

GLEN CANYON ENVIRONMENTAL
STUDIES OFFICE

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**DATA COLLECTION PROTOCOL
Preliminary Documentation And
Recommendations For Future Direction**

**GRAND CANYON FISHERIES INTEGRATED DATABASE
(GCFIN)**

Submitted To

Glen Canyon Environmental Studies
Flagstaff, Arizona

Submitted By

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EXECUTIVE SUMMARY

This DRAFT Data Collection Protocol was assimilated to provide GCES with information on the status and condition of the Native and Endangered Fish Studies (NEFS) databases currently in use in Grand Canyon investigations. The original purpose of this document was to arrive at a standard set of data fields and codes that could be adopted and used universally by Grand Canyon fisheries investigators. This is one of the first most critical steps to developing an integrated database.

Data fields are addresses or "headers" in which certain data types are stored. Displayed visually, data fields are analogous to column headings or titles. Standardizing data field names is important for database integration to facilitate search and access of certain common data types. Common data types stored under different field names cannot be linked without additional internal programming to make the field names linkable or convert them to a common field name.

Data codes are abbreviated numeric (arabic numerals) or alphanumeric (letters and numerals) strings which represent unique data parameters. These strings are usually abbreviated to 1 to 3 characters that may reflect some attribute of the parameter, e.g., M = male, PAR = Paria River.

It became evident, from a complete listing of field names and definitions associated with each field, that a standard set of unique field names and codes was possible only through coordination with NEFS investigators who had developed the existing datasets. Discrepancies in definitions for the same data field were found among investigative groups as well as within groups. The list of field names and codes revealed many inconsistencies in use of the same field name, as well as a variety of data codes for the same data parameter. The numbers of definitions for some data fields are large and cannot be arbitrarily standardized without concurrence of the creators of these data fields. Similarly, developing a standard set of data codes will require concurrence from present users of these codes.

Approximately 1,380 field names were identified from the existing databases of Arizona Game and Fish Department, U.S. Fish and Wildlife Service, Arizona State University, Northern Arizona University, and BIO/WEST. Of these, approximately 750 field

names are uniquely defined. Approximately 15-20% of these field names are the same, but defined or used in more than one way. Multiple definitions for field names can be confusing and problematic for future database users.

This document provides GCES with an assimilation of material that could be included in a Data Collection Protocol, including a complete list of field names and descriptions, and data codes. If an integrated database is to be developed for the NEFS in Grand Canyon, it is imperative that all investigators begin using a standard set of data fields and codes as soon as possible. If databases from Grand Canyon and the lower Colorado River basin are to be integrated with databases from the upper basin, it is also imperative to develop a basinwide data collection protocol. Otherwise, integrating these databases for future access and use will require extensive programming and coordination to standardize field names and codes. While the technical aspect of internal program linkages may not be insurmountable, the task of interpreting data fields and codes is best left to the respective investigators that created the databases.

GCES is advised to proceed with developing a standardized database as soon as possible. Establishing a standard set of field names and data codes will involve some time, since most investigators will probably resist making changes to their respective database structures. Alternatively, it may be possible to establish an effective starting date for standardizing database entries. While the decision is being made to proceed with an integrated concurrence for a standardized database, it would be wise to place a moratorium on establishing new data fields to minimize the extent of future database restructuring.

CHAPTER 1. INTRODUCTION

Glen Canyon Environmental Studies (GCES) has coordinated fisheries investigations in Grand Canyon since 1983. Numerous investigations were conducted as part of Phase I (1983-87) and Phase II (1988-95), and several investigations had been conducted previously. Integrating findings of these and future studies is vital to monitoring aquatic resources in Grand Canyon and to management of Glen Canyon Dam.

A Data Collection Protocol (DCP) can provide the guidance for standardized collection of the Native and Endangered Fish Studies (NEFS) in Grand Canyon. While not all investigators are likely to collect the same data, most will collect the same basic information. A DCP would provide a list of data codes and specifications (data type, field width, description) that would enable all investigations to become linked to a central integrated database.

Following the Introduction (Chapter 1) of this report are Specifications and Descriptions of Field Names (Chapter 2). These field names and specifications have been partitioned into 12 data groups and alphabetized within each group. The data type (N = numeric, C = character), field size (number of numerals and/or letters in data field), decimal place (numerals to the right of the decimal place), and description are provided for each field name, according to the information provided by the respective database owner (i.e., NEFS investigator).

Chapter 3 of this document provides examples of data code definitions. Ideas for these lists were adopted from the List of Field Names and Data Codes, Upper Colorado River Basin Database (U.S. Fish and Wildlife Service 1989). These codes may not be compatible with the codes currently in use by some investigators in Grand Canyon, but a standard set of codes should be implemented as soon as possible to maximize compatibility of databases. The goal of a DCP should be to have all investigators using the same data codes by a target date, e.g., January 1997.

Chapter 4 of this report provides examples of a data update form and a data custody form. These forms, or similar forms, should be used for all transfers of data to a database manager. The purpose for a data update form is to provide an ongoing update of data fields and data codes that are being created by investigators. This process would eliminate

duplication of field names and multiple data codes for the same parameter. It would also allow for the centralization of all data types, which would benefit the database manager, as well as the users of the database. The purpose of the data custody form is to identify all files submitted to the database manager, as well as principal investigator(s), file formats, collection dates, and description of data types. The data custody form would also establish an agreement between principal investigators and the database manager for privileged use of data.

Chapter 5 presents a list of recommendations for the future direction of establishing a Data Collection Protocol. Since this document is merely a framework for the eventual development of a protocol, recommendations offered at this time focus on those actions necessary to for that development.

CHAPTER 2. SPECIFICATIONS AND DESCRIPTIONS OF FIELD NAMES

This chapter contains a list of specifications and descriptions of field names currently in use by NEFS investigators in Grand Canyon. The list includes a sum of all field names submitted by Arizona Game and Fish Department, U.S. Fish and Wildlife Service, Arizona State University, Northern Arizona University, and BIO/WEST. The field names are ordered alphabetically under each of the following 12 major data groups. Multiple uses of field names have been included to provide the reader of this document with a perspective for the magnitude of duplication in field names and discrepancies in definitions. For example, the field name 'REACH' under the data group 'FISH COLLECTIONS' is defined two different ways, one with a single digit character code and the second with a code of 3-numerals. As another example, the field name 'RUN_MO' under the same data group is presented as four slightly different definitions; only the principal investigators that created these definitions will know the distinctions to allow for linkages.

- ▶ Group 1: Age Determination
- ▶ Group 2: Behavior
- ▶ Group 3: Benthic Invertebrates
- ▶ Group 4: Drift
- ▶ Group 5: Fish Collections
- ▶ Group 6: Food Habits
- ▶ Group 7: Habitat
- ▶ Group 8: Individual Fish Data
- ▶ Group 9: Morphometrics/Meristics
- ▶ Group 10: Primary Production/Sediment
- ▶ Group 11: Radiotelemetry
- ▶ Group 12: Water Quality

AGE DETERMINATION (scales and otoliths)

Field	Type	Size	Dec	Description
A1	N	4	1	First annulus from nucleus (μm)
A2	N	4	1	Second annulus from nucleus (μm)
A3	N	4	1	Third annulus from nucleus (μm)
A4	N	4	1	Fourth annulus from nucleus (μm)
A5	N	4	1	Fifth annulus from nucleus (μm)
A6	N	4	1	Sixth annulus from nucleus (μm)
AGE	N	1	0	Age of fish when scale collected
BC1	N	5	2	Back-calculated total length at first annulus (mm)
BC2	N	5	2	Back-calculated total length at second annulus (mm)
BC3	N	5	2	Back-calculated total length at third annulus (mm)
BC4	N	5	2	Back-calculated total length at fourth annulus (mm)
BC5	N	5	2	Back-calculated total length at fifth annulus (mm)
BC6	N	5	2	Back-calculated total length at sixth annulus (mm)
BCX	N	5	2	Back-calculated total length at trans. check (mm)
BOX	C	2	0	Box number of slide location
DATE	N	6	0	Date (year,month,day)
FISH_NO	C	2	0	Sequential fish number
METERS	N	5	0	Meters from tributary mouth (for AGF scales)
NO_CIRC	N	2	0	Total number of circuli
NO_CIRC_A1	N	2	0	Number of circuli to first annulus
NO_CIRC_A2	N	2	0	Number of circuli to second annulus
NO_CIRC_A3	N	2	0	Number of circuli to third annulus
NO_CIRC_A4	N	2	0	Number of circuli to fourth annulus
NO_CIRC_A5	N	2	0	Number of circuli to fifth annulus
NO_CIRC_A6	N	2	0	Number of circuli to sixth annulus
NO_CIRC_X	N	2	0	Number of circuli to transitional check
PC1	N	5	2	Proportional total length at first annulus
PCX	N	5	2	Proportional total length at trans. check
RELIABLE	C	1	0	Reliability of scale information
RIVER_MILE	N	6	2	Mainstem river mile (to 1/20 rm)

SAMPLE_NO	C	8	0	Unique sample identifier
SCALE_RAD	N	4	1	Length from nucleus to scale margin (μm)
SINGLE	C	1	0	Marks one of multiple scales per fish
SL	N	3	0	Standard length (mm)
SPECIES	C	2	0	Fish species code
TL	N	3	0	Total length (mm)
X	N	4	1	Length from nucleus to transitional check (μm)
YEAR_CLASS	N	4	0	Year fish was hatched

BEHAVIOR

Field	Type	Size	Dec	Description
ALGAE	N	8	4	Percent of time feeding on the algae
AREA	N	8	0	Area covered by fish (cm ²)
CALCIUM	N	8	4	Percent of time feeding on the calcium carbonate
CHASEE	N	8	4	Percent of time being chased by another fish
CHASER	N	8	4	Percent of time chasing another fish
CHNGDATE	D	8	0	Date of record change
CHNGDATE	D	8	0	Date record was changed
CHNGTIME	N	4	0	Time record was changed
CHNGTIME	N	4	0	Time of record change
CLAY	N	8	4	Percent of time feeding on the clay
CM15	N	5	2	Flow (m/s), 15 cm from shore, ± 0.015 m/s
CM25	N	5	2	Flow (m/s) at 25 cm from shore, ± 0.015 m/s
CM35	N	5	2	Flow (m/s) at 35 cm from shore, ± 0.015 m/s
CM45	N	5	2	Flow (m/s) at 45 cm from shore, ± 0.015 m/s
CM5	N	5	2	Current velocity (m/s), 5 cm from shore, ± 0.015 m/s
CM55	N	5	2	Flow (m/s) at 55 cm from shore, ± 0.015 m/s
COLUMN	N	8	4	Percent of time feeding in the water column
COMMENTS	C	10	0	Comments
DEPTH	N	8	4	Depth of fish at behavior change (code)
DOWN_CATCH	N	3	0	Number of fish caught in downstream facing trap
DRFT_CHECK	C	1	0	Drift taken? yes indicated as a check
FALG	N	8	0	Frequency of feeding in algae
FCC	N	8	0	Frequency of feeding in calcium carbonate
FCHEE	N	8	0	Frequency of being chased by another fish
FCHER	N	8	0	Frequency of chasing another fish
FCL	N	8	0	Frequency of feeding in clay
FCOL	N	8	0	Frequency of feeding in the water column
FMAC	N	8	0	Frequency of feeding in macrophytes
FO	N	8	0	Frequency of doing any other behavior
FRO	N	8	0	Frequency of feeding in rock

FSA	N	8	0	Frequency of feeding in sand
FSCH	N	8	0	Frequency of schooling
FSI	N	8	0	Frequency of feeding in silt
FSUR	N	8	0	Frequency of feeding on the surface
FSWIM	N	8	0	Frequency of swimming
FWS	C	3	0	Fish and Wildlife Service transect number
HAB_TYPE	C	2	0	Habitat type code
HABCHAN	C	9	0	Channel type code
HABTYPE	C	5	0	Habitat type code
HM	N	4	0	Hectometer above the mouth
IN_CATCH	N	3	0	Number of fish caught in the inflow trap
LENGTH	N	8	0	Length interval code (mm)
MAC	N	8	4	Percent of time feeding on the macrophyte
METER	N	5	0	Meter above mouth
MILE	N	8	0	Meter above mouth
NUM	N	5	0	Number assigned to habitat
OBSERVER	C	9	0	Observer
OTHER	N	8	4	Percent of time doing any other behavior
OUT_CATCH	N	3	0	Number of fish caught in the outflow trap
PAGE	N	3	0	Page of data sheets
POOL_DIM	N	8	0	Pool dimensions (cm ²)
POOLS	N	3	0	Estimated number of fish in pool
RECORDER	C	3	0	Person who recorded data
ROCK	N	8	4	Percent of time feeding on the rock
RUN_DA	N	2	0	Day of observations
RUN_DA	N	2	0	Day trap was run
RUN_HR	N	2	0	Hour trap was run
RUN_HR	N	2	0	Hour of observations
RUN_MM	N	2	0	Minute of observations
RUN_MM	N	2	0	Minute trap was run
RUN_MO	N	2	0	Month trap was run
RUN_MO	N	2	0	Month of observations
RUN_YR	N	2	0	Year trap was run

RUN_YR	N	2	0	Year of observations
SAND	N	8	4	Percent of time feeding on the sand
SCHOOL	N	8	4	Percent of time schooling
SET_DA	N	2	0	Day trap set
SET_HR	N	2	0	Hour trap set
SET_MM	N	2	0	Minute trap set
SET_MO	N	2	0	Month trap set
SET_YR	N	2	0	Year trap set
SIDE	C	1	0	Side of river: R=right, L=left, C=center
SIDE	C	9	0	Side of river: R=right, L=left, C=center
SILT	N	8	4	Percent of time feeding on the silt
SPECIES	C	9	0	Species code
STUDY	N	5	0	AGFD study number
SURFACE	N	8	4	Percent of time feeding on the surface
SWIM	N	8	4	Percent of time swimming
TALG	N	8	0	Total seconds feeding in algae
TCC	N	8	0	Total seconds feeding in calcium carbonate
TCHEE	N	8	0	Total seconds being chased by another fish
TCHER	N	8	0	Total seconds chasing another fish
TCL	N	8	0	Total seconds feeding in clay
TCOL	N	8	0	Total seconds feeding in the water column
TMAC	N	8	0	Total seconds feeding in macrophytes
TO_	N	8	0	Total seconds doing any other behavior
TOTAL	N	8	0	Total percent = 100
TRAP_SIZE	C	1	0	Trap size: S=small, L=large
TRO	N	8	0	Total seconds feeding in rock
TSA	N	8	0	Total seconds feeding in sand
TSCH	N	8	0	Total seconds schooling
TSI	N	8	0	Total seconds feeding in silt
TSUR	N	8	0	Total seconds feeding on the surface
TSWIM	N	8	0	Total seconds swimming

