EFFECTS OF INTERIM FLOWS FROM GLEN CANYON DAM ON THE AQUATIC RESOURCES OF THE LOWER COLORADO RIVER FROM DIAMOND CREEK TO LAKE MEAD

Quarterly Report No. 5
(Trip No. 5: May 25 - June 6, 1993)

Prepared For:

Mr. Donald E. Bay, Director
Hualapai Wildlife Management Department
P.O. Box 300, 947 Rodeo Way
Peach Spring, Arizona 86434

Mr. David Wegner, Program Manager
Glen Canyon Environmental Studies
P.O. Box 22459
121 East Birch, Suite 307
Flagstaff, Arizona 86002-2459

Prepared By:

Richard A. Valdez, Principal Investigator
Gloria Hardwick, Project Leader
Randall Filbert, Senior Biologist

BIO/WEST, Inc.
1063 West 1400 North
Logan, Utah 84321

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INTRODUCTION

This report presents pertinent details associated with Trip 5, 1993. Included in the report are a summary of trip logistics, personnel, research schedule, data collected, problems encountered, observations, and recommendations. Most information is presented in a tabular format to provide a quick synopsis of trip details and results. We emphasize that these data are hand tabulated and should be considered preliminary. The data will subsequently be computerized and checked for accuracy. The purpose of these trip reports is to provide information from BIO/WEST, Inc. trips as quickly as possible to aid other researchers.

LOGISTICS, RESEARCH SCHEDULE, AND PERSONNEL

Trip 5 of 1993 was conducted May 25 - June 6 1993, from Diamond Creek (RM 225.7) to the vicinity of Pearce Ferry (RM 280) on Lake Mead. Five campsites were established and sampling was conducted in the areas indicated in the schedule shown in Table 1. The Colorado River near Bridge Canyon was moderately swift and deep with fast runs and eddies. The river near Spencer Canyon had a slightly lower gradient, and was lined with vertical cliffs, talus slopes, and emergent shoreline vegetation. The river near Burnt Spring Canyon was slow and meandering with wide canyons and banks lined with heavily-vegetated lake sediment. The river in the area of river mile 265 was still slower and banks were lined with dense stands of willows and other riparian vegetation. Although the level of Lake Mead was slightly lower (approximately 2 - 3 ft) during this trip than during the previous trip (March - April), this portion of river (RM 265) still appeared to be highly influenced by the lake. River fluctuations were small, and it appeared that the fish community had changed from that observed further upstream. Green sunfish were sampled in this section of the river, and catch rate and size of striped bass (that originate in Lake Mead) were slightly higher than further upstream. The campsite on Lake Mead was located on Scorpion Island adjacent to the river inflow. Sampling was conducted primarily in a large bay east of Pearce Ferry, but some netting and electrofishing were conducted below Pearce Ferry. Inundated riparian vegetation, little or no current, and some settling of river sediments (lower turbidity) characterized the Lake Mead inflow area.

Table 2 is a list of personnel who participated in research activities for Trip 5, 1993.

DATA COLLECTED

Fish

A summary of fish-sampling effort by gear type is presented in Table 3. Trammel netting, and electrofishing were the most commonly used techniques, followed by gill netting and minnow trapping. Overall net sets appeared to be a more effective means of sampling adult fish than electrofishing. Gill nets were employed primarily in Lake Mead, and were rarely as effective as trammel nets. Minnow traps were used mainly to sample tributaries.

In addition to the normal sampling protocol, a multiple-pass removal technique was applied to derive a quantitative population estimate for Spencer Creek. A 53-m section of stream was selected (a side channel near the confluence with the mainstem Colorado River). To preclude the escape of fish from the area being sampled, block nets were set at both the upstream and downstream ends of the site. Electrofishing (using a backpack electrofishing unit), was initiated at

the downstream end of the site, and proceeded to the upstream block-net. This process was repeated three times, and fish captured on different passes were stored in separate containers. An additional site approximately 0.75 miles upstream was sampled with the backpack electrofishing unit. This site was 50 m long and was also isolated with block-nets. However, due to schedule constraints only a single pass was conducted at the upstream site. In addition to fish capture techniques, snorkeling was also used to observe fish in Surprise Creek.

