LAKE='TENKIL' THEN BETA_0=-5.148906195;IF SPECIES=101 AND LAKE='TENKIL'
  THEN BETA_1=3.200432183;
IF LAKE='STEED' THEN BETA_0=-6.120204917; IF LAKE='STEED' THEN   BETA_1=
3.527479659;
LENGTH=LOG10(CF LENGTH);
KG=BETA_0+BETA_1*LENGTH;
KG=(10**KG)/1000;
IF KG=. THEN KG=0;
RENAME KG=NO;
PROC SORT; YA;CR;
DATA FOURB; SET D2;RENAME NUMBER=KG;
MACRO YA BY LAKE SEASON SOUGHT TYPE DAYTYPE SPECIES;%
MACRO YB BY LAKE SEASON SOUGHT TYPE DAYTYPE;%
DATA THREE;SET ONE;
IF SOUGHT NE SPECIES THEN NO=0;
IF SOUGHT NE SPECIES THEN SPECIES = SOUGHT;
PROC SORT  DATA=THREE; YA; CR;
DATA THREE; SET D2;
DATA QWR;SET TEMP;KEEP LAKE  SEASON TYPE DAYTYPE N  SOUGHT;
PROC SORT DATA=SIX;YA;CR;DATA THREEA;SET D2;
RENAME NUMBER=KG;
DATA TWO; INFILE CB2;
INPUT LAKE$ 1-6 SECTION 8-9 MO 11-12 DAY 13-14
YEAR 15-16 DAYTYPE$ 18-19 TIME 21-24
NO_BOATS 26-30 BOAT 32-36 BANK 38-42
TUBE 44-48;
QW;
MACRO QA BY LAKE SEASON   DAYTYPE;%
PROC SORT; BY LAKE SEASON  DAYTYPE SECTION;
PROC MEANS STDERR MEAN NOPRINT; VAR BOAT BANK TUBE;
BY LAKE SEASON  DAYTYPE SECTION;
QD;
OUTPUT OUT=TE MEAN=BOAT BANK TUBE STDERR=SEBOAT SEBANK SETUBE;
PROC SORT; BY LAKE;
PROC PRINT; BY LAKE; ID SEASON;
TITLE1 MEANS FOR BOAT, BANK AND TUBE ANGLERS;
TITLE2 BY SEASON, SECTION AND DAYTYPE;
TITLE3 ;
TITLE4 THESE VALUES ARE UNEXPANDED AVERAGES CALCULATED;
TITLE5 DIRECTLY FROM PRESSURE COUNTS.;
TITLE6 ;
TITLE7 SEBOAT,SEBANK AND SETUBE ARE ST. ERROR VALUES OF THE;
```

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TITLE8 CALCULATED MEANS;
PROC SORT; QA;
PROC MEANS NOPRINT SUM N DATA=TE;QA; VAR BOAT BANK TUBE
SEBOAT SEBANK SETUBE;
OUTPUT OUT=D1 SUM=BOAT BANK TUBE SEBOAT SEBANK SETUBE
N=N1 N2 N3;
PROC SORT DATA=TWO; BY LAKE SEASON DAYTYPE MO DAY YEAR;
PROC MEANS MEAN NOPRINT;VAR DAYLIGHT;BY LAKE SEASON DAYTYPE MO DAY YEAR;
OUTPUT OUT=T MEAN=DAYLIGHT;
PROC MEANS SUM NOPRINT DATA=T; VAR DAYLIGHT;QA;
MACRO ZA BY LAKE SEASON DAYTYPE%;
OUTPUT OUT =D10 SUM=DAY;
DATA D10; SET D10;IF DAYTYPE='ND' THEN DAY=24-DAY;
IF DAYTYPE='NE' THEN DAY=24-DAY;
PROC SORT DATA=FOURA;ZA;
PROC  SORT DATA=QER;ZA;
DATA D1; MERGE D1 QER;ZA; FORMAT LAKE $LA. DAYTYPE $DA.;
DATA D1; SET D1;
IF SEASON='SPRING' AND DAYTYPE='DE' THEN DAY=338;
IF SEASON='SPRING' AND DAYTYPE='DD' THEN DAY=858;
IF SEASON='SUMMER' AND DAYTYPE='DE' THEN DAY=364;
IF SEASON='SUMMER' AND DAYTYPE='DD' THEN DAY=924;
IF SEASON='AUTUMN' AND DAYTYPE='DE' THEN DAY=296;
IF SEASON='AUTUMN' AND DAYTYPE='DD' THEN DAY=741;
IF TYPE='BOAT' THEN COUNT=N1;
IF TYPE='BANK' THEN COUNT=N2;
IF TYPE='TUBE' THEN COUNT=N3;
IF  TYPE='BOAT'  THEN PRESSURE=DAY*BOAT;
IF  TYPE='BANK' THEN PRESSURE=DAY*BANK;
IF TYPE='TUBE' THEN PRESSURE=DAY*TUBE;
IF TYPE='BOAT' THEN SE_PRESS=DAY*SEBOAT;
IF TYPE='BANK' THEN SE_PRESS=DAY*SEBANK;
IF TYPE='TUBE' THEN SE_PRESS=DAY*SETUBE;
PROC SORT DATA=FOURA; BY LAKE SEASON TYPE DAYTYPE;
PROC SORT DATA=FOURB;BY LAKE SEASON TYPE DAYTYPE;
DATA D1A; SET D1; KEEP LAKE SEASON TYPE DAYTYPE PRESSURE SE_PRESS;
PROC SORT; BY LAKE SEASON TYPE DAYTYPE;
DATA QER;SET D1;KEEP
LAKE SEASON TYPE DAYTYPE N   PRESSURE SE_PRESS COUNT;
DATA FOURA;  MERGE  FOURA D1A; BY LAKE SEASON TYPE DAYTYPE;
DATA FOURA; SET FOURA;
HARVEST=PRESSURE*PCR;
DATA FOURB;  MERGE  FOURB D1A;BY LAKE SEASON TYPE DAYTYPE;
DATA FOURB;SET FOURB;HARVEST=PRESSURE*PCR;
PROC SORT DATA=FOURA;BY LAKE SPECIES SEASON TYPE DAYTYPE;
PROC SORT DATA=FOURB;BY LAKE SPECIES SEASON TYPE DAYTYPE;
PROC SORT DATA=QER;BY LAKE  SEASON  TYPE DAYTYPE ;
DATA QPR;SET QER;DROP N;
PROC SORT; BY LAKE SEASON TYPE DAYTYPE;
PROC PRINT;BY LAKE;ID SEASON ; FORMAT LAKE$ LA. DAYTYPE $DA.;
TITLE1 ;
TITLE2 NUMBER OF PRESSURE COUNTS (COUNT), PRESSURE (PRESSURE) AND STANDA
RD ERROR OF THE PRESSURE (SE_PRESS);
TITLE3 BY LAKE, SEASON, FISHING TYPE AND DAYTYPE;
TITLE4 ;
TITLE5 PRESSURE AND ITS STD ERROR ARE EXPANDED VALUES;
TITLE6 BASED ON TOTAL DAYLIGHT HOURS AVAILABLE FOR FISHING;
TITLE7 ;
PROC MEANS SUM NOPRINT; BY LAKE SEASON TYPE; VAR  PRESSURE;
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OUTPUT OUT=DEF SUM=  PRESSURE;                                          00004540
PROC PRINT;FORMAT LAKE $LA.; BY LAKE;ID SEASON;                         00004550
TITLE2 PRESSURE (PRESSURE);                                             00004560
TITLE3 BY LAKE, SEASON AND FISHING TYPE;                                00004570
TITLE4 ;                                                                00004580
PROC MEANS SUM NOPRINT; BY LAKE SEASON; VAR  PRESSURE;                  00004590
OUTPUT OUT=DEF SUM=  PRESSURE;                                          00004600
PROC PRINT; BY LAKE;FORMAT LAKE $LA.;ID SEASON;                         00004610
TITLE3 BY LAKE AND SEASON;                                              00004620
TITLE4 ;                                                                00004630
DATA FOURA; SET FOURA; IF SPECIES=. THEN DELETE;                        00004640
PROC PRINT  DATA=FOURA; BY LAKE SPECIES;ID SEASON;                      00004650
QD;                                                                     00004660
TITLE1 CATCH BY NUMBER;                                                 00004670
TITLE2 NUMBER OF ANGLERS (N), HOURS FISHED (HOURS), NUMBER OF FISH CAUGH00004680
T (NUMBER) ;                                                            00004690
TITLE3 CATCH RATE (PCR), STANDARD ERROR OF CATCH RATE (SE_PCR),;        00004700
TITLE4 PRESSURE (PRESSURE), STANDARD ERROR OF PRESSURE (SE_PRESS) AND HA00004710
RVEST (HARVEST);                                                        00004720
TITLE5 BY LAKE, SEASON, FISHING TYPE AND DAY TYPE;                      00004730
TITLE6 ;                                                                00004740
TITLE7 CATCH RATES ARE CALCULATED DIRECTLY FROM INTERVIEWS;             00004741
TITLE8 PRESSURE VALUES ARE THE SAME ONES LISTED PREVIOUSLY;             00004742
TITLE9 HARVEST IS A CALCULATED PRODUCT OF CATCH RATE AND;               00004743
TITLE10 PRESSURE. ;                                                     00004744
DATA FOURB; SET FOURB; IF SPECIES=. THEN DELETE;                        00004750
PROC PRINT DATA=FOURB;BY LAKE SPECIES;ID SEASON; QD;                    00004760
TITLE1 CATCH BY WEIGHT;                                                 00004770
TITLE2 NUMBER OF ANGLERS (N), HOURS FISHED (HOURS), KILOGRAMS OF FISH CA00004780
UGHT (KG) ;                                                             00004790
TITLE3 CATCH RATE (PCR), STANDARD ERROR OF CATCH RATE (SE_PCR);         00004800
TITLE4 PRESSURE (PRESSURE), STANDARD ERROR OF PRESSURE (SE_PRESS) AND HA00004810
RVEST (HARVEST);                                                        00004820
TITLE5 BY LAKE, SEASON, FISHING TYPE AND DAY TYPE;                      00004830
TITLE6 ;                                                                00004840
TITLE7 CATCH RATES BY WEIGHT ARE CALCULATED FROM INPUT;                 00004841
TITLE8 LENGTHS USING AVAILABLE LTH-WT REGRESSION;                       00004842
TITLE9 EQUATIONS.;                                                      00004843
PROC MEANS SUM NOPRINT DATA=FOURA;                                      00004850
VAR  NUMBER  PCR  HARVEST;                                              00004860
BY LAKE SPECIES SEASON TYPE;                                            00004870
OUTPUT OUT=FOUR1 SUM= NUMBER PCR  HARVEST;                              00004880
PROC PRINT; BY LAKE SPECIES;ID SEASON;                                  00004890