BENTHIC INVERTEBRATES

Field	Type	Size	Dec	Description
ANALYST	C	3	0	Person who analyzed sample
ASH_WEIGHT	N	8	4	ash weight of organisms
ASH_WEIGHT	N	8	4	Ash weight (g) of sample+crucible, ± 0.0001 g
CHNGDATE	D	8	0	Date record was changed
CHNGTIME	N	4	0	Time record was changed
CRUC_NO	N	3	0	Crucible number
CRUC_NO	N	8	4	Number assigned to crucible
CRUC_WGHT	N	8	4	Crucible weight
CRUC_WGHT	N	8	4	Crucible weight (g), ± 0.0001 g
DATE_ANAL	N	6	0	Date analyzed
DEPTH	N	3	0	Depth (cm)
DISTANCE	N	4	1	Distance from shore (m)
DRY_WEIGHT	N	8	3	Dry weight (g) of sample+crucible, ± 0.0001 g
DRY_WEIGHT	N	8	4	Dry weight of organisms
FLOW	N	6	2	Current velocity (m/s), ± 0.01 m/s
HABCHAN	C	2	0	Channel type code
HABTY2	C	2	0	Secondary habitat type code
HABTYPE	C	2	0	Primary habitat type code
LIFE_STAGE	C	1	0	Life Stage
MILE	N	5	0	Meter above confluence
NO	N	20	2	Number per taxa and life stage
NUMBER	N	5	0	Number of that taxa counted
OFFPAGE	N	3	0	Total number of pages
PAGE	N	3	0	Page of data sheets
PAGE	N	3	0	Page number of data sheet
SAMP_NO	C	3	0	Sample number
SET_DA	N	2	0	Day of sample collection
SET_HR	N	2	0	Hour of sample collection
SET_MM	N	2	0	Minute of sample collection
SET_MO	N	2	0	Month of sample collection

SET_YR	N	2	0	Year of sample collection
SIDE	C	1	0	Side of river: R=right, L=left, C=center
SITE	C	5	0	Site number at that location
STUDY	N	5	0	Study number: trip and location numbers
STUDY	N	5	0	AGFD study number
SUBS1	C	2	0	Primary substrate code
SUBS2	C	2	0	Secondary substrate code
TAXA	C	9	0	Taxa of organism
TAXA	C	3	0	Taxa code
TRIP_NO	N	2	0	Trip number

DRIFT

Field	Type	Size	Dec	Description
AMOUNT	N	3	0	Duration of net set (minutes)
AMOUNT	N	3	0	Duration of net set, minutes
ANAL_DA	N	2	0	Day analyzed
ANAL_DA	N	2	0	Day analyzed
ANAL_MO	N	2	0	Month analyzed
ANAL_MO	N	2	0	Month analyzed
ANAL_YR	N	2	0	Year analyzed
ANAL_YR	N	2	0	Year analyzed
ANALYST	C	3	0	Person who analyzed sample
ANALYST	C	3	0	Person who analyzed sample
ANLYST	C	3	0	Person who burned sample
ASH_WEIGHT	N	9	4	Ash weight (g), sample+crucible; $\pm 0.0001g$
CHG_DATE	D	8	0	Date record was changed
CHG_TIME	C	8	0	Time record was changed
CHIRADU	N	7	2	Number of adult chironomids
CHIRLAR	N	7	2	Number of larval chironomids
CHIRPUP	N	7	2	Number of pupa chironomids
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change
CLADDRWT	N	7	4	Cladophora dry weight (g)
CLADPER	N	2	0	Percent cladophora
CMH	N	7	2	Water filtered through net (Cubic meters per hour)
CRUC_NO	N	3	0	Number assigned to specific crucible
CRUC_WEIGH	N	9	4	Crucible weight (g), $\pm 0.0001g$
DATE	N	6	0	Date of sample (year,month,day)
DATE	N	6	0	Date analyzed
DATE_BURN	N	6	0	Date burned
DEPTH	N	3	0	Depth (cm), to the nearest cm
DEPTH	N	3	0	Depth (cm), to the nearest cm
DEPTH	C	3	0	Height of net above water surface (cm)
DISTANCE	N	4	2	Distance from shore (m)

DISTANCE	N	4	2	Distance from shore (m)
DRY_WEIGHT	N	9	4	Dry weight (g), sample+crucible; $\pm 0.0001g$
FIELDVOL	N	3	0	Sample volume before preservation (ml)
FLOW_END	N	4	2	Flow (m/s) at time of net run
FLOW_END	N	4	2	Flow (m/s) at net pull
FLOW_INIT	N	4	2	Flow (m/s) at net set
FLOW_INIT	N	4	2	Flow (m/s) at time of net set
GAMMADU	N	7	2	Number of adult gammarus (>7mm)
GAMMIMM	N	7	2	Number of immature gammarus (<7mm)
HAB	C	2	0	Habitat
HABCHAN	C	2	0	Channel type code
HABCHAN	C	2	0	Channel type code
HABTY2	C	2	0	Secondary habitat type code
HABTY2	C	2	0	Secondary habitat type code
HABTYPE	C	2	0	Primary habitat type code
HABTYPE	C	2	0	Primary habitat type code
LABVOL	N	3	0	Sample volume after preservation (ml)
LIFE_STAGE	C	1	0	Life stage code
LIFE_STAGE	C	1	0	Life stage code
MILE	N	5	0	Meter above mouth
MILE	N	5	0	Meter above the mouth
NO	N	4	0	Number counted in subsample
NO	N	4	0	Number counted per subsample
NOTES	C	100	0	Specific notes about sample
NUMBER	N	3	0	Sample number
NUMBER	N	3	0	Sample number
OTHER	N	7	2	Number of other aquatic invertebrates
PAGE	N	3	0	Page of data sheets
PAGE	N	3	0	Page of data sheets
REHYDVOL	N	3	0	Sample volume after rehydration in lab (ml)
RM	C	5	0	River mile (to 1/20 m)
SAMP_NO	N	3	0	Sample number
SET_DA	N	2	0	Day net set

SET_DA	N	2	0	Day net set
SET_HH	N	2	0	Hour net set
SET_HH	N	2	0	Hour net set
SET_MM	N	2	0	Minute net set
SET_MM	N	2	0	Minute net set
SET_MO	N	2	0	Month net set
SET_MO	N	2	0	Month net set
SET_YR	N	2	0	Year net set
SET_YR	N	2	0	Year net set
SIDE	C	1	0	Side of river: R=right, L=left, C=Center
SIDE	C	1	0	Side of river: R=right, L=left, C=center
SIMADU	N	7	2	Number of adult simuliids
SIMLAR	N	7	2	Number of larval simuliids
SIMPUP	N	7	2	Number of pupa simuliids
STAGE	C	2	0	River stage change
STATUS	C	2	0	Status of data file; Initials of modifier
STUDY	N	5	0	AGFD study number
STUDY	N	5	0	AGFD study number
SUB_BOTT	N	1	0	Subsample fraction, denominator
SUB_TOP	N	1	0	Subsample fraction, numerator
SUBSAMPLE	N	1	0	Fraction of sample analyzed, denominator
SUBSAMPLE	N	1	0	Fraction of sample analyzed, denominator
SUBVOL	N	3	0	Liquid subsample volume burned
TAXA	C	3	0	Taxa, a three letter code
TAXA	C	3	0	Taxa code, three letters
TERR	N	7	2	Number of terrestrial insects
TIME	N	4	0	Time of sample
TLV	N	4	0	Total volume
VERSION	N	1	0	Version of data set, number for each modification

FISH COLLECTIONS

Field	Type	Size	Dec	Description
ADU	N	4	0	Number of adult fish
ADU	N	3	0	
ADU	N	4	0	Number of adult fish
ADU	N	4	0	Number of adult fish
AMPS	N	4	1	Amperage level
AREA	N	4	0	
CAMERA_NUM	C	2	0	Camera number
CAMERA_NUM	C	2	0	Camera number
CAMERA_NUM	C	2	0	Camera number
CHNGDATE	D	8	0	Date record was changed
CHNGDATE	D	8	0	Date of record change
CHNGDATE	D	8	0	Date record was changed
CHNGDATE	D	8	0	Date of record change
CHNGDATE	D	8	0	Date of record change
CHNGDATE	D	8	0	Date record was changed
CHNGTIME	N	4	0	Time of record change
CHNGTIME	N	4	0	Time record was changed
CHNGTIME	N	4	0	Time record was changed
CHNGTIME	N	4	0	Time of record change
CHNGTIME	N	4	0	Time record was changed
CHNGTIME	N	4	0	Time of record change
CLIPBOARD	C	1	0	Clipboard number
CLIPBOARD	C	1	0	Clipboard number
CLIPBOARD	C	1	0	Clipboard
COLLECT	C	1	0	Collect?: Y=yes, N=no
COLLECT_	C	1	0	Fish collected?: Y=yes, N=no
COMMENTS	C	25	0	Comments
COMMENTS	C	25	0	Comments, includes sample number
COMMENTS	C	25	0	Comments
COMMENTS	C	0	0	Comments

COMMENTS	C	60	0	Comments
COMMENTS	C	60	0	Comments
COMMENTS	C	25	0	Comments
COMMENTS	C	25	0	Comments
COMMENTS	C	25	0	Comments
CREW	C	8	0	Initials of crew members
CREW	C	8	0	Initials of crew members
CREW	C	8	0	Initials of crew members
DATE	C	6	0	Date (year,month,day)
DATE	C	6	0	Date (year,month,day)
DATE	C	6	0	Date (year,month,day)
DATE	N	6	0	
DEPTH	N	4	1	
DEPTH_1	N	4	1	Depth halfway between max and one side (ft)
DEPTH_2	N	4	1	Depth halfway between max and other side (ft)
DISPOSE	C	2	0	Disposition
DISPOSE	C	2	0	Disposition code
DISPOSE	C	2	0	Disposition
DISPOSE	C	2	0	Disposition of fish
END_DATE	C	6	0	Net pull date (year,month,day)
END_RM	N	6	2	River mile at end of sample (to 1/20 rm)
FISH_PRES	C	1	0	Fish or other materials preserved
FISH_PRES	C	1	0	Fish or other materials preserved
FISH_PRES	C	1	0	Fish or other materials preserved
FLUCT	C	2	0	River stage change
FLUCT	C	2	0	River stage change
FLUCT	C	2	0	River stage change
FRAME_NUM	C	5	0	Frame numbers
FRAME_NUM	C	5	0	Frame number
FRAME_NUM	C	5	0	Frame number
FWS	C	3	0	Fish and Wildlife Service transect number
FWS	C	3	0	Fish and Wildlife Service transect number
FWS	C	3	0	Fish and Wildlife Service transect number

FWS	C	3	0	Fish and Wildlife Service transect number
GEAR	C	2	0	Gear code
GEAR	C	2	0	Gear code
GEAR	C	2	0	
GEAR_H	N	2	0	Gear height (ft)
GEAR_H	N	2	0	Gear height (feet), to the nearest ft
GEAR_H	N	2	0	Gear height (feet), to the nearest ft
GEAR_H	N	2	0	Gear height (ft), to the nearest ft
GEAR_L	N	3	0	Gear length (feet), to the nearest ft
GEAR_L	N	3	0	Gear length (feet), to the nearest ft
GEAR_L	N	3	0	Gear length (ft)
GEAR_L	N	3	0	Gear length (ft), to the nearest ft
GEAR_M	N	7	5	Gear mesh (inches), to the hundredths of an inch
GEAR_M	N	7	5	Gear mesh (inches), to the hundredths of an inch
GEAR_M	N	7	5	Gear mesh (in)
GEAR_M	N	7	5	Gear mesh (inches), to the hundredth of an inch
GEAR_TYP	C	2	0	Gear type code
GEAR_TYP	C	2	0	Gear type code
GEAR_TYP	C	2	0	Gear type code
GEAR_TYP	C	2	0	Gear type code
HAB_1	C	2	0	
HAB_2	C	2	0	
HAB1	C	2	0	General habitat
HAB1	C	2	0	General habitat
HAB1	C	2	0	General habitat
HAB2	C	2	0	Specific habitat
HAB2	C	2	0	Specific habitat
HAB2	C	2	0	Specific habitat
HAB3	C	2	0	Shoreline habitat
HAB3	C	2	0	Shoreline habitat
HAB3	C	2	0	Shoreline habitat
HABCHAN	C	2	0	Channel type code
HABCHAN	C	2	0	Channel type code

HABCHAN	C	2	0	Channel type code
HABCHAN	C	2	0	Channel type code
HABL	N	5	1	Habitat length (m)
HABTY2	C	2	0	Secondary habitat type code
HABTY2	C	2	0	Secondary habitat type code
HABTY2	C	2	0	Secondary habitat type code
HABTY2	C	2	0	Secondary habitat type code
HABTYPE	C	2	0	Primary habitat type code
HABTYPE	C	2	0	Primary habitat type code
HABTYPE	C	2	0	Primary habitat type code
HABTYPE	C	2	0	Primary habitat type code
HABW	N	5	1	Habitat width (m)
HEAD_NUM	N	5	0	Head sample number
HEAD_NUM	N	5	0	Head sample code
HEAD_NUM	N	5	0	Head (otolith) sample number
HEAD_NUM	N	5	0	Collected head sample number
HEADSTOM	C	5	0	Sample code
HEADSTOM	C	5	0	Sample collection code
HEADSTOM	C	5	0	Sample number
HEADSTOM	C	5	0	Sample code
HEADSTOM	C	5	0	Collected sample code
HM	N	3	0	Hectometer above the mouth
HM	N	3	0	Hectometer above the mouth
JUV	N	4	0	Number of juvenile fish
JUV	N	3	0	
JUV	N	4	0	Number of juvenile fish
JUV	N	4	0	Number of juvenile fish
LAR	N	4	0	Number of larval fish
LENGTH	N	4	0	Total length (mm)
LENGTH	N	4	0	Total length of fish (mm), to the nearest mm
LENGTH	N	4	0	Total length (mm)
LENGTH	N	4	0	Total length of individual (mm)
LIGHT	C	2	0	Ambient light

LIGHT	C	2	0	Ambient light
LIGHT	C	2	0	Ambient light
LINE	N	3	0	Record line, from data sheet
LINE	N	3	0	Data line, from data sheet
LINE	N	3	0	Line of data on data sheet
LINE	N	3	0	Line of data on data sheet
MAP_ID_NUM	C	4	0	Unique net location ID to link with GIS
MARK_REC	C	1	0	Mark or Recapture: M=mark, R=recapture
MARK_REC	C	1	0	Mark or recapture? M=mark, R=recapture
MARK_REC	C	1	0	Mark or recapture?: M=mark, R=recapture
MARK_REC	C	1	0	Mark or recapture?: M=mark, R=recapture
MATURITY	N	1	0	Maturity code
MATURITY	N	1	0	Maturity code
MATURITY	N	1	0	Maturity code
MATURITY	N	1	0	Maturity code
MAX_DEPTH	N	4	1	Maximum depth of habitat (ft)
MAX_DEPTH	N	4	1	Maximum depth at gear location (m)
METER	N	4	0	Meters above tributary mouth ($\pm 20m$)
METER	N	4	0	Meters above tributary mouth ($\pm 20m$)
METER	N	4	0	Meters above tributary mouth ($\pm 20m$)
MILE	N	8	2	Meter upstream from mouth
MILE	N	8	2	Meter above mouth
MILE	N	8	2	Meter above mouth
MILE	N	8	2	Meter above mouth
MILE	N	5	0	Meter above mouth that fish was collected
NO_BOTTLES	N	1	0	Number of bottles with preserved materials
NO_BOTTLES	N	1	0	Number of bottles of preserved materials
NO_BOTTLES	N	1	0	Number of bottles of preserved materials
NO_COLLE	N	2	0	Number of fish collected
OLDTAG	C	1	0	Old external tag present? Y=yes, N=no
OLDTAG	C	1	0	Old tag = floy or carlin, present?: Y=yes, N=no
OLDTAG	C	1	0	Old external tag? Y=yes, N=no
OLDTAG	C	1	0	Old tag (external)? Y=yes, N=no