Overall fish species composition was similar to that observed during previous sampling trips, but some change in relative abundance was noted. It appears that channel catfish abundance has increased in the main channel since the beginning of the study, whereas fathead minnows are much more uncommon. During this trip rainbow trout were sampled in the main channel for the first time. Prior to this, only one rainbow trout, captured by electrofishing in Spencer Creek, had been sampled. Once again, native species represented a small fraction of the fish community, accounting for approximately 2 percent of the total number of fish sampled. The most abundant exotic species, red shiner, comprised 61 percent of the total number of fish collected during Trip 5. Although the population estimate analysis for Spencer Creek is incomplete, inspection of the data indicate that fish densities in this tributary were very high, and that the dominant species in the tributary were carp, channel catfish, and red shiner.

The only native species sampled during this field trip were speckled dace and flannelmouth suckers. Of the 27 flannelmouth suckers captured only four were adults. PIT-tags were implanted in these individuals (tagging data are presented below); all other individuals were juveniles and were too small to be tagged. No previously tagged flannelmouth suckers were recaptured during this trip. The endangered native species, humpback chub (Gila cypha) and razorback sucker (Xyrauchen texanus), were not captured or observed during Trip 5 (or any previous trips). Finally, numerous flannelmouth suckers were observed via snorkeling in Surprise Creek. All individuals observed were juveniles, with a maximum size of approximately 100 to 120 mm.

PIT-tag number	River mile	Total length (mm)	Weight (g)	Sex
7F0C5C1D5C	233.4	332	381	undetermined
7F7F480366	246.1	397	567	undetermined
6F7F22006C	260.0	221	137	undetermined
7F7B081724	266.6	387	519	male

Water Quality

Water quality parameters were measured with a Hydrolab Surveyor II and a recording Hydrolab DataSonde II at each campsite on the mainstem Colorado River. The DataSonde II was also deployed in Spencer Creek for approximately 36 hours and Lost Creek for about 24 hours. These instruments recorded water temperature, pH, conductivity, and dissolved oxygen every 15 minutes. In addition, on 8 June two thermographs (Ryan Instruments Tempmentor) were deployed: one in Spencer Creek and another in the main channel near the confluence with Spencer Creek. These thermographs will provide a long-term record of temperature dynamics (measurement intervals will be disclosed in the next trip report).

As expected, river temperature was higher than during the previous trip. Turbidity levels in the main channel were low throughout the duration of the trip, and were attributed to the overall decline in flow.

Primary/Secondary Productivity

Two sets of drift samples were taken in the mainstem Colorado River during Trip 5: one set taken above Spencer Creek at river mile 245.2, and another below Burnt Springs Canyon at river mile 259.5. In addition, a nighttime drift sample was also taken in Spencer Creek just above the confluence with the mainstem.

Stream benthos were collected with a Surber sampler in Travertine, Bridge, Spencer, and Surprise Canyons, and an Ekman dredge was also used to collect benthos in the mouth of surprise canyon. The greatest number (nine) of surber samples was collected in Spencer Creek. Incidental samples for invertebrates and algae were collected from Travertine, Bridge Canyon, Spencer, and Surprise Creeks as well.

River Stage Monitoring

Changes in river stage were monitored at three camps: Bridge Canyon, Above Spencer Creek, and below Burnt Springs Canyon. All changes in stage were linked to temporary benchmarks at the first two camps. The benchmark at the camp above Spencer Creek (RM 245.3 left) was established during Trip 5.

Mapping

Net sets and electrofishing runs in the mainstem and in Spencer Creek were mapped on several different baselines including aerial photos and 7.5 minute USGS quads.

OBSERVATIONS

1. Fish density was much greater in Spencer and Surprise Creeks than in the main channel of the Colorado River. Fish may be entering these streams in response to differences in water quality or food availability associated with the tributary mouths. Fish densities also appeared to be greater in Spencer and Surprise than the remainder of tributaries. One reason for this is that habitat quality in Spencer and Surprise Creeks surpasses that of other tributaries observed in Reach 4. Moreover, Spencer Creek is much larger (i.e., greater flow) than the remainder of the tributaries; another factor that accounts for the apparent high densities of large fish in the tributary.