FORMAT LAKE $LA. SPECIES KIND.;                                         00004900
TITLE1 CATCH BY NUMBER;                                                 00004910
TITLE2 NUMBER OF FISH CAUGHT (NUMBER),;                                 00004920
TITLE3 CATCH RATE (PCR) AND HARVEST (HARVEST);                          00004930
TITLE5 BY LAKE, SEASON AND FISHING TYPE;                                00004940
TITLE6 ;                                                                00004950
PROC MEANS SUM NOPRINT DATA=FOURB;                                      00004960
VAR KG PCR  HARVEST;                                                    00004970
BY LAKE SPECIES SEASON TYPE;                                            00004980
OUTPUT OUT=FOUR2 SUM= KG PCR  HARVEST;                                  00004990
PROC PRINT; BY LAKE SPECIES;ID SEASON; FORMAT LAKE $LA. SPECIES KIND.;  00005000
TITLE1 CATCH BY WEIGHT;                                                 00005010
TITLE2 KILOGRAMS OF FISH CAUGHT (KG),;                                  00005020
TITLE3 CATCH RATE (PCR) AND HARVEST (HARVEST);                          00005030
TITLE5 BY LAKE, SEASON AND FISHING TYPE;                                00005040
TITLE6 ;                                                                00005050
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PROC MEANS SUM NOPRINT DATA=FOUR1; BY LAKE SPECIES SEASON;
VAR NUMBER PCR  HARVEST;
OUTPUT OUT=FOUR1 SUM=
NUMBER  PCR  HARVEST;
PROC PRINT;BY LAKE SPECIES;ID SEASON;
FORMAT LAKE $LA. SPECIES KIND.;
TITLE1 CATCH BY NUMBER;
TITLE2 NUMBER OF FISH CAUGHT (NUMBER).;
TITLE3 CATCH RATE (PCR) AND HARVEST (HARVEST);
TITLE4 BY LAKE AND SEASON;
TITLE5;
PROC MEANS SUM NOPRINT DATA=FOUR2;
BY LAKE SPECIES SEASON; OUTPUT OUT=FOUR2
SUM=KG PCR  HARVEST;
PROC PRINT; BY LAKE SPECIES;ID SEASON; FORMAT LAKE $LA. SPECIES KIND.;
TITLE1 CATCH BY WEIGHT;
TITLE2 KILOGRAMS OF FISH CAUGHT (KG).;
TITLE3 CATCH RATE (PCR) AND HARVEST (HARVEST);
TITLE4 BY LAKE AND SEASON;
TITLE5 ;
PROC SORT DATA=THREE; BY LAKE SEASON TYPE DAYTYPE SPECIES;
DATA FOURA; SET FOURA;KEEP LAKE SPECIES SEASON TYPE DAYTYPE
PRESSURE ;
PROC SORT; BY LAKE SEASON TYPE DAYTYPE ;
PROC SORT DATA=QER; BY LAKE SEASON TYPE DAYTYPE;
DATA QER; SET QER;RENAME N=TOTAL;
PROC SORT DATA=THREEA; BY LAKE SEASON TYPE DAYTYPE SOUGHT;
DATA THREEA;  MERGE  THREEA  QER;
BY LAKE SEASON TYPE DAYTYPE ;
PROC SORT DATA = THREEA; BY LAKE SEASON TYPE DAYTYPE SOUGHT;
PROC SORT DATA=QWR; BY LAKE SEASON TYPE DAYTYPE SOUGHT;
 DATA THREEA;MERGE THREEA QWR; BY LAKE SEASON TYPE DAYTYPE SOUGHT;
DATA THREEA;SET THREEA;IF SOUGHT=. THEN DELETE;
PERCENT=N/TOTAL;PRESSURE=PERCENT*PRESSURE;
HARVEST=PRESSURE*PCR;
DATA THREEA; SET THREEA; DROP COUNT PERCENT TOTAL ;
PROC SORT;BY LAKE SPECIES SOUGHT SEASON TYPE DAYTYPE;
DATA THREE;MERGE THREE QER; BY LAKE SEASON TYPE DAYTYPE ;
PROC SORT;BY LAKE SEASON TYPE DAYTYPE SOUGHT;
DATA THREE;MERGE QWR THREE; BY LAKE SEASON TYPE DAYTYPE SOUGHT;
DATA THREE; SET THREE; IF SOUGHT=. THEN DELETE;
PERCENT=N/TOTAL;PRESSURE=PERCENT*PRESSURE;
HARVEST=PRESSURE*PCR;
DROP  TOTAL    ;
PROC SORT DATA=THREE; BY LAKE SPECIES SOUGHT SEASON TYPE DAYTYPE ;
DATA TG; SET THREE; KEEP LAKE SOUGHT SEASON TYPE DAYTYPE PRESSURE;
PROC SORT; BY  LAKE SOUGHT SEASON TYPE DAYTYPE;
PROC SORT DATA=QWR; BY LAKE SOUGHT SEASON TYPE DAYTYPE ;
DATA QWR; MERGE QWR THREE; BY  LAKE SOUGHT SEASON TYPE DAYTYPE;
DATA THREE; SET THREE; DROP COUNT PERCENT;
DATA QWR; SET QWR; KEEP LAKE SEASON DAYTYPE  PRESSURE
TYPE SOUGHT PERCENT;
IF SOUGHT=. THEN DELETE;
PERCENT=PERCENT*100;
PROC SORT; BY LAKE SOUGHT SEASON TYPE DAYTYPE;
PROC PRINT; BY LAKE SOUGHT;ID SEASON;FORMAT LAKE $LA. SOUGHT
KIND. DAYTYPE $DA.;
TITLE1 ;
TITLE2 PRESSURE (PRESSURE) AND PERCENT OF ANGLERS (PERCENT);
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TITLE3 BY LAKE, SPECIES SOUGHT, SEASON, FISHING TYPE AND DAYTYPE;
TITLE4 ;
TITLE5 PRESSURE FOR SPECIES SOUGHT IS CALCULATED AS A PERCENT;
TITLE6 OF THE TOTAL PRESSURE. THIS VALUE IS BASED ON THE ;
TITLE7 PERCENT OF ANGLER HOURS SEEKING A SPECIES TAKEN FROM THE;
TITLE8 INTERVIEWS. ;
PROC MEANS SUM NOPRINT; BY LAKE SOUGHT SEASON TYPE;
VAR PRESSURE PERCENT;
OUTPUT OUT=TEP SUM= PRESSURE PERCENT;
PROC PRINT; BY LAKE SOUGHT; ID SEASON;FORMAT LAKE $LA. SOUGHT KIND.;
TITLE3 BY SPECIES SOUGHT, SEASON AND FISHING METHOD;
TITLE4 ;
PROC MEANS SUM NOPRINT; BY LAKE SOUGHT SEASON;
OUTPUT OUT=TEP SUM= PRESSURE PERCENT;
PROC PRINT; BY LAKE SOUGHT;ID SEASON;
FORMAT LAKE $LA. SOUGHT KIND.;  TITLE3 BY SPECIES SOUGHT AND SEASON
; TITLE4 ;
PROC PRINT DATA=THREE;BY LAKE SPECIES SOUGHT;ID SEASON;
FORMAT LAKE $LA. DAYTYPE $DA. SOUGHT KIND. SPECIES KIND. SPECIES KIND.;
TITLE1 CATCH RATE BY NUMBER;
TITLE2 NUMBER OF FISH CAUGHT (NUMBER),;
TITLE3 CATCH RATE (PCR), STANDARD ERROR OF CATCH RATE (SE_PCR) AND HARVE
ST (HARVEST);
TITLE4 BY SPECIES SOUGHT, LAKE, SEASON, FISHING TYPE AND DAY TYPE;
TITLE5 ;
TITLE6 CATCH RATES FOR SPECIES SOUGHT ARE CALCULATED;
TITLE7 FROM THE INTERVIEWS USING ONLY HOURS AND CATCH FROM;
TITLE8 THOSE ANGLERS SEEKING A PARTICULAR SPECIES. PRESSURE;
TITLE9 ESTIMATES ARE THOSE PRESENTED PREVIOUSLY.;
PROC PRINT DATA=THREEA;BY LAKE SPECIES SOUGHT;ID SEASON;
FORMAT LAKE $LA. SOUGHT KIND. SPECIES KIND. DAYTYPE $DA.;
TITLE1 CATCH RATE BY WEIGHT;
TITLE2 KILOGRAMS OF FISH CAUGHT (KG),;
TITLE3 CATCH RATE (PCR), STANDARD ERROR OF CATCH RATE (SE_PCR) AND HARVE
ST (HARVEST);
TITLE4 BY SPECIES SOUGHT, LAKE, SEASON, FISHING TYPE AND DAY TYPE;
TITLE5 ;
PROC MEANS SUM NOPRINT DATA=THREE;BY LAKE SPECIES SOUGHT SEASON TYPE;
VAR NUMBER PCR  HARVEST;
OUTPUT OUT=T SUM=NUMBER PCR  HARVEST;
PROC PRINT; BY LAKE SPECIES SOUGHT;ID SEASON;
FORMAT LAKE $LA. SOUGHT KIND. SPECIES KIND.;
TITLE1 CATCH BY NUMBER;
TITLE2 NUMBER OF FISH CAUGHT (NUMBER),;
TITLE3 CATCH RATE (PCR) AND HARVEST (HARVEST);
TITLE4 BY SPECIES SOUGHT, LAKE, SEASON AND FISHING TYPE;
TITLE5 ;
PROC MEANS SUM NOPRINT DATA=THREEA;BY LAKE SPECIES SOUGHT SEASON TYPE;
VAR KG PCR  HARVEST ;OUTPUT OUT=T1 SUM= KG
PCR  HARVEST; PROC PRINT;BY LAKE SPECIES SOUGHT;ID SEASON;
FORMAT LAKE $LA. SOUGHT KIND. SPECIES KIND.;
TITLE1 CATCH BY WEIGHT;
TITLE2 KILOGRAMS OF FISH CAUGHT (KG),;
TITLE3 CATCH RATE (PCR) AND HARVEST (HARVEST);
TITLE4 BY SPECIES SOUGHT, LAKE, SEASON AND FISHING TYPE;
TITLE5 ;
PROC MEANS SUM NOPRINT DATA=T; BY LAKE SPECIES SOUGHT SEASON ;
VAR NUMBER PCR  HARVEST;
OUTPUT OUT=T SUM=NUMBER PCR  HARVEST;
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PROC PRINT; BY LAKE SPECIES SOUGHT;ID SEASON;                          00006150
FORMAT LAKE $LA. SOUGHT KIND. SPECIES KIND.;                           00006160
TITLE1 CATCH BY NUMBER;                                                00006170
TITLE2 NUMBER OF FISH CAUGHT (NUMBER).;                                00006180
TITLE3 CATCH RATE (PCR) AND HARVEST (HARVEST);                         00006190
TITLE4 BY SPECIES SOUGHT, LAKE AND SEASON;                             00006200
TITLE5 ;                                                               00006210
PROC MEANS SUM NOPRINT DATA=T1; BY LAKE SPECIES SOUGHT SEASON;         00006220
VAR KG PCR  HARVEST; OUTPUT OUT=T1                                     00006230
SUM=KG PCR  HARVEST;                                                   00006240
PROC PRINT;ID SEASON ; BY LAKE SPECIES SOUGHT;                         00006250
FORMAT LAKE $LA. SOUGHT KIND. SPECIES                                  00006260