PAGE	N	3	0	Page of data sheets
PAGE	N	3	0	Page of data sheets
PAGE	N	3	0	Page of data sheets
PAGE	N	3	0	Page of data sheet
PAGE	N	3	0	Page of data sheets
PAGE	N	3	0	Page of data sheets
PARASITE	N	2	0	Number of parasites, interval code
PARASITE	N	2	0	Numbers of parasites (interval code)
PARASITE	N	2	0	Numbers of parasites (interval code)
PARASITE	N	2	0	Number of parasites
PHOTO_ROLL	C	2	0	Roll number
PHOTO_ROLL	C	2	0	Roll number
PHOTO_ROLL	C	2	0	Roll number
PRESENCE	C	1	0	Presence or absence: +=present, -=absent
PRESENCE	C	1	0	Are fish present?: Y=yes, N=no
PRESERVE	C	1	0	Preservative type: E=ethanol, F=formalin
PROFILE	C	1	0	Cross-section fathometer profile status
QUANT	C	1	0	Quantitative seine haul
REACH	C	1	0	Mainstem Colorado River reach code
REACH	C	1	0	Mainstem Colorado River reach code
REACH	N	3	0	Colorado River reach: 22=Little Colorado River
REACH	C	1	0	Mainstem Colorado River reach code
REACH	N	3	0	Colorado River reach, 22=Little Colorado River
REACH	N	3	0	Colorado River reach: 22 = Little Colorado River
REACH	N	3	0	Colorado River Reach: 22= Little Colorado River
RIVER	C	2	0	River or tributary code
RIVER	C	2	0	River or tributary code
RIVER	C	2	0	River or tributary code
RIVERMILE	N	4	1	
RM	N	6	2	River mile (to 1/20 m)
RM	N	7	2	River mile (to 1/20 m)
RUN_DA	N	2	0	Day net run
RUN_DA	N	2	0	Day net was run

RUN_DA	N	2	0	Day that net was run
RUN_DA	N	2	0	Day data recorded
RUN_DA	N	2	0	Day data recorded
RUN_DA	N	2	0	Day net was run
RUN_HR	N	2	0	Hour that net was run
RUN_HR	N	2	0	Hour net was run
RUN_HR	N	2	0	Hour net was run
RUN_HR	N	2	0	Hour net run
RUN_MM	N	2	0	Minute that net was run
RUN_MM	N	2	0	Minute net run
RUN_MM	N	2	0	Minute net was run
RUN_MM	N	2	0	Minute net was run
RUN_MO	N	2	0	Month net run
RUN_MO	N	2	0	Month that net was run
RUN_MO	N	2	0	Month data recorded
RUN_MO	N	2	0	Month net was run
RUN_MO	N	2	0	Month net was run
RUN_MO	N	2	0	Month data recorded
RUN_YR	N	2	0	Year that net was run
RUN_YR	N	2	0	Year net run
RUN_YR	N	2	0	Year net was run
RUN_YR	N	2	0	Year net was run
RUN_YR	N	2	0	Year data recorded
RUN_YR	N	2	0	Year data recorded
SAMP_AREA	N	7	2	Sample area (m ²)
SAMP_LN	N	5	1	Sample length (m)
SAMP_WID	N	5	1	Sample width (m)
SAMPLE_NUM	C	3	0	Sample number
SAMPLE_NUM	C	3	0	Sample number
SAMPLE_NUM	C	3	0	Sample number
SECONDS	N	5	0	Seconds electrofished
SEINE_L	N	7	5	Seine length (m), to the nearest meter
SEINE_L	N	7	5	Length of seine haul

SEINE_L	N	7	5	Length of seine haul (m), to nearest m
SEINE_L	N	7	5	Length of seine haul (m) to the nearest meter
SEINE_W	N	7	5	Width of seine haul (m), to nearest m
SEINE_W	N	7	5	Width of seine haul (m) to the nearest meter
SEINE_W	N	7	5	Width of seine haul
SEINE_W	N	7	5	Seine width (m), to the nearest meter
SET_DA	N	2	0	Day net set
SET_DA	N	2	0	Day net set
SET_DA	N	2	0	Day of net set
SET_DA	N	2	0	Day net set
SET_HR	N	2	0	Hour net set
SET_HR	N	2	0	Hour net set
SET_HR	N	2	0	Hour of net set
SET_HR	N	2	0	Hour net set
SET_MM	N	2	0	Minute net set
SET_MM	N	2	0	Minute net set
SET_MM	N	2	0	Minute net set
SET_MM	N	2	0	Minute of net set
SET_MO	N	2	0	Month net set
SET_MO	N	2	0	Month net set
SET_MO	N	2	0	Month net set
SET_MO	N	2	0	Month of net set
SET_YR	N	2	0	Year net set
SET_YR	N	2	0	Year net set
SET_YR	N	2	0	Year net set
SET_YR	N	2	0	Year of net set
SEX	C	1	0	Sex code
SEX	C	1	0	Sex code
SEX	C	1	0	Sex code
SEX	C	1	0	Sex code
SIDE	C	1	0	Side of River. R=right, L=left, C=center
SIDE	C	1	0	Side of river looking downstream
SIDE	C	1	0	Side of river. R=right, L=left, C=center

SIDE	C	1	0	Side of river: R=right, L=left, C=center
SIDE	C	1	0	Side of river: L=left, R=right, C=center
SIDE	C	1	0	Side of river: R=right, L=left, C=center
SIDE	C	1	0	Side of river: R=right, L=left, C=center
SINGLE	C	1	0	Marks one of multiple records for a sample
SINGLE	C	1	0	Marks one of multiple records for a sample
SINGLE	C	1	0	Marks one of multiple records for a sample
SPECIES	C	3	0	Species code
SPECIES	C	3	0	Species code, three letters
SPECIES	C	2	0	Fish species code
SPECIES	C	2	0	Fish species code
SPECIES	C	3	0	Species code
SPECIES	C	2	0	Fish species code
SPECIES	C	3	0	Species code
SPECIES	C	2	0	
START	N	4	0	
START_RM	N	6	2	River mile at start of sample (to 1/20 rm)
STOM_NUM	N	5	0	Stomach sample number
STOM_NUM	N	5	0	Collected stomach sample number
STOM_NUM	N	5	0	Stomach sample code
STOM_NUM	N	5	0	Stomach sample number
STOP	N	4	0	
STRATUM	N	1	0	
STUDY	N	5	0	AGFD study number
STUDY	N	5	0	AGFD study number
STUDY	N	5	0	AGFD study number
STUDY	N	5	0	AGFD study number
STUDY	N	5	0	AGFD study number
STUDY	N	5	0	AGFD study number
SUB1	C	2	0	Dominant substrate
SUB1	C	2	0	Dominant substrate
SUB1	C	2	0	Dominant substrate
SUB2	C	2	0	Secondary substrate

SUB2	C	2	0	Secondary substrate
SUB2	C	2	0	Secondary substrate
SUBSAMPL	C	1	0	Subsampled habitat
SUBSTR_1	C	2	0	
SUBSTR_2	C	2	0	
TAGNUM	C	0	0	Tag number
TAGNUM	C	0	0	Tag number
TAGNUM	C	10	0	Tag number
TAGNUM	C	10	0	Tag number
TEMP_AIR	N	4	1	Air temperature (°C)
TEMP_AIR	N	4	1	Air temperature (°C)
TEMP_AIR	N	4	1	Air temperature (°C)
TEMP_HAB	N	4	1	Habitat temperature (°C)
TEMP_HAB	N	4	1	Habitat temperature (°C)
TEMP_HAB	N	4	1	Habitat temperature (°C)
TEMP_MC	N	4	1	Main channel temperature (°C)
TEMP_MC	N	4	1	Main channel temperature (°C)
TEMP_MC	N	4	1	Main channel temperature (°C)
TIME_ELAPS	N	5	2	Elapsed time
TIME_END	N	4	0	Sample end time
TIME_PULL	N	4	0	Net pull time
TIME_SET	N	4	0	Net set time
TIME_START	N	4	0	Sample start time
TIME_START	N	4	0	Sample start time
TOTAL	N	4	0	Total number of fish
TOTAL	N	4	0	Total number of fish
TOTAL	N	4	0	Total number of fish
TRIP	C	5	0	Trip code
TRIP	C	5	0	Trip code
TRIP	C	5	0	Trip code
TURBIDITY	C	2	0	Turbidity
TURBIDITY	C	2	0	Turbidity
TURBIDITY	C	2	0	Turbidity

TYPE	C	1	0	Type of sample
TYPE	C	1	0	
TYPE	C	1	0	Type of sample
TYPE	C	1	0	Type of sample
VELOCITY	N	3	1	
VOLTS	N	3	0	Voltage setting
WEATHER	C	2	0	Weather
WEATHER	C	2	0	Weather
WEATHER	C	2	0	Weather
WEIGHT	N	5	0	Weight (g), $\pm 1g$
WEIGHT	N	5	0	Weight (g), $\pm 1g$
WEIGHT	N	5	0	Weight of individual (g) $\pm 1g$
WEIGHT	N	5	0	Weight of fish (g), $\pm 1 g$
YOY	N	4	0	Number of young-of-year fish
YOY	N	4	0	
YOY	N	4	0	Number of young-of-year fish
YOY	N	4	0	Number of young-of-year fish

FOOD HABITS

Field	Type	Size	Dec	Description
AGE	C	2	0	Age of fish (adult or juvenile)
ANNELID	N	3	0	Number of annelids
BY	C	3	0	Person who performed the analysis
CHG_DT	D	8	0	Date of record change
CHG_TIME	C	8	0	Time of record change
CHIRADU	N	3	0	Number of adult chironomids
CHIRLAR	N	3	0	Number of larval chironomids
CHIRPUP	N	3	0	Number of pupa chironomids
CLADOVOL	N	3	0	Volume of cladophora (ml)
CLIPBOARD	C	1	0	Clipboard
COMMENT2	C	30	0	Comments
COMMENTS	C	30	0	Comments
DATANAL	N	6	0	Date analyzed
DATE	N	6	0	Date sample collected
DATE	N	6	0	Date of sample (year,month,day)
EGGS	N	6	2	Weight per 100 eggs
FISH	L	1	0	Presence of fish
GAMMADU	N	3	0	Number of adult gammarus (>7mm)
GAMMIMM	N	3	0	Number of immature gammarus (<7mm)
GEAR	C	2	0	Gear type code
GUTFULL	N	6	2	Initial gut fullness
HAB_CD	C	2	0	Habitat code
LB	N	3	0	Weight in pounds
LENGTH	N	3	0	Total length (mm)
LENGTH	N	3	0	Total length
LIFE	C	1	0	Life stage code
LIFE_STAGE	C	1	0	Life stage of food organism
MAT	N	1	0	Maturity code
MEATYPE	C	1	0	Viscera content measurement type
MEMO	C	200	0	Details of sample
MILE	N	5	0	Meter above confluence

NEMOTODES	L	1	0	Presence of nematodes
NOTES	C	30	0	Descriptive notes
NUMBER	N	4	0	Number of each taxa found in gut
NUMBER	N	4	0	Number of food organism counted
OTHER	N	3	0	Number of other aquatic insects
OZ	N	3	0	Weight in ounces
PAGE	N	3	0	Page of data sheets
PARASITE	C	1	0	Parasitic: Y or N
PARCODE	C	1	0	Number of parasites (interval code)
PIT_TAG	C	10	0	PIT tag number
REACH	C	1	0	Mainstem Colorado River reach code
REACH	N	3	0	Colorado River reach: 22 = Little Colorado River
RIVER	C	2	0	River or tributary code
RM	N	5	1	River mile (to 1/20 rm)
SAMPLE_NUM	C	3	0	Sample number
SEX	C	1	0	Sex code
SEX	C	1	0	Sex
SIMADU	N	3	0	Number of adult simuliids
SIMLARV	N	3	0	Number of larval simuliids
SIMPUP	N	3	0	Number of pupa simuliids
SL	N	3	0	Standard length (mm)
SPECIES	C	3	0	Fish species
SPECIES	C	3	0	Species of fish stomach pumped
SPECIES	C	3	0	Species code
STATUS	C	1	0	Status of data file
STOMNUM	C	4	0	Stomach number
STUDY	N	5	0	AGFD study number
STUDY	C	5	0	Study number: trip and location numbers
TAPEWORMS	L	1	0	Presence of tapeworms
TAXA	C	3	0	Taxonomic code
TAXA	C	3	0	Taxa of food organism
TERR	N	3	0	Number of terrestrial insects
TIME	N	4	0	Time sample collected

TL	N	3	0	Total length (mm)
TOTGONAD	N	7	2	Total gonad weight
TRIP	C	5	0	Trip code
TYPE	C	1	0	Type of sample
VERSION	N	2	0	Version of data file
VOLUME	N	6	2	Volume or weight of each taxa in gut
WEIGHT	N	4	0	Weight (g), $\pm 1g$
WT	N	4	0	Weight in grams

HABITAT

Field	Type	Size	Dec	Description
AGE	C	1	0	
AIRTEMP_C	N	2	0	
ALGAE	C	1	0	Algae collected: check if yes
AMB_LITE	C	2	0	Ambient light
AMB_LITE	C	2	0	Ambient light
ANGLING	N	2	0	Angling sample taken
AREA_10_15	N	6	1	Area > 100 cm and < 150 cm deep
AREA_15	N	6	1	Area > 15 cm deep
AREA_25	N	6	1	Area < 25 cm deep
AREA_25_50	N	6	1	Area > 25 cm and < 50 cm deep
AREA_50_1	N	6	1	Area > 50 cm and < 100 cm deep
AREA_TOT	N	6	1	Total area
BENTHOS	N	2	0	Benthos sample taken
BM_H20	N	3	0	Benchmark to water elevation
BOTTOM	C	2	0	Bottom substrate code
BOULDER_LD	N	6	1	Area with boulder or ledge substrate
BY	C	3	0	Initial of data recorder
BY	C	3	0	Initials of data recorder
C_MAX	N	4	1	Maximum temperature (°C)
C_MIN	N	4	1	Minimum temperature (°C)
CC	C	2	0	Current comments
CC	C	2	0	Current comments
CC	C	2	0	Current comments
CC	C	2	0	Current comments
CCV	N	2	0	Corrected cover
CCV	N	2	0	Corrected cover
CCV	N	2	0	Corrected cover
CCV	N	2	0	Corrected cover
CELL	C	2	0	Grid cell code
CHG_DATE	D	8	0	dBase information
CHG_DATE	D	8	0	dbase information