2. As observed during Trip 4, large numbers of ripe male carp were observed in Spencer Creek. However, ripe females were very rare, indicating that carp spawning in this tributary was coming to an end. Based on observations during the past two trips, it appears that carp are spawning from early March to late May. Additionally, young-of-the year carp were captured in the main channel downstream of Spencer and Surprise Creeks.

3. Red shiners were also spawning in Spencer and Surprise Creeks. Large numbers of males in spawning colors were observed and captured in both tributaries, and ripe females were

captured in Spencer Creek. Although red shiners were abundant in shoreline habitats in the main channel, the relative abundance of spawning fish was greater in samples taken in the tributaries.

4. The number of fish captured in Lake Mead was lower than anticipated. This was especially true for centrarchids that would be expected in higher densities in the type of habitat observed. Carp appeared to be the most abundant fish in the portion of the Lake that was sampled, and trammel nets were more effective than gill nets or electrofishing.

5. Visual reconnaissance were conducted on several of the tributaries in Reach 4. Travertine Creek had low flow and marginal fish habitat, and the channel was characterized by relatively high gradient and unstable substrate. Bedload movement was very high and invertebrate abundance, as expected, appeared quite low. Flow in Bridge Canyon was also low and under observed main-channel discharge, access to the tributary was restricted. This tributary also appeared to have marginal fisheries value, and would probably only be used by small fishes. Lost Creek slough was heavily sedimented and appeared to have low water quality and marginal fish habitat. Although this tributary may hold adult fish when flow in the main channel is greater, no apparent spawning areas were present, and the slough was largely dewatered under flow levels encountered during the trip.

6. Densities of tadpoles (larvae of canyon tree frogs and red-spotted toads) were abundant in Spencer Canyon and may represent a significant food source for fish, especially ictalurids, entering the tributary.

PROBLEMS ENCOUNTERED AND RECOMMENDATIONS

1. The level of Lake Mead is currently higher than in 1992, and the inflow region of the Colorado River has shifted upstream.Sampling schedules, gears, and methods will need to be adjusted to accommodate this change in the inflow.

2. Sampling in and around Quartermaster Canyon will be schedules and conducted in a manner that avoids areas of archeological significance.

3. Sampling effort in Spencer Creek was greater during Trip 5 than previous trips. We recommend that Spencer Creek, and to a lesser extent Surprise Creek, continue to be sampled more intensively during the next two trips. Specifically, population estimate(s) are recommended for Spencer Creek along with continued minnow trapping and seining. All sampling in tributaries will be conducted within one mile of the confluence with the main channel, but it is recommended that visual reconnaissance and perhaps some snorkeling be conducted further upstream in Spencer Creek (perhaps 2 miles).

4. We feel that sampling to this point has allowed us to reliably characterize fish populations in the main channel. Future sampling will refine our knowledge and may provide additional information on shifts in relative abundance and effects of changing lake levels. It is recommended that sampling effort in the main channel be reduced slightly and more time be allocated to working in the tributaries, primarily Spencer Creek and other streams on the Hualapai Reservation. Electrofishing and evening net runs should be continued according to

existing protocol, but we recommend that only one morning net set (0415-0600) be conducted. The time that would have been used to continue morning netting can then be used to work in tributaries. In this way, sampling intensity during the primary period of fish activity (evening crepuscular) will be maintained.

5. In addition to fisheries work in the tributaries, it is recommended that a greater number of drift samples be taken in the main channel and at the mouths of tributaries. This can also be accomplished in lieu of the later morning net sets.

6. In addition to sampling biota, we feel that physical measurements would be useful for interpreting the effects of interim flows on fisheries. Specifically, we recommend documentation of flow-related changes in the accessibility of tributaries to fish. This can be accomplished by establishing transects within tributaries immediately above their confluence with the main channel, and measuring velocity, depth, and wetted perimeter as flow changes. There may be a threshold below which fish passage into these streams is impaired. This approach should be employed in Spencer Creek, and may be appropriate for some of the other tributaries as well.