KIND. ;                                                                00006270
TITLE1 CATCH BY WEIGHT;                                                00006280
TITLE2 KILOGRAMS OF FISH CAUGHT (KG).;                                 00006290
TITLE3 CATCH RATE (PCR) AND HARVEST (HARVEST);                         00006300
TITLE4 BY SPECIES SOUGHT, LAKE AND SEASON;                             00006310
TITLE5 ;                                                               00006320
PROC SORT DATA=DRE;BY LAKE SEASON TYPE DAYTYPE;                        00006330
PROC MEANS SUM NOPRINT;VAR RETURNED HOURS;BY LAKE SEASON TYPE DAYTYPE; 00006340
OUTPUT OUT=DER SUM=RETURNED HOURS;DATA DER; SET DER; RATE=RETURNED/HOURS00006350
; PROC SORT; BY LAKE SEASON TYPE DAYTYPE;                              00006360
PROC PRINT; BY LAKE ; ID SEASON;                                       00006370
FORMAT LAKE $LA. DAYTYPE $DA.;                                         00006380
TITLE1 RETURN RATE FOR ALL ANGLERS;                                    00006390
TITLE2 BY SEASON, FISHING METHOD AND DAY TYPE;                         00006400
TITLE3 ;                                                               00006410
TITLE4 THE HOUR VALUE PRESENTED HERE ARE HOURS OF FISHING;             00006411
TITLE5 FROM THE INTERVIEWS. THE RETURN RATE IS A QUOTIENT OF;          00006412
TITLE6 THESE HOURS AND THE NUMBER OF FISH RETURNED. IT SHOULD;         00006413
TITLE7 BE NOTED THAT THE RETURNED FISH MAY OR MAY NOT BE OF;           00006414
TITLE8 ONE PARTICULAR SPECIES DEPENDING ON THE SAMPLING DESIGN;        00006415
PROC SORT DATA=DRE; BY LAKE SOUGHT SEASON TYPE DAYTYPE;                00006420
PROC MEANS SUM NOPRINT;VAR RETURNED HOURS; BY LAKE SOUGHT SEASON       00006430
TYPE DAYTYPE;                                                          00006440
OUTPUT OUT=DER SUM=RETURNED HOURS;                                     00006450
DATA DER;SET DER;RATE=RETURNED/HOURS;                                  00006460
PROC SORT; BY LAKE SOUGHT SEASON TYPE DAYTYPE;PROC PRINT; BY LAKE      00006470
SOUGHT;ID SEASON ;FORMAT LAKE $LA. DAYTYPE $DA. SOUGHT KIND.;          00006480
TITLE1 RETURN RATE FOR ANGLERS BY SPECIES SOUGHT;                      00006481
TITLE2 ;                                                               00006482
TITLE3 THESE DATA ARE THE SAME AS THE PREVIOUSLY SECTION;              00006483
TITLE4 EXCEPT THAT THE HOURS AND RATES ARE STRATIFIED;                 00006484
TITLE5 BY SPECIES SOUGHT. ;                                            00006485
DATA DRE ; SET DRE;                                                    00006490
IF FINISHED='N' THEN DELETE;                                           00006500
PROC SORT; BY LAKE SEASON TYPE;                                        00006510
PROC MEANS MEAN SUM NOPRINT; BY LAKE SEASON TYPE;                      00006520
VAR  N ; OUTPUT OUT=D4 MEAN=N SUM=TOTAL;                               00006530
DATA D9; SET D4; KEEP LAKE SEASON TYPE N;                              00006540
DATA D4; SET D4;                                                       00006550
DATA D4;  MERGE  D4 DRE;BY LAKE SEASON TYPE;                           00006560
HOURS=HOURS/TOTAL;RETURNED=RETURNED/TOTAL;                             00006570
FORMAT LAKE $LA. ;                                                     00006580
PROC MEANS SUM NOPRINT;VAR TOTAL HOURS RETURNED;BY LAKE SEASON TYPE;   00006590
OUTPUT OUT=D10 SUM=TOTAL HOURS RETURNED;                               00006600
DATA D10 ; MERGE D9 D10; BY LAKE SEASON TYPE;                          00006610
PROC PRINT; BY LAKE ; ID SEASON;                                       00006620
LABEL HOURS=AVERAGE HOURS FISHED   RETURNED=AVERAGE NUMBER OF RETURNED 00006630
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FISH;                                                                   00006640
TITLE1 AVERAGE NUMBER OF ANGLERS PER PARTY (N);                         00006650
TITLE2 TOTAL NUMBER OF ANGLERS INTERVIEWED WITH COMPLETED TRIPS (TOTAL);00006660
TITLE3 AVERAGE NUMBER OF HOURS FISHED FOR EACH ANGLER (HOURS);          00006670
TITLE4 AVERAGE NUMBER OF FISH RETURNED BY EACH ANGLER (RETURNED);       00006680
TITLE5 FOR THOSE ANGLERS WITH COMPLETED TRIPS;                          00006690
TITLE6 ;                                                                00006700
DATA ONE; SET ONE;                                                      00006710
IF LENGTH=. THEN DELETE;                                                00006720
LENGTH=CEIL(LENGTH/20);                                                 00006730
PROC SORT; BY SPECIES;                                                  00006740
PROC FREQ; TABLES LENGTH / SPARSE;                                      00006750
BY SPECIES;                                                             00006760
FORMAT LENGTH P. SPECIES KIND.;                                         00006770
TITLE1 FREQUENCY OF CATCH BY 20 MM LENGTH CATEGORIES BY SPECIES;        00006780
TITLE2 ;                                                                00006790
TITLE3 THESE VALUE ARE TAKEN DIRECTLY FROM THE INTERVIEWS;              00006791
TITLE4 AND ARE NOT EXPANDED. ;                                          00006792
PROC SORT DATA=THREEA;BY LAKE SEASON TYPE DAYTYPE SOUGHT;               00006800
DATA SIX; SET SIX; RENAME NO=KG;                                        00006810
IF SPECIES=. THEN DELETE;                                               00006820
LENGTH=10**LENGTH;                                                      00006821
PROC SORT DATA=SIX; BY LAKE SPECIES SEASON TYPE DAYTYPE;                00006830
PROC MEANS MEAN NOPRINT; VAR KG LENGTH; BY                              00006840
LAKE SPECIES SEASON TYPE DAYTYPE;                                       00006850
OUTPUT OUT=BETA MEAN=KG LENGTH;                                         00006860
PROC PRINT; BY LAKE SPECIES;ID SEASON;                                  00006870
FORMAT LAKE $LA. SPECIES KIND. DAYTYPE $DA.;                            00006880
TITLE1 MEAN WEIGHTS (KG) AND LENGTHS (LENGTH) ;                         00006890
TITLE2 BY LAKE, SPECIES, SEASON, FISHING METHOD AND DAYTYPE;            00006900
TITLE3 ;                                                                00006910
TITLE4 THESE VALUES ARE TAKEN DIRECTLY FROM THE INTERVIEWS;             00006911
TITLE5 AND ARE UNEXPANDED.;                                             00006912
PROC SORT DATA=SIX; BY LAKE SOUGHT SPECIES SEASON                       00006920
TYPE DAYTYPE;                                                           00006930
PROC MEANS MEAN NOPRINT; VAR KG LENGTH;                                 00006940
BY LAKE SOUGHT SPECIES SEASON TYPE DAYTYPE;                             00006950
OUTPUT OUT=BETA MEAN=KG LENGTH;                                         00006960
PROC PRINT; BY LAKE SOUGHT SPECIES; ID SEASON;                          00006970
FORMAT LAKE $LA. SOUGHT KIND. SPECIES KIND. DAYTYPE $DA.;               00006980
TITLE2 BY LAKE, SPECIES SOUGHT, SPECIES, SEASON, FISHING METHOD AND     00006990
DAYTYPE;                                                                00007000
TITLE3 ;                                                                00007010
TITLE4 THIS IS THE SAME AS THE PREVIOUS SECTION EXCEPT;                 00007011
TITLE5 THAT THE DATA IS STRATIFIED BY SPECIES SOUGHT. ;                 00007012