CHG_DATE	D	8	0	dbase information
CHG_TIME	C	8	0	dbase information
CHG_TIME	C	8	0	dbase information
CHG_TIME	C	8	0	dBase information
CHK_DA	N	2	0	Day
CHK_HR	N	2	0	Hour
CHK_MM	N	2	0	Minute
CHK_MO	N	2	0	Month
CHK_YR	N	2	0	Year
CHLOROPYLL	N	2	0	Chlorophyll sample taken
CHNGDATE	D	8	0	Date of record change
CHNGDATE	D	8	0	Date of record change
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change
CHNGTIME	N	4	0	Time of record change
CHNGTIME	N	4	0	Time of record change
CM_SHORE	N	3	0	Distance from shore (cm)
CM_SHORE	N	4	0	Distance from shore (cm)
CNFG	C	4	0	Configuration
COBBLE	N	6	1	Area with predominatly cobble substrate
COLLECT	C	1	0	Collect?: Y=yes, N=no
COMMENTS	C	20	0	Comments
COMMENTS	C	20	0	Comments
COMMENTS	C	30	0	Comments
COMMENTS	C	20	0	Comments
COND	N	4	0	Conductivity (microsiemens)
COND	N	4	0	Conductivity (microsiemen)
CONDUCT	N	4	0	
CREW	C	8	0	Initials of crew members
CUR	N	1	0	Current category
CUR	N	1	0	Current category
CUR	N	1	0	Current category
CUR	N	1	0	Current category

CVR	N	2	0	Cover
CVR	N	2	0	Cover
CVR	N	2	0	Cover
CVR	N	2	0	Cover
DATE	N	6	0	Date (year,month,day)
DATE	D	8	0	Date transect measured
DATE	N	6	0	
DATE	D	8	0	Date when measured
DATE	D	8	0	Date when measured
DATE	D	8	0	Date when measured
DAY	N	2	0	
DEEP_PT	N	3	0	Maximum depth
DEPTH	N	3	0	Depth (cm)
DEPTH	N	5	1	Depth (cm), to the nearest cm
DEPTH	N	3	0	Depth
DEPTH	N	4	0	Depth (cm)
DEPTH	N	3	0	Depth (cm)
DEPTH	N	3	0	Depth (cm)
DEPTH_CM	N	3	0	Depth (cm)
DIST_05_DP	N	5	2	Depth 0.5 meters from shore (ft)
DIST_05_S1	C	2	0	Dominant substrate 0.5 meters from shore
DIST_05_S2	C	2	0	Secondary substrate 0.5 meters from shore
DIST_05_VL	N	5	2	Velocity at 0.6 depth, 0.5 meters from shore (ft/s)
DIST_10_DP	N	5	2	Depth 1.0 meter from shore (ft)
DIST_10_S1	C	2	0	Dominant substrate 1.0 meter from shore
DIST_10_S2	C	2	0	Secondary substrate 1.0 meter from shore
DIST_10_VL	N	5	2	Velocity at 0.6 depth, 1.0 meter from shore (ft/s)
DIST_15_DP	N	5	2	Depth 1.5 meters from shore (ft)
DIST_15_S1	C	2	0	Dominant substrate 1.5 meters from shore
DIST_15_S2	C	2	0	Secondary substrate 1.5 meters from shore
DIST_15_VL	N	5	2	Velocity at 0.6 depth, 1.5 meters from shore (ft/s)
DIST_25_DP	N	5	2	Depth 2.5 meters from shore (ft)
DIST_25_S1	C	2	0	Dominant substrate 2.5 meters from shore

DIST_25_S2	C	2	0	Secondary substrate 2.5 meters from shore
DIST_25_VL	N	5	2	Velocity at 0.6 depth, 2.5 meters from shore (ft/s)
DISTANCE	N	5	0	Distance upstream from mainstem (tributaries only)
DO_MGL	N	5	2	Dissolved oxygen (mg/L)
DO_MGL	N	5	2	Dissolved oxygen (mg/L)
DO_PCNT	N	6	2	Dissolved oxygen (% saturation)
DO_PCNT	N	5	1	Dissolved oxygen (% saturation)
DO_PPM	N	2	0	
DPH	N	3	0	Depth (cm)
DPH	N	3	0	Depth (cm)
DPH	N	3	0	Depth (cm)
DPH	N	3	0	Depth (cm)
DRIFT	N	2	0	Drift sample taken
EDG	N	3	0	Distance (cm) when <=100 to edge
EDG	N	2	0	Distance (cm) when <=100 to edge
EDG	N	3	0	Distance (cm) when <=100 to edge
EDG	N	2	0	Distance (cm) when <=100 to edge
EFFORT	N	7	2	Effort (m ² for seines or hours for traps)
EFFORT	N	7	2	Effort (m ² for seines or hours for traps)
ELV	N	4	0	Change in elevation of water surface between transects
END_DA	N	2	0	Day finished taking pictures
END_MO	N	2	0	Month finished taking pictures
END_TIME	N	4	0	Trap check time
END_TIME	N	4	0	Time of day finished taking pictures
END_YR	N	2	0	Year finished taking pictures
FEATURE	C	2	0	Cover feature code
FEATURE1	C	2	0	Primary feature code
FEATURE1	C	2	0	Primary feature code
FEATURE1	C	2	0	Primary feature code
FEATURE2	C	2	0	Secondary feature code
FEATURE2	C	2	0	Secondary feature code
FEATURE2	C	2	0	Secondary feature code
FEATURE3	C	2	0	Tertiary feature code

FEATURE3	C	2	0	Tertiary feature code
FEATURE3	C	2	0	Tertiary feature code
FEATURE4	C	2	0	Quaternary feature code
FEATURE4	C	2	0	Quaternary feature code
FEATURE4	C	2	0	Quaternary feature code
FISH	C	1	0	Fish present?: Y=yes, N=no
FISHCOLL	N	4	0	Total number of fish collected
FISHPRESNT	C	1	0	Fish present
FLOW	N	6	2	Current velocity (m/s), ± 0.01 m/s
FLOW	N	6	2	Flow (m/s), ± 0.015 m/s
FLOW	N	5	2	Flow (m/s)
FLOW	N	5	0	Estimated flow (cfs)
FLOW_CD	C	2	0	Flow code
FLOW_CFS	N	5	0	Estimate flow (cfs)
FLOWCD	C	2	0	Flow code
FWS	C	3	0	Fish and Wildlife Service transect number
FWS	C	3	0	Fish and Wildlife Service transect number
FWS	C	3	0	Fish and Wildlife Service transect number
GAGE_BEG	N	4	0	River stage at beginning of sample
GAGE_END	N	4	0	River stage at end of sample
GEAR	C	3	0	Always MTP
GEAR	C	3	0	Gear code
GEAR	C	3	0	Gear code
GEAR	C	3	0	Always TRN
GEAR_CD	C	2	0	Gear code
GEAR_CD	C	2	0	Gear code
GEARD	C	5	0	Gear description
GRAVEL	N	6	1	Area with predominanty gravel substrate
H2OTEMP_C	N	3	1	
HAB	C	1	0	
HAB_CD	C	2	0	Habitat code at time of trap check
HAB_CD	C	2	0	Habitat code
HAB_CD	C	2	0	Habitat code

HABTYPE	C	2	0	Primary habitat type code
HAULS	N	2	0	Number of hauls taken with that gear
HEADSTOM	C	5	0	Sample code
HEIGHT	N	4	1	Height of net
ID	C	8	0	LCR transect ID, trap number, and bank position arrow
ID	C	8	0	LCR transect ID
ID	C	8	0	LCR transect and bank location coding
ID	C	8	0	LCR transect and bank location coding
KM	N	5	0	Distance in km from Zero Rock (confluence)
LATDS	N	4	0	Lateral distance to set
LATDS	N	4	0	Lateral distance to set
LATP	N	4	0	Lateral distance to nearest bank or edge
LATP	N	4	0	Distance from closest bank to middle of trap
LATP	N	4	0	Lateral distance to nearest bank or edge
LATP	N	4	0	Lateral distance to nearest stream bank
LC_MC_FLOW	N	5	0	Approximate discharge in cfs
LENGTH	N	3	0	Length of net
M	N	1	0	Indicates 100 transect or other
M_SEC	N	5	2	Current velocity (m/s), ± 0.015 m/s
MAP_PLANE	N	2	0	Plane table map drawn
MAP_TOTAL	N	2	0	Total station map drawn
MAXD_1	N	3	1	
MAXD_2	N	3	1	
MAXD_3	N	3	1	
MEAND_1	N	3	1	
MEAND_2	N	3	1	
MEAND_3	N	3	1	
MESH	N	7	5	Mesh size of net
MILE	N	5	0	Meter above the mouth
MILE	N	6	2	River mile: distance from Lee's Ferry
MILE	N	5	0	Meter above the mouth
MILE	N	5	0	Meters above the mouth
MO	N	3	0	Depth of water at mouth of hoop

MO	N	3	0	Depth of water at mouth of hoop
MONTH	N	2	0	
MST_DA	N	2	0	Day
MST_HR	N	2	0	Hour
MST_MM	N	2	0	Minute
MST_MO	N	2	0	Month
MST_YR	N	2	0	Year
MTH	N	3	0	Distance below water surface to top of hoop (mouth)
MTH	N	3	0	Distance below water surface to top of hoop (mouth)
NAME	C	20	0	
NET_LNGTH	N	5	1	Width of backwater at net location
NO_COLL	N	2	0	Number Collected
NUM_FISH	N	3	0	Number of fish caught
NUMBR_SITE	C	3	0	Site number and habitat code
OPPORTUN	N	2	0	Opportunistic sample taken
OVH	C	4	0	Overhang, vert. edge
OVH	C	4	0	Overhang, vert. edge
OVH	C	4	0	Overhang, vert. edge
OVH	C	4	0	Overhang, vert. edge
P	N	1	0	Point or column number for hoop net hab. meas. grid
P	N	1	0	Point or column number for hoop net hab. meas. grid
PAGE	N	3	0	Page of data sheets
PAGE	N	3	0	Page of data sheets
PAGE	N	4	0	Page of data sheets
PAGE	N	3	0	Page of data sheets
PEBBLE	N	6	1	Area with predominantly pebble substrate
PH	N	5	2	pH
PH	N	2	1	
PH	N	5	2	pH
PHOTOS	C	1	0	Photographs taken?: Y=yes, N=no
PLANKTON	N	2	0	Plankton sample taken
PO	N	3	0	Depth of water at point of net
PO	N	3	0	Depth of water at point of net

POS	N	3	0	Depth to top of trap
POWER	C	1	0	
PT	N	3	0	Habitat point number
PTH	N	3	0	Distance below water surface to top of front hoop
PTH	N	3	0	Distance below water surface to top of front hoop
PULD	D	8	0	Date pulled
PULD	D	8	0	Date pulled
PULD	D	8	0	Date pulled
PULT	C	4	0	Time pulled
PULT	C	4	0	Time pulled
PULT	C	4	0	Time pulled
REACH	C	1	0	Mainstem Colorado River reach code
REACH	N	3	0	Reach number
RIVER	C	2	0	River or tributary code
RIVER	C	2	0	
RIVERMILE	N	3	1	
RIVERMILE	N	5	0	
RM	N	5	2	River mile (to 1/20 rm)
ROLL_NO	C	4	0	Film roll number
RT_AQ_VEG	N	6	1	Area with rooted aquatic vegetation
RUN_DA	N	2	0	Day data recorded
RUN_DA	N	2	0	Day data recorded
RUN_DA	N	2	0	Day data recorded
RUN_MO	N	2	0	Month data recorded
RUN_MO	N	2	0	Month data recorded
RUN_MO	N	2	0	Month data recorded
RUN_TIME	N	4	0	Time data recorded
RUN_YR	N	2	0	Year data recorded
RUN_YR	N	2	0	Year data recorded
RUN_YR	N	2	0	Year data recorded
S2D_1	N	4	1	
S2D_2	N	4	1	
S2D_3	N	4	1	

SALIN	N	2	1	
SAMPLE_NUM	C	3	0	Sample number
SAND	N	6	1	Area with predominantly sand substrate
SBC	C	4	0	Secondary substrate descriptor
SBC	C	4	0	Secondary substrate descriptor
SBC	C	4	0	Secondary substrate descriptor
SBC	C	4	0	Secondary substrate descriptor
SEC	N	3	0	Number of seconds it took bead to traverse dist.
SEDIMENT	N	2	0	Sediment sample taken
SET_TIME	N	4	0	Trap set time
SETD	D	8	0	Date set
SETD	D	8	0	Date set
SETD	D	8	0	Date set
SETT	C	4	0	Time set
SETT	C	4	0	Time set
SETT	C	4	0	Time set
SHORE	C	1	0	
SHORETYPE	C	15	0	Shoreline type
SIDE	C	1	0	Side of river. R=Right, L=Left, C=Center
SIDE	C	1	0	Side of river looking downstream
SIDE	C	1	0	Side of the river (L or R) when facing downstream
SIDE	C	1	0	Side of river. R=Right, L=Left, C=Center
SIDE	C	1	0	Side of river. R=right, L=left, C=center
SILT	N	6	1	Area with predominantly silt substrate
SITE	N	2	0	Site number at that location
SITE	N	2	0	Site number at that location
SITE	N	3	0	Site number at that location
SITE_D	N	6	2	Mean site depth
SITE_L	N	6	2	Site length
SITE_W	N	6	2	Mean site width
SITES	N	3	0	Site number at that location
SONDE	N	2	0	DataSonde set
SPECIES	C	3	0	

START_DA	N	2	0	Day began taking pictures
START_MO	N	2	0	Month began taking pictures
START_TIME	N	4	0	Time of day began taking pictures
START_YR	N	2	0	Year began taking pictures
STATUS	C	1	0	dbase information
STATUS	C	1	0	dBase information
STATUS	C	1	0	dbase information
STRATUM	C	1	0	
STUDY	N	5	0	AGFD study number
STUDY	N	5	0	Study number. trip and location numbers
STUDY	N	5	0	Study number. trip and location numbers
STUDY	N	5	0	AGFD study number
STUDY	N	5	0	AGFD study number
STUDY	N	5	0	Study number. trip and location numbers
STUDY	N	5	0	Study number. trip and location numbers
STUDY	N	5	0	AGFD study number
STUDY	N	5	0	Study number. trip and location numbers
SUB	N	2	0	Primary substrate
SUB	N	2	0	Primary substrate
SUB	N	2	0	Primary substrate
SUB	C	1	0	
SUB	N	2	0	Primary substrate
SUBS1	C	2	0	Primary substrate code
SUBS1	C	2	0	Primary substrate code
SUBS1	C	2	0	Primary substrate code
SUBS2	C	2	0	Secondary substrate code
SUBS2	C	2	0	Secondary substrate code
SUBS2	C	2	0	Secondary substrate code
SUBST_CD	C	2	0	Substrate code
SUBST_CD	C	2	0	Substrate code
SUBST_CD	C	2	0	Substrate code
T	C	1	0	Transect letter for hoop net habitat meas. grid
T	C	1	0	Transect letter for hoop net habitat meas. grid

TBM	C	8	0	Temporary benchmark location code
TEMP	N	4	1	Temperature
TEMP	N	4	1	Temperature (°C)
TEMP	N	5	2	Temperature
TERR_VEG	N	6	1	Area with terrestrial vegetation
TIME	N	4	0	
TIME	N	4	0	
TIME	C	4	0	Time when measured
TIME	C	4	0	Time when measured
TIME	C	4	0	Time when measured
TIME	N	4	0	Time transect measured
TIME_AM	N	4	0	Time in morning that recorded minimum temperature
TIME_BEG	N	4	0	Time at start of sample
TIME_END	N	4	0	Time at end of sample
TIME_PM	N	4	0	Time in afternoon that recorded maximum temp.
TOT_PERIM	N	6	1	Total perimeter length
TRAN_NUM	N	2	0	Transect number
TRANSECT	N	1	0	Transect number
TRAP_NUM	N	2	0	Minnow trap number
TRIP	C	5	0	Trip code
TURB	N	6	0	Turbidity (NTU)
TURB	N	2	0	
TURB	N	6	0	Turbidity (NTU)
TYPE_A	N	2	0	Type A sample taken
TYPE_A2ND	N	2	0	Type A secondary sample taken
TYPE_B	N	2	0	Type B sample taken
UPDN	N	4	0	Distance up or downstream of transect
UPDN	N	4	0	Distance up or downstream of transect line
UPDN	N	4	0	Distance up or downstream of transect
VEG	C	1	0	
VELOCITY	N	3	0	Water velocity (cm/s)
VELOCITY	N	3	0	Water velocity (cm/s)
VELOCITY	N	4	2	Water velocity (cm/s)