7. The backpack electrofishing unit appeared to have malfunctioned in Surprise Creek. This unit will be repaired and ready for use prior to Trip 6. The backpack shocker was, however, fully functional when used in Spencer Creek.

Table 1. Dates, campsites, and sample locations for Trip No. 5, May 25 - June 6, 1993.

Date	Camp Site	Sample Locations
May 25 - 26	Bridge Canyon (RM 235.2)	Bridge Canyon Area (RM 233.8-235.2)
May 26 - 31	Above Spencer Creek (RM 245.2)	Above Spencer Creek to below Lost Creek (RM 241.8 to 250.2) including Spencer Creek (RM 246.0) Surprise Creek (RM 248.4), Lost Creek (RM 248.9)
May 31 - June 1	Below Burnt Spring Canyon (RM 259.5)	RM 259 - RM 262
June 1 - June 3	RM 265.0	RM 264 - RM 268
June 3 - June 6	Scorpion Island	RM 276 - RM 282 (approx.) 2 net sets below Pearce Ferry

RM = River Mile

Table 2. Personnel participating in Trip No. 5, May 25 - June 6, 1993.

PERSONNEL	AFFILIATION	DATES
Gloria Hardwick	BIO/WEST, Inc.	05/25 - 06/06
Randall Filbert	BIO/WEST, Inc.	05/25 - 06/06
Tony Anderson	BIO/WEST, Inc.	05/25 - 06/06
Morris Sampson	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	05/25 - 06/06
Soloise Powsky	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	05/25 - 06/06
Ben Zimmerman	HUALAPAI WILDLIFE MANAGEMENT DEPARTMENT	05/25 - 06/06
Debra Bills	USFWS	05/25 - 05/27
Lars Neimi	OARS	05/25 - 06/06
Kelly Smith	OARS	05/25 - 06/06
Kelly Johnson	OARS	05/25 - 06/06
Bill Leibfried	HWMD and BIO/WEST, Inc.	06/03 - 06/05

Table 3. Fish sample gears, codes, descriptions, and number of samples from the Lower Grand Canyon and Lake Mead.

SAMPLE GEAR CODE - DESCRIPTION	TOTAL NUMBER SAMPLES
Electrofishing	
EL - 220-v DC (Coffelt CPS)	62
EL - Backpack Coffelt	3
Gill Nets	
GS - 300'x6'x2"	6
GP - 100'x6'x2"	23
Trammel Nets	
TK - 75'x6'x1"x12"	17
TL - 75'x6'x1.5"x12"	26
TM - 50'x6'x1"x12"	40
TN - 50'x6'x1.5"x12"	18
TW - 75'x6'x0.5"x12"	3
Hoop Nets	
HS - 2' diameter (small)	2
Minnow Traps	
MT - commercial minnow traps	21
Seines	
SX - 10'x4'x1/16" seine	12
Total	233

Table 4. Numbers of fish by species captured during Trip No. 5 in the Lower Grand Canyon and Lake Mead Inflow.

FAMILY COMMON NAME (Code)	SCIENTIFIC NAME	TOTAL CAPTURED
CYPRINIDAE (minnows)		
red shiner (RS)	Cyprinella lutrensis	1,163
fathead minnow (FH)	Pimephales promelas	31
common carp (CP)	Cyprinus carpio	356
speckled dace (SD)	Rhinichthys osculus	13
CATOSTOMIDAE (suckers)		
flannelmouth sucker (FM)	Catostomus latipinnis	27
PERCICHTHYIDAE (temperate basses)		
striped bass (SB)	Morone saxatilis	34
SALMONIDAE (trout)		
rainbow trout (RB)	Oncorhynchus mykiss	3
ICTALURIDAE (catfishes)		
channel catfish (CC)	Ictalurus punctatus	168
POECILIDAE (livebearers)		
mosquitofish (GA)	Gambusia affinis	108
CENTRARCHIDAE (sunfishes)		
largemouth bass (LB)	Micropterus salmoides	3
bluegill (BG)	Lepomis macrochirus	1
green sunfish (GS)	Lepomis cyanellus	4
CLUPEIDAE		
threadfin shad (TS)	Dorosoma petenense	4
TOTAL		1,915