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CREEL SURVEY

SCHEDULING PROGRAM

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      DIMENSICN JDATE(53,7),JSDATE(16,7),          MI(112),MDAYLT(112),00000010
     1NSAMPL(112,24),INT1(112,24),INT2(112,24),SAMTIM(112,12),NOI(8),JDA00000020
     2YVX(7),IWDAY(7),IDYFT(7),IWKDY(265),IWKEND(106),ISDAY(80),ISEND(8000000030
     3),IWKENI(2),SEASCN(4),JEASON(4),KADDAY(16,7),END(112),NUMBRS(400) 00000040
      REAL*8 A,DIRE(2)                                                  00000050
       REAL*8 SEASON                                                    00000060
      REAL*4 LAKE(5)                                                    00000070
      REAL*4 E(12),C,MUI                                                00000080
      INTEGER RAMMIX                                                    00000090
      DATA DIRE/'LEFT','RIGHT'/,B/'JAN.','FEB.','MAR.','APR.','MAY.','JU00000100
     1N.','JUL.','AUG.','SEP.','OCT.','NOV.','DEC.'/,IWDAY/'MCN.','TUE.'00000110
     1,'WED.','THU.','FRI.','SAT.','SUN.'/                              00000120
      READ(5,99) SEASON,KN                                              00000130
   99 FCRMAT(4A6,I2)                                                    00000140
  100 FORMAT(5A4,I2,F3.0,F2.0,4I3,I9,3I3,6X,2I3,F3.0/8I2)               00000150
 1001 READ(5,100,END=101)LAKE,IYR,ALONG,ALONG1,JEASCN,RAMMIX,JOLT1,JOLT200000160
     1,MCNTTM,NSECT,NAPT,PERICD,NCI                                     00000170
      ICODE=1                                                           00000180
      ISW1=1                                                            00000190
      IF(NOI(2).GT.NCI(1))ISW1=2                                        00000200
C        CHECKING IYR TO DETERMINE IF IT'S A LEAP YEAR                  00000210
      PERICD=PERIOD+1.                                                  00000220
      AYR=IYR                                                           00000230
      ACK=AYR/4.                                                        00000240
      ICK=IYR/4                                                         00000250
      CK=ICK                                                            00000260
      IDAY=365                                                          00000270
      IF(CK .EQ. ACK)IDAY=366                                           00000280
C        DETERMINE FACTR AND CHECKING IF IT'S IN THE ALLOWABLE          00000290
C        RANGE.  IF NOT .7 WILL BE USED AS FACTR THROUGHOUT             00000300
C        REMAINDER CF PROGRAM                                           00000310
      FACTR=(PERICD*MCNTTM)/(602-MCNTTM)                                00000320
      IF(FACTR.GE..1.AND.FACTR.LE..7)GO TC 4000                         00000330
      FACTR=.7                                                          00000340
 4000 CONTINUE                                                          00000350
C        COMPUTE JULIAN DATES FROM THE FIRST DAY CF JEASON(1)           00000360
C        AND PUT JULIAN DATES INTC 7*53 MATRIX CALLED JDATE,            00000370
      K=JEASON(1)                                                       00000380
      DO 2 I=1,53                                                       00000390
      DO 2 J=1,7                                                        00000400
      JDATE(I,J)=K                                                      00000410
    2 K=K+1                                                             00000420
    3 CCNTINUE                                                          00000430
      WRITE(6,1210)                                                     00000440
 1210 FCRMAT(1H1)                                                       00000450
C                                                                       00000460
C       SELECT SAMPLE DATES RANDOMLY WITHIN DAY OF WEEK AND SEASON      00000470
C                                                                       00000480
      JSP1=IDAY+JEASCN(1)-1                                             00000490
      DO 450 I=2,4                                                      00000500
      IF(JEASCN(I).LT.JEASCN(1))JEASON(I)=JEASCN(I)+IDAY                00000510
  450 CONTINUE                                                          00000520
C        DECIDING WHAT DESIGN IS BEING USED AS DESCRIBED IN HEADER CARD 00000530
 6001 CALL DESGN2(JDATE,IYR,JEASON,JSP1,NCI,ICODE,RAMMIX,SEASON,LAKE,IDA00000540
     1Y,MI,K,KN)                                                        00000550
      GO TO 6003                                                        00000560
 6002 CONTINUE                                                          00000570
C        SAMPLE DAYS WILL BE PUT INTO MATRIX JSDATE.  FILLING           00000580
C        MATRIX JSDATE WITH ZERC'S                                      00000590
```

```
      DO 6 I=1,7
      DO 6 J=1,28
      JSDATE(J,I)=0
    6 CONTINUE
C        CHECKING EACH COLUMN OF JDATE MATRIX TO DETERMINE DAY
C        TYPE AND THUS HOW MANY SAMPLES PER SEASON WILL BE TAKEN
C        AS SPECIFIED BY HEADER CARD.
      DO 5 I=1,7
      JUL=JDATE(1,I)
      CALL DAYTP(IYR,JUL,IDT,JPIDT)
      JDAYVX(I)=IWDAY(JPIDT)
    5 CONTINUE
      DO 2001 I=1,7
      JUL=JDATE(1,I)
      CALL DAYTP(IYR,JUL,IDT,JPIDT)
      NC=NCI(1)
      IF(IDYPT(JPIDT).NE.0)NC=NCI(2)
      L=0
C        COUNTING HOW MANY TIMES DAY(I) OCCURS IN SEASON(1) AND
C        PICKING SAMPLE DAYS RANDOMLY.
      DO 33 J=1,53
      IF(JDATE(J,I).LT.JEASON(2))L=L+1
   33 CONTINUE
      MINNO=1
      MAXNO=L
      CALL RANMIX(MINNO,MAXNO,NUMBRS, NO,RANMIX,ICODE)
C        ASSIGNING SAMPLE DAYS TO SAMPLE MATRIX JSDATE
      DO 34 J=1,NO
       M=NUMBRS(J)
   34 JSDATE(J,I)=JDATE(M,I)
      MINNO=L+1
C        COUNTING HOW MANY TIMES DAY(I) OCCURS IN SEASON(2) AND
C        PICKING SAMPLE DAYS RANDOMLY
       DO 8 J=MINNO,53
      IF(JDATE(J,I).LT.JEASON(3))L=L+1
    8   CONTINUE
      MAXNO=L
      CALL RANMIX(MINNO,MAXNO,NUMBRS, NO,RANMIX,ICODE)
C        ASSIGNING SAMPLE DAYS TO SAMPLE MATRIX JSDATE
      NA=NOI(ISW1)+1
        LL=NA+NO-1
      N=1
      DO 9 J=NA,LL
        M=NUMBRS(N)
          JSDATE(J,I)=JDATE(M,I)
    9   N=N+1
C        COUNTING HOW MANY TIMES DAY(I) OCCURS IN SEASON(3) AND
C        PICKING SAMPLE DAYS RANDOMLY.
      MINNO=L+1
        DO 10 J=MINNO,53
      IF(JDATE(J,I).LT.JEASON(4))L=L+1
   10   CONTINUE
      MAXNO=L
      CALL RANMIX(MINNO,MAXNO,NUMBRS, NO,RANMIX,ICODE)
C        ASSIGNING SAMPLE DAYS TO SAMPLE MATRIX JSDATE
      ISW2=3
      IF(NOI(4).GT.NOI(3)) ISW2=4
      NA=NOI(ISW1)+NOI(ISW2)+1
        LL=NA+NO-1
```

```
      N=1
       DO 12 J=NA,LL
        M=NUMERS(N)
          JSDATE(J,I)=JDATE(M,I)
 12     N=N+1
 131        MAXNO=L
      ISW3=5
      IF(NOI(6).GT.NOI(5)) ISW3=6
      NA=NOI(ISW1)+NOI(ISW2)+NOI(ISW3)+1
         LL=NA+NO-1
      N=1
 11   CALL RANMIX(MINNO,MAXNO,NUMERS, NO,RAMMIX,ICODE)
C        ASSIGNING SAMPLE DAYS TO SAMPLE MATRIX JSDATE
       DO 14 J=NA,LL
        M=NUMERS(N)
          JSDATE(J,I)=JDATE(M,I)
 14     N=N+1
 2001 CONTINUE
      IF(NOI(1).GT.NOI(2))GO TO 4001
      L=4*NOI(2)
      GO TO 4002
 4001 L=4*NOI(1)
 4002 CONTINUE
C        ADJUSTING SAMPLE DATES WHICH FALL AFTER THE FIRST OF
C        THE YEAR AND BEFORE SEASON(1) AND PUTTING ALL SAMPLE
C        DATES INTO MATRIX KADDAY.