VERSION	N	2	0	dBase information
VERSION	N	2	0	dbase information
VERSION	N	2	0	dbase information
VISCERA	N	2	0	Viscera sample taken
VOL_FILTER	N	2	0	Volume of water filtered (ml), zooplankton sample
WIDTH_1	N	3	0	
WIDTH_2	N	3	0	
WIDTH_3	N	3	0	
YEAR	N	2	0	

INDIVIDUAL FISH INFORMATION

Field	Type	Size	Dec	Description
AGECLASS	C	2	0	
ANALFIN	N	2	0	
CAMP	C	1	0	Camp code
CHG_DATE	D	8	0	dBase information
CHG_TIME	C	8	0	dBase information
CLIPBOARD	C	1	0	Clipboard
COLNO	N	3	0	
COLOR	C	1	0	
COMMENTS	C	60	0	Comments
COVER	C	1	0	
D	N	3	1	
DATE	N	6	0	
DATE	C	6	0	Date (year, month, day)
DATE	C	6	0	
DATE	N	6	0	
DATE	D	8	0	Date fish was measured
DAY	N	2	0	Date
DAY	N	2	0	
DEPOSITION	C	2	0	
DEPTH	N	4	1	
DEPTH	N	4	0	
DISP	C	2	0	Disposition code
DISP	C	2	0	Disposition
DORSFIN	N	2	0	
EFFORT	N	5	0	
EFFORT	N	5	0	
EFFORT	N	5	0	
FIN	C	4	0	Fin clip code for new captures and recaps
GEAR	C	3	0	Gear code
GEAR	C	2	0	Gear code

GEAR	N	1	0	
GEAR	N	1	0	
GEAR	N	1	0	
GEAR	C	2	0	
GEAR	N	1	0	Gear code
HAB	C	1	0	
HAB_1	C	2	0	
HAB_2	C	2	0	
HAB_CD	C	2	0	Habitat code
HAB1	C	2	0	General habitat
HAB2	C	2	0	Specific habitat
HAB3	C	2	0	Shoreline habitat
HAUL_NO	N	3	0	Haul number
HOUR	N	4	0	Time
ID	C	8	0	LCR transect, bank location, trap/net number
LB	N	2	0	Pounds
LENGTH	N	4	0	Total length
LENGTH	N	5	0	
LENGTH	N	4	0	Total length
LENGTH	N	5	0	
LENGTH	N	5	0	
LERNAEA	N	8	0	
LNTH	N	3	0	Length of fish (mm)
LOCATION	C	8	0	USFWS transect code and/or generic site name
MARK_RECAP	C	1	0	Mark or recapture (if tagged)
MAT	N	1	0	
MAT	N	1	0	
MATURITY	N	1	0	Maturity code
MATURITY	N	1	0	Maturity code
METER	N	4	0	Meters above mouth of tributary ($\pm 20m$)
METERS	N*	7	1	Meters above the mouth
MONTH	N	2	0	Date
MONTH	N	2	0	

NAME	C	4	0	
NO_COLL	N	3	0	Number collected
NUM	N	3	0	Number of fish
OLD_TAG	C	10	0	Old tag number if fish is recapture
OZ	N	2	0	Ounces
P1_P2	N	3	1	
PER	C	1	0	Period of day fish was measured
PHOTO	C	1	0	Photographs taken
PIT	C	10	0	PIT tag number
PIT_TAG	C	10	0	PIT tag number
REACH	C	1	0	Mainstem Colorado River reach code
RECAP	C	1	0	Recapture or new capture
RECAP	C	1	0	
RECAPNO	N	10	0	
RECAPNO	N	10	0	
RECAPTURE	C	10	0	Tag number of recaptured fish
RECAPTURE	C	1	0	Recaptured fish
REMARKS	C	20	0	Remarks
RIPE	C	2	0	Gonadal maturity code
RIVER	C	2	0	River or tributary code
RIVER	C	2	0	
RIVERMILE	N	4	1	
RM	N	6	2	River mile of capture location (to 1/20 rm)
RM_RELEASE	N	6	2	River mile of release location (to 1/20 rm)
SAMPLE_NUM	C	3	0	Sample number
SEX	C	1	0	Sex
SEX	N	1	0	Sex code
SEX	C	1	0	
SEX	C	1	0	Sex
SEX	C	1	0	
SEX	C	1	0	Sex
SEX	C	1	0	
SITE	N	3	0	Site number at that location

SL	N	3	0	Standard length (mm)
SPECIES	C	2	0	Fish species code
SPECIES	C	3	0	
SPECIES	C	3	0	Fish species
SPECIES	C	3	0	Fish species
SPECIES	C	3	0	
SPECIES	C	3	0	
SPECIES	C	2	0	
SPP	C	3	0	Fish species
START	N	4	0	
STATION	C	5	0	
STATION	C	5	0	
STATION	C	5	0	
STATUS	C	1	0	dBase information
STOP	N	4	0	
STRATUM	C	1	0	
STUDY	N	5	0	Study number: trip and location numbers
SUB	C	1	0	
SUB1	C	2	0	Dominant substrate
SUB2	C	2	0	Secondary substrate
SUBSTR_1	C	2	0	
SUBSTR_2	C	2	0	
TAG	C	10	0	Type of mark or tag number (if marked or tagged)
TAG	C	10	0	Tag number
TAGNO	N	10	0	
TAGNO	C	5	0	
TAGNO	N	10	0	
TEMP	N	4	0	
TIME	N	4	0	
TIME	N	4	0	
TIME	N	4	0	
TIME	C	4	0	Time fish was measured
TL	N	3	0	Total length (mm)

TL_MM	N	5	0	
TRIP	C	5	0	Trip code
TRIP	N	2	0	Trip number
TYPE	C	1	0	
TYPE	C	1	0	Type of sample
VELOCITY	N	3	1	
VELOCITY	N	4	0	
VERSION	N	2	0	dBase information
VIDEO	C	1	0	Video footage taken
WACODE	N	2	0	AGFD reach code: 22=Little Colorado River
WACODE	N	4	0	
WACODE	N	4	0	
WACODE	N	4	0	
WATER	C	5	0	
WATER	C	5	0	
WEIGHT	N	5	0	
WEIGHT	N	5	0	
WEIGHT	N	4	0	Weight
WEIGHT	N	5	0	
WEIGHT	N	4	0	Weight
WGHT	N	4	0	Weight of fish (g)
WT	N	4	0	Weight (g), ±1g
WT_G	N	5	1	
YEAR	N	2	0	Date
YEAR	N	2	0	
YEARCODE	C	1	0	Year code

MORPHOMETRICS AND MERISTICS

Field	Type	Size	Dec	Description
ANAL_FB	N	4	1	Anal fin base (mm)
ANAL_RAY	N	2	0	Number of anal fin rays
BODY_DEPTH	N	5	1	Body depth (mm)
CAMERA_NUM	C	2	0	Camera number
CLIPBOARD	C	1	0	Clipboard number
COMMENTS	C	60	0	Comments
CPL	N	5	1	Caudal peduncle length (mm)
CPMAXD	N	4	1	Maximum caudal peduncle depth (mm)
CPMIND	N	4	1	Minimum caudal peduncle depth (mm)
DATE	C	6	0	Date (year,month,day)
DISP	C	2	0	Disposition code
DORSAL_FB	N	4	1	Dorsal fin base (mm)
DORSAL_RAY	N	2	0	Number of dorsal fin rays
FL	N	3	0	Fork length (mm)
FRAME_NUM	C	5	0	Frame numbers
GEAR	C	2	0	Gear code
HEAD_LN	N	4	1	Head length (mm)
METER	N	4	0	Meters above tributary mouth ($\pm 20m$)
ND	N	4	1	Nuchal depression depth (mm)
OLD_TAG	C	10	0	Old tag number if fish is recapture
P1_P2	N	4	1	Distance between insertions of pectoral and pelvic fins (mm)
PIT_TAG	C	10	0	PIT tag number
RADIO	C	1	0	Radio-tagged fish
REACH	C	1	0	Mainstem Colorado River reach code
RECAPTURE	C	1	0	Recaptured fish
RIPE	C	3	0	Gonadal maturity code
RIVER	C	2	0	River or tributary code
RM_CAPTURE	N	6	2	River mile of capture location (to 1/20 rm)
RM_RELEASE	N	6	2	River mile of release location (to 1/20 rm)
ROLL_NUM	C	2	0	Roll number
SAMPLE_NUM	C	3	0	Sample number

SEX	C	1	0	Sex code
SL	N	3	0	Standard length (mm)
SNOUT_LN	N	4	1	Snout length (mm)
TL	N	3	0	Total length (mm)
TRIP	C	5	0	Trip code
TYPE	C	1	0	Type of sample
VIDEO_NUM	C	2	0	Video number
WT	N	4	0	Weight (g), $\pm 1g$

PRIMARY PRODUCTION/SEDIMENT

Field	Type	Size	Dec	Description
A666	N	5	3	Post-acidification absorbance, 666 nm, ± 0.001 nm
A7501	N	5	3	Post-acidification absorbance, 750 nm, ± 0.001 nm
A7502	N	5	3	Post-acidification absorbance, 750 nm #2, ± 0.001 nm
AMOUNT	N	2	0	Amount of sample collected (cc), if core sample.
ANAL_DA	N	2	0	Day analyzed
ANAL_MO	N	2	0	Month analyzed
ANAL_YR	N	2	0	Year analyzed
ANALYST	C	3	0	Person who analyzed sample
ASH_WEIGHT	N	9	4	Ash weight of sample, ± 0.0001 g
ASH_WT	N	9	4	Ash weight of sediments
B480	N	5	3	Pre-acidification absorbance, 480 nm, ± 0.001 nm
B666	N	5	3	Pre-acidification absorbance, 666 nm, ± 0.001 nm
B7501	N	5	3	Pre-acidification absorbance, 750 nm, ± 0.001 nm
B7502	N	5	3	Pre-acidification absorbance, 750 nm #2, ± 0.001 nm
CELL_NO	C	5	0	Sample or cell number
CHNGDATE	D	8	0	Date of record change
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change
CHNGTIME	N	4	0	Time of record change
CRU_WT	N	9	4	Crucible weight
CRUC_NO	N	4	0	Crucible number, used to burn sample
CRUC_WEIGH	N	9	4	Crucible weight, ± 0.0001 g
DEPTH	N	3	0	Depth (cm), to the nearest cm
DISTANCE	N	4	1	Distance from shore (m), to the nearest dm
DRY_WEIGHT	N	9	4	Dry weight of sample, ± 0.0001 g
DRY_WT	N	9	4	Dry weight of sediments
FLOW	N	5	2	Flow (m/s) ± 0.015 m/s
GEAR_TYP	C	2	0	Gear type code
HAB_CD	C	3	0	Habitat code
HAB_CD	C	2	0	Habitat code
HABCHAN	C	2	0	Channel type code

HABITAT	C	3	0	Habitat code and site number
HABTYPE	C	2	0	Primary habitat code
MAG	N	3	0	Microscope magnification used
METER	N	5	0	Meter above mouth
MILE	N	5	0	Meters upstream from mouth
PAGE	N	3	0	Page of data sheets
PAGE	N	3	0	Page of data sheets
PET_65	N	9	4	Weight of sediments > 65 μ m
PET_WT	N	9	4	Petri dish weight
PHOTO_NO	N	2	0	Photograph number
PHOTO_ROLL	N	2	0	Film roll number
REACH	N	2	0	Colorado River Reach 22=Little Colorado River
ROW	N	1	0	Row number on counting slide
SAMP_NO	C	4	0	Sample number
SET_DA	N	2	0	Day of collection
SET_DA	N	2	0	Day of collection
SET_HR	N	2	0	Hour of collection
SET_HR	N	2	0	Hour of collection
SET_MM	N	2	0	Minute of collection
SET_MM	N	2	0	Minute of collection
SET_MO	N	2	0	Month of collection
SET_MO	N	2	0	Month of collection
SET_YR	N	2	0	Year of collection
SET_YR	N	2	0	Year of collection
SIDE	C	1	0	Side of river: R=right, L=left, C=center
STUDY	N	5	0	Study number: trip and location numbers
STUDY	N	5	0	AGFD Study Number
STUDY	N	5	0	Study number: trip and location numbers
STUDY	N	5	0	AGFD study number
SUBS1	C	2	0	Primary substrate code
SUBS2	C	2	0	Secondary substrate code
SUBSAMPLE	N	1	0	Subsample number
TAXA	C	3	0	Taxa of plankton organism

GAGE	N	6	1	River stage change during observation block (cm)
HAB_MAP_NO	C	10	0	Habitat map number
HAB2	C	2	0	Specific habitat
JUL_DATE	N	3	0	Julian date
LIGHT	C	2	0	Ambient light
MODE	C	2	0	Mode of observation
MODE	C	2	0	Type of surveillance
MOVEMENT	N	3	0	Movement during observation block (m)
NTU	N	6	1	Turbidity (NTU)
PHOTO_ROLL	C	2	0	Roll number
PIT_TAG	C	10	0	PIT tag number
PIT_TAG	C	10	0	PIT tag number
PIT_TAG	C	10	0	PIT tag number
PULSE	N	3	0	Tag pulse rate (pulses/minute)
PULSE	N	3	0	Tag pulse rate (pulses/minute)
PULSE_1	N	2	0	Original tag pulse rate
PULSE_2	N	2	0	Tag pulse rate during observation
REACH	C	1	0	Mainstem Colorado River reach code
REACH	C	1	0	Mainstem Colorado River reach code
REACH	C	1	0	Mainstem Colorado River reach code
RIVER	C	2	0	River or tributary code
RIVER	C	2	0	River or tributary code
RM	N	6	2	River mile (to 1/20 rm)
RM	N	6	2	River mile (to 1/20 rm)
SAMPLE_NUM	C	3	0	Sample number
SAMPLE_NUM	C	3	0	Sample number
SAMPLE_NUM	C	3	0	Sample number
SECHI_DISK	N	4	2	Secchi depth (m)
SEX	C	1	0	Sex
SIDE	C	1	0	Side of river looking downstream
SINGLE	C	1	0	Marks one of multiple records for a sample
SINGLE	C	1	0	Marks one of multiple records for a sample
SINGLE	C	1	0	Marks one of multiple records for a sample

STAGE_RATE	N	7	2	Rate of river stage change (cm/hr)
START_DATE	N	6	0	Date at start of observation (year,month,day)
START_DATE	N	6	0	Date at start of observation block (year,month,day)
START_DATE	N	6	0	Date at start of surveillance (year,month,day)
START_GAGE	N	5	1	River stage at start of observation block
START_HAB	C	2	0	Specific habitat at start of observation block
START_LITE	C	2	0	Ambient light at start of observation block
START_RMI	N	6	2	River mile location at start of observation block (to 1/20 rm)
START_RMI	N	5	1	Starting river mile of surveillance (to 1/20 rm)
START_TIME	N	4	0	Time at start of surveillance
START_TIME	N	4	0	Time at start of observation block
START_TIME	N	4	0	Time at start of observation
START_TURB	C	2	0	Turbidity code at start of observation block
START_WEAT	C	2	0	Weather code at start of observation block
SURGEON	C	2	0	Initials of surgeon
TAG_SIZE	N	2	0	Weight of tag (g)
TIME	N	4	0	Time of individual fish contact
TIME	N	4	0	Time
TIME_ELAPS	N	6	0	Time elapsed during observation
TIME_ELAPS	N	6	2	Time elapsed during observation block
TIME_ELAPS	N	6	2	Time elapsed during surveillance
TL	N	3	0	Total length when implanted (mm)
TRIP	C	5	0	Trip code
TRIP_NUM	C	2	0	Trip code
TRIP_NUM	C	2	0	Trip code
TURBIDITY	C	1	0	Turbidity code
WEATHER	C	2	0	Weather code
WT	N	4	0	Weight when implanted (g), $\pm 1g$

TOTAL	N	3	0	Total number counted of that taxa
XTR_VOL	N	3	0	Volume of methanol (ml) for chlorophyll extraction

RADIOTELEMETRY

Field	Type	Size	Dec	Description
BENCHMARK	C	6	0	Temporary benchmark code
CAMERA_NUM	C	2	0	Camera number
CLIPBOARD	C	1	0	Clipboard number
CLIPBOARD	C	1	0	Clipboard number
CLIPBOARD	C	1	0	Clipboard number
COMMENTS	C	75	0	Comments
CONFIDENCE	C	1	0	Observer confidence in location accuracy
CONFIDENCE	N	1	0	Observer confidence in location accuracy
COVER	C	2	0	Instream cover
CREW	C	8	0	Initials of crew members
CREW	C	8	0	Initials of crew members
DATE	N	6	0	Date of individual fish contact (year,month,day)
END_DATE	N	6	0	Date at end of observation block (year,month,day)
END_DATE	N	6	0	Date at end of surveillance (year,month,day)
END_DATE	N	6	0	Date at end of observation (year,month,day)
END_GAGE	N	5	1	River stage at end of observation block
END_HAB	C	2	0	Specific habitat at end of observation block
END_LITE	C	2	0	Ambient light at end of observation block
END_RMI	N	5	1	Ending river mile of surveillance (to 1/20 m)
END_RMI	N	6	2	River mile location at end of observation block (to 1/20 m)
END_TIME	N	4	0	Time at end of observation
END_TIME	N	4	0	Time at end of observation block
END_TIME	N	4	0	Time at end of surveillance
END_TURB	C	2	0	Turbidity code at end of observation block
END_WEAT	C	2	0	Weather code at end of observation block
FLUCT	C	2	0	River stage change during surveillance
FRAME_NUM	C	5	0	Frame numbers
FREQ	N	3	0	Tag frequency (40.XXX MHz)
FREQ	N	3	0	Tag frequency (40.XXX MHz)
FREQ_1	N	3	0	Original tag frequency
FREQ_2	N	3	0	Strongest tag frequency observed

WATER QUALITY

Field	Type	Size	Dec	Description
AMBT	N	3	0	Present ambient air temperature (°F)
BATT	N	5	2	Battery voltage
BATT	N	5	2	Battery voltage
CAMP	C	1	0	Camp
CELEV	N	5	0	Corrected river elevation
COND	N	6	3	Conductivity
COND	N	5	3	Conductivity
COND	N	6	3	Conductivity
COND	N	4	2	Conductivity (mS)
DATE	N	6	0	Date (year,month,day)
DATE	D	8	0	Date measured
DATE	N	6	0	Date (year,month,day)
DAY	N	2	0	Date
DHI	N	3	0	Daily high air temperature (°F)
DLO	N	2	0	Daily low air temperature (°F)
DO	N	4	1	Dissolved oxygen (ppm)
DO	N	5	2	Dissolved oxygen
DOMGPERL	N	5	2	Dissolved oxygen (mg/L)
DOPERSAT	N	5	1	Dissolved oxygen (% Saturation)
GAUGE	N	5	1	Reading on staff gauge
GEAR	C	3	0	Water quality instrumentation
HOUR	N	2	0	Time of day
KM	N	5	0	Kilometers
LEVEL	N	4	2	Depth of sonde
MIN	N	2	0	Time of day
MONTH	N	2	0	Date
ORP	N	6	3	Oxidation-reduction potential
ORP	N	5	2	Oxidation/reduction potential (hydrolab only)
PH	N	5	2	pH
PH	N	4	2	pH
PH	N	5	2	pH

PH	N	4	2	pH
REDOX	N	3	0	Redox potential
RELEV	N	4	0	Depth of river above base flow (cm)
RIVER	C	2	0	River or tributary code
RIVER	C	2	0	River or tributary code
RM	N	6	2	River mile (to 1/20 rm)
RM	N	6	2	River mile (to 1/20 rm)
SAL	N	4	1	Salinity (percent)
SALINITY	N	3	1	Salinity
SECCHI	N	3	0	Secchi depth (cm)
SITE	N	3	0	Site number at that location
STUDY	N	5	0	Study number: trip and location numbers
TEMP	N	4	1	Water temperature (°C)
TEMP	N	5	2	Temperature (°C)
TEMP	N	5	2	Temperature (°C)
TEMP	N	5	2	Temperature (°C)
TIME	N	4	0	Military time
TIME	N	4	0	Military time
TIME	N	4	0	Time measured
TRUEDO	N	5	2	Dissolved oxygen
TURBID	N	5	0	Turbidity (NTUs)
VOLTS	N	4	1	Battery strength
YEAR	N	2	0	Date

CHAPTER 3. EXAMPLES OF DATA CODE DEFINITIONS

The following is a list of examples of data code definitions. These lists may or may not be used in a Data Collection Protocol for the NEFS. However, developing an integrated database will require forethought in determining future uses and possible cross integration of this database with other databases. Hence, such codes as organization, principal investigators, and sample design may seem esoteric and unnecessary for this database, but may be very valuable when integrating with other databases.

Some of the examples presented were taken from the List of Field Names and Data Codes, Upper Colorado River Basin Database (U.S. Fish and Wildlife Service 1989), a protocol in use in the upper basin since about 1979. This protocol has helped greatly to centralize data storage and establish common fields and codes that enable upper basin researchers to access data collected by other investigators.

Following the sample list of code definitions is a set of codes taken from the Grand Canyon Fisheries Integrated Database (GCFIN) (Brown et al. 1995). Code definitions are presented for each of the NEFS investigative groups, and provide an illustration of the variety of data codes currently in use. These lists of data codes show inconsistencies in codes among the different groups. For example, the code for common carp is CRP (ASU, AGFD), CCP (USFWS), and CP (B/W). Only the two character code used by BIO/WEST is consistent with the upper basin database.

Table 1. Public and private organizations and codes that have collected fisheries data in Grand Canyon.

Organization	Code
Arizona Game and Fish Department	AGF
Arizona State University	ASU
BIO/WEST, Inc.	B/W
Hualapai Tribe	HUA
Hopi Tribe	HOP
Navajo Tribe	NAV
Northern Arizona University	NAU
SWCA	SWC
University of Arizona	UOA
U.S. Fish and Wildlife Service	FWS

Table 2. Principal investigators and researchers that have collected fisheries data in Grand Canyon.

Investigator	Code	Investigator	Code
Steve Carothers	SC		
Chuck Minckley	CM		
Paul Marsh	PM		
Mike Douglas	MD		
Bill Persons	BP		
Tim Hoffnagle	TM		
Rich Valdez	RV		
Bill Masslich	BM		
Owen Gorman	OG		

Table 3. Longitudinal reaches of the Colorado River from Glen Canyon Dam to Pearce Ferry. From Schmidt and Graf (1988).

Reach Description	Reach Number	River Mile
Permian Section	1	0-11.3
Supai Gorge	2	11.3-22.6
Redwall Gorge	3	22.6-35.9
Lower Marble Canyon	4	35.9-61.5
Furnace Flats	5	61.5-77.4
Upper Granite Gorge	6	77.4-117.8
Aisles	7	117.8-125.5
Middle Granite Gorge	8	125.6-139.9
Muav Gorge	9	140-159.9
Lower Canyon	10	160-213.8
Lower Granite Gorge	11	213.9-225

Table 4. Longitudinal reaches of the Colorado River from Glen Canyon Dam to Pearce Ferry. From Maddux et al. (1987).

Reach Description	Reach Number	River Mile
Glen Canyon Dam to Lees Ferry	10	-15.5-0
Lees Ferry to Little Colorado River	20	0-61.5
Little Colorado River to Bright Angel Creek	30	61.5-88.0
Bright Angel Creek to National Canyon	40	88.0-166.5
National Canyon to Diamond Creek	50	166.5-226
Paria River	11	1.0
Nankoweap Creek	21	52.0
Little Colorado River	22	61.5
Clear Creek	31	84.0
Bright Angel Creek	32	88.0
Crystal Creek	41	98.0
Shinumo Creek	42	108.5
Tapeats Creek	43	134.0
Deer Creek	44	136.0
Kanab Creek	45	143.5
Havasu Creek	46	157.0

Table 5. Monitoring sites and river miles of the Colorado River from Glen Canyon Dam to Pearce Ferry. From Werth et al. (1993).

Monitoring Site	River Mile
1	Dam to -10
2	-4 to 2
3	42 to 48
4	51 to 56
5	60 to 72 and one mile up the LCR
6	93 to 99
7	120 to 123
8	133 to 138
9	143 to 145
10	179 to 181
11	207 to 210
12	225 to 230
13	273 to 276
14*	-10 to -4
15*	One mile to 11 miles up the LCR

* = special study site

Table 6. Codes and river miles for rivers and tributaries in Grand Canyon.

River or Tributary	Code	River Mile at Inflow
Colorado River	COR	-
Paria River	PAR	0.9
Nankoweap Creek	NAN	52.2
Little Colorado River	LCR	61.3
Clear Creek	CLC	84.1
Bright Angel Creek	BAC	87.7
Salt Creek	SAL	92.5
Crystal Creek	CRK	98.1
Shinumo Creek	SHI	108.6
119-Mile Creek	ONC	118.9
127-Mile Creek	OTC	126.8
Tapeats Creek	TAP	133.7
Deer Creek	DRC	136.3
Kanab Creek	KAN	143.5
Havasu Creek	HAV	156.7
Diamond Creek	DIA	225.7
Spencer Creek	SPE	246.0
Surprise Creek	SUR	248.4
Lost Creek	LOS	249.0
Quartermaster Creek	QUA	259.9

Table 7. Reaches and meters from the confluence for the Little Colorado River.

Reach Description	Meters From Confluence
Chute Falls to Salt Trail Camp	14.9 to 10.8
Salt Trail Camp to Sipapu	10.8 to 7.5
Sipapu to Powell Canyon Camp	7.5 to 3.0
Powell Canyon Camp to Confluence	3.0 to 0.0

Table 8. Sampling design used by fisheries researchers in Grand Canyon.

Sampling Design	Code
Predam Survey	PRE
Postdam Survey	POS
GCES Phase I	GCI
GCES Phase II	GII
Long-Term Monitoring	LTM
Backwater Sampling	BAC
Special Survey	SPE

Table 9. Description of mandatory dBASE IV fields for fisheries data for use in master PIT tag list.

Field Number	Field Name	Field Type	Field Length	Field Decimals
1	AGENCY	C	2	
2	PRINCIPAL	C	2	
3	RIVER	C	3	
4	RMI	N	6	2
5	DATE	N	6	0
6	SPECIES	C	2	
7	LENGTH	N	3	0
8	WEIGHT	N	4	0
9	PIT TAGNO	N	10	0
10	OLD TAGNO	N	5	0
11	OLD TAGTYPE	C	2	
12	OLD TAGCOLOR	C	2	
13	RECAP	C	1	
14	DISP	C	2	

**B-1. ARIZONA STATE UNIVERSITY
DATABASE CODE DEFINITIONS**

CAMP

C	Confluence
P	Powell
S	Salt

TRIP

Numbered sequentially from 1-12+ for a given year

YEAR CODE

A	1991
B	1992
C	1993
etc	

WACODE

22	Little Colorado River
----	-----------------------

LOCATION

USFWS transect code and/or generic site name

GEAR

2	Trammel
3	Seine
5	Hoop
6	Angling

SPECIES

RET	Rainbow trout
BRT	Brown trout
HBC	Humpback chub
STB	Striped bass
FHM	Fathead minnow
RGK	RioGrand killifish
CRP	Common carp
SD	Speckled dace
FMS	Flannelmouth sucker
CCF	Channel catfish
BHS	Bluehead sucker
BBH	Black bullhead
YBH	Yellow bullhead
RBS	Razorback sucker
BG	Bluegill

SEX

0	Unknown
1	Male
2	Female

MATURITY

0	Immature
2	Mature
3	Ripe
4	Spent
6	Mortality

**B-2. U.S. FISH AND WILDLIFE SERVICE
DATABASE CODE DEFINITIONS**

GEAR		B	smooth or bottom/basement travertine
AHP	ASU hoopnet	V	vegetation
MNP	FWS mini-hoopnet	A	algae
MTP	FWS minnow trap	P	pondweed
SEN	FWS seine	R	roots
TRN	FWS transect	F	phragmites stems
ICM	ICM meter	C	cattail stems
HDL	Hydrolab	S	shrubs or small tree
HDLL	Hydrolab with logger	D	detritus
		W	wood
		L	leaves
GEARD (mesh, # hoops, hoop diameter)		G	dry ground or land
mesh	25 1/4"	Z	particle is composed of solid travertine
	50 1/2"		
# hoops	4		
	5		
	6	M	
	etc.	0	20m transect
diameter	50	1	100m transect
	60		
	70	CVR	
	80	0	none
	90	1	slight
		2	little
		3	moderate
		4	extensive
		5-8	deep water cover negative values unsuitable habitat
CUR			
0	none (0-.02 m/s)		
1	very slow (.02-.10 m/s)		
2	slow (.10-.30 m/s)		
3	moderate (.30-.70 m/s)		
4	fast (.70-1.20 m/s)		
5	very fast (>1.20 m/s)		
CC (current comments)		VER	
E	backcurrent or eddy	0	no vertical structure
T	turbulent flow	1	V in OVH and depth 10-25 cm
P	plunge pool or waterfall	2	V in OVH and depth 25-50 cm
+	slightly faster current	3	V in OVH and depth 50-100 cm
-	slightly slower current	4	V in OVH and depth >100 cm
		+1	E and O,LU, or W in OVH and depth >25 cm
SUB		VEG	
M	marl	0	no vegetation
0	silt or marl (<.06 mm)	1	small macrophytes or filamentous algae
1	silt-sand (.07-.10 mm)	2	roots and small emergent vegetation, rushes
2	sand (.11-2.0 mm)	3	large emergent vegetation
3	gravel (2.1-15 mm)		
4	pebble (16-31 mm)	MAR	
5	rock (32-100 mm)	0	no marl
6	cobble (101-255 mm)	1	mixture of marl and silt or sand
7	small boulder (256-1000 mm)	2	marl coating on larger substrates
8	boulder (1-3 m)	3	thick marl deposit as primary substrate
9	large boulder (>3 m)		
10 or T	travertine	TRA	
11	bedrock	0	no travertine
SBC (substrate descriptor)		1	travertine coated substrates
M	marl	2	smooth or rough travertine as primary substrate
T	travertine		
H	rough or horny travertine		
Q	travertine dam or terrace		

Structure

*

B-2. U.S. Fish and Wildlife Service Database Code Definitions - cont.