      DO 17 I=1,L
      DO 17 J=1,7
         IF(IDAY .EQ. 366) GO TO 38
      KADDAY(I,J)=JSDATE(I,J)
      IF(JSDATE(I,J).GT.IDAY)KADDAY(I,J)=JSDATE(I,J)-IDAY
         GO TO 17
   38 KADDAY(I,J)=JSDATE(I,J)
      IF(JSDATE(I,J).GT.IDAY)KADDAY(I,J)=JSDATE(I,J)-(IDAY-1)
 17   CONTINUE
C        WRITE SAMPLE DATE MATRIX KADDAY
      I=1
      WRITE(6,151)  LAKE,IYR,RAMMIX
 151  FORMAT(1H1/////10X,'THE EXPERIMENTAL DESIGN FOR LAKE ',5A4//19X,
     .     'IN JULIAN DATES FOR 19',I2,', IS AS FOLLOWS:'//19X,'( WITH',
     .     ' RANDOM STARTING NUMBER ',I9,')'///)
      WRITE(6,251)JDAYVX
  251 FORMAT(8X,7A8)
      DO 15 LL=1,KN
      WRITE(6,152)SEASON(LL)
 152  FORMAT(//2X,A6)
      ISW=1
      NO=NOI(ISW)
      DO 15 LI=1,NO
      WRITE(6,16)(KADDAY(I,J),J=1,7)
 15   I=I+1
 16   FORMAT(8X,7I8)
C       PUT JSDATE MATRIX VALUES INTO VECTOR MI  PUT VALUES IN MI IN
C       ASCENDING ORDER
      K=1
      DO 19 I=1,7
       DO 19 J=1,L
      IF(JSDATE(J,I).LT.1)GO TO 19
       MI(K)=JSDATE(J,I)
```

```
      K=K+1
   19 CONTINUE
      K=K-1
 6003  DO 50 I=1,K
       M=MI(I)
      DO 50 J=I,K
       IF(MI(J) .GE. M) GO TO 50
      MI(I)=MI(J)
      MI(J)=M
       M=MI(I)
 50   CONTINUE
C        ADJUST DATES IN VECTOR MI WHICH FALL AFTER THE FIRST
C.       OF THE YEAR AND BEFORE THE BEGINNING OF SEASON(1)
      DO 65 I=1,K
      IF(MI(I).GT.IDAY)MI(I)=MI(I)-IDAY
   65 CONTINUE
C        COMPUTE TOTAL DAYLIGHT AVAILABLE FOR EACH SAMPLE DATE
      DO 21 I=1,K
   21 MDAYLT(I)=600
C        COMPUTE NO SECTIONS IT IS POSSIBLE TO SAMPLE ON ANY GIVEN DAY
      NSECTS=((MDAYLT(1)-MCNTTM)*FACTR)/MCNTTM
      ICODE=1
      DO 23 I=1,K
C        COMPUTE THE SECTIONS THAT WILL BE SURVEYED AND THE SEQUENCE THAT
C        THEY WILL BE SURVEYED
      NO=NSECTS
      MAXNO=NSECT
      MINNO=1
      CALL RONMIX(MINNO,MAXNO,NUMBRS,NO,RANMIX,ICODE)
      DO 23 J=1,NSECTS
   23 NSAMPL(I,J)=NUMBRS(J)
C        COMPUTE TIME SAMPLES WILL BE TAKEN
      DO 36 J=1,NSECTS
      DO 36 I=1,K
      INT2(I,J)=1
   36 INT1(I,J)=1
      DO 24 I=1,K
      KK=1
      MINNO=1
      MAXNO=MDAYLT(I)-MCNTTM
      DO 24 J=1,NSECTS
      NO=1
   27 CALL RANMIX(MINNO,MAXNO,NUMBRS,NO,RANMIX,ICODE)
      IF(KK.GT.100)GO TO 28
      NX=NUMBRS(1)
      NY=NUMBRS(1)+MCNTTM
      KK=KK+1
C        CHECK FOR OVERLAPPING SAMPLES
   29 FORMAT(10X,'SELECTION OF THE REQUIRED NUMBER OF SAMPLE TIMES IS IM
     1POSSIBLE',3X,3I5)
      DO 26 LL=1,J
      IF(NX.GE.INT1(I,LL).AND.NX.LE.INT2(I,LL).OR.NY.GE.INT1(I,LL).AND.N
     1Y.LE.INT2(I,LL))GO TO 27
   26 CONTINUE
      INT1(I,J)=NX
      INT2(I,J)=NY
      GO TO 24
   28 WRITE(6,29)I,J,KK
   24 SAMTIM(I,J)=NX
```

```
      DO 40 I=1,K                                                       00002370
      M=SAMTIM(I,1)                                                     00002380
      DO 40 J=1,NSECTS                                                  00002390
      M=SAMTIM(I,J)                                                     00002400
      DO 40 IK=J,NSECTS                                                 00002410
      IF(SAMTIM(I,IK).GE.M)GO TO 40                                     00002420
      SAMTIM(I,J)=SAMTIM(I,IK)                                          00002430
      SAMTIM(I,IK)=M                                                    00002440
      M=SAMTIM(I,J)                                                     00002450
   40 CONTINUE                                                          00002460
C       TRANSFORM TIME SAMPLE IS TO BEGIN INTO 2400 HOUR SYSTEM         00002470
      DO 54 I=1,K                                                       00002480
      JUDT=MI(I)                                                        00002490
      CALL DALT(JUDT,SNST,SNRZ,ALCNG,ALCNGI,JCLTI,JCLT2)                00002500
C       WE ARE USING A TEN HOUR DAY                                     00002510
C       WE CHOSE TO USE THE 10 HOURS AFTER SUNRISE                      00002520
      M=SNRZ*100                                                        00002530
      NHRS=(M/100)*100                                                  00002540
      MIN=M-NHRS                                                        00002550
      END(I)=SNST+12.                                                   00002560
C       TRANSFORM MINUTES AFTER SUNRISE INTO HOURS AND MINUTES          00002570
      DO 54 J=1,NSECTS                                                  00002580
      NT=SAMTIM(I,J)                                                    00002590
      AT=NT                                                             00002600
      AHRSI=AT/60.*100.                                                 00002610
      NHRSI=NT/60*100                                                   00002620
      MINI=((AHRSI-NHRSI)*60)/100                                       00002630
      MINTOT=MIN+MINI                                                   00002640
      MINTP=MINTOT/60                                                   00002650
      IF(MINTP.GE.1)MINTOT=MINTOT-MINTP*60                              00002660
      NHRST=NHRS+NHRSI+MINTP*100                                        00002670
      SAMTIM(I,J)=NHRST+MINTOT                                          00002680
   54 SAMTIM(I,J)=SAMTIM(I,J)/100                                       00002690
C         WRITING OUT DAILY SCHEDULES BEGINNING AT THE FIRST            00002700
C         DAY OF THE SAMPLE YEAR                                        00002710
      DO 42 I=1,K                                                       00002720
      FIN=SAMTIM(I,1)+10.                                               00002730
      IF(END(I) .LE. FIN) GO  TO 42                                     00002740
      END(I)=FIN                                                        00002750
42    CONTINUE                                                          00002760
      WRITE(6,410)LAKE,IYR                                              00002770
  410 FORMAT(1H1///  /6X,'SAMPLING SCHEDULE FOR LAKE ',5A4,10X,'19',I2/ 00002780
     1///)                                                              00002790
      WRITE(6,420)                                                      00002800
  420 FORMAT( 3X,'SAMPLING TIMES HAVE BEEN CONVERTED TO THE 2400 HOUR SY00002810
     2STEM'//3X,'THE TIME OF SAMPLING HAS BEEN ADJUSTED FOR DAYLIGHT',  00002820
     3//3X,'SAVINGS TIME AND MAY BE READ DIRECTLY FROM THE SCHEDULE.',//00002830
     43X,'THE DIRECTION OF TRAVEL IS CODED LEFT OR RIGHT, LEFT MEANS',//00002840
     53X,'TO TRAVEL IN A CLOCK-WISE DIRECTION WHILE CONDUCTING THE ',// 00002850
     63X,'SURVEY AND RIGHT MEANS TO TRAVEL IN A COUNTER-CLOCK-WISE ',// 00002860
     73X,'DIRECTION.')                                                  00002870
      NPG=2                                                             00002880
      NPAGE=1                                                           00002890
      NPP=4                                                             00002900
      IF(NSECTS.GE.10)NPP=3                                             00002910
      K=NOI(1)+NOI(2)+NOI(3)+NOI(4)+NOI(5)+NOI(6)+NOI(7)+NOI(8)         00002920
      DO 46 I=1,K                                                       00002930
      JYR=IYR                                                           00002940
      IF(MI(I).LT.JEASON(1))GO TO 6005                                  00002950
```

```
      GO TO 7001
 6005 JYR=IYR+1
 7001 CONTINUE
      NPG=NPG+1
      NPG=1
      NPAGE=NPAGE+1
      WRITE(6,291)LAKE,NPAGE
  291 FORMAT(1H1,38X,5A4,2X,'PAGE ',I4)
  290 MINNO=1
      MAXNO=NAPT
      NO=1
C     CALL RCNMIX(MINNO,MAXNO,NUMBRS,NO,RAMMIX,ICODE)
C     NN=NUMBRS(1)
      JUL=MI(I)
      CALL JUTOCA(JUL,JYR,MO,IDAYI)
      MOI=B(MO)
      WRITE(6,31)IDAYI,MOI,JYR,MI(I)
   31 FORMAT (1H ,//3X,'SAMPLE SCHEDULE FOR ',I2,1X,A4,' 19',I2,5X
     ~2  /3X,6X,
     3  'JULIAN DATE OF SAMPLE ',I3//5X,' TIME   SECT.  DIRECT.     ')
      DO 30 J=1,NSECTS
      MINNO=1
      MAXNO=2
      NO=1
      CALL RCNMIX(MINNO,MAXNO,NUMBRS,NO,RAMMIX,ICODE)
      A=DIRE(NUMBRS(1))
      WRITE(6,32)SAMTIM(I,J),NSAMPL(I,J),A
   32 FORMAT(2X,F8.2,4X,I2,5X,A5,/)
   30 CONTINUE
      WRITE(6,6000) END(I)
 6000 FORMAT(1H ,'     STOPPING TIME  ',F8.2)
46    CONTINUE
      GO TO 1001
  101 STOP
      END
C
C        SUBROUTINE RANMIX
C
C        PURPOSE
C           FILL AN ARRAY WITH RANDOM INTEGERS IN A SPECIFIED RANGE
C           WITHOUT ANY INTEGER BEING REPEATED WITHIN THE ARRAY.
C
C        USAGE
C           CALL RANMIX(MINNO,MAXNO,NUMBRS,NO)
C
C        DESCRIPTION OF PARAMETERS
C           MINNO  - INTEGER DEFINING LOWER LIMIT OF RANGE,
C                    MINNO MUST BE .GE. 0.
C           MAXNO  - INTEGER DEFINING UPPER LIMIT OF RANGE,
C                    MAXNO MUST BE .GT. MINNO.
C           NUMBRS - OUTPUT ARRAY CONTAINING THE RANDOM INTEGERS.
C           NO     - NUMBER OF RANDOM INTEGERS RETURNED, NO MUST BE
C                    .LE. TO THE DIMENSION OF NUMBRS IN CALLING PROGRAM.
C
C        REMARKS
C           NO MUST BE .LE. TO THE RANGE (MAXNO-MINNO+1).