3 rough travertine and solid travertine masses associated with travertine dams and reefs

SHA

0 <10% or no shade
 1 10-50% shade
 2 50-75% shade
 3 >75% shade

DEB

0 no debris
 1 detritus and leaves
 2 sticks and small logs
 3 large submerged logs

PER

M midnight sample (22:00-02:00)
 A night time sample (02:00-10:00)
 P daytime sample (10:00-22:00)

SPP

HBC humpback chub
 BHS bluehead sucker
 FMS flannelmouth sucker
 SPD speckled dace
 CCF channel catfish
 FHM fathead minnow
 CCP common carp
 KLF plains killifish
 RBT rainbow trout
 BNT brown trout
 CUT cutthroat trout
 GSF green sunfish
 LMB largemouth bass
 RBS razorback sucker
 RSH red shiner

FIN

UCRP upper caudal, right pectoral
 UCLP upper caudal, left pectoral
 LCRP lower caudal, right pectoral
 LCLP lower caudal, left pectoral

CAMP

S Salt camp
 P Powell camp
 A Atomizer
 B Blue Springs
 C confluence

SECCHI

0 <0.5
 1 0.5-1.0

**B-3. ARIZONA GAME AND FISH
DATABASE CODE DEFINITIONS
Little Colorado River**

REACH		CB	Connected backwater
022	Little Colorado River	IB	Isolated backwater
020	Colorado above LCR	ED	Eddy
030	Colorado below LCR	RI	Riffle
		RU	Run
		EW	Edgewater
MILE		CO	Cove
Confluence at 61.5		SC	Springflow Channel (arising from sidechannel)
Use meters above mouth for LCR		PO	Pool
SIDE		2° HABITAT	
L	Left (looking downstream)	PL	Plunge Pool
R	Right (looking downstream)	DP	Dammed Pool
C	Center	PW	Pocket Water (pool)
		TP	Travertine Pool
GEAR-TYPE		LP	Lateral Scour Pool
BS	Bag Seine	PP	Peripheral Pool
SS	Straight Seine	CA	Cascade (riffle)
MT	Minnow Trap		
HN	Hoop Net (round, no leads)	SUBSTRATE	
AN	Angling	BD	Bedrock (>4.096 m)
DP	Dip Net	BO	Boulder (0.256-4.096 m)
		CO	Cobble (64-256 mm)
GEAR-H (height)		PB	Pebble (32-64 mm)
Record to the nearest ft.		GR	Gravel (2-32 mm)
		SA	Sand (0.062-2 mm)
GEAR-L (length)		SI	Silt (4-62 µm)
Record to the nearest ft.		CL	Clay (0.24-4 µm)
		DE	Detritus
GEAR-M (mesh)		CC	Calcium carbonate floc
0.03	1/32 in.	TR	Travertine (tufa)
0.06	1/16 in.		
0.12	1/8 in.	FEATURES	
0.25	1/4 in.	DE	Depth >0.5 m
0.50	1/2 in.	TU	Turbulence
0.75	3/4 in.	LE	Ledge
1.00	1 in.	BO	Boulder
1.50	1-1/2 in.	UB	Undercut Bank
2.00	2 in.	TD	Turbidity
E	Experimental	OV	Overhanging Vegetation
		IV	Instream Vegetation
AREAL EFFORT-LEN		WD	Woody Debris
Length of seine haul to nearest meter		DA	Dam (upstream)
Length of dip net sweep to nearest cm			
		SPECIES	
AREAL EFFORT-WID		BHS	Bluehead mountain sucker
Width of seine haul to nearest meter		FMS	Flannelmouth sucker
Width of dip net to nearest cm		RBS	Razorback sucker
		SUC	Unidentified sucker
CHANNEL TYPE		HBC	Humpback chub
MC	Main Channel	SPD	Speckled dace
SC	Side Channel	FHM	Fathead minnow
TS	Tributary Stream	RSH	Red shiner
TM	Tributary Mouth	CRP	Carp
		PKF	Plains killifish
1° HABITAT		CCF	Channel catfish

B-3. Arizona Game and Fish Database Code Definitions - cont.
Little Colorado River

RBT	Rainbow trout	06	Predator bite scars
UID	Unidentified species	07	Fin condition
SHY	Sucker hybrid	08	Pulled net
		09	Pit tag/external tag scar
SEX		10	Upper caudal + RP2 fin clips
M	Male	11	Upper caudal + LP2 fin clips
F	Female	12	Lower caudal + RP2 fin clips
U	Undetermined	13	Lower caudal + LP2 fin clips
N	Determination not attempted	14	Dorsal fin punch
		15	Caudal fin punch
MAT (maturity)		16	Radio tagged
3	Ripe-gametes extrudable	20	Escaped
4	Spent female-fish has expelled gametes	21	PIT tagged but number not recorded
5	Tuberculate (not ripe)	22	More than one tag injected
6	Undeterminable	23	Collected from longitudinal survey
7	Not attempted	24	Proto larva
8	<i>COLOR</i>	25	Meso larva
		26	Meta larva
PAR #			
	Number of external parasites (Lernea) visible		
	Record location codes in comments!		
EXT-Y/N (external tag) - Record type code, color code, and number in Comments		LENGTH	
F	Floy tag (type)	01	<6 mm
C	Carlin tag (type)	02	6-10 mm
Y	Yellow	03	11-20 mm
G	Green	04	21-30 mm
B	Blue	05	31-40 mm
O	Orange	06	41-50 mm
R	Red	07	51-60 mm
		08	61-70 mm
		09	71-80 mm
		10	81-90 mm
		11	91-100 mm
		etc	
HEAD-STOM - Record 2-letter code followed by 2-digit number		HABTYPE	
HE	Head, ethanol	PP	Periferal pool
SF	Stomach, formalin	VS	Vegetated shoreline
BE	Body (entire fish), ethanol	OS	Non-vegetated shoreline
BF	Body (entire fish), formalin	SC	Spring-flow channel
HS	Head and stomach preserved in ethanol and formalin, respectively		
DIS (disposition)			
RA	Released alive		
DN	Dead, not taken		
DP	Dead, preserved		
DS	Dead, skeletonized		
SP	Sacrificed, preserved		
SS	Sacrificed, skeletonized		
MN	Mortality, not taken		
MP	Mortality, preserved		
MS	Mortality, skeletonized		
COMMENT CODES			
00	Fishless		
01	Coloration		
02	Fishless w/ qualification		
03	Equipment failure		
04	External tag		
05	Body scars/bruising		

DRIFT AND VISCERA INVERTEBRATE CODE SHEET

INSECTS				QUARTER SAMPLE	
Diptera	DPA	Megaloptera	MEG	FISH (UKN)	FHS
Simuliidae	SIM	Corydalidae	CYD		
Chironomidae	CHI			Sucker	SUC
Empididae	EMP	Embioptera	EMB	Flannel Mth	FMS
		Odonata	ODO	Bluehead	BHS
Ceratopogonida	CPG			Speck Dace	SPD
Dixidae	DIX	Gomphidae	GPH	Humpback Chub	HBC
		Thysanoptera	THY	Fathead Minn.	FHM
Dolichopodidae	DOL	Thripidae	THR	Killifish	PKF
Sciaridae	SCI			Catfish	CCF
Ephydriidae	EPY	Phloeothripidae	PHL	Carp	CRP
Schizophora-DIV	SCZ			Eggs(UKN)	EGG
Trichoscelidae	TRX	Collembola	COL	Fish eggs-100%	EEE
		Psocoptera	PSO	Fish eggs-25%	EGF
Hemiptera	HMA	Plecoptera	PLE	Insect eggs	EGI
Gerridae	GER	Neuroptera	NEU	Amph. eggs	EGA
Veliidae	VEL	Thysanura	THU		
Miridae	MIR	Orthoptera	ORT	MISCS.	
Tingidae	TNG	Lepidoptera	LEP	Body parts	BPS
Berytidae	BEY	Strepsiptera	STR	Pollen	POL
Saldidae	SAL	Isoptera	ISO	Seeds	SEE
Hebridae	HEB	Mallophaga	MLO	Crustacea	CRU
Mesovellidae	MES			Algae	ALG
Macrovellidae	MAC	OTHERS		Other Misc. Org.	OMO
		Araneida	ARA		
Homoptera	HOM	Acarina	ACA	Detritus	DET
Cicadellidae	CDL	Hydracarina	HYD	Sand, Gravel	ROC
Aphididae	APH	Ostrocoda	OST	Empty	EPT
Psyllidae	PSY	Amphibia	AMP		
		Bufo	BFO	LIFE STAGE	
Trichoptera	TRI	Mollusca	MOL	Adult	A
		Bivalvia	BIV	Pupae	P
Hydropsychidae	HPS	Gastropoda	GAS	Larva	L
Hydroptilidae	HPT	Tapeworm(s)	TPW	Nymph	N
		Nematoda	NEM	Prolarva	R
Hymenoptera	HYM	Annelida	ANN	Mesolarva	M
Encyrtidae	ENC	Hirundea	HIR	Metalarva	T
Pteromalidae	PTE	Oligochaeta	OLJ	Juvenile	J
Formicidae	FOR	Rotifera	ROT		
Braconidae	BRA	Cladocera	CLC	MATURITY	
Eulophidae	EUL	Copepoda	COP	No Maturity	0
Apidae	APO	Taxa	TAX	Many Sm eggs	1
Eurytomidae	EUR	Chlorohydra	HYA	Mature	2
				Ripe	3
Coleoptera	CLA	WHOLE SAMPLE		Spent	4
Elmidae	ELM	Fish(UKN)	FFF	Unknown Mat.	6
Dryopidae	DRY	Sucker	SUW		
Chrysomelidae	CHR	Flannel Mth	FMW	PARASITE CODES	
		Bluehead	BHW	None	0
Curculionidae	CUR	Speck. Dace	SPW	1-10	1
Hydrophilidae	HYP	Humpback Chub	HBW	11-100+	2
		Fathead Minn.	FHW		
Ephemeroptera	EPH	Killifish	PKW		
Baetidae	BAT	Catfish	CCW		
Siphonuridae	SIP	Carp	CRW		

**B-3. ARIZONA GAME AND FISH
DATABASE CODE DEFINITIONS
Mainstem Colorado River**

AMB_LITE: Ambient Light Codes

SU	Sunny
PC	Partly Cloudy (<50% cloud cover)
CL	Cloudy (>50% cloud cover)
SH	Shade
NI	Night
ML	Moonlight
DN	Dawn
DK	Dusk

BF

BO

CO

DM

ED

MC

ME

MR

MS

SC

Beach Face

Boulder Shoreline

Cove

Dewatered (used for trap sets)

Eddy

Mainchannel

Mainchannel Eddy

Main River

Mainstream

Side Channel

DISP: Disposition codes

RA	Released Alive
MN	Mortality
MP	Mortality, Preserved
SP	Sacrificed, Preserved
OB	Observed

Tributaries

DT

ED

PO

RA

RI

RU

TM

TS

PL

TS

TB

Dewatered (used for trap sets)

Eddy

Pool

Rapid

Riffle

Run

Tributary Mouth

Tributary Side Channel

Pool

Tributary Side Channel

Tributary

FLOW_CD: Flow Codes

AC	Ascending
DC	Descending
SH	Stable High
SL	Stable Low

GEAR_CD: Gear codes

BS	Small Bag Seine 15' x 6' x 1/8" (1/32" bag mesh)
BL	Large Bag Seine 30' x 6' x 1/4" (1/8" bag mesh)
SS	Small Straight Seine 15' x 4' x 1/8"
SL	Large Straight Seine 30' x 6' x 1/16"
KS	Kick Seine 3' x 3' x 1/32"
DS	Small Mesh Dip Net 1/16"
DL	Large Mesh Dip Net 3/16"
MH	Mini-Hoop Net 1.5' x 4' x 3/8"
HN	Hoop Net 3' x 5' x 3/8" x 40' wings
TN	Trammel Net (Set)
TS	Trammel Net (Used As A Seine)
LD	Larval Drift
MT	Minnow Trap
AN	Angling

LIFE_STAGE: Life stage codes for diet analysis

A

P

L

N

R

M

T

J

U

Adult

Pupae

Larva

Nymph

Prolarva

Mesolarva

Metalarva

Juvenile

Unknown

MATURITY

0

1

2

3

4

5

6

7

8

Larval, Juvenile

Adult, Non-breeding

Gravid

Ripe

Spent

Tuberculate

Undetermined

Not Attempted

High Color

HAB_CD: Habitat Codes

Backwaters

BE	Backwater Eddy
BW	Backwater
BM	Backwater Mouth - Connected Mouth
BC	Backwater Center - Connected Center
CB	Connected Backwater
CC	Connected Center
CE	Connected Eddy
CF	Connected Foot
CM	Connected Mouth
DW	Dewatered (used for trap sets)
IB	Isolated Backwater
IP	Isolated Pool
SC	Side Channel

PARASITE

0

1

2

None

1-10

11-100+

REACH

010

011

020

021

Mainstem: Glen Canyon Dam to

Lees Ferry (RM 0)

Paria River (RM 0.9)

Mainstem: Lees Ferry to Little

Colorado River (RM 81.5)

Nankoweap Creek (RM 52.2R)

Mainchannel

B-3. Arizona Game and Fish Database Code Definitions - cont.
Mainstem Colorado River

022	Little Colorado R. (RM61.5L)
030	Mainstem: LCR to Bright Angel Creek (RM 87.62)
031	Clear Creek (RM 84.03R)
032	Bright Angel Creek (RM 87.62R)
040	Mainstem: Bright Angel to National Canyon (RM 166.4)
401	Pipe Creek (RM 88.95L)
041	Crystal Creek (RM 98.04R)
042	Shinumo Creek (RM 108.6R)
402	Elves Chasm (RM 116.5L)
403	Stone Creek (RM 131.8R)
043	Tapeats Creek (RM 133.83R)
044	Deer Creek (RM 136.25R)
045	Kanab Creek (RM 143.5R)
404	Olo Canyon (RM 145.5L)
046	Havasu Creek (RM 156.93L)
047	Diamond Creek (RM 225.6L)
050	Mainstem: National Canyon to Diamond Creek (RM 225.6)
060	Mainstem: Diamond Creek to Lake Mead (RM 270?)
061	Travertine Creek (RM 229.0L)
062	Spencer Creek (RM 246.0)

Sex Codes

F	Female
M	Male

SPECIES

Common Species

BBH	Black Bullhead
BGS	Bluegill
BHS	Bluehead Sucker
BKT	Brook Trout
BNT	Brown Trout
CCF	Channel Catfish
CRP	Common Carp
CUT	Cutthroat Trout
FMS	Flannelmouth Sucker
GSH	Golden Shiner
HBC	Humpback Chub
LMB	Largemouth Bass
PKF	Plains Killifish
RBS	Razorback Sucker
RBT	Rainbow Trout
RSH	Red Shiner
SMB	Smallmouth Bass
SPD	Speckled Dace
STB	Striped Bass
TFS	Threadfin Shad
UTC	Utah Chub
YBH	Yellow Bullhead
SUC	Sucker (unidentified)
UID	Unidentified

SUBST_CD: Substrate Codes

SI	Silt
SA	Sand

GR	Gravel
PE	Pebble
CO	Cobble
BO	Boulder
BD	Bedrock

TAG: Tag Codes and Fin Clips/Punches

Tag Types

C	Carlin
F	Floy
P	PIT

Fin Clips/Punches

D	Dorsal
UC	Upper Caudal
LC	Lower Caudal
CD	Caudal
RP2	Right Pelvic
LP2	Left Pelvic

TAXA

ALG	Algae
ACA	Acarina
AMP	Amphibia
ANN	Annelids
APD	Amphipod
APH	Aphididae
APO	Apoidea
ARA	Araneida
BAT	Baetidae
BEY	Berytidae
BFO	Bufo
BIV	Bivalvia
BPS	Body parts
BRA	Braconidae
CDL	Cicadellidae
CHI	Chironomidae
CHR	Chrysomelidae
CIL	Ciliate
CLA	Coleoptera
CLC	Cladocera
COL	Collembola
COP	Copepoda
CPG	Ceratopogonidae
CRU	Crustacean
CST	Cestoda
CUR	Curculionidae
CYD	Corydalidae
DET	Detritus
DIA	Diatom
DIX	Dbidae
DOL	Dolichopodidae
DPA	Diptera
DRY	Dryopidae
ECT	Ectoproct
ELM	Elmidae
EMB	Embioptera
EMP	Empididae
ENC	Encyrtidae
EPH	Ephemeroptera

B-3. Arizona Game and Fish Database Code Definitions - cont.
Mainstem Colorado River

EPT	Empty	VOL	Volvox
EPY	Ephyridae		
EUL	Eulophidae		
EUR	Eurytomidae		
FOR	Formicidae		
GAS	Gastropoda		
GER	Gerridae		
GPH	Gomphidae		
HEB	Hebridae		
HIR	Hirundea		
HMA	Hemiptera		
HOM	Homoptera		
HPS	Hydropsychidae		
HPT	Hydroptilidae		
HYA	Chlorohydra		
HYD	Hydracarina		
HYM	Hymenoptera		
HYP	Hydrophilidae		
ISO	Isoptera		
LEP	Lepidoptera		
MAC	Macroveliidae		
MEG	Megaloptera		
MES	Mesoveliidae		
MIR	Miridae		
MLO	Mallophaga		
MOL	Mollusca		
NAP	Copepod nauplius		
NEM	Nematoda		
NEU	Neuroptera		
ODO	Odonata		
OLI	Oligochaeta		
OMO	Other Misc. Org.		
ONP	Ostracod nauplius		
ORT	Orthoptera		
OST	Ostrocooda		
PHL	Phloeothripidae		
PLE	Plecoptera		
POL	Pollen		
PRO	Protozoan		
PSO	Psocoptera		
PSY	Psyllidae		
PTE	Pteromalidae		
ROC	Sand, Gravel		
ROT	Rotifera		
SAL	Saldidae		
SCI	Sciaridae		
SCZ	Schizophora		
SEE	Seeds		
SIM	Simuliidae		
SIP	Siphonuridae		
STR	Strepsiptera		
THR	Thripidae		
THU	Thysanura		
THY	Thysanoptera		
TIP	Tipulidae		
TNG	Tingidae		
TRI	Trichoptera		
TRX	Trixoscelidae		
VEL	Vellidae		

B-4. BIO/WEST Inc., DATABASE CODE DEFINITIONS

AMBIENT LIGHT
 SU Sunny
 CL Cloudy (> 50% cloud cover)
 PC Partly cloudy (< or 50% cloud cover)
 SH Shadow
 NI Night
 ML Moonlight
 DD Dawn/dusk

DISPOSITION
 RA Returned alive (no radio implant)
 RI Returned with newly implanted radio
 RR Returned with active radio transmitter
 RN Returned with non-active radio transmitter (removed external antennae but did not re-implant)
 RS Returned alive with stomach contents
 removed
 DR Dead, released (non-native fish)
 DP Dead, preserved
 DS Dead, stomach contents preserved

FLUCTUATIONS OR FLUCT
 RI Rising
 FA Falling
 SL Steady at a low stage
 SH Steady at a high stage

GEAR
 EL Electrofishing
 BP Backpack electrofishing
 FR Frame net
 SA 10'x3'x1/8" seine
 SB 30'x4'x1/4" seine
 SC 15'x4'x1/8" seine
 SG 30'x5'x1/4" seine
 DL Larval fish drift net
 DR Invert drift net
 SU Surber
 AQ Aquarium net
 KS Kick screen
 TK 75'x6'x1'x12" Trammel net
 TL 75'x6'x1 1/2'x12" Trammel net
 TF Floated Trammel net RECORD AREA

SAMPLED
 TM 50'x6'x1'x12" Trammel net
 TN 50'x6'x1.5'x12"
 GM 100'x6'x2" gill net
 GP 100'x6'x1 1/2" gill net
 GX 100' experimental gill net
 GZ 60' experimental gill net
 GY 50'x6'x1.5' gill net
 GF Floated gill net RECORD AREA

SAMPLED
 MT Minnow trap
 HL Large hoop net (4' diam.)
 HM Medium hoop net (3' diam.)
 HS Small hoop net (2' diam.)
 AN Angling

TW 75'x6'x1/2'x10
 TZ TL with attached floats
 TY TK with attached floats

HAB1: General habitat
 MC Main channel
 TS Tributary stream
 SC Side channel
 LK Lake

HAB2: Specific habitat
 BA Backwater
 ED Eddy
 EM Embayment = PO ?
 RI Riffle
 RU Run
 SH Shoreline = GL ?
 PO Pool
 RC Return channel

IP ?
HAB3: Shoreline habitat
 TS Talus scree TA
 SW Shear wall CL
 LE Ledge
 BE Bedrock
 SI Silt
 SA Sand BB
 CO Cobble CB
 BO Boulder field BL
 CB Cut bank
 VG Vegetation
 DF Debris flow
 TV Travertine

RIPE: State of gonadal maturity of fish
 +TU Tubercled only
 +TC Tubercled and colored
 -MI Running milt
 -EG Expressible eggs
 -SP Spent
 +CO Colored only

SUB1: Dominant substrate
 SI Silt = 0
 SA Sand = 2
 GR Gravel = 3
 CO or CB Cobble = 6
 BO Boulder = 8
 BE Bedrock = 10
 OR Organic matter = 11

SUB2: Secondary substrate
 SI Silt
 SA Sand
 GR Gravel
 CO Cobble
 BO Boulder

cond chaos
 T
 B
 R
 S
 C

B-4. BIO/WEST, Inc. Database Code Definitions - cont.

BE	Bedrock	Carlin tag number	
OR	Organic matter		
TURBIDITY OR TURB		REACH	
H	High secchi = < 0.5m	0	Lees Ferry to Kwagunt (RM 0-56.0)
L	Low secchi = > 0.5m	1	Kwagunt to Hance (RM 56-76.6)
		2	Hance to Havasu (RM 76.6-156.7)
		3	Havasu to Diamond Creek (RM 156.7-
WEATHER		226)	
SU	Sunny	4	Diamond Creek to Pearce Ferry (RM
CS	(SU) clear skies	226-280)	
CL	Cloudy (> 50% cloud cover)		
PC	Partly cloudy (< or 50% cloud		
cover)		RIVER	
OV	Overcast or foggy	CO	Mainstem Colorado River
RA	Raining	LC	Little Colorado River
SN	Snowing	BA	Bright Angel Creek
		KN	Kanab Creek
		HV	Havasu Creek
		TP	Tapeats Creek
		SH	Shinumo Creek
		DC	Deer Creek
		NK	Nankoweap
		CL	Clear Creek
		CR	Crystal Creek
		ST	Stone Creek
		CB	Carbon Creek
		DI	Diamond Creek
		SP	Spencer Creek
		SU	Surprise Creek
		LO	Lost Creek
SPECIES CODE OR SPECIES: Code for fish species		SAMPLE TYPE	
HB	Humpback chub	E	Electrofishing
FM	Flannelmouth sucker	N	Gill/Trammel nets
BH	Bluehead sucker	S	Seining
SD	Speckled dace	T	Traps, i.e. hoop nets, minnow traps
RZ	Razorback sucker		
FH	Fathead minnow	SEX	
CC	Channel catfish	M	Male
BB	Black bullhead	F	Female
CP	Carp	I	Immature
RB	Rainbow trout	U	Undetermined
BR	Brown trout		
BK	Brook trout	SIDE	
PK	Plains killifish (<u>Fundulus zebrinus</u>)	R	River right (looking downstream)
SB	Striped bass	L	River left (looking downstream)
WE	Walleye	C	Center (tributary hoop net sets)
FR	Flannelmouth X razorback hybrid	CONFIDENCE	
SU	Unidentified sucker	1	High, excellent reception
YB	Yellow bullhead	2	Low, poor reception
BG	Bluegill	3	Only a few 'hits', use for location only
GA	Gambusia	COVER	
GS	Green sunfish	OB	Overhanging bank
LG	Largemouth bass	SV	Streamside vegetation
RS	Red shiner	NC	No cover
TS	Threadfin shad	MODE	
BC	Black crappie	IM	Implant
NP	Northern pike		
RT	Roundtail chub		
SH	Shiner (red or sand)		
SM	Smallmouth bass		
SS	Sandshiner		
OLD TAG			
UCRP2	Upper caudal plus RP2		
UCLP2	Upper caudal plus LP2		
LCRP2	Lower caudal plus RP2		
LCLP2	Lower caudal plus LP2		
DP	Dorsal punch		
UCP	Upper caudal punch		
LCP	Lower caudal punch		
PIT	PIT tag number		
Floy tag number			

B-4. BIO/WEST, Inc. Database Code Definitions - cont.

LO	Locate
2H	2-hour
24	24-hour
TF	Test flow

CHAPTER 4. DATA UPDATE AND CUSTODY FORMS

The following forms are examples of a data update form and a data custody form. These forms are recommended as part of any data integration process. A data update form would serve to centralize all changes or additions to data structures with a database manager. A data custody form would formalize transfer and centralization of data. It would also be a vehicle for dealing with priveleged use of data and questions of public domain of certain databases. Agreements should be made in advance with investigators submitting databases to insure willingness and cooperation in development of an integrated database. Contributors to the upper basin database have not experienced problems with data priveleges or access to other databases. Concerned investigators will find that people interested in other databases generally have need for additional data to support their own information. There are no known cases of misuses of data from the upper basin database.

GRAND CANYON FISHERIES INTEGRATED DATABASE
DATA CUSTODY FORM

This custody form is provided to users of the Grand Canyon Fisheries Integrated (GCFIN) Database to facilitate transfer of data from researchers to a centralized database. The purpose of this form is to transfer custody of data gathered under Bureau of Reclamation contracts to the GCES Database Manager. This transfer of data is for integration of data into a centralized database.

Data should be submitted in final form to insure accuracy and minimize errors in integrated analyses. The final form should be submitted according to contract specifications.

A 2-year period from the data of submission will be provided to each principal investigator for exclusive rights to publication. Afterward, the data are considered public domain, but their use in publications by others requires written permission from the principal investigator.

Principal Investigator(s) - PRINT NAME: _____

SIGNATURE (agree to terms): _____

File Name: _____

File Format (dBASE, Quatro, ASCII, etc.): _____

Month(s) and Year(s) of Data Collection: _____

Sampling Design or Brief Description of Data Type: _____

**FIELD NAMES AND DESCRIPTION OF CONTENTS FOR FIELDS NOT
DESCRIBED IN THE LIST OF FIELD NAMES AND DATA CODES FOR
GRAND CANYON FISHERIES INTEGRATED DATABASE¹.**

Field Names

Description of Contents

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¹Provide brief summary of sampling design to database manager, or enclose copy of annual report

²New fields will be added to the master list to prevent multiple uses of the same field.

CHAPTER 5. RECOMMENDATIONS FOR FUTURE DIRECTION

This document provides GCES with a framework and ideas for developing a Data Collection Protocol (DCP). A DCP is an important first step in developing an integrated database for Grand Canyon, and possibly for the Colorado River Basin. A DCP would serve as a handbook for all investigators and their field crews and as a guide for all data entries. A protocol would help to standardize data collection and facilitate integration.

This document provides a list of specifications and descriptions of field names currently in use by the Native and Endangered Fish Studies. Lists of data codes and definitions are provided as examples of codes that should be standardized before developing an integrated database.

The list of data fields and codes is extensive, and many data fields have multiple definitions and multiple data codes are used for the same parameter. Standardizing data fields and codes is a process that will require concurrence of investigators, and a clear understanding of future data collection strategies. Hence, the recommendations offered in this chapter address those issues and steps that need to be identified and taken before a Data Collection Protocol can be developed.

1. Assimilate A Complete List Of Data Fields and Codes Currently In Use.

The list of data fields and codes provided in this document is probably outdated. Investigators continue to collect data in Grand Canyon, and add or expand data fields and codes according to needs and convenience. Complete and updated lists of field names and descriptions, as well as data codes, are needed in order to assess the variety of data fields and codes currently in use.

2. Identify The Unique Data Fields and Codes Currently In Use.

Lists of unique data fields and codes should be developed to minimize the amount of concurrence necessary from participating investigators. Once data fields are identified with multiple definitions, it should be possible to request unique data fields or definitions from each affected user. Similarly, it should be possible to standardize data codes.

3. Decide If The Grand Canyon Database Is To Be Integrated With The Upper Basin Database.

The decision to integrate the Grand Canyon database with the upper basin database should be made as soon as possible. As time passes, these databases will become more dissimilar with investigators creating new data fields or codes with new or different definitions than currently in use. Eventually, the number of data fields and codes that will need to be converted into a standardized system may become unmanageable. That time may have already passed, depending on the attitudes and cooperativeness of the various investigators. Some may be resistant to changing data field names or codes.

4. Standardize The Grand Canyon Database By Developing Standard Field Names and Codes For Use By Investigators Rather Than By Internal Program Linkages.

While it may seem a fairly straightforward process of converting data fields or codes through internal linkage routines, the difficulty of standardizing these parameters will be in interpreting and deciding which ones are the same and linkable, and which ones are different. These decisions will probably have to be made by the investigators that collected the data, and so it is best, to the extent possible, to establish the standard at the data collection and entry level.

5. Establish A Date By Which All Data Entries Will Be Standardized.

A date should be established at which time all data entries are standardized by field name and data code, e.g., January 1997. The field names and data codes should be taken from current databases, as much as possible, to minimize changes to respective data structures. If the decision is made to integrate and standardize the Grand Canyon database with the upper basin database, then a Data Collection Protocol will need to be developed that is consistent with the Upper Basin Protocol. This will involve substantial changes to existing field names and data codes currently in use in Grand Canyon.

6. Proceed With Development Of A Data Collection Protocol.

A Data Collection Protocol is a vital step in development of an integrated database. A protocol serves to standardize all data entries and provides a common foundation and language for all users of the database. A protocol can serve as a

handbook for field technicians, data entry personnel, and data analysts. A protocol can also serve as an archive of data structuring for future collections. Perhaps the most important function of a Data Collection Protocol is the role of this document in the overall integration process, and as a document that helps to centralize all data collection efforts.