C
C        SUBROUTINES REQUIRED
C           RANDU
```

```
C                                                                       00003560
C         METHOD                                                        00003570
C            RANDOM NUMBERS BETWEEN 0 AND 1 ARE GENERATED BY RANDU.     00003580
C            THESE NUMBERS ARE CONVERTED TO INTEGERS IN THE RANGE 1 TO  00003590
C            MAXNO-MINNO+1.  AS THE INTEGERS ARE PUT IN THE ARRAY THEY  00003600
C            ARE COMPARED WITH THOSE ALREADY STORED.  IF THERE IS A     00003610
C            DUPLICATE ANOTHER RANDOM INTEGER IS GENERATED.  WHEN THE   00003620
C            ARRAY IS FILLED A CONSTANT IS ADDED TO EACH NUMBER TO PUT  00003630
C            IT IN THE RANGE MINNO TO MAXNO.                            00003640
C                                                                       00003650
      SUBROUTINE RANMIX(MINNO,MAXNO,NUMBRS,NO,RAMMIX,ICODE)             00003660
      DIMENSION NUMBRS(400)                                             00003670
      INTEGER RAMMIX                                                    00003680
      IF (ICODE.EQ.1) IX=RAMMIX                                         00003690
      IF(MINNO) 10,40,40                                                00003700
 10   PRINT 20                                                          00003710
 20   FORMAT(/' MINIMUM NUMBER IS NEGATIVE.  RANDOM NO. ARRAY FILLED WIT00003720
     1H ZEROS'/)                                                        00003730
      DO 30 I=1,NO                                                      00003740
 30   NUMBRS(I)=0                                                       00003750
      RETURN                                                            00003760
 40   CONTINUE                                                          00003770
      IF((MAXNO-MINNO+1).LT.NO) GO TO 50                                00003780
      GO TO 80                                                          00003790
 50   PRINT 60                                                          00003800
 60   FORMAT(/' NUMBER OF RANDOM NOS. REQUESTED IS GREATER THAN THE RANG00003810
     1E SPECIFIED.  RANDOM NO. ARRAY FILLED WITH ZEROS'/)               00003820
      DO 70 I=1,NO                                                      00003830
 70   NUMBRS(I)=0                                                       00003840
      RETURN                                                            00003850
 80   CONTINUE                                                          00003860
      KONST=0                                                           00003870
      FACTR=MAXNO                                                       00003880
      IF(MINNO.EQ.1) GO TO 110                                          00003890
      IF(MINNO.EQ.0) GO TO 90                                           00003900
      GO TO 100                                                         00003910
 90   FACTR=MAXNO+1                                                     00003920
      KONST=-1                                                          00003930
      GO TO 110                                                         00003940
 100  KONST=MINNO-1                                                     00003950
      FACTR=MAXNO-KONST                                                 00003960
 110  CONTINUE                                                          00003970
      ICNTR=0                                                           00003980
 120  ICNTR=ICNTR+1                                                     00003990
 130  CALL RANDU(IX,IY,RNO)                                             00004000
      IX=IY                                                             00004010
      INTRNO=FACTR*RNO+.99999999                                        00004020
      IF(INTRNO.LT.1.OR.INTRNO.GT.FACTR) GO TO 130                      00004030
      INTRNO=INTRNO+KONST                                               00004040
      IF(ICNTR.EQ.1) GO TO 140                                          00004050
      GO TO 150                                                         00004060
 140  NUMBRS(1)=INTRNO                                                  00004070
      GO TO 170                                                         00004080
 150  LCNTR=ICNTR-1                                                     00004090
      DO 160 I=1,LCNTR                                                  00004100
      IF(INTRNO.EQ.NUMBRS(I)) GO TO 130                                 00004110
 160  CONTINUE                                                          00004120
      NUMBRS(ICNTR)=INTRNO                                              00004130
 170  IF(ICNTR.LT.NO) GO TO 120                                         00004140
```

```
      ICODE=ICODE+1
      RETURN
      END
C
C     ..................................................................
C
C        SUBROUTINE RANDU
C
C        PURPOSE
C           COMPUTES UNIFORMLY DISTRIBUTED RANDOM REAL NUMBERS BETWEEN
C           0 AND 1.0 AND RANDOM INTEGERS BETWEEN ZERO AND
C           2**31. EACH ENTRY USES AS INPUT AN INTEGER RANDOM NUMBER
C           AND PRODUCES A NEW INTEGER AND REAL RANDOM NUMBER.
C
C        USAGE
C           CALL RANDU(IX,IY,YFL)
C
C        DESCRIPTION OF PARAMETERS
C           IX - FOR THE FIRST ENTRY THIS MUST CONTAIN ANY ODD INTEGER
C                NUMBER WITH NINE OR LESS DIGITS. AFTER THE FIRST ENTRY,
C                IX SHOULD BE THE PREVIOUS VALUE OF IY COMPUTED BY THIS
C                SUBROUTINE.
C           IY - A RESULTANT INTEGER RANDOM NUMBER REQUIRED FOR THE NEXT
C                ENTRY TO THIS SUBROUTINE. THE RANGE OF THIS NUMBER IS
C                BETWEEN ZERO AND 2**31
C           YFL- THE RESULTANT UNIFORMLY DISTRIBUTED, FLOATING POINT,
C                RANDOM NUMBER IN THE RANGE 0 TO 1.0
C
C        REMARKS
C           THIS SUBROUTINE IS SPECIFIC TO SYSTEM/360 AND WILL PRODUCE
C           2**29 TERMS BEFORE REPEATING.  THE REFERENCE BELOW DISCUSSES
C           SEEDS (65539 HERE), RUN PROBLEMS, AND PROBLEMS CONCERNING
C           RANDOM DIGITS USING THIS GENERATION SCHEME.  MACLAREN AND
C           MARSAGLIA, JACM 12, P. 83-89, DISCUSS CONGRUENTIAL
C           GENERATION METHODS AND TESTS.  THE USE OF TWO GENERATORS OF
C           THE RANDU TYPE, ONE FILLING A TABLE AND ONE PICKING FROM THE
C           TABLE, IS OF BENEFIT IN SOME CASES.  65549 HAS BEEN
C           SUGGESTED AS A SEED WHICH HAS BETTER STATISTICAL PROPERTIES
C           FOR HIGH ORDER BITS OF THE GENERATED DEVIATE.
C           SEEDS SHOULD BE CHOSEN IN ACCORDANCE WITH THE DISCUSSION
C           GIVEN IN THE REFERENCE BELOW.  ALSO, IT SHOULD BE NOTED THAT
C           IF FLOATING POINT RANDOM NUMBERS ARE DESIRED, AS ARE
C           AVAILABLE FROM RANDU, THE RANDOM CHARACTERISTICS OF THE
C           FLOATING POINT DEVIATES ARE MODIFIED AND IN FACT THESE
C           DEVIATES HAVE HIGH PROBABILITY OF HAVING A TRAILING LOW
C           ORDER ZERO BIT IN THEIR FRACTIONAL PART.
C
C        SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C           NONE
C
C        METHOD
C           POWER RESIDUE METHOD DISCUSSED IN IBM MANUAL C20-8011,
C           RANDOM NUMBER GENERATION AND TESTING
C
C     ..................................................................
C
      SUBROUTINE RANDU(IX,IY,YFL)
      IY=IX*65539
      IF(IY)5,6,6
```

```
    5 IY=IY+2147483647+1
    6 YFL=IY
      YFL=YFL*.46566135-9
      RETURN
      END
      SUBROUTINE TIMADD(J,N,ND)
C     BASED ON JULIAN DATE COMPUTE TOTAL DAYLIGHT IN MINUTES
C     J    JULIAN DATE OF YEAR
C     N    TOTAL TIME OF DAYLIGHT FOR DAY J IN MINUTES
C     ND   TOTAL TIME OF DARKNESS FOR DAY J IN MINUTES
      IF(J .GE. 1) N=602.351962+.611357*(J)+.015917*(J**2)
      IF(J .GT.30) N=585.751837+1.542857*(J)+.002857*(J**2)
      IF(J .GT.90) N=492.942857+3.490714*(J)-.0075*(J**2)
      IF(J .GT.140) N=214.588025+7.393616*(J)-.021213*(J**2)
      IF(J .GT.175) N=459.500+4.842308*(J)-.014615*(J**2)
      IF(J .GT.210) N=994.685707+.049286*(J)-.003929*(J**2)
      IF(J .GT.260) N=1448.399994-3.365*(J)+.00250*(J**2)
      IF(J .GT.310) N=2934.371428-12.915714*(J)+.017857*(J**2)
      IF(J .GT.349) N=602
C     COMPUTE MINUTES OF DARKNESS
      ND=1440-N
      RETURN
      END
      SUBROUTINE JUTOCA (JUL,JYR,MO,IDAY)
      INTEGER*2 LAST(13)/0,31,60,91,121,152,182,213,244,274,305,335,366/
      IF (MOD(JYR,4).NE.0.AND.JUL.GT.59) JUL=JUL+1
      DO 12 K=2,13
      IF (JUL.LE.LAST(K)) GO TO 13
   12 CONTINUE
      MO=13
      IDAY=32
      RETURN
   13 MO=K-1
      IDAY=JUL-LAST(K-1)
      RETURN
      END
C
C        SUBROUTINE RONMIX
C
C        PURPOSE
C           FILL AN ARRAY WITH RANDOM INTEGERS IN A SPECIFIED RANGE
C
C        USAGE
C           CALL RANMIX(MINNO,MAXNO,NUMBRS,NO)
C
C        DESCRIPTION OF PARAMETERS
C           MINNO  - INTEGER DEFINING LOWER LIMIT OF RANGE,
C                    MINNO MUST BE .GE. 0.
C           MAXNO  - INTEGER DEFINING UPPER LIMIT OF RANGE,
C                    MAXNO MUST BE .GT. MINNO.
C           NUMBRS - OUTPUT ARRAY CONTAINING THE RANDOM INTEGERS.
C           NO     - NUMBER OF RANDOM INTEGERS RETURNED, NO MUST BE
C
C        REMARKS
C           NO MUST BE .LE. TO THE RANGE (MAXNO-MINNO+1).
C
C        SUBROUTINES REQUIRED
C           RANDU
C
```

```
C          METHOD                                                       00005330
C             RANDOM NUMBERS BETWEEN 0 AND 1 ARE GENERATED BY RANDU.    00005340
C             THESE NUMBERS ARE CONVERTED TO INTEGERS IN THE RANGE 1 TO 00005350
C             MAXNO-MINNO+1.  AS THE INTEGERS ARE PUT IN THE ARRAY THEY 00005360
C             ARRAY IS FILLED A CONSTANT IS ADDED TO EACH NUMBER TO PUT 00005370
C             IT IN THE RANGE MINNO TO MAXNO.                           00005380
C                                                                       00005390
      SUBROUTINE RONMIX(MINNO,MAXNO,NUMBRS ,NO,RAMMIX,ICODE)            00005400
      DIMENSION NUMBRS(400)                                             00005410
      INTEGER RAMMIX                                                    00005420
       IF(ICODE .EQ. 1) IX=RAMMIX                                       00005430
      IF(MINNO) 10,40,40                                                00005440
 10   PRINT 20                                                          00005450
 20   FORMAT(/' MINIMUM NUMBER IS NEGATIVE.  RANDOM NO. ARRAY FILLED WIT00005460
     1H ZEROS'/)                                                        00005470
      DO 30 I=1,NO                                                      00005480
 30   NUMBRS(I)=0                                                       00005490
      RETURN                                                            00005500
 40   CONTINUE                                                          00005510
      GO TO 80                                                          00005520
 60   FORMAT(/' NUMBER OF RANDOM NOS. REQUESTED IS GREATER THAN THE RANG00005530
     1E SPECIFIED.  RANDOM NO. ARRAY FILLED WITH ZEROS'/)               00005540
      DO 70 I=1,NO                                                      00005550
 70   NUMBRS(I)=0                                                       00005560
      RETURN                                                            00005570
 80   CONTINUE                                                          00005580
      KONST=0                                                           00005590
      FACTR=MAXNO                                                       00005600
      IF(MINNO.EQ.1) GO TO 110                                          00005610
      IF(MINNO.EQ.0) GO TO 90                                           00005620
      GO TO 100                                                         00005630
 90   FACTR=MAXNO+1                                                     00005640
      KONST=-1                                                          00005650
      GO TO 110                                                         00005660
 100  KONST=MINNO-1                                                     00005670
      FACTR=MAXNO-KONST                                                 00005680
 110  CONTINUE                                                          00005690
      ICNTR=0                                                           00005700
 120  ICNTR=ICNTR+1                                                     00005710
 130  CALL RANDU(IX,IY,RNO)                                             00005720
      IX=IY                                                             00005730
      INTRNO=FACTR*RNO+.99999999                                        00005740
      IF(INTRNO.LT.1.OR.INTRNO.GT.FACTR) GO TO 130                      00005750
      INTRNO=INTRNO+KONST                                               00005760
      IF(ICNTR.EQ.1) GO TO 140                                          00005770
      GO TO 150                                                         00005780
 140  NUMBRS(1)=INTRNO                                                  00005790
      GO TO 170                                                         00005800
 150  LCNTR=ICNTR-1                                                     00005810
      NUMBRS(ICNTR)=INTRNO                                              00005820
 170  IF(ICNTR.LT.NO) GO TO 120                                         00005830
      ICODE=ICODE+1                                                     00005840
      RETURN                                                            00005850
      END                                                               00005860
      SUBROUTINE DALT(JUDT,SNST,SNRZ,ALONG,ALONG1,JOLT1,JOLT2)          00005870
C XX            THIS SUBROUTINE COMPUTES TIME OF SUNRISE AND            00005880
C     TIME OF SUNSET AND SUNRISE IS AVAILABLE FOR USE IN OTHER PROGRAMS 00005890
C     JUDT    JULIAN DATE                                               00005900
C     SNST    TIME OF SUNSET                                            00005910
```

```
C       SNRZ    TIME OF SUNRISE
C       ALONG   LONGITUDE
C
        DIMENSION  NF(2) ,FNF(2)
C
C       COMPUTE SUNRISE FOR A PARTICULAR DAY
          IF(JUDT .LT. 7)SNRZ=7.34
          IF(JUDT .GT. 6)SNRZ=7.372422-.000253*JUDT-.000096*(JUDT**2)
          IF(JUDT .GT.  61)SNRZ=7.17433-.008091*JUDT-.000026*(JUDT**2)
        IF(JUDT .GT. 109)SNRZ=7.75-.0275*JUDT+.000071*(JUDT**2)
          IF(JUDT .GT. 135)SNRZ=7.9305-.031226*JUDT+.000090*(JUDT**2)
          IF(JUDT .GT. 162)SNRZ=6.972114-.022503*JUDT+.000072*(JUDT**2)
          IF(JUDT .GT. 190)SNRZ=5.211055-.004240*JUDT+.000025*(JUDT**2)
          IF(JUDT .GT. 234)SNRZ=5.617606-.002324*JUDT+.000017*(JUDT**2)
          IF(JUDT .GT. 319)SNRZ=-4.482604+.061216*JUDT-.000079*(JUDT**2)
C        COMPUTE SUNSET FOR A PARTICULAR DAY
          IF(JUDT .LT.  27)SNST=6.362+.009857*JUDT-.000029*(JUDT**2)
          IF(JUDT .GT.  26)SNST=5.7314 +.010553*JUDT-.000022*(JUDT**2)
          IF(JUDT .GT. 103)SNST=6.141813+.009083*JUDT-.0000078*(JUDT**2)
          IF(JUDT .GT. 155)SNST=5.239964+.022066*JUDT-.000054*(JUDT**2)
          IF(JUDT .GT. 180)SNST=4.292072+.035599*JUDT-.000100*(JUDT**2)
          IF(JUDT .GT. 205)SNST=6.143171+.019258*JUDT-.000065*(JUDT**2)
          IF(JUDT .GT. 244)SNST=11.446385-.025674*JUDT+.000024*(JUDT**2)
          IF(JUDT .GT. 290)SNST=15.325706-.055113*JUDT+.000074*(JUDT**2)
          IF(JUDT .GT. 315)SNST=18.198509-.075164*JUDT+.000109*(JUDT**2)
          IF(JUDT .GT. 336)SNST=21.931283-.098514*JUDT+.000146*(JUDT**2)
C
C
C
C       COMPUTE ADJUSTMENTS FOR LONGITUDE
C
        AD=ALONG1/60.
        ALONG=ALONG+AD
C       COMPUTE ADJUSTMENTS FOR DAYLIGHT SAVINGS TIME
C       JOLT1   FIRST DAY OF DAYLIGHT SAVINGS TIME
C       JOLT2   LAST   DAY OF DAYLIGHT SAVINGS TIME
        IF(JUDT .GT. JOLT1 .AND. JUDT .LE. JOLT2) GO TO 2
          GO TO 3
  2       SNRZ=SNRZ+1.
          SNST=SNST+1.
  3     MIN=4*(ALONG-98.)
        NF(1)=SNRZ*100
         NF(2)=SNST*100
        DO 7 I=1,2
        M=NF(I)
        MP=M/100
        MEN=NF(I)-MP*100
        MEN=MIN+MEN
        IF(MEN-60)7,5,6
  6     MEN=MEN-60
        MP=MP+1
        GO TO 7
  5     MEN=0
        MP=MP+1
  7     NF(I)=(MP*100)+ MEN
         FNF(1)=NF(1)
        FNF(2)=NF(2)
         SNRZ=FNF(1)/100.
        SNST=FNF(2)/100.
```

```
      ALONG=ALONG-AD
         RETURN
         END
      SUBROUTINE DAYTP(IYR,JUL,IDT,JPIDT)
     THIS SUBROUTINE TAKES THE YEAR AND JULIAN DATE AND DETERMINES:
       2- THE SPECIFIC DAY TYPE (MON., TUES., ETC.)
       1- WHETHER THIS DAY IS A WEEKEND OR WEEKDAY
     VARIABLES
         IYR        YEAR SURVEY TAKES PLACE
         JUL        JULIAN DATE OF SAMPLE DAY
         IDT        1=WEEKDAY  2=WEEKEND DAY
         SPIDT      SPECIFIC DAY AS NUMBERS 1-7
      IDT=1
      IK=(IYR-1)*365+(IYR-1)/4+JUL
      IF(MOD(IK,7).GE.5)IDT=2
      JPIDT=MOD(IK,7)+1
      RETURN
      END
      SUBROUTINE DESGN2(JDATE,IYR,JEASON,JSP1,NCI,ICODE,RAMMIX,SEASON,LA
     1KE,IDAY,MI,K,KN)
         THIS SUBROUTINE IS USED TO GIVE YOU DESIGN(2) OUTPUT. IF ISUB=1
         THE PROGRAM WILL BRANCH OFF TO DESGN2 AND PICK THE SAMPLE DAYS
         TO FOR THE SPECIFICATIONS OF DESIGN(2).  THESE SAMPLE DAYS WILL
         BE PUT INTO VECTOR MI AND RETURNED TO THE MAIN PROGRAM TO
         DETERMINE INDIVIDUAL DAY SCHEDULES.
      DIMENSION JDATE(53,7),NCI(8),            IWKDY(265),IWKEND(106),ISD
     1AY(80),ISEND(80),MI(112),IWKENI(2),JEASON(4),IADDAY(83),IADEND(80)
     2,NUMBRS(400)
      REAL*4 LAKE(5)
      REAL*8 SEASON(4)
      INTEGER RAMMIX

 PUT WEEKDAYS INTO VECTOR IWKDY AND WEEKEND DAYS INTO VECTOR IWKEND

         CHECK FIRST LINE OF JDATE MATRIX FOR POSITION OF WEEKEND DAYS

      I= 1
      DO 1000 J=1,7
      JUL=JDATE(1,J)
      CALL DAYTP(IYR,JUL,IDT,JPIDT)
      IF(IDT.EQ.1)GO TO 1000
      IWKENI(I)=J
      I=I+1
 000  CONTINUE
      WRITE(6,1011)
 011  FORMAT(1H1)
      L=0
      K=0
      DO 1002 I=1,53
      DO 1002 J=1,7
      IF(J.EQ.IWKENI(1).OR.J.EQ.IWKENI(2))GO TO 1003
      L=L+1
      IWKDY(L)=JDATE(I,J)
      GO TO 1002
 003  K=K+1
      IWKEND(K)=JDATE(I,J)
 002  CONTINUE
         SELECTING WEEKDAY SAMPLE DAYS FOR SEASON(1) AND PUTTING
         THEM INTO VECTOR ISDAY
```

```
      LDY=0                                                             00007100
      DO 20 L=1,265                                                     00007110
      IF(IWKDY(L).LT.JEASCN(2))LDY=LDY+1                                00007120
   20 CONTINUE                                                          00007130
      NC=NOI(1)                                                         00007140
      MAXNO=LDY                                                         00007150
      MINNO=1                                                           00007160
      CALL RANMIX(MINNO,MAXNO,NUMBRS,NO,RAMMIX,ICODE)                   00007170
      N=1                                                               00007180
      DO 30 J=1,NC                                                      00007190
      M=NUMBRS(N)                                                       00007200
      ISDAY(J)=IWKDY(M)                                                 00007210
   30 N=N+1                                                             00007220
      MINNO=LDY+1                                                       00007230
      IF(KN.EQ.1) GO TO 300                                             00007240
C        SELECTING WEEKDAY SAMPLE DAYS FOR SEASCN(2) AND PUTTING        00007250
C        THEM INTO VECTOR ISDAY                                         00007260
        NC=NOI(3)                                                       00007270
      DO 21 L=MINNO,265                                                 00007280
      IF(IWKDY(L).LT.JEASCN(3))LDY=LDY+1                                00007290
   21 CONTINUE                                                          00007300
      MAXNO=LDY                                                         00007310
      CALL RANMIX(MINNO,MAXNO,NUMBRS,NO,RAMMIX,ICODE)                   00007320
      NA=NOI(1)+1                                                       00007330
      LL=NA+NC-1                                                        00007340
      N=1                                                               00007350
      DO 31 J=NA,LL                                                     00007360
      M=NUMBRS(N)                                                       00007370
      ISDAY(J)=IWKDY(M)                                                 00007380
   31 N=N+1                                                             00007390
      MINNO=LDY+1                                                       00007400
      IF(KN.EQ.2) GO TO 300                                             00007410
C        SELECTING WEEKDAY SAMPLE DAYS FOR SEASCN(3) AND PUTTING        00007420
C        THEM INTO VECTOR ISDAY                                         00007430
      NC=NOI(5)                                                         00007440
      DO 22 L=MINNO,265                                                 00007450
      IF(IWKDY(L).LT.JEASCN(4))LDY=LDY+1                                00007460
   22 CONTINUE                                                          00007470
      MAXNO=LDY                                                         00007480
      CALL RANMIX(MINNO,MAXNO,NUMBRS,NO,RAMMIX,ICODE)                   00007490
      NA=(NOI(1)+NOI(3))+1                                              00007500
      LL=NA+NC-1                                                        00007510
      N=1                                                               00007520
      DO 32 J=NA,LL                                                     00007530
      M=NUMBRS(N)                                                       00007540
      ISDAY(J)=IWKDY(M)                                                 00007550
   32 N=N+1                                                             00007560
      IF(KN.EQ.3) GO TO 300                                             00007570
C        SELECTING WEEKDAY SAMPLE DAYS FOR SEASCN(4) AND PUTTING        00007580
C        THEM INTO VECTOR ISDAY                                         00007590
      MINNO=LDY+1                                                       00007600
      KI=265                                                            00007610
      NC=NOI(7)                                                         00007620
      DO 23 L=MINNO,KI                                                  00007630
      IF(IWKDY(L).LT.JSP1)LDY=LDY+1                                     00007640
   23 CONTINUE                                                          00007650
      MAXNO=LDY                                                         00007660
      CALL RANMIX(MINNO,MAXNO,NUMBRS,NO,RAMMIX,ICODE)                   00007670
      NA=(NOI(1)+NOI(3)+NOI(5))+1                                       00007680
```

```
      LL=NA+NC-1                                                        00007690
      N=1                                                               00007700
      DO 33 J=NA,LL                                                     00007710
      M=NUMBRS(N)                                                       00007720
      ISDAY(J)=IWKDY(M)                                                 00007730
   33 N=N+1                                                             00007740
  300 CONTINUE                                                          00007750
C        SELECTING WEEKEND SAMPLE DAYS FOR SEASON(1) AND PUTTING        00007760
C        THEM INTO VECTOR ISEND                                         00007770
      LND=0                                                             00007780
      DO 24 K=1,106                                                     00007790
      IF(IWKEND(K).LT.JEASON(2))LND=LND+1                               00007800
   24 CONTINUE                                                          00007810
      MINNO=1                                                           00007820
      MAXNO=LND                                                         00007830
      NC=NOI(2)                                                         00007840
      CALL RANMIX(MINNO,MAXNO,NUMBRS,NO,RAMMIX,ICODE)                   00007850
      N=1                                                               00007860
      DO 34 I=1,NC                                                      00007870
      M=NUMBRS(N)                                                       00007880
      ISEND(I)=IWKEND(M)                                                00007890
   34 N=N+1                                                             00007900
      MINNO=LND+1                                                       00007910
      IF(KN.EQ.1) GO TO 301                                             00007920
C        SELECTING WEEKEND SAMPLE DAYS FOR SEASON(2) AND PUTTING        00007930
C        THEM INTO VECTOR ISEND                                         00007940
      NC=NOI(4)                                                         00007950
      DO 25 K=MINNO,106                                                 00007960
      IF(IWKEND(K).LT.JEASON(3))LND=LND+1                               00007970
   25 CONTINUE                                                          00007980
      MAXNO=LND                                                         00007990
      CALL RANMIX(MINNO,MAXNO,NUMBRS,NO,RAMMIX,ICODE)                   00008000
      NA=NOI(2)+1                                                       00008010
      LL=NA+NC-1                                                        00008020
      N=1                                                               00008030
      DO 37 I=NA,LL                                                     00008040
      M=NUMBRS(N)                                                       00008050
      ISEND(I)=IWKEND(M)                                                00008060
   37 N=N+1                                                             00008070
      MINNO=LND+1                                                       00008080
      IF(KN.EQ.2) GO TO 301                                             00008090
C        SELECTING WEEKEND SAMPLE DAYS FOR SEASON(3) AND PUTTING        00008100
C        THEM INTO VECTOR ISEND                                         00008110
      NO=NOI(6)                                                         00008120
      DO 26 K=MINNO,106                                                 00008130
      IF(IWKEND(K).LT.JEASON(4))LND=LND+1                               00008140
   26 CONTINUE                                                          00008150
      MAXNO=LND                                                         00008160
      CALL RANMIX(MINNO,MAXNO,NUMBRS,NO,RAMMIX,ICODE)                   00008170
      NA=(NOI(2)+NOI(4))+1                                              00008180
      LL=NA+NC-1                                                        00008190
      N=1                                                               00008200
      DO 35 I=NA,LL                                                     00008210
      M=NUMBRS(N)                                                       00008220
      ISEND(I)=IWKEND(M)                                                00008230
   35 N=N+1                                                             00008240
      IF(KN.EQ.3) GO TO 301                                             00008250
C        SELECTING WEEKEND SAMPLE DAYS FOR SEASON(4) AND PUTTING        00008260
C        THEM INTO VECTOR ISEND                                         00008270
```

```
      MINNC=LND+1                                                       00008280
      KJ=106                                                            00008290
       NO=NCI(8)                                                        00008300
      DO 27 K=MINNC,KJ                                                  00008310
      IF(IWKEND(K).LT.JSP1)LNC=LND+1                                    00008320
   27 CONTINUE                                                          00008330
      MAXNC=LND                                                         00008340
      CALL RANMIX(MINNO,MAXNO,NUMBRS,NO,RANMIX,ICCDE)                   00008350
      NA=(NCI(2)+NCI(4)+NCI(6))+1                                       00008360
      LL=NA+NC-1                                                        00008370
      N=1                                                               00008380
      DO 36 I=NA,LL                                                     00008390
      M=NUMBRS(N)                                                       00008400
      ISEND(I)=IWKEND(M)                                                00008410
   36 N=N+1                                                             00008420
301   CONTINUE                                                          00008430
C        PUTTING VECTOR ISDAY INTO VECTCR IADDAY AND ADJUST WINTER DATES00008440
      LA=NCI(1)+NCI(3)+NCI(5)+NCI(7)                                    00008450
      DO 17 L=1,LA                                                      00008460
      IADDAY(L)=ISDAY(L)                                                00008470
      IF(ISDAY(L).GT.IDAY)IADDAY(L)=ISDAY(L)-IDAY                       00008480
   17 CONTINUE                                                          00008490
C        PUTTING VECTCR ISEND INTC VECTCR IADEND AND ADJUST WINTER DATES00008500
      LE=NCI(2)+NCI(4)+NCI(6)+NCI(8)                                    00008510
      DO 18 L=1,LE                                                      00008520
      IADEND(L)=ISEND(L)                                                00008530
      IF(ISEND(L).GT.IDAY)IADEND(L)=ISEND(L)-IDAY                       00008540
   18 CONTINUE                                                          00008550
C        WRITEOUT EXPERIMENTAL DESIGN(2)                                00008560
      WRITE(6,151)LAKE,IYR,RANMIX                                       00008570
  151 FORMAT(1H1,/////10X,'THE EXPERIMENTAL DESIGN FOR LAKE ',5A4//19X, 00008580
     1      'IN JULIAN DATES FCR 19',I2,' IS AS FOLLOWS:'//19X,'( WITH', 00008590
     2      ' RANDOM STARTING NUMBER ',I9,')'///)                       00008600
      LI=1                                                              00008610
      LC=1                                                              00008620
      NC1=NCI(1)                                                        00008630
      NO2=NCI(2)                                                        00008640
      DO 15 LL=1,KN                                                     00008650
      WRITE(6,152)SEASCN(LL)                                            00008660
  152 FORMAT(//2X,A6)                                                   00008670
      WRITE(6,50)                                                       00008680
   50 FORMAT(26X,'WEEKDAYS',//)                                         00008690
      WRITE(6,51)(IADDAY(L),L=LI,NC1)                                   00008700
   51 FORMAT(14X,4I8)                                                   00008710
      LI=NO1+1                                                          00008720
      NO1=NC1+NCI(2*LL+1)                                               00008730
      WRITE(6,52)                                                       00008740
   52 FORMAT(//24X,'WEEKEND DAYS',//)                                   00008750
      WRITE(6,53)(IADEND(L),L=LO,NO2)                                   00008760
   53 FORMAT(14X,4I8)                                                   00008770
      LO=NO2+1                                                          00008780
      NO2=NC2+NCI(2*LL+2)                                               00008790
   15 CONTINUE                                                          00008800
C        PUT VECTORS ISDAY AND ISEND INTO VECTOR MI                     00008810
      I=1                                                               00008820
      LW=NCI(1)+NCI(3)+NCI(5)+NCI(7)                                    00008830
      DO 55 J=1,LW                                                      00008840
      MI(I)=ISDAY(J)                                                    00008850
   55 I=I+1                                                             00008860
```

```
      LE= NCI(2)+NOI(4)+NCI(6)+NOI(8)                                   00008870
      DO 54 J=1,LE                                                      00008880
      MI(I)=ISEND(J)                                                    00008890
   54 I=I+1                                                             00008900
      K=I-1                                                             00008910
      RETURN                                                            00008920
      END                                                               00008930
```

ODWC CREEL FORM I

PRESSURE

LAKE	SEC.	MO.	DAY	YEAR	WEEKDAY WEEKEND	TIME OF COUNT
CC 1-6	CC8-9	CC11-12	CC13-14	CC15-16	CC18-19	CC 21-24

NO. OF FISHING BOATS	NO. OF BOAT ANGLERS	NO. OF BANK ANGLERS	NO. OF TUBE ANGLERS
CC 26-30	CC 32-36	CC 38-42	CC44-48

NO. OF HEATED DOCK ANGLERS	SERIAL NUMBER		
CC 50-54	CC 56-60		

REMARKS:

ODWC CREEL FORM 2

INTERVIEW

LAKE	SEC.	MO.	DAY	YEAR	WEEKDAY WEEKEND	TYPE OF FISHING
CC 1-6	CC 8-9	CC 11-12	CC 13-14	CC 15-16	CC 18-19	CC 20-23

NO. IN PARTY	TIME STARTED	TIME ENDED	FINISHED	SPECIES SOUGHT	NO. OF FISH RETURNED
CC 25-26	CC 28-31	CC 33-36	CC 38	CC 40-42	CC 44-45

SERIAL NUMBER	DIST. TRAV.	BAIT	RESIDENCE	SEX	OTHER
CC 47-51					

REMARKS: