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BIO/WEST, Inc.

CHARACTERIZATION OF THE LIFE HISTORY AND ECOLOGY OF THE HUMPBACK CHUB IN THE GRAND CANYON

TRIP REPORT #1 - 1991
January 5 - January 25, 1991

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Bureau of Reclamation

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INTRODUCTION

This report presents pertinent details associated with Trip #1, 1991. Included in the report are a summary of trip logistics, research schedule, personnel, data collected, observations, problems encountered and recommendations. Most information is presented in tabular format to provide a quick synopsis of pertinent trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Tables 1 and 1a present a summary of all camp locations and research activities for Trip #1, 1991. Table 2 is a list of personnel on the trip as well as their affiliation.

DATA COLLECTED

Table 3 presents a summary of fish species captured by gear type and reach for Trip #1, 1991. Table 4 is a summarizes basic information on all humpback chubs handled during the trip. Table 5 gives pertinent information on all humpback chubs radiotagged during Trip #1, 1991.

Humpback Chubs Captured

A total of 83 humpback chub were handled during Trip #1, 1991. Eleven of the 83 humpback chubs processed were recaptures, possessing either Carlin, Floy or PIT tags. Recapture information, including tag type, color and number is presented in Table 4. All Carlin and Floy dangler tags were removed from recaptured fish and the fish were equipped with a PIT tag for future identification. Tags removed by BIO/WEST will be returned to Arizona Game and Fish Department (AGFD) with associated information for each fish. The majority of humpback chubs were captured in Reach 1 in the vicinity of the LCR. Three humpback chub, however, were collected from downstream locations. Two were collected immediately upstream of Shinumo Creek and one near 220 Mile Canyon (Table 4).

Three radio-tagged fish were recaptured during Trip #1, 1991. Two of these fish appeared in good condition and appeared to be recovering normally from surgical implant procedures. These fish were processed, photographed and released. The third recaptured radiotagged fish, implanted 87 days prior to recapture, (PIT tag #7F7F3F3626) showed signs of stress related to implant procedures and was held for observation. The fish was held for observation and subsequently died. The carcass was transported out of the canyon immediately and taken to Northern Arizona University for further inspection. Special reports will be submitted to AGF and USFWS regarding this fish.

Radiotelemetry

Seven humpback chubs were implanted with radio transmitters during Trip #1, 1991. All tags were implanted without complications and the fish were vigorous and in good condition at the time of release. Three of the seven fish were relocated and observed at least once following release, and showed no signs of aberrant behavior. All fish were actively moving both vertically and longitudinally and were judged to be showing no ill effects from implantation.

Bench Marks

Three temporary bench marks were established in the Little Colorado River (LCR) area (Reach 1) for the purpose of measuring river stage change and relating it to movement of radiotagged fish. Each bench mark will eventually be correlated to one of the 50 permanent known elevation marks for determining absolute stage and flow changes.

Each bench mark is a 1 cm diameter dot of latex paint placed on a permanent rock above the high water mark. A given bench mark will be used to monitor stage change between hydraulic controls, e.g., between riffles or rapids.

The three bench marks are:

1. RMI 61.2, river right on a large supai boulder on the point below the primary camp at the Little Colorado River.

2. RMI 62.2, river right on tapeats boulder sitting on a Tapeats ledge at the top of the eddy above "Crash Canyon" rapid.

3. RMI 65.3, river right upstream of mine at the Lava Chuar camp on bedrock on upstream side of small gully.

OBSERVATIONS

1. All chubs handled appeared robust, vigorous and in good condition.

2. Under fluctuating flows (≈5,000 - 18,000 cfs) in January, netting with gill and trammel nets proved an effective means for collecting adult and large juvenile humpback chubs in the mainstem Colorado River.

3. Under clear water conditions, most humpback chubs were captured during the crepuscular and nocturnal period. Under turbid conditions humpback chubs were captured during the diurnal period, but catch rates still appeared higher during the crepuscular and nocturnal periods. All chubs collected in Reaches 2 and 3 were collected during the crepuscular and early nocturnal periods.

4. Contacts with previously radiotagged fish suggested that the fish move to deeper places in the river channel during the daylight period in clear water. Radiotelemetry information also indicated that the fish moved higher in the water column in the nocturnal period and during higher turbidity.

5. Ten days of surveillance of radiotagged fish suggests very little long range movement occurred during Trip #1, 1991.

6. Successful deliberate attempts to recapture radiotagged fish on two occasions with intensive netting, future recapture attempts (if deemed necessary) are feasible.

7. High numbers of humpback chubs captured near Awatubi Canyon (RM 58.3), which represents the furthest upstream where intensive sampling has been conducted, suggests that densities of humpback chubs continue to be high to this point upstream.

8. Low numbers of chubs were captured in Reaches 2 and 3. However, the capture of two humpback chub near Shinumo Creek during Trip 1, 1991 and one humpback chub during Trip 2, 1990 suggests that a population of undetermined size and reproductive status could be present at that location.

9. Egg masses were observed in all female humpback chubs implanted during Trip #1, 1991. Eggs were well developed, with individual eggs being discernable.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. Recapture and inspection of three radiotagged fish during Trip #1, 1991, suggest that external antennae may be irritating tissue in the vicinity of the antenna exit point. For subsequent radio transmitter implant procedures will be slightly modified, specifically so that external antennae will be trimmed to a length so that the antenna will not protrude beyond the hyperal plate, thus reducing mechanical disturbance of the antenna by the caudal fin. Additional techniques to minimize mechanical injury will also be investigated.

2. Resolution of both Steven's and Belnap's river guide continues to be problematic in terms of locating and monitoring movements of radiotagged humpback chubs. Aerial photography will be used for delineating fish locations and movements beginning on Trip #2, 1991.

RECOMMENDATIONS

1. Radio transmitters should only be implanted in large male humpback chubs during Trip #3, 1991 (March). Observations of egg maturation during Trip #1, 1991, indicate that by March egg masses may be too large enough to risk implanting females without fear of injury.

Table 1. Logistics and Research Schedule for Trip #1, 1991. Team 1 (LCR)

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R[1]	FS	TE	HQ
1/6/91	28.2	Shinumo Wash	X			
1/7/91	58.2	Awatubi Canyon	X	X	X	X
1/8/91	58.2	Awatubi Canyon		X	X	X
1/9/91	58.2	Awatubi Canyon		X	X	X
1/10/91	61.3	LCR	X	X	X	X
1/11/91	61.3	LCR		X	X	X
1/12/91	61.3	LCR		X	X	X
1/13/91	65.4	Lava Chuar	X	X	X	X
1/14/91	65.4	Lava Chuar		X	X	X
1/15/91	65.4	Lava Chuar		X	X	X
1/16/91	65.4	Lava Chuar		X	X	X
1/17/91	65.4	Lava Chuar		X	X	X
1/18/91	91.0	Below Horn Creek	X		X	
1/19/91	131.8	Stone Creek	X			
1/20/91	178.0	Vulcans Anvil	X	X		
1/21/91	178.0	Vulcans Anvil		X		
1/22/91	202.0	202-Mile Canyon	X	X		
1/23/91	202.0	202-Mile Canyon	X	X		
1/24/91	225.0	Diamond Creek	X	X		
1/25/91	225.8	Diamond Creek	Take out			

[1] T&R = Travel and Reconnaissance
FS = Fish Sampling
TE = Telemetry
HQ = Habitat Quantification

Table 1a. Logistics and Research Schedule for Trip #1, 1991, Team 2.						
			RESEARCH ACTIVITIES			
DATE	RM	LOCATION	T&R[1]	FS	TE	HQ
1/6/91	29.3	Shinumo Wash	X			
1/7/91	81.1	Grapevine	X	X		
1/8/91	81.1	Grapevine		X		X
1/9/91	81.1	Grapevine		X		X
1/10/91	98.0	Crystal Creek	X	X		
1/11/91	98.0	Crystal Creek		X		X
1/12/91	108.3	Lower Bass	X	X		
1/13/91	108.3	Lower Bass		X		X
1/14/91	120.0	Blacktail Canyon	X	X		
1/15/91	120.0	Blacktail Canyon		X		X
1/16/91	131.8	Stone Creek	X	X		
1/17/91	131.8	Stone Creek		X		X
1/18/91	164.9	Tuckup Canyon	X	X		
1/19/91	164.9	Tuckup Canyon		X		X
1/20/91	177.7	Vulcan's Anvil	X	X		
1/21/91	177.7	Vulcan's Anvil		X		X
1/22/91	219.8	220-Mile Canyon	X	X		
1/23/91	219.8	220-Mile Canyon		X		X
1/24/91	225.8	Diamond Creek	X	X		
1/25/91	225.8	Diamond Creek	Take out			

[1] T&R = Travel and Reconnaissance
FS = Fish Sampling
TE = Telemetry
HQ = Habitat Quantification

Table 2. Personnel Participating in Trip #1, 1991.			
PERSONNEL	**AFFILIATION**	**DATES**	**COMMENTS**
TEAM #1			
Bill Masslich	B/W	1/6-1/25	Project Leader - B/W
Tony Wasowicz	B/W	1/6-1/25	
Helen Yard	B/W	1/6-1/25	
Randy VanHaverbeke	B/W	1/6-1/25	
Peter Weiss	B/W	1/6-1/25	
Rich Valdez	B/W	1/11-1/14	In/Out Tanner
Bill Leibfried	B/W	1/11-1/14	In/Out Tanner
Mike Yard	GCES	1/11-1/1	In Tanner/Out B.A.
Allen Hayden	GCES	1/6-1/25	
John Toner	OARS	1/6-1/25	
Allister Bleifuss	OARS	1/6-1/25	
Ann Cassidy	OARS	1/6-1/25	
TEAM #2			
Larry Crist	B/W	1/6-1/25	Project Leader - B/W
Glenn Doster	B/W	1/6-1/25	
Erika Prats	B/W	1/6-1/25	
Mondell Hebbert	B/W	1/6-1/25	
Stuart Reeder	B/W	1/6-1/25	
Bob Grusy	OARS		Trip Leader - OARS
Alan Tinnes	OARS		
Jan Kempster	OARS		
John Olwine	GCES		Volunteer

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY

[1]	[2]	HB[3]	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV
Reach 1 EL N=6 1.65 hr	A	1	1	0	49	0	0	2	0	0	0	0
	J	0	0	0	4	0	0	0	0	0	0	0
	Y	0	0	0	1	0	0	0	0	0	0	0
Reach 2 EL N=38 13.11 hr	A	0	0	0	299	20	0	60	0	0	0	0
	J	0	0	0	27	1	0	1	0	0	0	0
	Y	0	0	0	2	0	0	0	0	0	0	0
Reach 3 EL N=14 4.13 hr	A	0	0	0	6	1	0	46	0	1	0	0
	J	0	0	0	3	0	0	0	0	0	0	0
	Y	0	0	0	1	0	0	0	0	0	0	0
Reach 1 TL N=64 130.83 hr	A	35	15	0	62	0	2	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TL N=50 101.60 hr	A	0	1	1	12	1	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 TL N=60 132.76 hr	A	0	1	1	2	0	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY

1	2	HB[3]	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV
Reach 1 TK N=41 94.53 hr	A	17	13	2	25	0	0	0	0	0	0	0
	J	4	0	0	1	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TK N=50 99.47 hr	A	1	0	0	25	2	0	3	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 TK N=62 123.43 hr	A	1	1	1	6	0	3	1	0	0	0	0
	J	0	0	0	0	0	1	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 GM N=12 21.76 hr	A	7	4	0	4	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 GM N=35 70.60 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GM N=34 70.19 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY

[1]	[2]	HB[3]	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV
Reach 1 GP N=38 81.64 hr	A	12	4		9	0	0	0	0	0	0	0
	J	1	1	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 GP N=42 83.75 hr	A	1	0	0	12	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GP N=41 83.13 hr	A	0	2	0	3	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 GX N=4 7.42 hr	A	1	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	1	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 GX N=2 2.74 hr	A	0	0		7	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GX N=18 34.99 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	1	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY

[1]	[2]	HB[3]	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV
Reach 2 HM N=3 41.67 hr	A	0	0	0	13	1	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 HS N=1 19.00 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 TF N=1 -	A	1	0	0	0	0	0	0	0	0	0	0
	J	1	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
TOTAL	A	77	42	5	534	25	5	114	0	1	0	0
	J	6	1	0	37	1	1	1	0	0	0	0
	Y	0	0	0	4	0	0	0	0	0	0	0

[1]- Gear Types
EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1"x12" trammel net
GM = 10'x6'x2" gill net
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net
HS = Small hoop net (2' diameter)
HM = Medium hoop net (3' diameter)
TF = Floated trammel

[2] - A = Adult
J = Juvenile
Y = Young of year

[3] - HB = humpback chub
FM = flannelmouth sucker
BH = bluehead sucker
RB = rainbow trout
BR = brown trout
CC = channel catfish
CP = carp
SD = speckled dace
BK = brook trout
RK = Rio Grande killifish
FV = flannelmouth variant

Table 4. Summary of Humpback Chub handled during Trip #1, 1991. DRAFT

#	DATE	GEAR[c] TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
1	910108	TK	7F7F3E3030[A]	N	-	480	868	58.3	58.3
2	910108	TK	7F7F3C3457	N	-	352	456	58.3	58.3
3	910108	TL	7F7F3F442D	N	-	305	283	58.8	58.8
4	910108	TL	7F7F3C4208[A]	N	-	400	634	58.8	58.8
5	910108	GP	7F7F3E2640	N	-	377	529	58.2	58.2
6	910108	TL	7F7F3C4341	N	-	355	289	58.8	58.8
7	910108	TL	7F7F3F427E	N	-	386	505	58.8	58.8
8	910109	TL	7F7F3E3675	N	-	315	282	58.9	58.9
9	910109	TL	7F7F3E2712	N	-	360	509	58.9	58.9
10	910109	TL	7F7F3F3D79	N	-	313	315	58.9	58.9
11	910109	TL	7F7F3C3171[A]	N	-	395	564	59.0	59.0
12	910109	TL	7F7F3C3445	N	-	406	696	58.9	58.9
13	910109	TL	7F7F3E3E15	N	-	312	318	58.9	58.9
14	910109	TL	7F7F3F3A5C[A]	Y	085[2]	385	594	58.3	58.3
15	910109	TL	7F7F043917	Y	-[5]	397	624	58.3	58.3
16	910109	TL	7F7F3E2E05	N	-	333	337	58.3	58.3
17	910109	TL	7F7F3F4349	N	-	308	290	58.9	58.9
18	910109	TK	7F7F3E387D	N	-	385	535	58.9	58.9

Table 4. Summary of Humpback Chub handled during Trip #1, 1991. DRAFT

#	DATE	GEAR[C] TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
19	910109	TK	7F7F3E2B68	N	-	386	539	58.9	58.9
20	910110	GM	7F7F3C2D06[A]	Y	-	405	669	60.5	60.5
21	910110	GM	7F7F3E3D23[A]	N	-	394	635	60.5	60.5
22	910110	GM	7F7F3E2A37	N	-	400	515	60.5	60.5
23	910110	GM	7F7F3E2F33	N	-	321	325	61.1	60.5
24	910110	GM	7F7F3E2727[A]	N	-	380	648	60.6	60.6
25	910110	GM	7F7F3F4E32	N	-	403	670	60.5	60.6
26	910111	TL	7F7F3F4B64	N	-	349	333	60.6	60.6
27	910111	TL	7F7F3F5216	N	-	432	674	60.6	60.6
28	910111	TL	7F7F45094A	N	-	409	622	60.6	60.6
29	910111	TK	7F7F3C3B2D	N	-	268	142	61.1	61.1
30	910111	TL	7F7F050F0A	Y	-[6]	395	633	60.6	60.6
31	910111	TL	-	N	-	334	-	60.6	60.6
32	910112	TK	7F7F3E3C0E	N	-	456	780	60.4	60.4
33	910112	GP	7F7F3E2619	Y	084[2]	357	462	61.3	61.3
34	910112	GP	7F7F3E2630	N	-	385	534	60.5	60.5
35	910112	GP	7F7F3F5144	N	-	294	262	108.3	108.3

Table 4. Summary of Humpback Chub handled during Trip #1, 1991. DRAFT

#	DATE	GEAR[c] TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
36	910112	EL	7F7F3F3626	Y	-[5]	432	724	60.8	60.8
37	910112	TK	7F7F3C4111	N	-	286	278	108.3	108.3
38	910112	GP	7F7F3C2E7A	N	-	353	344	60.5	60.5
39	910112	GP	7F7F3E3B03	Y	3OL182[4]	434	933	60.5	60.5
40	910112	GP	7F7F3C2830	N	-	190	67	61.3	61.3
41	910112	GP	7F7F3C2705	N	-	395	633	60.5	60.5
42	910112	GP	7F7F3F4209	N	-	333	381	60.5	60.5
43	910112	GP	7F7F3D063C	N	-	438	829	60.5	60.5
44	910112	TL	7F7F3E3326	N	-	305	269	60.7	60.7
45	910113	TF	7F7F3E4104	N	-	217	104	64.6	64.6
46	910113	TF	7F7F3E3A77	N	-	365	465	64.6	64.6
47	910113	TL	7F7F3E2429	N	-	336	300	64.6	64.6
48	910113	TK	7F7F3F4676	N	-	183	65	64.6	64.6
49	910113	TL	7F7F3F4352	Y	-[6]	401	610	64.6	64.6
50	910113	TL	7F7F3F5100	N	-	345	425	64.6	64.6
51	910114	TL	7F7F3C3370	N	-	340	498	64.7	64.7
52	910114	TK	7F7F3C4279	N	-	390	712	64.6	64.6

Table 4. Summary of Humpback Chub handled during Trip #1, 1991. DRAFT

#	DATE	GEAR[c] TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
53	910114	TK	7F7F3F4B28	N	-	342	414	64.6	64.6
54	910114	TL	7F7F3F5016	N	-	341	354	64.7	64.7
55	910114	TL	7F7F3C4162	Y	-[5]	399	692	64.1	64.1
56	910115	GP	7F7F3E3D73	N	-	335	389	64.7	64.7
57	910115	GP	7F7F3E4171	N	-	365	419	64.7	64.7
58	910115	GP	7F7F3F3174	N	-	326	334	64.7	64.7
59	910115	TL	7F7F3C4546	N	-	346	396	64.4	64.4
60	910115	TK	7F7F3F4A6A	N	-	345	393	64.4	64.4
61	910115	TK	7F7F3E2865	N	-	279	215	64.4	64.4
62	910115	TK	7F7F451820	N	-	219	97	64.4	64.4
63	910115	GM	7F7F3F3C2B	N	-	334	393	64.8	64.8
64	910115	TK	7F7F3E2C30	N	-	220	96	64.5	64.5
65	910116	TK	7F7F3F4B3B	N	-	351	437	64.7	64.7
66	910116	TK	7F7F451924	N	-	359	564	64.7	64.7
67	910116	TK	7F7F3F3146	N	-	245	152	64.7	64.7
68	910116	GP	7F7F3C2E4C	Y	801[3]	301	256	64.5	64.5
69	910116	GX	7F7F3F3425	N	-	318	303	65.0	65.0

Table 4. Summary of Humpback Chub handled during Trip #1, 1991. DRAFT

#	DATE	GEAR[c] TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
70	910116	TL	7F7F3F4146	N	-	343	420	65.3	65.3
71	910116	TK	7F7F3F3C2F	N	-	210	82	64.7	64.7
72	910116	TK	7F7F3C7431	N	-	305	266	64.9	64.9
73	910116	TK	7F7F3F3968	N	-	329	316	64.9	64.9
74	910116	TL	7F7F456B2C	Y	-[5]	392	318	64.7	64.7
75	910117	TL	7F7F3E2A1D	N	-	332	370	64.4	64.4
76	910117	TL	7F7F3E3D73	N	-	333	280	64.4	64.4
77	910117	TL	7F7F3E294D	N	-	373	558	64.4	64.4
78	910117	TL	7F7F3F4C38	Y	281[2]	392	517	64.4	64.4
79	910117	TL	7F7F3F4302	Y	754[1]	395	518	64.4	64.4
80	910117	TK	7F7F3E212B	N	-	369	496	64.5	64.5
81	910117	TL	7F7F3C330D	N	-	348	430	64.4	64.4
82	910117	TK	7F7F3E2865	Y	-[5]	274	243	64.5	64.5
83	910123	TK	7F7F3F4525	N	-	245	133	219.7	219.7

DRAFT

[1]- Yellow Floy tag - AGFD
[2]- Small Yellow Carlin
[3]- Orange Floy - AGFD
[4]- Yellow Floy - AGFD
[5]- PIT Tag
[6] Fin clip
[A]- Fish implanted with radio transmitter
[B]- Probable misreading
[C]- Gear Types
EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1"x12" trammel net
GM = 10'x6'x2" gill net
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1991. DRAFT

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPEC-TANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

DRAFT

Table 6. A list of radio frequencies contacted on Trip #1, 1991, and locations relative to capture and release sites.

			River Mile		
FREQ/PULSE	TAG SIZE (g)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.600/64	11	901116	60.4	60.4	
		910108(1631)			60.1
		910109(1250)			60.1
		910110(1130)			60.1
		910110(1711)			60.1
		910111(1222)			60.1
		900115(1835)			60.1
40.670/48	11	901017	60.2	60.2	
		910108(1525)			60.5
		910109(1255)			60.5
		910110(1140)			60.5
		910111(1214)			60.5
		910115(1906)			60.5
40.620/74	11	901017	60.4	60.4	
		910109(1309)			60.9
		910112(1655)	-- RECAP	-TURED--	60.9
40.740/80	11	901119	62.0	62.0	
		910108(1424)			62.2
		910109(1338)			62.2
		910110(1425)			62.2
		910111(1400)			62.2
		910115(1953)			62.2
40.640/82	11	901121	64.1	64.1	
		910108(1400)			63.9
		910109(1428)			63.9
		910110(1452)			63.9
		910111(1435)			63.9
		910111(1253)			63.9
		910115(0930)			64.2
		910115(2018)			64.5
		910116(1330)			64.5

DRAFT

Table 6. A list of radio frequencies contacted on Trip #1, 1991, and locations relative to capture and release sites. Page 19

			River Mile		
FREQ/PULSE	TAG SIZE (g)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.630/64	11	901123	64.4	64.4	
		910108(1340)			64.1
		910108(1430)			64.1
		910110(1516)			64.1
		910111(1440)			64.1
		910112(1310)			64.1
		910115(2009)			64.1
40.610/56	11	901020	64.6	64.7	
	11	910108(1317)			64.8
		910108(1440)			64.7
		910110(1543)			64.7
		910111(1448)			64.7
		910112(1420)			64.7
		910115(2028)			64.7
		910116(1350)			64.7
40.680/60	11	901018	60.6	60.5	
		910115			60.4
40.660/64[1]	11	910108	58.8	58.8	
		910109			58.8
40.710/43[1]	11	910109	58.3	58.3	
		910110(1115)			58.3
		910111(1248)			58.3
40.720/67[1]	11	900110	60.6	60.6	
		900111(1200)			60.7

[1] Implanted during current trip

REPORT NO. PR 250-05
BIO/WEST, Inc.

CHARACTERIZATION OF THE LIFE HISTORY AND ECOLOGY OF THE HUMPBACK CHUB IN THE GRAND CANYON

TRIP REPORT #2 - 1991
February 7 - February 19, 1991

Prepared For:

Bureau of Reclamation

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BIO/WEST INC.
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February 27, 1991

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APPENDIX A
Data Sheets for Trip #2, 1991

INTRODUCTION

This report presents pertinent details associated with Trip #2, 1991. Included in the report are a summary of trip logistics, research schedule, personnel, data collected, observations, problems encountered and recommendations. Most information is presented in tabular format to provide a quick synopsis of pertinent trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Tables 1 present a summary of all camp locations and research activities for Trip #2, 1991. Table 2 is a list of personnel on the trip as well as their affiliation.

DATA COLLECTED

Table 3 presents a summary of fish species captured by gear type and reach for Trip #2, 1991. Table 4 is a summarizes basic information on all humpback chubs handled during the trip. Table 5 gives pertinent information on all humpback chubs radiotagged during Trip #2, 1991.

Humpback Chubs Captured

A total of 3 humpback chub were handled during Trip #2, 1991. Two of the 3 humpback chubs processed were recaptures, possessing PIT tags. Recapture information, including tag type, color and number is presented in Table 4. All of humpback chubs were captured at the LCR confluence area in two locations, including the "parallel" trammel set and the "plume" set. The netting effort was minimal since the main focus of the trip was radiotelemetry.

Radiotelemetry

A summary of radiotagged fish implanted prior to Trip #2, 1991 are presented in Table 5. A summary of radiotelemetry data collected during Trip #2, 1991 is presented in Tables 6 and 7.

Of the 24 fish implanted by BIO/WEST on 3 previous trips, 14 fish were contacted. One additional fish may have been contacted, but the contact occurred only once and consisted of 2 pulses. The fish could not be recontacted, so was categorized as a "possible" contact. The remaining eight fish were not contacted (the ninth fish and transmitter were removed from the river on the previous trip). All eight fish not contacted are equipped with transmitters that have exceeded their life expectancy and may no longer by functional.

An aerial telemetry survey of Reach 1, by helicopter, was conducted one day prior to launch. Based on earlier behavior patterns observed for radio-tagged fish, a late afternoon flight was chosen to survey the fish as near to dusk as possible. Additionally, the previous telemetry flight was conducted during the early morning, so results of the two telemetry flights could be compared to assess which time period is most effective for conducting aerial surveys. Contact was made on 3 frequencies during the aerial survey. One contact consisted of constant narrow band interference on 40.690. The other two contacts represented radio-tagged fish and were located to within 0.3 and 0.4 miles of subsequent on the ground locations.

Twenty-four hour monitoring was conducted on five fish, one during stable 5000 cfs flows, three during fluctuating flows in the main channel and one on a fish that had moved into the Little Colorado River on the 13th of February. Two-hour monitoring was conducted on four fish. Movements and surface habitat features were mapped for all two-hour and 24-hour monitoring efforts.

Eighteen telemetry surveillance runs were conducted within Reach 1 during Trip #2, 1991. Eight surveillance runs were completed during daytime and eight during nighttime. The primary purpose of the telemetry surveillance was to provide detailed location information for interpretation of gross movements of radio-tagged fish. Telemetry surveillance data will also be used to assess diel behavior patterns of radio-tagged fish.

One remote telemetry station was established just above the confluence of the LCR and was operational on February 13, 1991. The remote station effectively logged the presence of four radio-tagged fish utilizing the LCR confluence in two observation periods during Trip #2, 1991. A test of the antenna's effective range was conducted during high flows on 910214.

Bench Marks

No new bench marks were established during Trip #2, 1991.

OBSERVATIONS

1. All chubs handled appeared robust, vigorous and in good condition.

2. Aggregations of up to three radio-tagged fish in eddies above the Little Colorado River (LCR) suggest that fish may be engaged in pre-spawning staging activities.

3. Direct observation of one radio-tagged fish moving into the LCR and the location of a second radio-tagged fish in the LCR suggest that fish may be engaged in staging activities or migration in the first 0.2 miles of the LCR. Upstream movement of both radio-tagged fish in the LCR only extended to the base of the first significant riffle/rapid at RM 0.2 during the observations made on Trip #2, 1991.

4. The recapture of a PIT tagged fish within the plume of the LCR in the main channel (RM 61.4), that was originally tagged in January 14, 1991 at RM 64.6 suggests that movements of humpback chubs into the LCR confluence area is occurring from distances greater than four miles.

5. Two radio-tagged fish were observed moving into then back out of the LCR confluence area, traversing distances of up to 0.5 miles, also suggesting possible staging or migratory activities.

6. Flows in the LCR were base flows from Blue Springs, water clarity was high and temperatures were ranging from a afternoon high of 17°C to a early morning low of 14°C.

7. Average numbers of fish contacted during day and night surveillance runs were 4.6 and 7.8, respectively, further suggesting a diel pattern of vertical migration by humpback chubs during clear water conditions.

8. The LCR remote telemetry station performed satisfactorily during tests conducted on Trip #2, 1991 and is currently in operation.

9. One fish was successfully radio tracked in the LCR for a period exceeding 24 hours, despite signal extinction problems. Although it appears that radio tracking may be feasible in the LCR, it would require more intensive effort due to periodic signal extinction.

10. Helicopter aerial telemetry techniques have been refined and appears to be adequate to locate radio-tagged fish that are above the extinction depth in the main channel Colorado River.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. Use of 1:2400 aerial photography during Trip #2, 1991, significantly improved resolution of locating radiotagged fish and mapping movements during the trip, however, a standardized mileage must be transferred to the photographs to insure database accuracy and compatibility between researchers utilizing aerial telemetry for location data.

2. BIO/WEST has not received the computer hardware necessary to completely install the downstream remote telemetry station. Delivery of computer hardware is anticipated by the first week of April, 1991. In the interim, BIO/WEST will install the antenna apparatus (which is the most labor intensive aspect) during Trip #3, 1991, so that it will be readily operational when the necessary equipment is sent from the manufacturer. Since only one radio-tagged fish was located below the confluence area (and below the lower remote site), it is felt that minimal information will be lost due to the delay in installation.

RECOMMENDATIONS

1. Radio transmitters should only be implanted in large male humpback chubs during Trip #3, 1991 (March). Observations of egg maturation during Trip #1, 1991, indicate that by March egg masses may be too large enough to risk implanting females without fear of injury.

2. Environmental factors that may be dictating or cuing humpback chub spawning behavior must be monitored in greater detail. Interaction between BIO/WEST personnel and GCES water quality specialist during Trip #2, 1991 indicated that datasondes in addition to other remote water quality monitoring equipment may be available for use on the G.C. humpback chub studies. Collection of water quality data would be greatly enhance by use of continuous water quality recording devices. It was suggested that possibly two datasondes could be provided to each of the BIO/WEST crews for purposes of recording water quality data in both the main channel and pertinent tributaries.

3. Continuous and concurrent monitoring of ambient light, turbidity and fish behavior in the main channel could greatly aid in understanding the influence of ambient light conditions and turbidity on fish behavior. BIO/WEST recommends that GCES personnel continue to pursue the develop of continuous recording remote sensors to measure ambient light and turbidity. Contingent on NPS approval, BIO/WEST plans on relocating the remote telemetry stations following June, in order to monitor vertical movement of large numbers of radio-tagged humpback chub. The antenna configuration will be changed from directional to omni-directional and remote stations will be moved well above the river corridor to increase antenna range. Site evaluation will be initiated during Trip #3, 1991, to be followed by coordination with GCES and NPS personnel. Ideally, remote monitoring of ambient light and turbidity would also be able to be installed concurrently.

Table 1. Logistics and Research Schedule for Trip #2, 1991

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R[1]	FS	TE	HQ
2/8	31.7	South Canyon	X			
2/9	61.3	LCR	X		X	X
2/10	61.3	LCR			X	X
2/11	61.3	LCR			X	X
2/12	61.3	LCR			X	X
2/13	61.3	LCR		X	X	X
2/14	61.3	LCR		X	X	X
2/15	87.5	Cremation	X		X	X
2/16	137.0	Poncho's Kitchen	X			
2/17	188.5	Whitmore Wash	X			
2/18	225.0	Diamond Creek	X			
2/19		Take Out				

[1] T&R = Travel and Reconnaissance
FS = Fish Sampling
TE = Telemetry
HQ = Habitat Quantification

Table 2. Personnel Participating in Trip #2, 1991.			
PERSONNEL	AFFILIATION	DATES	COMMENTS
B. Masslich	BIO/WEST	2/8-2/16	Out B.A. Trail
B. Leibfried	BIO/WEST	2/9-2/16	Out B.A. Trail
T. Wasowicz	BIO/WEST	2/8-2/16	Out B.A. Trail
J. White	BIO/WEST	2/8-2/16	Out B.A. Trail
G. Doster	BIO/WEST	2/8-2/19	
G. Williams	BIO/WEST	2/8-2/19	
B. Vernieu	GCES	2/8-2/19	
B. Grussy	OARS	2/8-2/19	
A. Tines	OARS	2/8-2/19	
J. Kempster	OARS	2/8-2/19	

Table 3. Summary of Fish Collected and Effort by Gear Type.

[1]	[2]	HB	FM	BH	SD	RB	BR	CC	CP	SB
EL N=0 0 hr	A									
	J									
	Y									
TL N=1 3.0 hr	A	1	5			4				
	J									
	Y									
TK N=2 4.1 hr	A	2	9							
	J									
	Y									
GM N=0 0 hr	A									
	J									
	Y									
GP N=0 0 hr	A									
	J									
	Y									
GX N=0 0 hr	A									
	J									
	Y									
TOTAL	A	3	14			4				
	J									
	Y									

[1]- Gear Types
EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1"x12" trammel net
GM = 10'x6'x2" gill net
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net

[2] - A = Adult
J = Juvenile
Y = Young of year

Table 4. Summary of Humpback Chub handled during Trip #2, 1991.

#	DATE	GEAR[C] TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
1	910214	TL	7F7F3C4279	Y	PIT	391	716	61.4	61.4
2	910214	TK	7F7F3F4D43	N	--	386	561	61.3	61.3
3	910214	TK	7F7F3C7C06	Y	PIT	240	126	61.3	61.3
			7F7F050D7A	(Previous PIT tag, now double-tagged w/7F7F3C7C06)					

[1]- Yellow Floy tag - AGFD
[2]- Small Yellow Carlin
[3]- Orange Floy - AGFD
[4]- Yellow Floy - AGFD
[5]- Small Orange Carlin Tag
[A]- Fish implanted with radio transmitter
[B]- Probable misreading

[C]- Gear Types
EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1"x12" trammel net
GM = 10'x6'x2" gill net
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net

Table 5. Summary of radio-transmitter implants in humpback chub during previous trips.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	10/17/90	7F7F3F5050	428	840	40.670	60	11	100	910125	60.2	60.4
2	10/17/90	7F7F3E2D2D	439	865	40.640	59	11	100	910125	60.4	60.4
3	10/17/90	7F7F3F3626	432	780	40.620	78	11	75	901231	60.4	60.4
4	10/17/90	7F7F3E2253	382	535	40.650	81	11	75	901231	60.2	60.4
5	10/18/90	7F7F3F4054	415	720	40.630	39	9	50	901207	60.4	60.5
6	10/18/90	7F7F3F5044	388	580	40.680	77	11	75	910101	60.6	60.5
7	10/19/90	7F7F3F4E11	376	465	40.690	40	9	50	901208	64.6	64.9
8	10/20/90	7F7F3E2F3A	367	500	40.660	39	9	50	901209	64.6	64.7
9	10/20/90	7F7F456B2C	390	605	40.610	58	11	100	910128	64.6	64.7
10	10/20/90	7F7F3C311C	395	525	40.600	40	9	50	901210	64.6	64.7
1	11/16/90	7F7F3C4452	404	670	40.600	62	11	100	02/23/91	60.4	60.4
2	11/16/90	7F7F3C303B	396	665	40.700	62	11	100	02/23/91	60.1	60.1
3	11/17/90	7F7F3F4E77	407	675	40.710	79	11	75	01/30/91	61.0	61.0
4	11/18/90	7F7F3E3C5C	422	798	40.730	61	11	75	01/31/91	61.1	61.1
5	11/19/90	NO PITTAG	407	825	40.740	79	11	75	02/01/91	62.0	62.0
6	11/21/90	7F7F3C2919	394	635	40.640	78	11	75	02/03/91	64.1	64.1
7	11/23/90	7F7F3C4162	402	732	40.630	62	11	100	02/29/91	64.4	64.4

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 6. A list of radio frequencies contacted on Trip #2, 1991, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (g)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.710/42	11	910109	58.3	58.3	
		910210(2250)			58.4
		910211(2031)			58.4
		910211(2237)			58.4
		910212(1258)			58.4
		910212(1312)			58.4
		910212(2205)			58.4
		910213(1158)			58.4
		910213(2214)			58.4
		910214(1408)			58.4
		910214(2335)			58.4
40.600/63	11	901116	60.4	60.4	
		910212(1240)			60.1
		910212(1333)			60.1
		910212(2240)			60.0
		910213(1227)			60.1
		910213(2226)			60.1
		910214(1430)			60.0
		910214(2350)			60.0
40.730/87	11	910326	59.0	59.0	
		910212(1227)			60.4
		910212(1335)			60.4
		910212(2250)			60.4
		910213(2205)			61.3
		910215(0004)			60.6
40.680/68	11	901018	60.6	60.5	
		910212(1227)			60.4
		910212(1335)			60.4
		910212(2250)			60.4
		910213(2240)			60.4

Table 6. A list of radio frequencies contacted on Trip #2, 1991, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (g)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.710/81	11	901117	61.0	61.0	
		910211(1126)			60.9
		910211(1324)			60.9
		910211(2308)			60.9
		910212(1343)			60.9
		910212(2252)			60.8
		910213(1238)			60.8
		910213(2247)			60.8
		910215(0030)			60.8
40.700/60	11	901116	60.1	60.1	
		910211(2312)			61.1
		910212(2252)			60.8
		910213(2255)			60.8
		910215(0115)			61.3
40.740/44	11	910110	60.5	60.5	
		910212(2252)			60.5
		910213(2000)			0.1[1]
		910214(0220)			0.1[1]
		910214(0324)			0.2[1]
		910215(0824)			0.2[1]
					[1]-(LCR)
40.720/67	11	910110	60.6	60.6	
		910211(1132)			60.8
		910211(1317)			60.8
		910211(2010)			60.8
		910211(2308)			60.9
		910212(1222)			60.8
		910212(1343)			60.8
		910212(2309)			60.8
		910213(1238)			60.8
		910213(2247)			60.8
		910215(0030)			60.8
40.680/46	11	910109	58.3	58.3	
		910212(2318)			61.3
		910213(0915)			61.4

Table 6. A list of radio frequencies contacted on Trip #2, 1991, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (g)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.640/50	11	901017	60.4	60.4	
		910212(2319)			61.2
		910213(2305)			61.3
		910214(1450)			60.8
		910215(0030)			60.8
40.630/62	11	901123	64.4	64.4	
		910210(1330)			64.1
		910211(1410)			64.3
		910212(1440)			64.3
		910213(1356)			64.3
		910214(1531)			64.3
40.670/84	11	900110	60.5	60.5	
40.730/56	11	901118	61.1	61.1	
		910214(2200)			61.3
40.670/52	11	901017	60.2	60.4	
		910215(0712)			0.2[1]
					[1]-(LCR)

Table 7. Summary of radiotelemetry information collected during previous trips, 1990, and current status of radiotagged humpback chubs.

#	DATE OF LAST LOCATION[1]	FREQ.	CURRENT PULSE[2]	PREVIOUS PULSE[3]	RM[4]	CONTACTED[5]	LOCATED[6]	2HR[7]	24HR[7]
1	910215	40.670	52	64	0.2LC	Y	Y		
2	910215	40.640	50	54	60.3	Y	Y		
3	901214	40.620	-	68	(60.8)	N	N		
4	901017	40.650	-	81	(60.4)	N	N		
5	901214	40.630	-	39	(60.6)	N	N		
6	910213	40.680	68	77	60.4	Y	Y		Y
7	901117	40.690	-	40	(64.6)	N	N		
8	901215	40.660	-	39	(64.7)	N	N		
9	901117	40.610	-	59	(62.6)	N	N		
10	901217	40.600	-	38	(64.8)	N	N		
11	910214	40.600	63	64	60.0	Y	Y	Y	
12	910215	40.700	60	62	61.3	Y	Y		
13	910215	40.710	81	82	60.8	Y	Y		Y
14	910214	40.730	56	60	61.3	Y	Y		
15	901121	40.740	-	79	(62.0)	N	N		
16	901122	40.640	-	78	(64.0)	N	N		
17	910214	40.630	62	65	64.3	Y	Y	Y	
18	910212	40.660	NC	64	-	P	N		
19	910213	40.680	46	44	61.4	Y	Y		
20	910215	40.730	87	86	60.6	Y	Y		Y
21	910214	40.710	42	41	58.4	Y	Y	Y	
22	910214	40.740	44	42	0.2LC	Y	Y	Y	Y
23	910211	40.670	80	84	(60.5)	Y	N		
24	910215	40.720	67	66	60.8	Y	Y		Y

1- Date of most recent location, from current trip or previous trips.
2- Pulse counts from current trips, NC=not counted.
3- Pulse counts from most recent contact prior to current trip.
4- River mile of last location from current trip or (previous trip).
5- Indicates if fish was contacted on current trip, Y=Yes, P=Possible, N=No.
6- Indicates if specific location of fish was determined during current trip.
7- Indicates whether 2-hour or 24-hour monitoring was conducted.

APPENDIX A

DATA SHEETS FOR TRIP #2, 1991

REPORT NO. PR 250-06
BIO/WEST, Inc.

CHARACTERIZATION OF THE LIFE HISTORY AND ECOLOGY OF THE HUMPBACK CHUB IN THE GRAND CANYON

TRIP REPORT #3 - 1991
March 3 - March 22, 1991

Prepared For:

Bureau of Reclamation

Prepared By:

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March 31, 1991

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APPENDIX A

INTRODUCTION

This report presents pertinent details associated with Trip #3, 1991. Included in the report are a summary of trip logistics, research schedule, personnel, data collected, observations, problems encountered and recommendations. Most information is presented in tabular format to provide a quick synopsis of pertinent trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Tables 1a and 1b present a summary of all camp locations and research activities for Trip #3, 1991. Table 2 is a list of personnel on the trip as well as their affiliation.

DATA COLLECTED

Table 3 presents a summary of fish species captured by gear type and reach for Trip #3, 1991. Table 4 summarizes basic information on all humpback chubs handled during the trip. Table 5 gives pertinent information on all humpback chubs radiotagged during Trip #3, 1991.

Humpback Chubs Captured

Of the 130 humpback chub handled during Trip #3, 1991, 38 were recaptures (Table 4). Fish #122 and 123 (PIT tag #7F7F3F4F13) represent the same fish recaptured on the same day. Of the 38 fish recaptured, 19 had been PIT tagged, 8 had Floy tags, 9 had Carlin tags, and 2 had thread anchor material at the base of the dorsal fin indicating a lost Floy tag. Recapture information, including tag type, color and number is presented in Table 4. All Carlin and Floy dangler tags were removed from recaptured fish and the fish were equipped with a PIT tag for future identification. Tags removed by BIO/WEST will be returned to Arizona Game and Fish Department (AGFD) with associated information for each fish. The majority of humpback chubs were captured in Reach 1 in the vicinity of the LCR. Four humpback chub, however, were collected from downstream locations. These fish included three recaptures of fish PIT tagged by BIO/WEST during previous trips. All three recaptures were netted in the same locations where they were originally captured. The fourth humpback chub collected in the lower reach was captured at RM 221.8 and represents the furthest downstream capture to date.

Radiotelemetry

Seven humpback chubs were implanted with radio transmitters during Trip #3, 1991 (Table 5). All tags were implanted without complications and the fish were vigorous and in good condition at the time of release. Five of the seven fish were relocated and observed at least once following release, and showed no signs of aberrant behavior. All fish were actively moving both vertically and longitudinally and were judged to be showing no ill effects from implantation. A total of 31 humpback chub have been radiotagged since this investigation began in October 1990.

One radio-tagged fish was recaptured during Trip #3, 1991. The fish appeared vigorous and in good condition. The incision was healed and sutures were removed by BIO/WEST personnel. The antenna exit point showed some signs of irritation including minor redness and swelling.

An aerial telemetry surveillance was conducted from helicopter on March 7, concurrent with an on-ground telemetry surveillance. A total of 9 radio-tagged fish contacted on the ground were also contacted from the air. Two fish that were contacted on the ground were not contacted in the air, while two fish contacted in the air were not contacted from the ground. Differences between ground and air surveillance is probably due to fish movement above and below the extinction depth, at the times the boat or helicopter were in the area.

Bench Marks

No new bench marks were established during Trip #3, 1991.

OBSERVATIONS

1. All chubs handled appeared robust, vigorous and in good condition.

2. Under fluctuating flows (≈3,000 - 18,000 cfs) in March, netting with gill and trammel nets proved an effective means for collecting adult and large juvenile humpback chubs in the mainstem Colorado River.

3. Diel behavior patterns observed during previous trips were not as apparent during Trip #3, 1991. It is assumed that differences in diel activity patterns may be related to reproductive behavior as humpback chubs begin to migrate and stage in the vicinity of the LCR.

4. Aggregations of up to nine radio-tagged fish at or immediately above the confluence of the LCR suggest that fish may be engaged in pre-spawning staging activities.

5. Observations of five radio-tagged fish moving into the LCR on March 14, suggest that fish may be engaged in staging activities or migration in first 100 meters of the LCR. The LCR was running turbid and high during the majority of Trip #3, 1991. For the period of March 4 - March 15, peak flows in the LCR were observed during March 5-10, then flows began to recede and temperatures gradually increased. LCR temperatures ranged from 9.8 - 11.3°C during high flows to 11.5 - 12.8°C as flows began to recede.

6. Catch rates of humpback chubs at areas such as Awatubi (RM 58.3) and Lava Chuar (RM 65.3) appeared to be much less that during previous effort at these locations, suggesting that densities of fish at locations removed from the LCR confluence area were down as compared to January. In contrast netting catch rates appeared to be substantially higher in the LCR confluence area further suggesting migration to, and staging in the area of the LCR confluence.

7. During Trip #3, 1991, five radio tagged fish were observed moving distances of 0.5 to 1.7 miles into the LCR confluence area.

8. A significant number of chubs captured were exhibiting external breeding characters including tuberculation, coloration and swelling in the area of the vent. Only one male chub captured was expressing gametes.

9. Only male humpback chubs were implanted with radio transmitters during Trip #3, 1991.

10. Four humpback chub were captured downstream of Reach 1 during March. Three of the four fish captured were recaptures from areas sampled during November 1990 and January 1991.

11. Chubs which were recaptured were collected from the same locations at which they were originally captured, indicating that these fish were not engaged in any prespawning movements.

12. No prespawning accumulations of humpback chub were noted in the vicinity of Bright Angel, Shinumo, Tapeats, Kanab or Havasu Creeks.

13. Evidence of spawning by rainbow trout was observed in Clear Creek, Bright Angel Creek, Pipe Creek, Shinumo Creek, Crystal Creek, Royal Arches Creek, Tapeats Creak, and Deer Creek.

14. Accumulations of flannelmouth and bluehead suckers exhibiting breeding characters were found at Kanab Creek; and ripe male and female flannelmouth and bluehead suckers were collected from Havasu Creek.

PROBLEMS ENCOUNTERED AND SOLUTIONS

No significant problems were encountered on Trip #3, 1991.

RECOMMENDATIONS

1. Aerial telemetry techniques have been refined and appear to be adequate to contact and locate radio-tagged chubs in the main channel of the Colorado River that are occupying positions above the extinction depth for radio transmissions. However, due to the cost and logistical considerations of coordinating helicopter flights and that the study area is relatively small and workable by boats, it is recommended that aerial telemetry efforts be discontinued under the present circumstances. If at a future date, radio telemetry efforts are expanded to encompass a larger reach of the river, aerial telemetry may become practical.

Table 1a. Logistics and Research Schedule for Trip #3, 1991. Team 1 (LCR)

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R[1]	FS	TE	HQ
3/3/91	24.0	24 Mile Rapid	X			
3/4/91	57.0	Above Malgosa Canyon	X	X	X	X
3/5/91	57.0	Above Malgosa Canyon		X	X	X
3/6/91	58.3	Awatubi Canyon	X	X	X	X
3/7/91	58.3	Awatubi Canyon		X	X	X
3/8/91	61.3	LCR	X	X	X	X
3/9/91	61.3	LCR		X	X	X
3/10/91	61.3	LCR		X	X	X
3/11/91	61.3	LCR		X	X	X
3/12/91	65.3	Lava Chuar	X	X	X	X
3/13/91	65.3	Lava Chuar		X	X	X
3/14/91	65.3	Lava Chuar		X	X	X
3/15/91	91.0	91 Mile Creek	X	X	X	X
3/16/91	133.7	Tapeats Creek	X			
3/17/91	182.0	Hell's Hollow	X			
3/18/91	208.9	Granite Park	X	X		
3/19/91	208.9	Granite Park		X		
3/20/91	221.8	222 Mile Canyon	X	X		
3/21/91	221.8	222 Mile Canyon		X		
3/22/91	225.0	T/O @ Diamond Cr.				

[1] T&R = Travel and Reconnaissance
FS = Fish Sampling
TE = Telemetry
HQ = Habitat Quantification

Table 1b. Logistics and Research Schedule for Trip #3, 1991. Team 2.						
			RESEARCH ACTIVITIES			
DATE	RM	LOCATION	T&R[1]	FS	TE	HQ
3/3/91	23.5		X			
3/4/91	76.7	Hance	X	X		
3/5/91	87.1	Cremation		X		
3/6/91	87.1	Cremation		X		
3/7/91	108.3	Lower Bass	X	X		
3/8/91	108.3	Lower Bass		X		
3/9/91	133.5	Racetrack - Above Tapeats	X	X		X
3/10/91	133.5	Racetrack - Above Tapeats		X		X
3/11/91	136.3	Across from Deer Creek	X	X		X
3/12/91	136.3	Across from Deer Creek		X		X
3/13/91	143.2	Across from Kanab Creek	X	X		X
3/14/91	143.2	Across from Kanab Creek		X		X
3/15/91	155.6	Last Chance-Above Havasu	X	X		
3/16/91	155.6	Last Chance-Above Havasu		X		
3/17/91	182.4	Hells Hollow	X	X		
3/18/91	182.4	Hells Hollow		X		
3/19/91	214.1	214 Mile Canyon	X	X		
3/20/91	214.1	214 Mile Canyon		X		
3/21/91	214.1	214 Mile Canyon	X	X		
3/22/91	225.8	Take Out - Diamond				

[1] T&R = Travel and Reconnaissance
FS = Fish Sampling
TE = Telemetry
HQ = Habitat Quantification

Table 2. Personnel Participating in Trip #3.			
PERSONNEL	AFFILIATION	DATES	COMMENTS
TEAM #1			
B. Masslich	B/W	3/3-3/22	B/W Project Leader
B. Leibfried	B/W	3/3-3/22	
H. Yard	B/W	3/3-3/22	
R. VanHaverbeke	B/W	3/4-3/22	Pick up @ Nankoweep
B. Dierker	B/W	3/3-3/22	
J. White	GCES-Vol.	3/3-3/22	
M. Hylton	GCES-Vol.	3/3-3/22	
M. Yard	GCES	3/3-3/22	
M. Severson	AGF	3/3-3/15	Out B.A. Trail
R. Valdez	B/W	3/12-3/14	In/Out Tanner Trail
M. Pucherelli	BOR	3/9-3/14	In/Out Tanner Trail
D. Wegner	GCES	3/9-3/11	In/Out Tanner Trail
TEAM #2			
L. Crist	B/W	3/3-3/22	B/W Project Leader
G. Doster	B/W	3/3-3/22	
E. Prats	B/W	3/3-3/22	
P. Weiss	B/W	3/3-3/22	
G. Williams	B/W	3/3-3/22	
R. Hedlund	B/W	3/3-3/22	Volunteer
A. Hayden	GCES	3/3-3/22	
J. Korn	GCES	3/3-3/22	Volunteer
S. Bledsoe	OARS	3/3-3/22	
S. Reeder	OARS	3/3-3/22	
C. Krznarich	OARS	3/3-3/22	

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY

[1]	[2]	HB[3]	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV
Reach 1 EL N=2 3 hr	A	0	0	0	8	1	0	0	0	0	0	0
	J	0	0	0	1	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 EL N=46 16 hr	A	0	0	0	250	118	2	104	1	0	0	0
	J	0	0	1	34	1	0	4	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 EL N=16 3 hr	A	0	1	2	7	0	0	30	2	0	0	0
	J	0	3	3	1	0	0	2	0	0	0	0
	Y	0	0	0	0	0	0	2	0	0	0	0
Reach 1 TL N=61 122 hr	A	84	21	5	79	1	1	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TL N=193 386 hr	A	2	10	2	34	9	0	6	0	0	0	0
	J	3	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 TL N=77 154 hr	A	2	3	2	10	0	2	9	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY

[1]	[2]	HB[3]	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV
Reach 1 TK N=48 96 hr	A	15	2	8	20	0	0	0	0	0	0	0
	J	3	0	0	1	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TK N=97 194 hr	A	0	19	10	23	1	0	3	0	0	0	0
	J	1	0	0	1	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 TK N=73 146 hr	A	1	19	5	2	0	0	3	0	0	0	0
	J	0	1	1	1	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 TF N=1 2 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 TF N=1 2 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 GP N=23 46 hr	A	17	0	0	32	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY												
[1]	[2]	HB[3]	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV
Reach 2 GP N=76 152 hr	A	0	4	3	1	0	0	1	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GP N=24 48 hr	A	0	1	0	0	0	0	0	0	0	0	0
	J	0	0	1	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 GX N=11 22 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 GX N=8 16 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 HL N=2 30 hr	A	2	0	2	0	0	1	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 HL N=2 41 hr	A	0	3	4	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY

[1]	[2]	HB[3]	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV
Reach 2 HM N=6 91 hr	A	0	0	0	21	0	0	0	0	0	0	0
	J	0	0	0	2	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 HS N=12 170 hr	A	0	0	19	60	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 3 HS N=1 24 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 MT N=20 278 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
TOTAL	A											
	J											
	Y											

[1]- Gear Types
EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1"x12" trammel net
GM = 10'x6'x2" gill net
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net
HL = Large hoop net (4' diameter)
HM = Medium hoop net (3'diameter)
HS = Small hoop net (2' diameter)
TF = Floated trammel (TK)
MT = Minnow trap

[2] - A = Adult
J = Juvenile
Y = Young of year

[3] - HB = humpback chub
FM = flannelmouth sucker
BH = bluehead sucker
RB = rainbow trout
BR = brown trout
CC = channel catfish
CP = carp
SD = speckled dace
BK = brook trout
PK = plains killifish
FV = flannelmouth variant

Table 4. Summary of Humpback Chub handled during Trip #3.

#	DATE	GEAR[c]	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
1	910307	TK	7F7F3E2661[A]	N	--	399	511	58.8	58.8
2	910307	TK	7F7F3E2F7B	N	--	329	336	58.8	58.8
3	910310	HL	7F7F3F501B	N	--	286	218	100m up LCR	100m up LCR
4	910311	HL	7F7F3F3A55	Y	0314827[1]	344	383	100m up LCR	100m up LCR
5	910304	TL	7F7F3E362E[A]	N	--	369	497	57.0	57.0
6	910305	TL	7F7F3C3230	N	--	359	550	57.0	57.0
7	910305	TL	7F7F3E2813	N	--	354	450	57.0	57.0
8	910306	GP	7F7F3E3E15	N	--	320	365	58.8	58.8
9	910306	GP	7F7F3F3226	Y	PITTAG	346	495	58.8	58.8
10	910306	GP	7F7F3E3675	Y	PITTAG	320	310	58.8	58.8
11	910307	TK	7F7F3F4B3A	N	--	321	317	58.8	58.3
12	910308	GP	7F7F3E3B7A	N	--	302	325	61.4	61.4
13	910308	GP	7F7F3F5108	N	--	311	318	61.4	61.4
14	910308	GP	7F7F3E2913	N	--	308	343	61.4	61.4
15	910308	GP	7F7F3E212E	N	--	342	394	61.4	61.4
16	910308	GP	7F7F3E4231	Y	0314506[1]	340	379	61.4	61.4
17	910308	GP	7F7F3E2625	N	--	281	239	61.4	61.4
18	910308	GP	7F7F3F4F70	N	--	316	320	61.4	61.4
19	910308	GP	7F7F3F452B	N	--	304	264	61.4	61.4

Table 4. Summary of Humpback Chub handled during Trip #3.									
#	DATE	GEAR[c]	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
20	910308	GP	7F7F3F4E3B	N	--	392	451	61.4	61.4
21	910308	GP	7F7F3F430E	N	--	282	239	61.4	61.4
22	910308	TK	7F7F3F4D30	N	--	390	472	60.1	60.1
23	910308	GP	7F7F3E2907	N	--	332	308	61.4	61.4
24	910308	GP	7F7F3C4471	Y	622[2]	305	269	61.4	61.4
25	910308	GP	7F7F051102	N	--	376	538	61.4	61.4
26	910308	GP	7F7F3F5108	Y	PITTAG	306	326	61.4	61.4
27	910308	TK	7F7F3E2B5C	N	--	196	82	60.1	60.1
28	910308	TL	7F7F450D11	N	--	340	361	60.1	60.1
29	910308	TK	7F7F3C4554	Y	PITTAG	415	711	60.1	60.3
30	910308	TL	7F7F3E2E60	N	--	260	143	60.3	60.3
31	910309	TL	7F7F3C2E01	N	--	325	340	60.8	60.8
32	910309	TL	7F7F3C4244	N	--	373	483	61.4	61.4
33	910309	TL	7F7F3F5152	N	--	336	398	61.4	61.4
34	910309	TL	7F7F3E3C40	N	--	317	289	60.8	60.8
35	910309	TL	7F7F3E2C21	N	--	375	479	60.8	60.8
36	910309	TL	7F7F3F4A0F	N	--	364	427	60.8	60.8
37	910309	TL	7F7F3C2D69	Y	463[4]	353	463	60.8	60.8
38	910309	TL	7F7F3F4575	Y	LOST FLOY	380	476	60.8	60.8

Table 4. Summary of Humpback Chub handled during Trip #3.									
#	DATE	GEAR[C]	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
39	910309	TL	7F7F3F4453[a]	Y	890[2]	399	577	60.8	60.8
40	910309	TL	7F7F45181E	Y	0314155[1]	358	425	60.8	60.8
41	910309	TL	7F7F3E382D	N	--	308	245	60.8	--
42	910309	TL	7F7F3E384D	N	--	384	514	60.8	60.8
43	910309	TL	7F7F3F4D30	Y	PITTAG	390	358	60.8	60.8
44	910309	TL	7F7F3F332D	N	--	324	319	61.9	61.9
45	910309	TL	7F7F3F445B	N	--	306	274	61.9	61.9
46	910309	TL	7F7F3E2913	Y	PITTAG	312	329	61.9	61.9
47	910309	TL	7F7F3F5071	N	--	334	390	61.9	61.9
48	910309	TL	7F7F3E2B48	N	--	334	363	61.9	61.9
49	910309	TL	7F7F3F4D3B	N	--	346	361	61.9	61.9
50	910309	TL	7F7F3F490D	N	--	290	301	61.9	61.9
51	910309	TL	7F7F3F4B2F	N	--	325	331	61.9	61.9
52	910309	TL	7F7F3F4F72	N	--	345	380	61.9	61.9
53	910309	TL	7F7F3F395A	N	--	284	171	61.4	61.4
54	910309	TL	7F7F050E06	N	--	325	308	61.2	60.8
55	910309	TL	7F7F3F4012	Y	PITTAG	308	270	61.2	60.8
56	910310	TL	7F7F3F4F0A	N	--	315	326	61.1	61.1
57	910310	TL	7F7F3F4424[B]	N	--	326	333	61.1	61.1

Table 4. Summary of Humpback Chub handled during Trip #3.									
#	DATE	GEAR[C]	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
58	910310	TK	7F7F3C324A	N	--	283	200	61.4	61.4
59	910310	TK	7F7F3F4424[B]	N	--	307	297	61.4	61.4
60	910310	TL	7F7F3E3D28	Y	0314377[1]	351	495	61.1	61.1
61	910310	TL	7F7F3F4E5C	Y	966[6]	311	385	61.1	61.1
62	910310	TL	7F7F3E3863	N	--	326	313	61.1	61.1
63	910310	TL	7F7F3C2546	Y	6314385[1]	420	991	61.1	61.1
64	910310	TL	7F7F447F69	N	--	333	321	61.0	61.0
65	910310	TL	7F7F3C3D40	N	--	449	815	61.0	61.0
66	910310	TK	7F7F3E325B	N	--	277	189	61.4	61.4
67	910311	TL	7F7F3F4E77	Y	PITTAG	409	660	61.2	61.2
68	910311	TL	7F7F3C366B	N	--	407	770	61.2	61.2
69	910311	TL	7F7F3F4040	N	--	381	435	61.4	61.4
70	910311	TL	7F7F3C2E7A[E]	Y	PITTAG	356	355	61.2	61.2
71	910311	TL	7F7F3C243E[A]	N	--	382	580	61.2	61.2
72	910311	TL	7F7F3F520D[A]	N	--	377	604	61.2	61.2
73	910311	TL	7F7F3F4F33	N	--	312	365	61.2	61.2
74	910311	TL	7F7F3F4942	N	--	325	350	61.4	61.4
75	910311	TL	7F7F3E2773	N	--	359	490	61.4	61.4
76	910311	TL	7F7F441A38	N	--	321	334	61.4	61.8

Table 4. Summary of Humpback Chub handled during Trip #3.

#	DATE	GEAR[C]	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
77	910311	TL	7F7F3F4D29	N	--	302	251	61.8	61.8
78	910311	TL	7F7F3E3867	N	--	364	435	61.8	61.8
79	910311	TL	7F7F3E3E12	N	--	384	629	61.8	61.8
80	910311	TL	7F7F3C3E75	N	--	252	162	61.8	61.8
81	910311	TL	7F7F3F345F	N	--	368	443	61.8	61.8
82	910311	TL	7F7F3C345A	Y	301656[1]	363	474	61.8	61.8
83	910311	TL	7F7F3C3F7E	N	--	406	657	61.2	61.2
84	910311	TL	7F7F3E2B11	N	--	346	426	61.2	61.2
85	910311	TL	7F7F3E3B00[A]	Y	305657[3]	410	688	61.2	61.2
86	910311	TL	7F7F3F3A28	N	--	318	328	61.2	61.3
87	910311	TL	7F7F3E2B64	N	--	310	290	61.2	61.2
88	910311	TL	7F7F3C2E7A[E]	Y	PITTAG	347	349	61.2	61.2
89	910311	TL	7F7F3E2460	Y	0152[6]	391	612	61.2	61.2
90	910311	TL	7F7F3F3F12	N	--	346	446	61.4	61.4
91	910311	TL	7F7F3C3E72	N	--	320	318	61.4	61.4
92	910311	TL	7F7F3E2473	N	--	305	292	61.4	61.4
93	910311	TL	7F7F3C3174	Y	472[6]	267	194	61.8	61.8
94	910311	TL	7F7F3C4543	N	--	347	362	61.8	61.8
95	910311	TL	7F7F3C3A67	N	--	347	479	61.8	61.8

Table 4. Summary of Humpback Chub handled during Trip #3.

#	DATE	GEAR[C]	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
96	910311	TL	7F7F3E2E20	N	--	314	343	61.4	61.4
97	910311	TL	7F7F3F4942	Y	PITTAG	322	326	61.4	61.4
98	910311	TL	7F7F3E2B48	Y	PITTAG	334	354	61.4	61.4
99	910311	TL	7F7F3F3A28	Y	PITTAG	315	340	61.4	61.4
100	910311	TL	7F7F3E372A[A]	Y	877[5]	387	599	61.4	61.4
101	910311	TL	7F7F3F4D50	Y	151[2]	359	458	61.4	61.4
102	910311	TL	7F7F3C425C	N	--	314	319	61.4	61.4
103	910311	TL	7F7F3E2512	Y	0314595[1]	328	355	61.4	61.4
104	910311	TL	7F7F3F4A56	N	--	284	248	61.4	61.4
105	910311	TL	7F7F3E2C41	N	--	272	220	61.4	61.4
106	910312	TK	7F7F3F467F	N	--	265	148	64.5	64.5
107	910312	TL	7F7F431A46[E]	N	--	235	184	64.5	64.5
108	910312	TL	7F7F431A46[E]	Y	PITTAG	235	184	64.5	64.5
109	910312	TL	7F7F3E3C5F	N	--	360	562	64.8	64.8
110	910312	TL	7F7F3C3A75	N	--	275	240	64.8	64.8
111	910313	TK	7F7F3C3454	N	--	198	82	63.4	63.4
112	910313	TK	7F7E50233E	N	--	242	105	63.4	63.4
113	910314	TL	7F7F3E3B32	N	--	383	413	62.7	62.7
114	910314	TL	7F7F3F4C39	N	--	298	300	62.7	62.4

Table 4. Summary of Humpback Chub handled during Trip #3.

#	DATE	GEAR[C]	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
115	910314	TK	7F7F3F5217	Y	888[6]	263	200	62.5	62.5
116	910314	TK	7F7F451160	N	--	282	229	62.5	61.5
117	910314	TK	7F7E501A24	N	--	274	264	62.5	62.5
118	910314	TK	7F7F432C25	N	--	208	103	62.5	62.5
119	910314	TK	7F7F450F49	N	--	197	76	62.5	62.5
120	910314	TL	7F7F3F430F	N	--	376	492	62.7	62.7
121	910314	TK	7F7F3E2267	N	--	256	104	62.5	62.5
122	910314	T#[D]	7F7F3F4F13[E]	N	--	278	218	62.5	62.5
123	910314	T#[D]	7F7F3F4F13[E]	Y	PITTAG	278	218	62.5	62.5
124	910320	TK	7F7F3F5130	N	--	275	196	221.8	221.8
125	910320	TL	7F7F3F4B6C	Y	PITTAG	326	291	213.6	213.6
126	910320	TL	7F7F3E3212	Y	PITTAG	315	306	213.6	213.6
127	910308	TL	7F7F3F3523	Y	LOST FLOY	400	549	60.1	60.1
128	910310	TL	7F7F3F4F0A	Y	PITTAG	315	326	61.1	61.1
129	910309	TL	ESCAPED	--	--	--	--	61.9	61.9
130	910307	TL	7F7F3F5144	Y	PITTAG	294	271	108.3	108.3

[1]- Yellow Floy Tag - AGFD
[2]- Small Yellow Carlin Tag
[3]- Orange Floy Tag - AGFD
[4]- Blue Carlin Tag - AGFD
[5]- Small Orange Carlin Tag
6- Red Carlin Tag

[A]- Fish implanted with radio transmitter
[B]- Probable misreading

[c]- Gear Types
EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1"x12" trammel net
GM = 10'x6'x2" gill net
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net
HL = Large hoop net

D- Missing information
E- Fish recaptured in same net location later the same day

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1990.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	10/17/90	7F7F3F5050	428	840	40.670	60	11	100	910125	60.2	60.4
2	10/17/90	7F7F3E2D2D	439	865	40.640	59	11	100	910125	60.4	60.4
3	10/17/90	7F7F3F3626	432	780	40.620	78	11	75	901231	60.4	60.4
4	10/17/90	7F7F3E2253	382	535	40.650	81	11	75	901231	60.2	60.4
5	10/18/90	7F7F3F4054	415	720	40.630	39	9	50	901207	60.4	60.5
6	10/18/90	7F7F3F5044	388	580	40.680	77	11	75	910101	60.6	60.5
7	10/19/90	7F7F3F4E11	376	465	40.690	40	9	50	901208	64.6	64.9
8	10/20/90	7F7F3E2F3A	367	500	40.660	39	9	50	901209	64.6	64.7
9	10/20/90	7F7F456B2C	390	605	40.610	58	11	100	910128	64.6	64.7
10	10/20/90	7F7F3C311C	395	525	40.600	40	9	50	901210	64.6	64.7

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #2, 1990.

#	DATE	PITTAG	TL (mm)	WT (gm)	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gm)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (RM)	RELEASE (RM)
1	11/16/90	7F7F3C4452	404	670	40.600	62	11	100	02/23/91	60.4	60.4
2	11/16/90	7F7F3C303B	396	665	40.700	62	11	100	02/23/91	60.1	60.1
3	11/17/90	7F7F3F4E77	407	675	40.710	79	11	75	01/30/91	61.0	61.0
4	11/18/90	7F7F3E3C5C	422	798	40.730	61	11	75	01/31/91	61.1	61.1
5	11/19/90	NO PITTAG	407	825	40.740	79	11	75	02/01/91	62.0	62.0
6	11/21/90	7F7F3C2919	394	635	40.640	78	11	75	02/03/91	64.1	64.1
7	11/23/90	7F7F3C4162	402	732	40.630	62	11	100	02/29/91	64.4	64.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #3, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910304	7F7F3E362E	369	497	40.640	42	9	50	910423	57.0	57.0
2	910307	7F7F3E2661	379	511	40.670	39	9	50	910426	58.8	58.8
3	910309	7F7F3F4453	399	577	40.600	40	11	120	910706	60.8	60.8
4	910311	7F7F3C243E	382	580	40.621	64	11	100	910618	61.2	61.2
5	910311	7F7F3F520D	377	604	40.630	86	11	75	910525	61.2	61.2
6	910311	7F7F3E3B00	410	688	40.680	66	11	100	910618	61.2	61.2
7	910311	7F7F3E372A	387	599	40.600	85	11	75	910525	61.4	61.4

Table 6a. A list of radio frequencies contacted on Trip #3, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.660/66	11	910108	58.8	58.8	
		910305(1045)			58.8
		910305(2225)			58.8
		910306(1318)			59.0
		910307(1300)			59.0
		910308(1100)			59.0
		910309(1443)			59.0
		910310(1450)			59.4
40.710/43	11	910109	58.3	58.3	
		910305(1113)			59.6
		910305(2252)			59.6
		910306(1332)			59.6
		910307(1314)			59.6
		910308(1122)			59.6
		910309(1458)			59.6
		910310(1630)			61.2
		910311(1652)			61.3
		910313(1430)			10m LCR
40.710/84	11	910110	60.5	60.5	
		910305(1130)			60.6
		910306(1349)			60.6
		910307(1330)			60.4
		910308(1140)			60.6
		910309(1514)			60.6
		910309(2227)			60.4
		910310(1510)			60.5
		910311(1610)			61.0
		910313(1345)			20m LCR
40.680/45	11	910109	58.3	58.3	
		910305(1146)			60.8
		910305(1359)			60.8
		910307(1500)			61.3
		910309(1558)			61.3
		910310(1640)			61.3

Table 6b. A list of radio frequencies contacted on Trip #3, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.730/86	11	910109	59.0	59.0	
		910305(1146)			60.8
		910306(1500)			61.2
		910307(1438)			61.2
		910309(1520)			60.7
		910310(1630)			61.3
		910311(1553)			60.7
40.740/44	11	910110	60.5	60.5	
		910305(1146)			60.8
		910306(1500)			61.2
		910307(1419)			61.2
		910308(1547)			61.2
		910311(1647)			61.3
		910313(1350)			10m LCR
40.720/66	11	910110	60.6	60.6	
		910305(1243)			61.3
		910306(1500)			61.2
		910307(1453)			61.2
		910309(1547)			61.3
		910310(1650)			61.3
		910313(1415)			45m LCR
40.710/67	11	901117	61.0	61.0	
		910305(1243)			61.2
		910308(1150)			60.1
		910310(1620)			61.2
		910311(1655)			61.3
40.700/55	11	901116	60.1	60.1	
		910305(1217)			61.2
		910306(1500)			61.2
		910307(1525)			61.2
		910309(1547)			61.2
		910311(1630)			61.3
40.730/52	11	901118	61.1	61.1	
		910305(1218)			61.2
		910306(1500)			61.2
		910307(1508)			61.2
		910310(1640)			61.2

Table 6c. A list of radio frequencies contacted on Trip #3, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.630/56	11	901123	64.4	64.4	
		910305(1218)			63.7
		910308(1710)			63.9
		910310(1830)			63.9
40.600/62	11	901116	60.4	60.4	
		910306(1359)			61.0
		910307(1400)			60.9
		910310(1530)			60.9
		910311(1600)			61.0
		910313(1315)			60.5
40.670/54	11	901017	60.2	60.4	
		910306(1500)			61.3
		910307(1514)			61.3
40.670/40[1]	9	910307	58.8	58.5	
		910308(1100)			59.0
		910309(1400)			58.9
		910310(1440)			58.9
		910311(1455)			59.0
		910312(1254)			59.0
40.680/68[1]	11	910311	61.2	61.2	
		910313(1350)			35m LCR
40.600/40[1]	11	910309	60.8	60.8	
		910310(1550)			61.0
		910311(1600)			61.0
		910313(1330)			60.9

[1] Implanted during current trip

REPORT NO. PR 250-07
BIO/WEST, Inc.

CHARACTERIZATION OF THE LIFE HISTORY AND ECOLOGY OF THE HUMPBACK CHUB IN THE GRAND CANYON

TRIP REPORT #4 - 1991
April 9 - April 22, 1991

Prepared For:

Bureau of Reclamation

Prepared By:

Richard A. Valdez, Principal Investigator
William Leibfried, Project Leader
William J. Masslich, Project Leader

BIO/WEST INC.
1063 West 1400 North
Logan, UT. 84321

May 6, 1991

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INTRODUCTION

This report presents pertinent details associated with trip #4, April 1991. Included in this report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, pertinent observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of pertinent trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip #4, April 1991. Table 2 presents personnel who were present or participated in research activities during this trip.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip #4, April 1991. Table 4 is a summary of all humpback chubs handled during this effort.

Humpback Chubs Captured

A total of 7 humpback chub were handled during this trip. No previously tagged chubs were recaptured. All chubs were captured at the LCR confluence area and nearby mainchannel sites. The netting effort was low since the primary focus of this trip was radiotelemetry.

Radiotelemetry

A summary of radiotagged chubs implanted prior to Trip #4, 1991 is presented in Table 5. A summary of radiotelemetry location and movement data collected during Trip #4, 1991 is presented in Table 6.

A total of 13 radiotagged chubs were contacted during Trip #4, 1991. Two fish were with transmitters that had exceeded their predicted tag life expectancy. Two chubs were not contacted with transmitters that should still be active.

Twenty-four hour monitoring was conducted on seven different chubs. Five of these fish were monitored for 72 consecutive hours. One chub was in the LCR when we arrived on April 9. By April 17, three additional chubs had entered and moved upstream 500 meters. Two-hour monitoring was conducted on seven chubs. Movements, surface habitats and velocity and depth measurements were recorded and mapped on mylar overlays of 1:1200 color photographs.

The remote telemetry station at the LCR was fitted with a 18 watt solar panel to recharge its battery system. This resolved the previous problem with power chortage at the station. The station was working well and had logged up to five chubs during period of April 9-17, 1991.

Bench Marks

One additional benchmark was established at RM 57.2 right shore. No other benchmarks were established.

OBSERVATIONS

1. Eight radiotagged chubs were observed near the mouth of the LCR for the entire study period. This may suggest staging at the mouth in preparation to spawn in the LCR or confluence area.

2. Three radiotagged chubs were observed entering the LCR during the study period. All 3 fish moved in after discharge from the LCR decreased from peak flood flows present during the first several days of observations.

3. Flows from the LCR were turbid the entire period, but discharge dropped substantially by April 17.

4. Temperatures in the LCR rose to 16.7 C. as discharge fell.

5. Four of the seven chubs captured showed signs of spawning condition. All were robust and in good condition.

6. Sampling at Kanab Creek confluence yielded nine bluehead suckers and one rainbow trout.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. The LCR remote telemetry station had been having power shortage problems. The addition of a solar panel has corrected this problem.

2. The use of 1:1200 color aerial photographs for mapping of movements and habitats has proved very effective. Mylar overlays allow mapping at various discharges.

3. The use of triangulation with compass bearings at night, allows for precise locating of fish without visual observations. Triangulation points are marked on photos and referenced during the daylight to plot nighttime locations of chubs.

4. Color photographs of Kwagunt area were not available for mapping radiotagged fish and habitats in this area.

RECOMMENDATIONS

1. Continue radiotelemetry observations as before, but utilize nighttime triangulation with compass bearings.

2. Obtain color 1:1200 aerial photographs of the Kwagunt area.

3. The remote telemetry station at the LCR is collecting good movement information and will be left operational until June 15, 1991, as previously agreed with The National Park Service.

Table 1. Logistics and Research Schedule for Trip #4

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R[1]	FS	TE	HQ
4/9	29.2	Shinumo Wash	X			
4/10	61.2	Little Colorado River			X	X
4/11	61.2	Little Colorado River			X	X
4/12	61.2	Little Colorado River			X	X
4/13	61.2	Little Colorado River			X	X
4/14	61.2	Little Colorado River		X	X	X
4/15	61.2	Little Colorado River			X	X
4/16	61.2	Little Colorado River			X	X
4/17	61.2	Little Colorado River		X	X	X
4/18	99	Above Crystal	X			
4/19	143.2	Kanab Creek	X	X		
4/20	-	-	X	X		
4/21	222	222 Mile	X			

[1] T&R = Travel and Reconnaissance
FS = Fish Sampling
TE = Telemetry
HQ = Habitat Quantification

Table 2. Personnel Participating in Trip #4			
PERSONNEL	AFFILIATION	DATES	COMMENTS
R. Valdez	BIO/WEST	4/15 - 4/18	In/Out Tanner Trail
B. Leibfried	BIO/WEST	4/9 - 4/18	Out Tanner Trail
G. ~~Porter~~ Dexter	BIO/WEST	5/9 - 4/22	To Diamond Creek
E. Prats	BIO/WEST	4/9 - 4/18	Out Tranner Trail
H. Yard	BIO/WEST	4/9 - 4/22	To Diamond Creek
G. Williams	BIO/WEST	4/9 - 4/22	To Diamond Creek
R. VanHaverbeke	BIO/WEST	4/9 - 4/18	Out Tanner Trail
A. Haden	GCES	4/9 - 4/22	To Diamond Creek
C. Hanson	OARS	4/9 - 4/22	To Diamond Creek
C. Geanious	OARS	4/9 - 4/22	To Diamond Creek
K. Burke	OARS	4/9 - 4/22	To Diamond Creek

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY

[1]	[2]	HB[3]	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV
Reach 1 TL N=3 5.2 hr	A	0	10	0	4	0	1	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 TK N=5 7.9 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 GP N=5 10.2 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 HS N=3 29.6 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	1	0	1	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 HS N=1 15.3 hr	A	0	0	5	1	0	0	0	0	0	0	0
	J	0	0	4	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
TOTAL	A	1	10	10	5	0	1	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

[1]- Gear Types
EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1"x12" trammel net
GM = 10'x6'x2" gill net
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net
HL = Large hoop net (4'diameter)
HS = Small hoop net (2' diameter)

[2] - A = Adult
J = Juvenile
Y = Young of year

[3] - HB = humpback chub
FM = flannelmouth sucker
BH = bluehead sucker
RB = rainbow trout
BR = brown trout
CC = channel catfish
CP = carp
SD = speckled dace
BK = brook trout
RK = Rio Grande killifish
FV = flannelmouth variant

Table 4. Summary of Humpback Chub handled during Trip #4.

#	DATE	GEAR[C] TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
1	910416	HS	7F7DO75072	N	-	249	116	61.3	61.3
2	910414	GP	7F7D084A7E	N	-	305	248	61.8	61.8
3	910417	TK	747D085054	N	-	345	424	61.3	61.3
4	910417	TK	7F7D07645B	N	-	411	706	61.3	61.3
5	910417	TK	7F7D075C32	N	-	342	377	61.3	61.3
6	910417	TK	7F7D025F29	N	-	325	360	61.3	61.3
7	910417	TK	7F7D984B62	N	-	291	209	61.3	61.3

[1]- Yellow Floy tag - AGFD
[2]- Small Yellow Carlin
[3]- Orange Floy - AGFD
[4]- Yellow Floy - AGFD
[5]- Small Orange Carlin Tag
[A]- Fish implanted with radio transmitter
[B]- Probable misreading

[C]- Gear Types
EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1"x12" trammel net
GM = 10'x6'x2" gill net
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1990.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	10/17/90	7F7F3F5050	428	840	40.670	60	11	100	910125	60.2	60.4
2	10/17/90	7F7F3E2D2D	439	865	40.640	59	11	100	910125	60.4	60.4
3	10/17/90	7F7F3F3626	432	780	40.620	78	11	75	901231	60.4	60.4
4	10/17/90	7F7F3E2253	382	535	40.650	81	11	75	901231	60.2	60.4
5	10/18/90	7F7F3F4054	415	720	40.630	39	9	50	901207	60.4	60.5
6	10/18/90	7F7F3F5044	388	580	40.680	77	11	75	910101	60.6	60.5
7	10/19/90	7F7F3F4E11	376	465	40.690	40	9	50	901208	64.6	64.9
8	10/20/90	7F7F3E2F3A	367	500	40.660	39	9	50	901209	64.6	64.7
9	10/20/90	7F7F456B2C	390	605	40.610	58	11	100	910128	64.6	64.7
10	10/20/90	7F7F3C311C	395	525	40.600	40	9	50	901210	64.6	64.7

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #2, 1990.

#	DATE	PITTAG	TL (mm)	WT (gm)	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gm)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (RM)	RELEASE (RM)
1	11/16/90	7F7F3C4452	404	670	40.600	62	11	100	02/23/91	60.4	60.4
2	11/16/90	7F7F3C303B	396	665	40.700	62	11	100	02/23/91	60.1	60.1
3	11/17/90	7F7F3F4E77	407	675	40.710	79	11	75	01/30/91	61.0	61.0
4	11/18/90	7F7F3E3C5C	422	798	40.730	61	11	75	01/31/91	61.1	61.1
5	11/19/90	NO PITTAG	407	825	40.740	79	11	75	02/01/91	62.0	62.0
6	11/21/90	7F7F3C2919	394	635	40.640	78	11	75	02/03/91	64.1	64.1
7	11/23/90	7F7F3C4162	402	732	40.630	62	11	100	02/29/91	64.4	64.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #3, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910304	7F7F3E362E	369	497	40.640	42	9	50	910423	57.0	57.0
2	910307	7F7F3E2661	379	511	40.670	39	9	50	910426	58.8	58.8
3	910309	7F7F3F4453	399	577	40.600	40	11	120	910706	60.8	60.8
4	910311	7F7F3C243E	382	580	40.621	64	11	100	910618	61.2	61.2
5	910311	7F7F3F520D	377	604	40.630	86	11	75	910525	61.2	61.2
6	910311	7F7F3E3B00	410	688	40.680	66	11	100	910618	61.2	61.2
7	910311	7F7F3E372A	387	599	40.600	85	11	75	910525	61.4	61.4

Table 6. A list of radio frequencies contacted on Trip #4, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.640/42	9	910304	57.0	57.0	
/34		910412(1515)			57.3L
		910415(1230)			57.3
		910416(1227)			57.3
		910417(1225)			57.3R
40.660/66	11	910108	58.8	58.8	
/58		910412(1425)			60.7
		910412(2230)			60.7
		910413(1327)			60.8L
		910413(2118)			60.8L
		910416(2139)			60.5L
40.670/39	9	910307	58.8	58.8	
/43		910411(1424)			61.3
		910411(2318)			61.5
		910412(1240)			61.3
		910412(2245)			61.3
/46		910413(2140)			61.3L
/46		910414(2245)			61.3L
		910415(2042)			61.4L
40.620/64	11	910311	61.2	61.2	
/66		910411(1654)			60.8
		910411(2222)			60.8
		910412(1426)			60.8
		910412(2230)			60.8
		910413(1331)			60.9
		910413(2130)			60.9
		910414(2215)			60.9L
		910415(2122)			60.8L
		910416(0660)			60.8R
		910416(2200)			60.8R
40.630/86	11	910311	61.2	61.2	
/88		910411(2319)			61.3
		910412(2245)			61.3
		910413(2133)			61.3L
		910414(0200)			61.3L
		910415(2041)			61.3L
		910416(1419)			190 m up LCR
		910417(2320)			500 m up LCR

Table 6. A list of radio frequencies contacted on Trip #4, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.600/40	11	910309	60.8	60.8	
/34		910415(2040)			61.3L
		910416(2217)			61.3L
40.600/62	11	911116	60.4	60.4	
/68		910411(2320)			61.3
		910412(0140)			61.3
		910417(1030)			150 m up LCR
40.600/85	11	910311	61.4	61.4	
/88		910411(1330)			500 m up LCR
		910412(1440)			500 m up LCR
		910413(1500)			500 m up LCR
		910414(0800)			500 m up LCR
		910415(1400)			500 m up LCR
		910416(1424)			500 m up LCR
		910417(2333)			500 m up LCR
40.670/84	11	910110	60.5	60.5	
/92		910411(1551)			61.6
		910412(1359)			61.6
		910412(2255)			61.6
		910414(1555)			61.5L
		910414(2330)			61.5L
		910415(1100)			61.5L
		910416(1346)			61.5L
		910416(2217)			61.3L
		910417(1300)			61.5L
40.680/66	11	910311	61.2	61.2	
/70		910411(1624)			61.3
		910411(2320)			61.3
		910412(1426)			60.8
		910412(2230)			60.8
		910413(2120)			60.8L
		910414(2240)			61.3L
		910415(1030)			61.2L
		910415(2043)			61.3L
		910416(2233)			61.3L
40.710/84	11	910110	60.5	60.5	
/83		910414(1425)			60.7L
		910414(2230)			60.8

Table 6. A list of radio frequencies contacted on Trip #4, and locations relative to capture and release sites.

FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
			----------River Mile----------		
40.710/43	11	910109	58.3	58.3	
/41		910411(1442)			61.6
		910411(2319)			61.6
		910412(1240)			61.4
		910412(2255)			61.4
		910413(1355)			61.6
		910413(2140)			61.4L
		910414(1555)			61.4L
		910414(2310)			61.4L
		910415(1045)			61.4L
		910415(2044)			61.5L
		910416(1346)			61.5L
		910416(2236)			61.4L
		910417(1300)			61.5L
40.740/44	11	910110	60.5	60.5	
/42		910411(1507)			61.4
		910411(2319)			61.5
		910412(2245)			61.3
		910413(2140)			61.3L
		910414(1545)			61.3L
		910415(1430)			61.3L
		910416(1415)			75 m up LCR
		910417(2313)			500 m up LCR

REPORT NO. PR 250-07
BIO/WEST, Inc.

CHARACTERIZATION OF THE LIFE HISTORY AND ECOLOGY OF THE HUMPBACK CHUB IN THE GRAND CANYON

TRIP REPORT #4 - 1991
April 9 - April 22, 1991

Prepared For:

Bureau of Reclamation

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Prepared By:

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May 6, 1991

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This report presents pertinent details associated with trip #4, April 1991. Included in this report are a summary of the trip logistics, personnel and research schedule, data collected, problems encountered, pertinent observations and recommendations. Most information is presented in a tabular format to provide a quick synopsis of pertinent trip details and results.

LOGISTICS, RESEARCH SCHEDULE AND PERSONNEL

Table 1 presents a summary of logistics and the research schedule for Trip #4, April 1991. Table 2 presents personnel who were present or participated in research activities during this trip.

DATA COLLECTED

Table 3 presents a summary of gear types used, sampling effort and fish captured by gear type for Trip #4, April 1991. Table 4 is a summary of all humpback chubs handled during this effort.

Humpback Chubs Captured

A total of 7 humpback chub were handled during this trip. No previously tagged chubs were recaptured. All chubs were captured at the LCR confluence area and nearby mainchannel sites. The netting effort was low since the primary focus of this trip was radiotelemetry.

Radiotelemetry

A summary of radiotagged chubs implanted prior to Trip #4, 1991 is presented in Table 5. A summary of radiotelemetry location and movement data collected during Trip #4, 1991 is presented in Table 6.

A total of 13 radiotagged chubs were contacted during Trip #4, 1991. Two fish were with transmitters that had exceeded their predicted tag life expectancy. Two chubs were not contacted with transmitters that should still be active.

Twenty-four hour monitoring was conducted on seven different chubs. Five of these fish were monitored for 72 consecutive hours. One chub was in the LCR when we arrived on April 9. By April 17, three additional chubs had entered and moved upstream 500 meters. Two-hour monitoring was conducted on seven chubs. Movements, surface habitats and velocity and depth measurements were recorded and mapped on mylar overlays of 1:1200 color photographs.

The remote telemetry station at the LCR was fitted with a 18 watt solar panel to recharge its battery system. This resolved the previous problem with power chortage at the station. The station was working well and had logged up to five chubs during period of April 9-17, 1991.

Bench Marks

One additional benchmark was established at RM 57.2 right shore. No other benchmarks were established.

OBSERVATIONS

1. Eight radiotagged chubs were observed near the mouth of the LCR for the entire study period. This may suggest staging at the mouth in preparation to spawn in the LCR or confluence area.

2. Three radiotagged chubs were observed entering the LCR during the study period. All 3 fish moved in after discharge from the LCR decreased from peak flood flows present during the first several days of observations.

3. Flows from the LCR were turbid the entire period, but discharge dropped substantially by April 17.

4. Temperatures in the LCR rose to 16.7 C. as discharge fell.

5. Four of the seven chubs captured showed signs of spawning condition. All were robust and in good condition.

6. Sampling at Kanab Creek confluence yielded nine bluehead suckers and one rainbow trout.

PROBLEMS ENCOUNTERED AND SOLUTIONS

1. The LCR remote telemetry station had been having power shortage problems. The addition of a solar panel has corrected this problem.

2. The use of 1:1200 color aerial photographs for mapping of movements and habitats has proved very effective. Mylar overlays allow mapping at various discharges.

3. The use of triangulation with compass bearings at night, allows for precise locating of fish without visual observations. Triangulation points are marked on photos and referenced during the daylight to plot nighttime locations of chubs.

4. Color photographs of Kwagunt area were not available for mapping radiotagged fish and habitats in this area.

RECOMMENDATIONS

1. Continue radiotelemetry observations as before, but utilize nighttime triangulation with compass bearings.

2. Obtain color 1:1200 aerial photographs of the Kwagunt area.

3. The remote telemetry station at the LCR is collecting good movement information and will be left operational until June 15, 1991, as previously agreed with The National Park Service.

Table 1. Logistics and Research Schedule for Trip #4

DATE	RM	LOCATION	RESEARCH ACTIVITIES			
			T&R[1]	FS	TE	HQ
4/9	29.2	Shinumo Wash	X			
4/10	61.2	Little Colorado River			X	X
4/11	61.2	Little Colorado River			X	X
4/12	61.2	Little Colorado River			X	X
4/13	61.2	Little Colorado River			X	X
4/14	61.2	Little Colorado River		X	X	X
4/15	61.2	Little Colorado River			X	X
4/16	61.2	Little Colorado River			X	X
4/17	61.2	Little Colorado River		X	X	X
4/18	99	Above Crystal	X			
4/19	143.2	Kanab Creek	X	X		
4/20	-	-	X	X		
4/21	222	222 Mile	X			

[1] T&R = Travel and Reconnaissance
FS = Fish Sampling
TE = Telemetry
HQ = Habitat Quantification

Table 2. Personnel Participating in Trip #4			
PERSONNEL	AFFILIATION	DATES	COMMENTS
R. Valdez	BIO/WEST	4/15 - 4/18	In/Out Tanner Trail
B. Leibfried	BIO/WEST	4/9 - 4/18	Out Tanner Trail
G. Porter	BIO/WEST	5/9 - 4/22	To Diamond Creek
E. Prats	BIO/WEST	4/9 - 4/18	Out Tranner Trail
H. Yard	BIO/WEST	4/9 - 4/22	To Diamond Creek
G. Williams	BIO/WEST	4/9 - 4/22	To Diamond Creek
R. VanHaverbeke	BIO/WEST	4/9 - 4/18	Out Tanner Trail
A. Haden	GCES	4/9 - 4/22	To Diamond Creek
C. Hanson	OARS	4/9 - 4/22	To Diamond Creek
C. Geanious	OARS	4/9 - 4/22	To Diamond Creek
K. Burke	OARS	4/9 - 4/22	To Diamond Creek

Table 3. Summary of Fish Collected and Effort by Gear Type. THESE DATA ARE PRELIMINARY

[1]	[2]	HB[3]	FM	BH	RB	BR	CC	CP	SD	BK	RK	FV
Reach 1 TL N=3 5.2 hr	A	0	10	0	4	0	1	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 TK N=5 7.9 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 GP N=5 10.2 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 1 HS N=3 29.6 hr	A	0	0	0	0	0	0	0	0	0	0	0
	J	1	0	1	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
Reach 2 HS N=1 15.3 hr	A	0	0	5	1	0	0	0	0	0	0	0
	J	0	0	4	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0
TOTAL	A	1	10	10	5	0	1	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	0
	Y	0	0	0	0	0	0	0	0	0	0	0

[1]- Gear Types
EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1"x12" trammel net
GM = 10'x6'x2" gill net
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net
HL = Large hoop net (4'diameter)
HS = Small hoop net (2' diameter)

[2] - A = Adult
J = Juvenile
Y = Young of year

[3] - HB = humpback chub
FM = flannelmouth sucker
BH = bluehead sucker
RB = rainbow trout
BR = brown trout
CC = channel catfish
CP = carp
SD = speckled dace
BK = brook trout
RK = Rio Grande killifish
FV = flannelmouth variant

Table 4. Summary of Humpback Chub handled during Trip #4.

#	DATE	GEAR[C] TYPE	PIT TAG	RECAP	OLD TAG	TL (mm)	WT (g)	RM (capture)	RM (release)
1	910416	HS	7F7DO75072	N	-	249	116	61.3	61.3
2	910414	GP	7F7D084A7E	N	-	305	248	61.8	61.8
3	910417	TK	747D085054	N	-	345	424	61.3	61.3
4	910417	TK	7F7D07645B	N	-	411	706	61.3	61.3
5	910417	TK	7F7D075C32	N	-	342	377	61.3	61.3
6	910417	TK	7F7D025F29	N	-	325	360	61.3	61.3
7	910417	TK	7F7D984B62	N	-	291	209	61.3	61.3

[1]- Yellow Floy tag - AGFD
[2]- Small Yellow Carlin
[3]- Orange Floy - AGFD
[4]- Yellow Floy - AGFD
[5]- Small Orange Carlin Tag
[A]- Fish implanted with radio transmitter
[B]- Probable misreading

[C]- Gear Types
EL = Electrofishing
TL = 75'x6'x1½"x12" trammel net
TK = 75'x5'x1"x12" trammel net
GM = 10'x6'x2" gill net
GP = 100'x6'x1½" gill net
GX = 100', 2" to ½" @ ½ increment, experiment gill net

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1990.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	10/17/90	7F7F3F5050	428	840	40.670	60	11	100	910125	60.2	60.4
2	10/17/90	7F7F3E2D2D	439	865	40.640	59	11	100	910125	60.4	60.4
3	10/17/90	7F7F3F3626	432	780	40.620	78	11	75	901231	60.4	60.4
4	10/17/90	7F7F3E2253	382	535	40.650	81	11	75	901231	60.2	60.4
5	10/18/90	7F7F3F4054	415	720	40.630	39	9	50	901207	60.4	60.5
6	10/18/90	7F7F3F5044	388	580	40.680	77	11	75	910101	60.6	60.5
7	10/19/90	7F7F3F4E11	376	465	40.690	40	9	50	901208	64.6	64.9
8	10/20/90	7F7F3E2F3A	367	500	40.660	39	9	50	901209	64.6	64.7
9	10/20/90	7F7F456B2C	390	605	40.610	58	11	100	910128	64.6	64.7
10	10/20/90	7F7F3C311C	395	525	40.600	40	9	50	901210	64.6	64.7

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #2, 1990.

#	DATE	PITTAG	TL (mm)	WT (gm)	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gm)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (RM)	RELEASE (RM)
1	11/16/90	7F7F3C4452	404	670	40.600	62	11	100	02/23/91	60.4	60.4
2	11/16/90	7F7F3C303B	396	665	40.700	62	11	100	02/23/91	60.1	60.1
3	11/17/90	7F7F3F4E77	407	675	40.710	79	11	75	01/30/91	61.0	61.0
4	11/18/90	7F7F3E3C5C	422	798	40.730	61	11	75	01/31/91	61.1	61.1
5	11/19/90	NO PITTAG	407	825	40.740	79	11	75	02/01/91	62.0	62.0
6	11/21/90	7F7F3C2919	394	635	40.640	78	11	75	02/03/91	64.1	64.1
7	11/23/90	7F7F3C4162	402	732	40.630	62	11	100	02/29/91	64.4	64.4

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #1, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910108	7F7F3C4208	400	634	40.660	64	11	100	910418	58.8	58.8
2	910109	7F7F3E3030	480	868	40.680	44	11	120	910429	58.3	58.3
3	910109	7F7F3C3171	395	564	40.730	86	11	75	910326	59.0	59.0
4	910109	7F7F3F3A5C	385	594	40.710	41	11	120	910429	58.3	58.3
5	910110	7F7F3C2D06	405	669	40.740	42	11	120	910430	60.5	60.5
6	910110	7F7F3E3D23	394	635	40.670	84	11	75	910327	60.5	60.5
7	910110	7F7F3E2727	380	648	40.720	66	11	100	910420	60.6	60.6

Table 5. Summary of radio-transmitter implants in humpback chub during Trip #3, 1991.

#	DATE	PITTAG	TL	WT	FREQ	PULSE RATE (pulses/min)	RADIOTAG SIZE (gms)	LIFE EXPECTANCY (days)	ESTIMATED DATE OF EXTINCTION	CAPTURE (rm)	RELEASE (rm)
1	910304	7F7F3E362E	369	497	40.640	42	9	50	910423	57.0	57.0
2	910307	7F7F3E2661	379	511	40.670	39	9	50	910426	58.8	58.8
3	910309	7F7F3F4453	399	577	40.600	40	11	120	910706	60.8	60.8
4	910311	7F7F3C243E	382	580	40.621	64	11	100	910618	61.2	61.2
5	910311	7F7F3F520D	377	604	40.630	86	11	75	910525	61.2	61.2
6	910311	7F7F3E3B00	410	688	40.680	66	11	100	910618	61.2	61.2
7	910311	7F7F3E372A	387	599	40.600	85	11	75	910525	61.4	61.4

Table 6. A list of radio frequencies contacted on Trip #4, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.640/42	9	910304	57.0	57.0	
/34		910412(1515)			57.3L
		910415(1230)			57.3
		910416(1227)			57.3
		910417(1225)			57.3R
40.660/66	11	910108	58.8	58.8	
/58		910412(1425)			60.7
		910412(2230)			60.7
		910413(1327)			60.8L
		910413(2118)			60.8L
		910416(2139)			60.5L
40.670/39	9	910307	58.8	58.8	
/43		910411(1424)			61.3
		910411(2318)			61.5
		910412(1240)			61.3
		910412(2245)			61.3
/46		910413(2140)			61.3L
/46		910414(2245)			61.3L
		910415(2042)			61.4L
40.620/64	11	910311	61.2	61.2	
/66		910411(1654)			60.8
		910411(2222)			60.8
		910412(1426)			60.8
		910412(2230)			60.8
		910413(1331)			60.9
		910413(2130)			60.9
		910414(2215)			60.9L
		910415(2122)			60.8L
		910416(0660)			60.8R
		910416(2200)			60.8R
40.630/86	11	910311	61.2	61.2	
/88		910411(2319)			61.3
		910412(2245)			61.3
		910413(2133)			61.3L
		910414(0200)			61.3L
		910415(2041)			61.3L
		910416(1419)			190 m up LCR
		910417(2320)			500 m up LCR

Table 6. A list of radio frequencies contacted on Trip #4, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.600/40 /34	11	910309	60.8	60.8	
		910415(2040)			61.3L
		910416(2217)			61.3L
40.600/62 /68	11	911116	60.4	60.4	
		910411(2320)			61.3
		910412(0140)			61.3
		910417(1030)			150 m up LCR
40.600/85 /88	11	910311	61.4	61.4	
		910411(1330)			500 m up LCR
		910412(1440)			500 m up LCR
		910413(1500)			500 m up LCR
		910414(0800)			500 m up LCR
		910415(1400)			500 m up LCR
		910416(1424)			500 m up LCR
		910417(2333)			500 m up LCR
40.670/84 /92	11	910110	60.5	60.5	
		910411(1551)			61.6
		910412(1359)			61.6
		910412(2255)			61.6
		910414(1555)			61.5L
		910414(2330)			61.5L
		910415(1100)			61.5L
		910416(1346)			61.5L
		910416(2217)			61.3L
		910417(1300)			61.5L
40.680/66 /70	11	910311	61.2	61.2	
		910411(1624)			61.3
		910411(2320)			61.3
		910412(1426)			60.8
		910412(2230)			60.8
		910413(2120)			60.8L
		910414(2240)			61.3L
		910415(1030)			61.2L
		910415(2043)			61.3L
		910416(2233)			61.3L
40.710/84 /83	11	910110	60.5	60.5	
		910414(1425)			60.7L
		910414(2230)			60.8

Table 6. A list of radio frequencies contacted on Trip #4, and locations relative to capture and release sites.

			----------River Mile----------		
FREQ/PULSE	TAG SIZE (gm)	DATE (time)	CAPTURE	RELEASE	LOCATE
40.710/43	11	910109	58.3	58.3	
/41		910411(1442)			61.6
		910411(2319)			61.6
		910412(1240)			61.4
		910412(2255)			61.4
		910413(1355)			61.6
		910413(2140)			61.4L
		910414(1555)			61.4L
		910414(2310)			61.4L
		910415(1045)			61.4L
		910415(2044)			61.5L
		910416(1346)			61.5L
		910416(2236)			61.4L
		910417(1300)			61.5L
40.740/44	11	910110	60.5	60.5	
/42		910411(1507)			61.4
		910411(2319)			61.5
		910412(2245)			61.3
		910413(2140)			61.3L
		910414(1545)			61.3L
		910415(1430)			61.3L
		910416(1415)			75 m up LCR
		910417(2313)			500 m up LCR

APPENDIX A
DATA SHEETS FOR TRIP# 4

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 001 Trip: 04 Reach: 1 CB#: 1 <Aerial: N Boat: ✓>

Date: 910411 (Y Y M M D D) Time: Start 1330 End 1700 RM 65.4 to 56.0

Ambient Light: PC (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather PC Turbidity High below LCR / Low above LCR (Low, Moderate, High, Clear) Sechi Disk 1.5 m Fluctuations: EA

Crew: DV, CG, __

Time	RM	Side	Frequency	Pulse	Confidence	Description
1429	61.3	L	40.670	43	1	Fish in green Colo. R. water, in channel between LCR Point & Rock Island
1442	61.6	L	40.710	41	1	In LCR brown water, in channel between Sand Island and rock island, N 75-10 up LCR from Plume Point
1507	61.4	L	40.740	42	1	Fish in brown water of LCR, in channel between Sand Island & Rock Island.
1530	61.3	?	40.670	92	2	Fish appears to be in brown LCR water in channel between Sand Sand Island & Rock Island.
1551	61.6	L	40.670	92	1	Fish located about 50 m upriver from Plume Point, in LCR muddy water, hugging river left shore of Sand Island.
1624	61.3	L	40.680	70	1	Fish located in mixing zone between LCR Point & Rock Island
1654	60.8	L	40.620	66	1	Fish located along left shore between small rock point & small backwater
1656	60.5	?	4.630	88	2	Brief contact

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 001 **Trip:** 04 **Reach:** 1 **CB#:** 1 **<Aerial:** N **Boat:** Y>

Date: 91 04 11 (Y Y M M D D) **Time: Start** 1330 **End** 1700 **RM** 65.4 **to** 56.0

Ambient Light: SH (SU=sunny, CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather PC **Turbidity** L (Low, Moderate, High, Clear) High below LCR Low above LCR **Sechi Disk** 1.5 **m Fluctuations:** EA

Crew: DV, GG, __

Time	RM	Side	Frequency	Pulse	Confidence	Description
1722	57.0	R	40.640	34	2	Brief on & off contact, fish appears to be deep, we get hits while passing over

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BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 002 **Trip:** 04 **Reach:** 1 **CB#:** 1 **<Aerial:** N **Boat:** Y>

Date: 910411 (Y Y M M D D) **Time: Start** 2220 **End** 2345 **RM** 60.0 **to** 61.3

Ambient Light: NI (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather CS **Turbidity** L (Low, Moderate, High, Clear) **Sechi Disk** 1.5 **m Fluctuations:** EA

Crew: BL, KY, __ __

Time	RM	Side	Frequency	Pulse	Confidence	Description
2222	60.75	L	40.620	64	1	Fish appears to be off rock at just downstream of EAN Rock - moving upstream in H_2O column.
2318	61.5	L	40.670	43	1	Main Channel on right of rock island - clear H_2O
2319	61.5	L	40.740	42	1	Downstream of rock island at mouth of LCR in turbid H_2O (as per Eureka)
2319	61.6	L	40.710	42	1	Eddy below rock island - between rock island at and sand island
2319	61.3	L	40.630	88	1	Same as 40.740 + 40.680
2319	61.3	L	40.680	70	1	Same area as 740 - downstream side of rock island at mouth of LCR - turbid H_2O
2319	61.4	L	40.600	68	1	Same as 740, 680 and 630

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BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 003 Trip: 04 Reach: 1 CB#: 1 <Aerial: N Boat: Y>

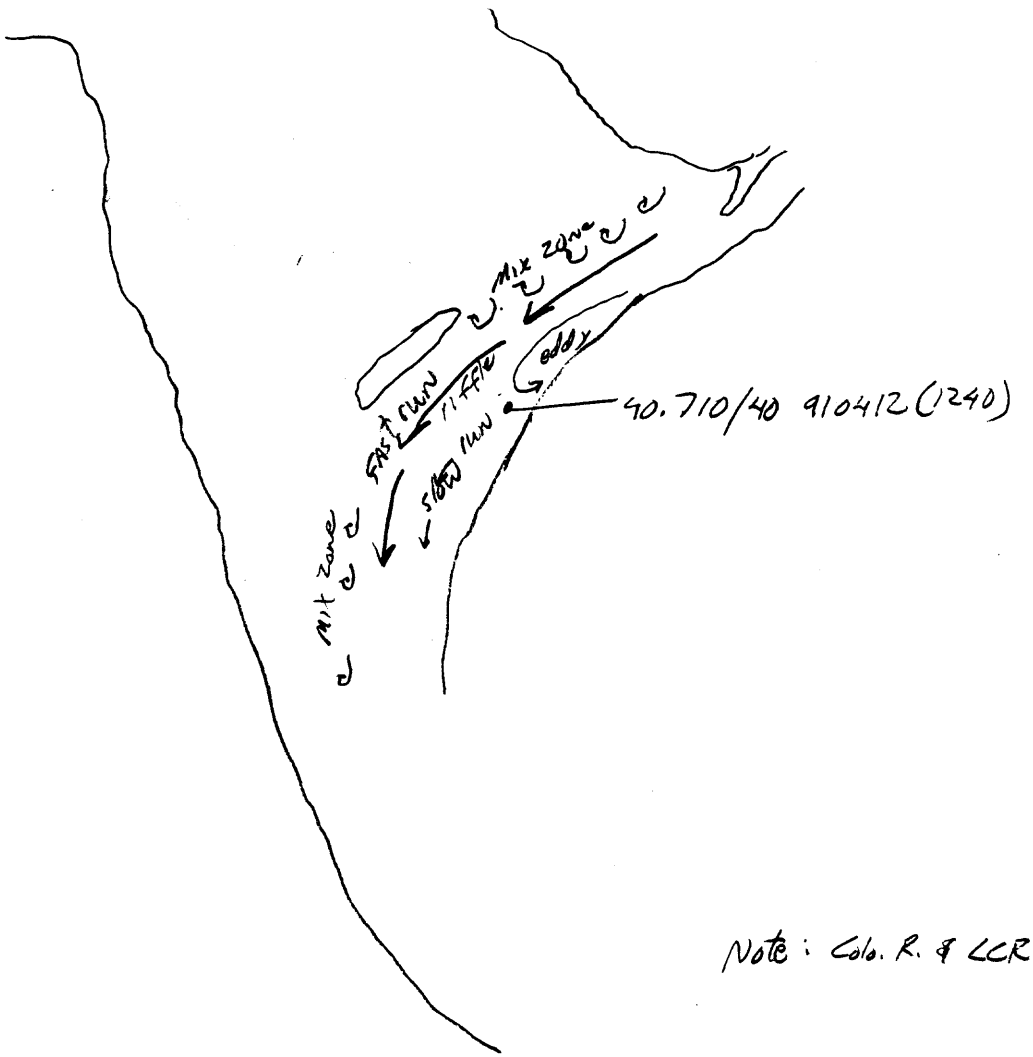
Date: 91 04 12 (Y Y M M D D) Time: Start 1205 End 1548 RM 65.4 to 56.7

Ambient Light: PC (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather PC Turbidity L above LCR / H below LCR (Low, Moderate, High, Clear) Sechi Disk 1.7 m Fluctuations: FA

Crew: RV, GD, __ __

Time	RM	Side	Frequency	Pulse	Confidence	Description
1240	61.3	L	40.670	44	1	fish in green water of Colo. R. in channel between boat beach and small Rock island
1240	61.4	L	40.710	40	1	Fish is between large Sand Island AND small rock Island. Fish is in brown LCR water, in slow run water, river left.
1359	61.6	L	40.670	94	1	Fish hugging shore of Sand Island, about 10 m upriver from Plume Point.
1425	60.7	L	40.660	58	1	Fish along left shore in boulders along shore, immediately (~10 m) downriver from ESPN rock.
1426	60.8	L	40.620	66	1	Fish in same location as yesterday, along river left, between a small rock point and a small backwater
1426	60.8	L	40.680	68	2	Fish appears to be in same general location as 40.620/66, but nulls are unclear.
1515	57.3	L	40.640	34	1	Fish is just outside of small (i.e. a return channel) reattachment bar that forms tiny backwater



Note: Colo. R. & LCR are both running high.

FORM 5 *Page __ of __*

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 004 **Trip:** 04 **Reach:** 1 **CB#:** 1 **<Aerial:** N **Boat:** Y>

Date: 9 1 04 12 (Y Y M M D D) **Time: Start** 2200 **End** 2255 **RM** 60.2 **to** 61.3

Ambient Light: NI (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather CS **Turbidity** L (Low, Moderate, High, Clear) **Sechi Disk** 1.0 m **Fluctuations:** RI

Crew: DV, EP, __ __

Time	RM	Side	Frequency	Pulse	Confidence	Description
2230	60.8	L	40.620	66	1	Same location as earlier today, between small rock point & small backwater
2230	60.8	L	40.680	68	1	Fish just upriver from small rock point (i.e. ~ 50 m upriver from 40.620)
2230	60.7	L	40.660	58	1	Just below ESPN rock, same location as earlier today.
2245	61.3	L	40.740	42	1	In channel between LCR Point & Rock Island. Note: This channel is now muddy due to dropping flows in main river
2245	61.3	L	40.670	44	1	Approx same location as 40.740/42
2245	61.3	L	40.630	88	1	Approx same location as 40.740 and 40.670
2255	61.6	L	40.670	94	1	Same location as earlier today (i.e. along Sand Island shoreline ~10 m upriver from Plume Pt.)
2255	61.4	L	40.710	41	1	In channel between Sand Island & Rock Island, toward lower end of channel.

FORM 5 *Page __ of __*

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 005 **Trip:** 04 **Reach:** 1 **CB#:** 1 **<Aerial:** N **Boat:** ~~L~~ **>**

Date: 91 04 13 (Y Y M M D D) **Time: Start** 1500 **End** 1400 **RM** 56.5 **to** 65.4

Ambient Light: PC **(SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)**

Weather PC **Turbidity** L **(Low, Moderate, High, Clear)** **Sechi Disk** 2.2 **m Fluctuations:** EA

Crew: EP, GW, __

Time	RM	Side	Frequency	Pulse	Confidence	Description
1327	60.8	L	40.660	58	1	@ ESPN Rock, river left
1331	60.9	L	40.620	66	1	Below ESPN Rock, @ base of drainage by boulder. Same location as yesterday
1355	61.6	L	40.710	40	1	Between Rock Island & Sand Island
1345	61.6		40.630	88	2	Single hit on fish, w/ Smith-Root. Couldn't triangulate on him.

FORM 5 *Page __ of __*

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 006 **Trip:** 04 **Reach:** 1 **CB#:** 1 **<Aerial:** N **Boat:** Y>

Date: 91 04 13 (Y Y M M D D) **Time: Start** 2106 **End** 2205 **RM** 60.0 **to** 62.0

Ambient Light: NI (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather CS **Turbidity** L (Low, Moderate, High, Clear) **Sechi Disk** 1.9 m **Fluctuations:** FA

Crew: HYGW

Time	RM	Side	Frequency	Pulse	Confidence	Description
2118	60.8	L	40.660	58	2	above ESPN Rock on river left
2120	60.8	L	40.680	68	1	river left below ESPN Rock - Eddy off of boulder pt
2130	60.9	L	40.620	66	1	top of sand spit river left - veg. on bank
2133	61.3	L	40.630	88	1	upstream side of cobble bar at LCR mouth - clear H_2O
2140	61.4	L	40.710	41	1	between cobble bar and sand island - off rocky pt at LCR mouth in muddy H_2O
2140	61.3	L	40.740	42	1	above cobble bar at mouth of LCR in clear H_2O
2145	61.3	L	40.650	43	1	on top of cobble bar at mouth of LCR in clear H_2O

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 007 **Trip:** 04 **Reach:** 1 **CB#:** 1 **<Aerial:** N **Boat:** LS

Date: 9 1 0 4 1 4 (Y Y M M D D) **Time: Start** 1336 **End** 1450 **RM** 056.4 **to** 065.4

Ambient Light: SU (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather CS **Turbidity** C (Low, Moderate, High, Clear) **Sechi Disk** 2.0 m **Fluctuations:** RI

Crew: AH, BL

Time	RM	Side	Frequency	Pulse	Confidence	Description
1425	60.7	L	740	83	1	(NEW FISH) very weak signal; fading in and out, LOCATED IN New eddy with VEG. CUTBANK NEAR LARGE ANGULAR BOULDER FALL.
1545	61.3	R	740	42	1	POSSIBLY UNDER LARGE TRAVERTINE BOULDERS UPSTREAM OF LCR BOAT BEACH.

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 008 Trip: 04 Reach: 1 CB#: 1 <Aerial: N Boat: Y>

Date: 91 04 14 (Y Y M M D D) Time: Start 1545 End 1630 RM 061.2 to 61.9

Ambient Light: SU (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather CS Turbidity H (Low, Moderate, High, Clear) Sechi Disk 2.0m Fluctuations: ST

Crew: BL, AH, __ TURBID H_2O TEMP = 14.0°C. CLEAR H_2O TEMP =

Time	RM	Side	Frequency	Pulse	Confidence	Description
1555	61.4	L	40.710	40	1	IN SHALLOW WATER (EDDY) 15m off shore, below Plume PT 50m.
1555	61.4	L	40.670	98	1	IN SAME EDDY AS 40.710/40, CLOSE TO SAME LOCATION.

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 009 Trip: 04 Reach: 1 CB#: 1 <Aerial: N Boat: ~~1~~ S

Date: 9 1 0 4 1 4 (Y Y M M D D) Time: Start 2145 End 2310 RM 60.1 to 61.4

Ambient Light: N 1 (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather CS Turbidity C (Low, Moderate, High, Clear) Sechi Disk __ __ m Fluctuations: EA

Crew: BY, AH __ __

Time	RM	Side	Frequency	Pulse	Confidence	Description
2215	60.9	R	40.620	66	1	Along ledges ≈10 m from shore.
2230	60.8	?	40.710	≈80	2	Very weak intermittent signal
2240	61.3	L	40.680	70	1	between Rock Island and LCR Boat Beach in slow run, mud [illegible]
2245	61.3	L	40.670	46	2	Somewhere between rock Island and upper end of LCR Boat Beach.
2310	61.4	L	40.670	98	1	Same location as afternoon survey (small eddy) below Plume PT.
2310	61.4	L	40.710	40	1	Same location as afternoon survey (small eddy) below Plume PT.

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22/30 5.6

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 210 **Trip:** 04 **Reach:** 1 **CB#:** 1 **<Aerial:** N **Boat:** ✓>

Date: 9 1 0 4 1 5 (Y Y M M D D) **Time: Start** 1 0 3 0 **End** 1 3 1 2 **RM** 5 6 . 5 **to** 6 1 . 4

Ambient Light: SU **(SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)**

Weather CS **Turbidity** L above LCR, M below LCR **(Low, Moderate, High, Clear)** **Sechi Disk** __ __ **m Fluctuations:** RI

Crew: HY, EP, GD

Time	RM	Side	Frequency	Pulse	Confidence	Description
1030	61.2	L	40.680	70	1	Directly across from surgery pt. - intermittent signals about 10 m off left shoreline
1045	61.3	L	40.710	40	1	fish just off downstream tip of Rock Island in mining zone
1100	61.5	R	40.670	98	1	Fish is along right shoreline (Tapeats ledges) approx .1 mi below surgery point
1230	57.3	?	40.640	34	2	Heard intermittent signals - unable to get exact location or pulse

FORM 5

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Rock IS

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Sand Island

Turbid flow

Lee Point

Telemetry Surveillance

Sample No: 011 **Trip:** 04 **Reach:** 1 **CB#:** 3 **<Aerial:** N **Boat:** ✓ **>**

Date: 910415 (Y Y M M D D) **Time: Start** 2041 **End** 2122 **RM** 60.0 **to** 61.5

Ambient Light: NI **(SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)**

Weather CS **Turbidity** L **(Low, Moderate, High, Clear)** **Sechi Disk** __ __ **m Fluctuations:** EA

Crew: GD, HY, RV Note: Colo. River side channel is turbid from Lee Flow

Time	RM	Side	Frequency	Pulse	Confidence	Description
2041	61.3	L	40.630	88	1	In side channel of Colorado R between boat beach & Rock Island
2042	61.4	L	40.670	46	1	Just off beach just below Plume Pt on Sand Island
2043	61.3	L	40.680	68	1	In side channel of Colo. R. between boat beach & Rock Island
2044	61.5		40.710	40	1	Just off beach just below Plume Pt on Sand Island
2045 locate 2143	61.3		40.740	42	1	In side channel between boat beach & Rock Island
2046	61.3		40.600	34	1	In side channel near tip of rock island between boat beach & rock Island
2122	60.8	L	40.620	65	1	sand beach below

ESPN Rock - 24 hr monitoring (BL, GW, AH)

FORM 5 *Page __ of __*

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 112 **Trip:** 04 **Reach:** 1 **CB#:** 1 **<Aerial:** N **Boat:** Y>

Date: 910416 (Y Y M M D D) **Time: Start** 1241 **End** 1452 **RM** 56.5 **to** 61.6

Ambient Light: SU (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather CS **Turbidity** L (Low, Moderate, High, Clear) **Sechi Disk** __ __ **m Fluctuations:** FA

Crew: GD, DV, EP

Time	RM	Side	Frequency	Pulse	Confidence	Description
(1) 1227	57.3		40.640	34	2	Got a null & strongest signals on river right along boulder point -- not too confident.
(4) 1415	75 m up LCR		40.740	42	1	In eddie left of center channel below sandy beach (in lower H_2O); 75m up river of mouth
(5) 1419	190 m up LCR		40.630	88	1	In eddie in middle of LCR river, just below drainage (river left); 190m up river of mouth.
(2) 1346	61.5	L	40.670	98	1	In eddie river left in muddy H_2O
(3) 1346	61.5	L	40.710	42	1	In eddie river left in muddy H_2O
(6) 1424	500 m up LCR	L	40.600	88	1	In run, LCR river left, at upper end of phragmites, just above Beamer's cabin
(7) 1443	175 m up LCR		40.630	88	1	moved up LCR directly across drainage in base of 2 huge boulders side to side in H_2O (175 m up)

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 113 Trip: 04 Reach: 1 CB#: 1 <Aerial: N Boat: Y>

Date: 910416 (Y Y M M D D) Time: Start 2128 End 2300 RM 60.0 to 61.4

Ambient Light: NI (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather CS Turbidity L (Low, Moderate, High, Clear) Sechi Disk __ __ m Fluctuations: FA

Crew: BL, EP, CH

Time	RM	Side	Frequency	Pulse	Confidence	Description
2139	60.5	L	40.660	58	1	Located chub river left in upstream end of embayment (below sandy beach)
2200	60.8	R	40.620	66	1	located chub river right across from beach
2217	61.3	L	40.600	34	1	In sidechannel at tip of Rock Island (facing LCR pt), in clear running H_2O - before reaching mixing zone.
2217	61.3	L	40.670	98	1	In muddy H_2O below LCR point, but just above Rock Island.
2233	61.3	L	40.680	68	1	At lower end of boat beach in shallow muddy H_2O.
2236	61.4	L	40.710	41	1	Chub in usual eddy between Rock Island & Sand Island
2313	500m up LCR		40.740	43	1	Chub above Beamers Cabin possibly around reeds, LCR left
2320	500m up LCR		40.630	90	1	Chub above Beamers Cabin, possibly downriver of reeds, LCR left
2333	500m up LCR		40.600	88	1	Chub above Beamers Cabin around chub .740, @ reeds, LCR left

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BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Surveillance

Sample No: 014 **Trip:** 04 **Reach:** 1 **CB#:** 2 **<Aerial:** N **Boat:** Y>

Date: 91 04 17 (Y Y M M D D) **Time: Start** 1220 **End** 1315 **RM** 56.5 **to** 61.3

Ambient Light: SU (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather CS **Turbidity** L (Low, Moderate, High, Clear) **Sechi Disk** __ __ **m Fluctuations:** SI

Crew: HY, RV, DV

Time	RM	Side	Frequency	Pulse	Confidence	Description
1225	57.3	R	40.640	34	1	In boulders
						10m off shore (where 24 hr. monitor took place)
1246	60.7	?	40.910	?	2	Just below ESPA (no location
						Rock - Got strong signal - then lost it - (fast pulse 60+)
1300	61.5	L	40.712	46	1	off sand island
						beach in MC side
1300	61.5	L	40.672	104	1	off downstream
						point of mud beach off sand island MC side

Fl

Jenny: we're having problems w/ Hab "2" maybe we can add Hab = ED, RA, etc on this front page... or

Hab = MC, TS Hab 2

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 001 Trip: 04 Reach: 1 CB #: 2 Date: 910411

Start Time: 1020 (continuation 3 days) End Time: ____ River: CO RM: 61.3 <Locate:_ 2H:_ 24H:X Test Flow:_ Implant:_> Mode

Habitat Map #: GCES 37-14 (910412) Benchmark: 2.0612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: EP, GW, AH

Fish Information

Species: H B PIT tag: 7E7E3F3A5C TL: 385 Wt.: 594 Radiotag Size: 11g

Freq 1: 40.710 Freq 2: 40.710 Pulse 1 (#/min): 41 Pulse 2: 42 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1055	61.3	SC					PC	PC	H

COMMENTS (In muddy, LCR H_2O). Staff gage not set up yet! Water dropping fast. In eddy between Rock Is & Sand Islan

1130	61.3	SC		247.0	0		PC	PC	H

same location. Muddy water area.

1328	61.3	SC		238.0	-9.0		PC	PC	H

same location.

1412	61.3	SC		231.0	-7.0		PC	PC	H

Same location

1530	61.3	SC		217.0	-14.0		PC	PC	H

Same location. Changed gage. New reading starting at 240

1635	61.3	SC		227.0	-13.0		DD	PC	H

Same location

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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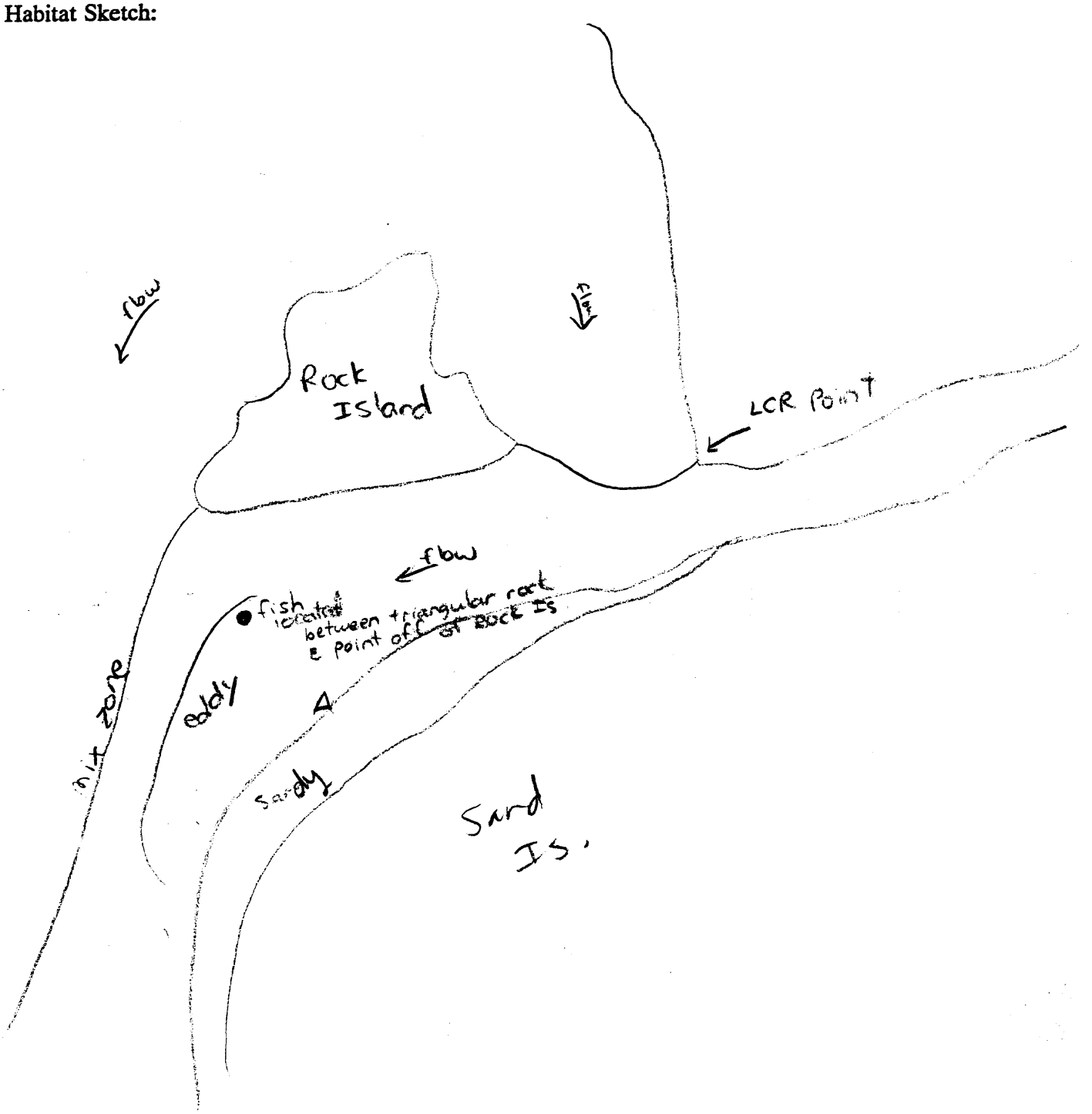
Habitat Sketch:



BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

cont. **Telemetry Observations**

Sample No: 00L Trip: 04 Reach: 1 CB #: 2 Date: 910411

Start Time: 1020 End Time: ____ River: C RM: 61.3 <Locate:_ 2H:_ 24H:X Test Flow:_ Implant:_> Mode

Habitat Map #: GCES 37-14 910412 Benchmark: 2.0612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: AH, GW, EP

Fish Information

Species: H B PIT tag: 7F7E3E3A5C TL: 385 Wt.: 594 Radiotag Size: 11 g

Freq 1: 40.710 Freq 2: 40.710 Pulse 1 (#/min): 41 Pulse 2: 42 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1830	61.3	SC		214.0	-13.0		DD	PC	H
COMMENTS same location (changed gages last reading 211.0, new reading 214)									
2000	61.3	SC		215.0	+1.0		NI	CS	H
same location									
2048	61.3	SC		241.5	+26.5		NI	CS	H
same (changed gages, last reading 211, new reading 241.5)									
2135	61.3	SC		241.5	0		NI	CS	H
same									
2210	61.3	SC		247.0	+5.5		NI	CS	H
same. H_2O seems to be rising									
2245	61.3	SC					NI	CS	H
same									

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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Habitat Sketch:

BIO/WEST GRAND CANYON STUDY

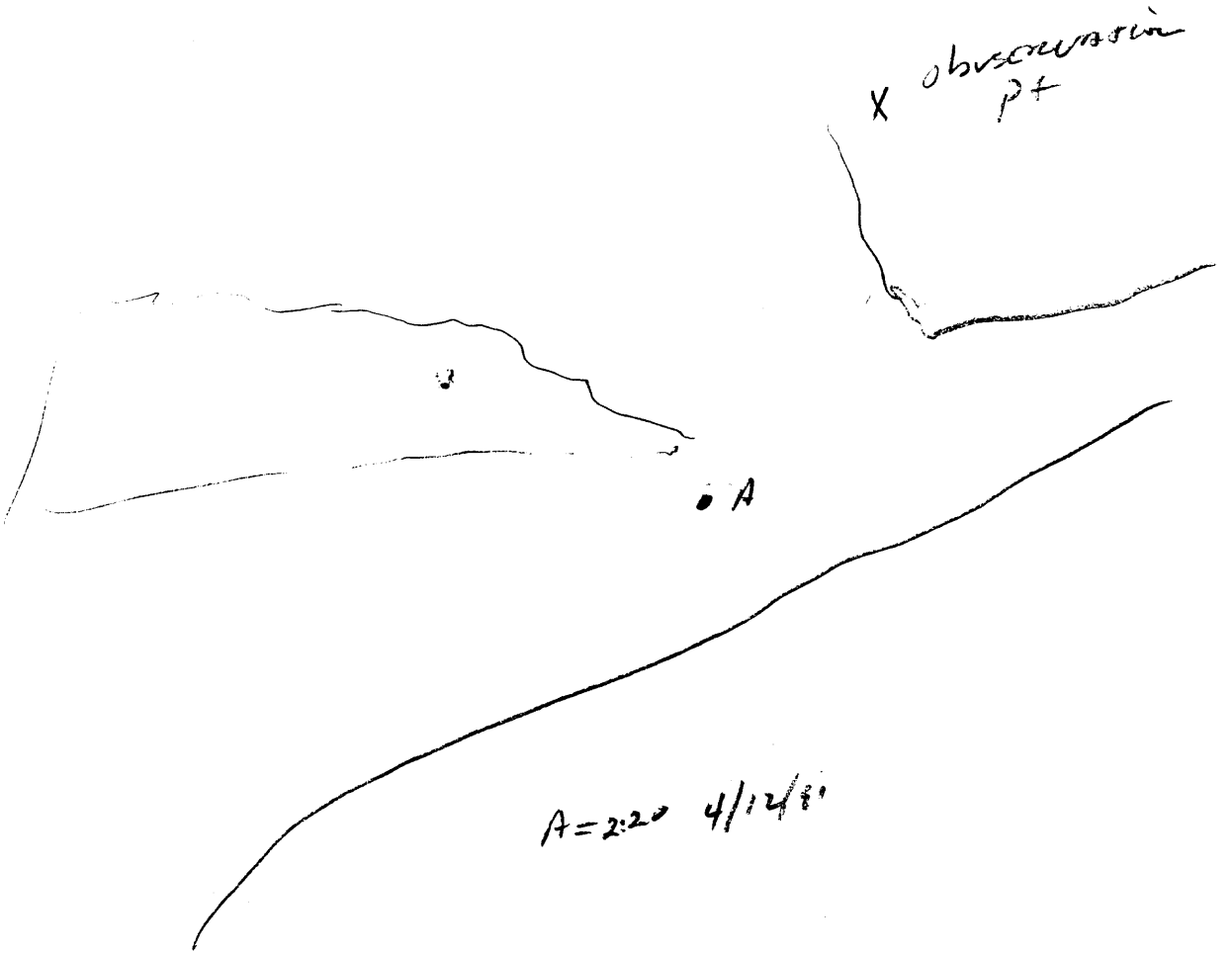
(Colorado River Mainstem)

Telemetry Observations

Sample No: 001 Trip 04 Reach: L CB #: 2 Date: 910412

PIT tag: 7F7F3E3A5C Freq 2: 40.710 Pulse 2: 42

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2400	61.3	SC	0	2345 hrs 290.0			NI	CS	H
COMMENTS same area.									
910412 0050	61.3	SC	0	331.5	+41.5		NI	RC	H
same area									
02:20	61.3	SC	0	215.0	-115.5		VI	RC	H
see Diag. on back (A)									
03:00	61.3	SC		215.0	0		NI	CS	H
Same location as 2120									
0350	61.3	SC		216.0	+1.0		NI	CS	H
Same. Pulse is a lot louder. Still appears to be in same area, possibly moving upstream									
0449	61.3	SC		218.0	+2.0		NI	CS	H
Same									
0600	61.3	SC		212	-6.0		DD	CS	H
fish between RC island & LCR island just below riffle									
910412 0650	61.3	SC		212	0		DD	CS	H
same area									


X observation pt
A
A=2:20 4/12/81

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 001 Trip: 04 Reach: 1 CB #: 2 Date: 910412
Continuation of 24hr started 910411
Start Time: 0845 End Time: ____ River: CO RM: 61.3 <Locate:_ 2H:_ 24H:X Test Flow:_ Implant:_> Mode

Habitat Map #: GCES 37-14 910412 Benchmark: 2.0612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: AH, GW, HV

Fish Information

Species: HB PIT tag: 7F7E3E3A5C TL: 385 Wt.: 594 (at implant) Radiotag Size: 11 g

Freq 1: 40.710 Freq 2: 40.710 Pulse 1 (#/min): 41 Pulse 2: 42 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
8:45	61.3	–		N/A	–		SU	CS	C
COMMENTS	No fish								
0925	61.3	SC	–	–	–		SU	PC	H
	T_1 = 261°		T_2 = 253°		in slack water at base of confluence island w/in main flow				
1050	61.3	SC	0	30.5	–		SU	PC	H
	same position								
11:25	61.3	SC	0	25.5	-15.0		SU	PC	H
							same position		
12:25	61.3	SC	0	17.5	-8.0		SU	PC	H
							same position		
1400	61.3	SC	0	4.0 = 22.0	-13.5		OV	PC	H
							same position		

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._ m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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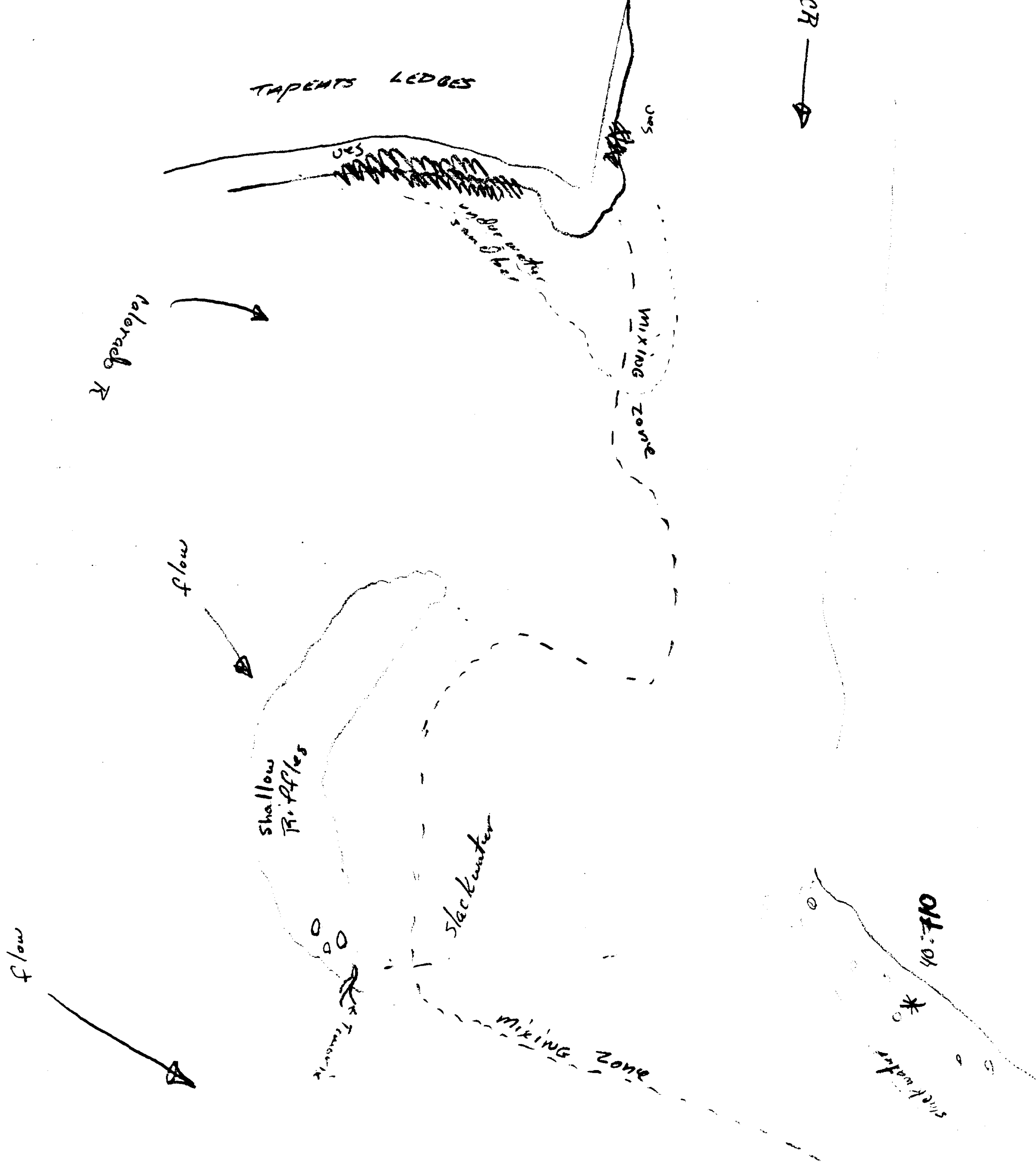
Habitat Sketch: @1015 hrs 4/12/91



BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 001 Trip: 04 Reach: 1 CB #: 2 Date: 910412

PIT tag: 7E7E3F3A5C Freq 2: 40.710 Pulse 2: 42

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1425	61.3	SC	Ø	14.0	-6.0		OV	PC	L
COMMENTS				NO MOVEMENT					
1458	61.3	SC	Ø	7.5 39.0	-6.5		PC	PC	L
				SAME LOCATION					
1530	61.3	SC	Ø	32.5	-6.5		PC	PC	L
In eddy, shoreline w/ boulders									
1635	61.3	SC	10 m	20.5	-12.0		SU	PC	H
*R_2 on map	T_1 = 270°	T_2 = 257°		same area, but location where fish was has been exposed by falling water stage					
1805	61.3	SC		6.5 =60.0	-14.0		DD	PC	H
	T_1 = 263	T_2 = 262	T_3 = 252°		moved back downstream the corner of the island				R_3 on map
1945	61.3	SC	Ø	42.0	-18.0		NI	PC	H
same location									
2112	61.3	SC	Ø	31.0	-11.0		NI	CS	H
same locat	T_3 - 226								
2210	61.3	SC	Ø	35.0	+4.0		NI	CS	H
same location									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 001 Trip: 04 Reach: 1 CB #: 2 Date: 910412

PIT tag: 7E7F0F3A5C Freq 2: 40.710 Pulse 2: 42

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2255	61.3	S.C		51.0	+16.0		NI	CS	H
COMMENTS - same location. In eddy									
4/13/91 0005	61.3	S.C		37.5 (24.0)	-13.5		NI	CS	H
	T_1=261		T_3=246						
0106	61.3	SC	3-5M	32.0 (21.7)	-5.5		NI	CS	H
			T_1= 265	T_3 235					
0200	61.3	SC	Ø	23.0	+1.3		NI	CS	H
NO MOVEMENT									
0300	61.3	SC	Ø	23.3	+ 3		NI	CS	H
NO MOVEMENT.									
0358	61.3	SC	Ø	22.1	- 2		NI	CS	H
no movement, air temp 40C, MT-8°									
0505	61.3	SC	Ø	22.2	- 3		NI	CS	-
no movement - remained in same location									
0600	61.3	SC	Ø	22.35	- 5.5		DA	CS	-
same location									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 001 Trip: 04 Reach: 1 CB #: 2 Date: 9/10/13

PIT tag: 7F7F3E3A5C Freq 2: 40.710 Pulse 2: 42

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
06:58	61.3	SC	ø	22.0	-2.5		DD	PC	H
COMMENTS same location									
07:55	61.3	SC	ø				SU	CS	H
0950	61.3	SC	120m	223	+3.0	—	SU	CS	H
Ay - MOVED UP CHANNEL between Sand Island and Rock Island. T_1 = 260 T_3 = 239° Eddie									
11:42	61.3	SC	Ø	21.7	-6.0		SU	CS	H
same location - in interface between MC and LCR, eddie									
1335	61.4	SC					SU	CS	H
Fish in brown water of LCR, in slow run/eddy habitat, in channel between Sand Island & Rock Island, about 10 m out from Sand Island shoreline.									
1520	61.4	SC	~20 m	14.0	-7.7		SU	PC	H
Fish has moved upriver, along shore of Sand Island & now is in top of eddy									
1712	61.4	SC	~10 m	37.7	+23.7		SH	CS	H
Fish has moved along Sand Island shore to either the very top of eddy or is entering the mouth of LCR									
① 2023	61.3	MC		20.0	-17.7		DD	CS	H
262° from point T_1, T_3 = 238°									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 001 Trip: 04 Reach: 1 CB #: 2 Date: 910413

PIT tag: 7F7E3F3A5C Freq 2: 40.710 Pulse 2: 42

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2	2154	61.3	S.C		61.7	+41.7		NI	CS	H
COMMENTS	269 from T_1, 220° from T_3									
3	2320	61.3	MC		60.0	-1.7		NI	CS	H
	278° from T_1; 246° from T_3 still appears to be near top of eddy just north of Sand Island									
910414 4	0015	61.3	MC		8.5	+2.0		NI	CS	H
	266° from T_1; 246° from T_3									
5	0120	61.3	MC		16.0	+7.5		NI	CS	H
	275° from T_1 254° from T_3									
6	0214	61.3	MC		22.5	+6.5		NI	CS	H
	265° from T_1 240° from T_3									
7	0305	61.3	MC		27.0	+4.5		NI	CS	H
	T_1 = 265°, T3 = 241									
8	0430	61.3	MC		27.0	Ø		NI	CS	H
	T_1 = 265 T_3 = 237									
9	0600	61.3	MC		24.0	-3.0		DD	CS	H
	T_1 = 259°, T_3 = 246									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 001 Trip: 04 Reach: 1 CB #: 2 Date: 910414

PIT tag: 7F7F3F3A5C Freq 2: 40.710 Pulse 2: 42

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0	0735	61.3	MC		20.5	-3.5		SU	CS	H
	COMMENTS $T_1 = 264°$, $T_3 = 243°$									
11	1043	61.3	MC		20.5	Ø		SU	CS	H
	$T_1 = 263$ $T_2 = 240$									

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 002 Trip: 04 Reach: 1 CB #: 2 Date: 910411

Start Time: 1020 End Time: ____ River: CO RM: 61.3 <Locate:_ 2H:_ 24H:X Test Flow:_ Implant:_> (Mode)

Habitat Map #: GCES 37-14 Benchmark: 2.0612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: EP, GW, AH

Fish Information

Species: HB PIT tag: 7F7F3E2661 TL: 379 Wt.: 511 Radiotag Size: 09 g

Freq 1: 40.670 Freq 2: 40.670 Pulse 1 (#/min): 39 Pulse 2: 43 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1055	61.3	SC	0	—	—		PC	PC	L

COMMENTS Water dropping fast. In clear H_2O near mixing zone, near tip of Rock

1130	61.3	SC	0	247.0	0		PC	PC	L

Same location. Turbidity still 1.5m (fish appears to be in clear H_2O area)

1328	61.3	SC	0	238.0	-9.0		PC	PC	L

Same location

1436	61.3	SC	0	231.0	-9.0		PC	PC	L

Same location

1530	61.3	SC	0	217.0	-14.0		PC	PC	L

Same Location. Changed gage. New reading starts at 240

1635	61.3	SC	0.9 m	227.0	+10.0		DD	PC	L

Moved down river less than a meter. Appears to still be in clear water, near the mixing zone

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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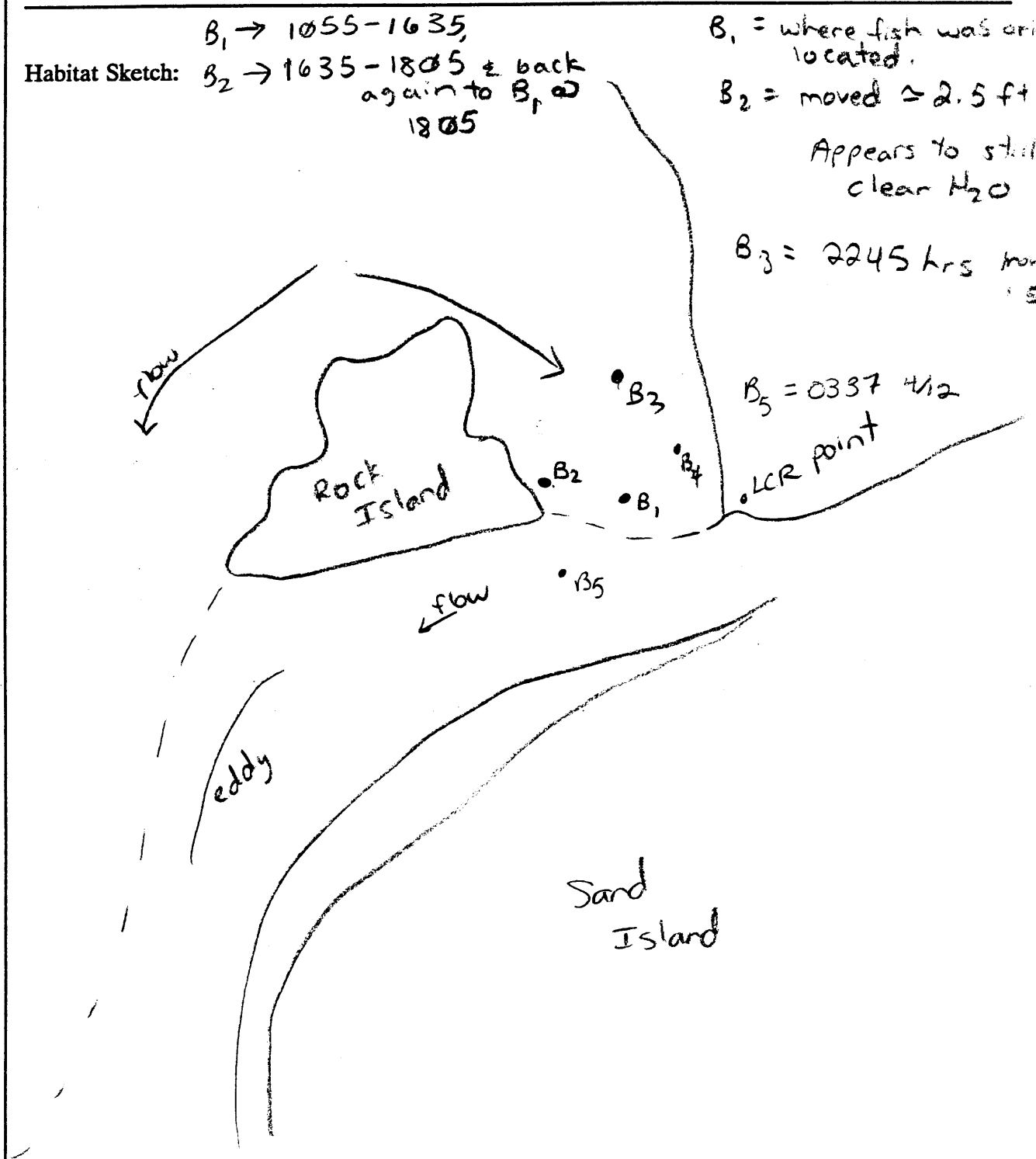
Habitat Sketch:



BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

cont **Telemetry Observations**

Sample No: 002 Trip: 04 Reach: 1 CB #: 2 Date: 910411

Start Time: 1020 End Time: ____ River: CO RM: 61.3 <Locate: _ 2H: _ 24H: X Test Flow: _ Implant: _> (Mode)

Habitat Map #: GCES 37-14 Benchmark: 2.0612 Confidence: L

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: AH, GW, EP

Fish Information

Species: H B PIT tag: 7F7E3E2661 TL: 379 Wt.: 511 Radiotag Size: 09 g

Freq 1: 40.670 Freq 2: 40.670 Pulse 1 (#/min): 39 Pulse 2: 43 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1805	61.3	SC	2.5 ft	214.0	-13.0		DD	PC	L
COMMENTS moved to same spot as 1st found. (see back of pg 1.)									
2000	61.3	SC	0	215.0	+1.0		NI	CS	L
same location (as above)									
2048	61.3	SC	0	241.5	+26.5		NI	CS	L
same									
2135	61.3	SC	0	241.5	0		NI	CS	L
same									
2210	61.3	SC	0	247	+6.5		NI	CS	L
same. H2O starting to rise									
2245	61.3	SC	1.5m	–	–		NI	CS	L
moving upriver (see pg 1)									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 002 Trip: 01 Reach: 1 CB #: 2 Date: 91 0411

PIT tag: 7E7E3E2661 Freq 2: 40.670 Pulse 2: 43

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2400	61.3	MC	0	290.0	+43.0		NI	CS	L
COMMENTS same area (gage readings taken @ 2345 hrs)									
0050	61.3	SC	30m	331.5	+41.5		NI	PC	L
moved downstream into mouth area									
staff gauge fell down set again @ 1:55									
01:55	61.3	SC	0	211.0	-120.5		NI	PC	L
Same area B3 1:55 4/12/91									
02:50	61.3	SC		215.0	+4.0		NI	PC	L
B4 2:50 4/12/91 closer to mouth of Lee									
0337	61.3	SC		216.0	+1.0		NI	CS	L
moved a bit. See label "B5" on pg 1.									
0449	61.3	SC		217.0	+2.0		NI	CS	L
seems to be moving upriver									
0550	61.3	SC		-	-		DD	CS	-
fish between plume of Marble and Island									
0650		SC		212	-6.0		DD	CS	-
same									

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 002 Trip: 04 Reach: 1 CB #: 2 Date: 910412
continuation of 24hr Started 910411

Start Time: ____ End Time: ____ River: LO RM: 61.3 <Locate:_ 2H:_ Mode 24H:_ Test Flow:_ Implant:_>

Habitat Map #: GCES 37-14 9104/12 Benchmark: 20612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: AH, GW, HY

Fish Information

Species: HB PIT tag: 7F7F3E2661 TL: 379 Wt.: 511 Radiotag Size: 09 g

Freq 1: 40.670 Freq 2: 40.670 Pulse 1 (#/min): 39 Pulse 2: 43 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0930	61.3	SC		39.0	—		SU	PC	H
COMMENTS		T_1 =	283°	T_2 =	268°	with in behind	muddy main channel	plume Riffle bar	in slack water + in eddy.
1050	61.3	SC	0	30.5	-8.5		SU	PC	H
same position									
11:25	61.3	SC	0	25.5	-5.0		SU	PC	H
same position									
12:25	61.3	SC	0	17.0	-8.5		SU	PC	H
same position									
1:50	61.3	SC	~40m	4.0	-13.0		OV	PC	L
* Bson		T_1 =	303°	T_2 =	260°	flow velocity in main channel is dropping off the fish has moved up into green water above rock bar running			
1425	61.3	SC	0	14.0	+10.0		OV	PC	L

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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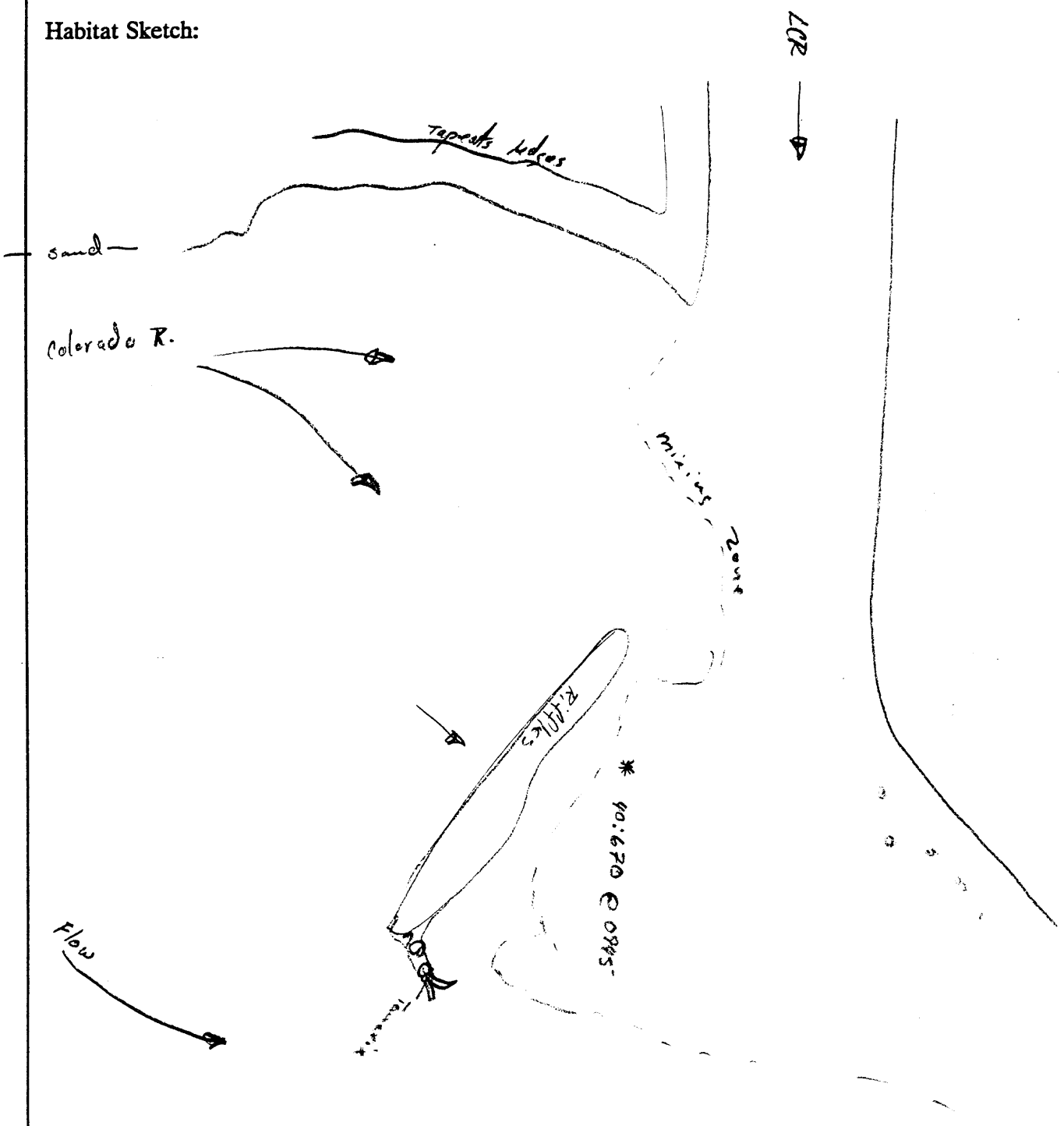
Habitat Sketch:



BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 002 Trip: 04 Reach: 1 CB #: 2 Date: 910412

PIT tag: 7F7F3F2661 Freq 2: 40.670 Pulse 2: 42

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1458	61.3	RU	7-10m	7.5	-6.5		PC	PC	L
COMMENTS		* B_2 on map FISH	MOVED	39.0 UPSTREAM		T_1 = 310° TOWARD	SURGERY	DT	7-10m FROM LAST OBSER.
1530	61.3	RU	Ø	30.5	-6.5		PC	PC	L
			SAME LOCATION						
1635	61.3	RU	Ø	20.5	-12.0		SU	PC	L
	same location								
1805	61.3	RU		6.5 =60.0	-14.0		DD	PC	L
	same location								
1945	61.3			42.0	-18.0		NI	PC	L
	T_1 = 326°		T_3 = 202°		* B_4 on map moving up into mouth area				
2110	61.3	RU		31.0	-11.0		NI	CS	L
T_1 284			T3-209		* B_5 on map				
2215	61.3	RU		35.0	+4.0		NI	CS	L
	T_1 = 310		T_3 = 236		* B_6				
2300	61.3	RU	Ø	51.0	+16.0		NI	CS	L
	same position								

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 002 Trip: 04 Reach: 1 CB #: 2 Date: 2 L 04 L 3

PIT tag: 7E7E3E2661 Freq 2: 40.670 Pulse 2: 42

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0005	61.3	MC	Ø	37.5 (24.0)	-13.5		NI	CS	L
COMMENTS same position									
0100	61.3	RU	8-10M	32.0 (21.7)	-5.5		NI	CS	L
T_1=290 T_3 = 198, NEAR * By on map SHORE w/in 50M OF LCR									
0200	61.3	RU	Ø	23.0	+13		NI	CS	L
Same LOCATION									
0300	61.3	RU	Ø	23.3	+3		NI	CS	L
SAME LOCATION									
0358	61.3	RU	Ø	23.1	-2		NI	CS	L
Same location air temp 7°C MCT-8°									
0506	61.3	RU	Ø	22.8	-3		NI	CS	L
same location									
0605	61.3	RU	Ø	22.25	-5.5		DD	CS	L
same location									
0710	61.3	RU		22.0	-2.5		DD	PC	L
T_1 = 316 T_3 = 220 * B8 on map									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 002 Trip: 01 Reach: 1 CB #: 2 Date: 910413

PIT tag: 7F7F3E2661 Freq 2: 40.670 Pulse 2: 42

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0750	61.3	MC	Ø	220	0		SU	CS	L
COMMENTS same position. In run (H_2O)									
0950	61.3	MC		223	+3.		SU	CS	L
B_9 = B_5 on map			T_1 = SAME 272		T_3 = ~~242~~ 215°	Approx 75m offshore & 20m from MUDDY LCR			
11:41	61.3		?	213	-5.5		SU	CS/OV	L
no contact									
1332	61.3		?				SU	CS	Low above LCR High below LCR
No contact									
1535	61.3	MC	?	140	-7.75		SU	PC	L above LCR H below LCR
can occasionally hear fish, but cannot triangulate.									
1550	61.2	MC	0/mile	11.0	-3.0		SU	PC	L
Fish located in deep calm clear water beneath Chub Rock, in eddies									
1710	61.2	MC	Ø	37.7	+26.7		SH	CS	L
Fish in same location as observation above (1550 hr)									
(1) 2019	61.3	MC		18.0	-19.7		DD	CS	L?
Fish moved from Chub Rock to location 300° (from point T_1), T_3 = 224°									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 002 Trip: 01 Reach: _ CB #: _ Date: 910413

PIT tag: 7F7F3E2661 Freq 2: 40.670 Pulse 2: 42

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2	2148	61.3	MC		9.0	-9.0		NI	CS	L
	COMMENTS 292° from T_1 ; 211° from T_3									
3	2310	61.3	MC		60.0	-8.5		NI	CS	L
	In run (H_2O) 290° from T_1 ; 23° from T_3 fish in green Colo. R. water between LCR pt & Rock I.									
4	910414 0014	61.3	MC		8.5	+2.5		NI	CS	L
	300° from T_1 ; 220° from T_3									
5	0120	61.3	MC		16.0	+7.5		NI	CS	L
	320° from T_1 218° from T_3									
6	0212	61.3	MC		22.5	+6.5		NI	CS	L
	320° from T_1 214° from T_3									
7	0315	61.3	MC		27.0	+4.5		NI	CS	L
	T_1 = 322, T_3 = 203°									
8	0429	61.3	MC		27.0	Ø		NI	CS	L
	T_1 = 340 T_3 = 210									
9	0604	61.3	MC		24.0	-3.0		DD	CS	L
	T_1 = 300, T_3 = 241									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 002 Trip: 04 Reach: 1 CB #: 2 Date: 910414

PIT tag: 7F7F3E2661 Freq 2: 40.670 Pulse 2: 42

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0734	61.3			20.5	-3.5		su	cs	L (above LCR)
COMMENTS	no contact								
1043	61.3			20.5	Ø		su	cs	L
	no contact								

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 003 Trip: 04 Reach: 1 CB #: 2 Date: 910411

Start Time: 1020 Continued 3 days End Time: ____ River: CO RM: 61.3 <Locate:_ 2H:_ 24H:X Mode Test Flow:_ Implant:_>

Habitat Map #: GCES 37-14 Benchmark: 2.0612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: EP, GW AH

Fish Information

Species: H B PIT tag: 7E7E3C2D06 TL: 485 Wt.: 669 Radiotag Size: 11 g

Freq 1: 40.740 Freq 2: 40.740 Pulse 1 (#/min): 42 Pulse 2: 42 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1055	61.3	SC					PC	PC	H
COMMENTS Water dropping fast. Near tip of Rock Is. (mouth of LCR) in mixing zo									
1130	61.3	SC		247.0			PC	PC	H
same location. Turbidity st. 11 1.5m									
1328	61.3	SC		238.0	-9.0		PC	PC	H
same location									
1412	61.3	SC		231.0	-9.0		PC	PC	H
same location									
1527	61.3	SC		217.0	-14.0		PC	PC	H
same location									
* 1635	61.3	SC	.8 m	227.0	+10.0		DD	PC	H
Moved about .8m down river. Appears to still be in muddy H_2O area.									

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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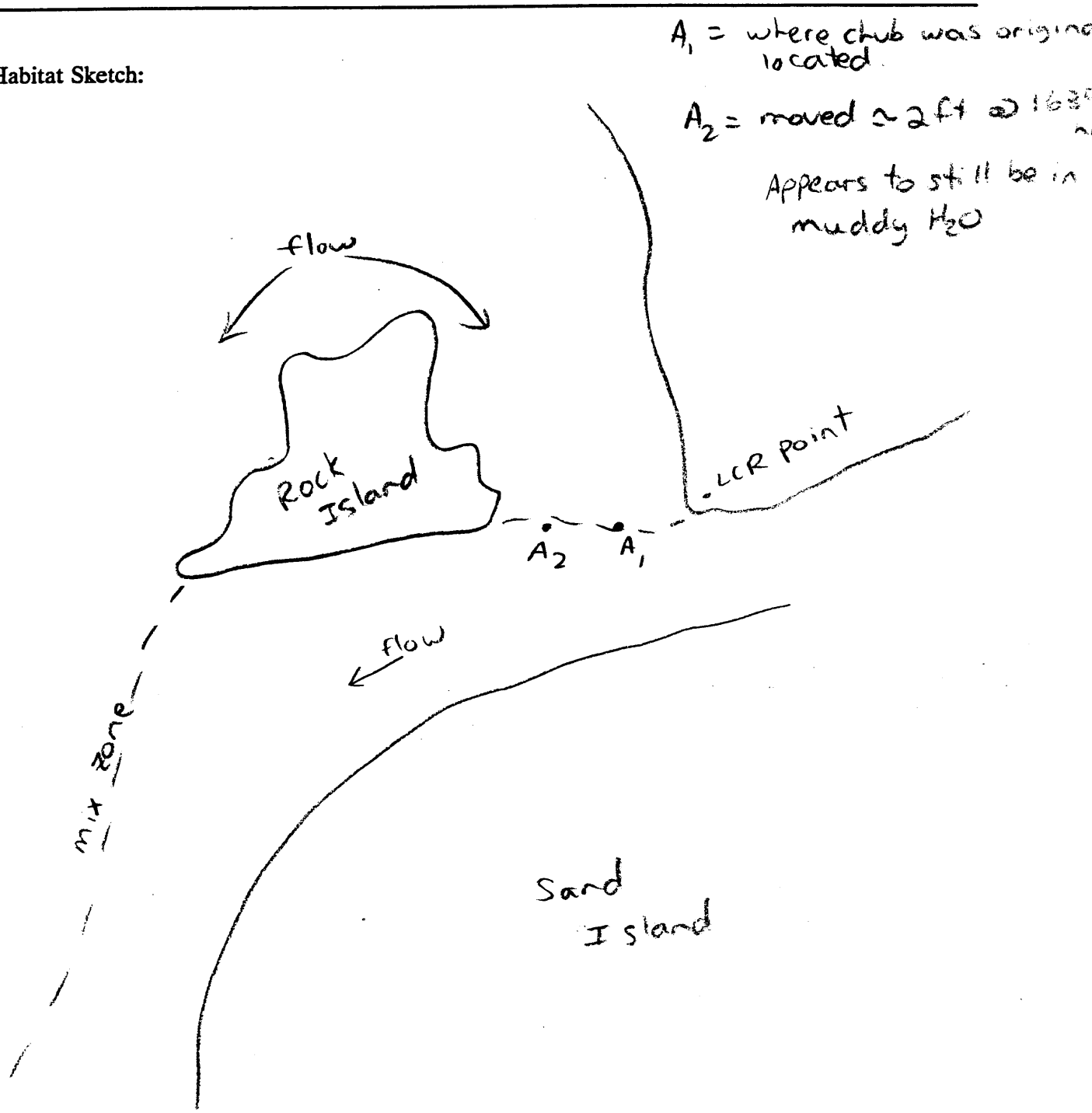
Habitat Sketch:



BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 003 Trip: 04 Reach: L CB #: 2 Date: 910411

Start Time: 1020 End Time: ____ (continuation) River: CO RM: 61.3 <Locate:_ 2H:_ 24H:X Mode Test Flow:_ Implant:_>

Habitat Map #: GCES 37-14 Benchmark: 2.0612 Confidence: L

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: AH, GW EP

Fish Information

Species: H B PIT tag: 7F7E3C2D06 TL: 405 Wt.: 669 Radiotag Size: 11 g

Freq 1: 40.740 Freq 2: 40.740 Pulse 1 (#/min): 42 Pulse 2: 42 Surgeon: __

Time	RM	Hab	Distance Moved	(cm) Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1830	61.3	–		214.0	-13.0		DD	PC	H
COMMENTS Lost him! moved up river									
2210	61.3	SC		247.0	+33.0		NI	CS	L
He's back!!! Readings indicate he's in same area as fish .680 (D4)									
2245	61.3	SC		?			NI	CS	L
moving downstream (≈ly .5 ft from previous)									
2341		–		?					
Gone									
2400		no contact		290.0	+43.0				
910412 0050	no contact (gage readings taken @ 2345 hrs)								
0220	61.3	SC		215.0	-75.0		NI	CS	L
~~[illegible]~~	SEE AC on back								
0 3:07									

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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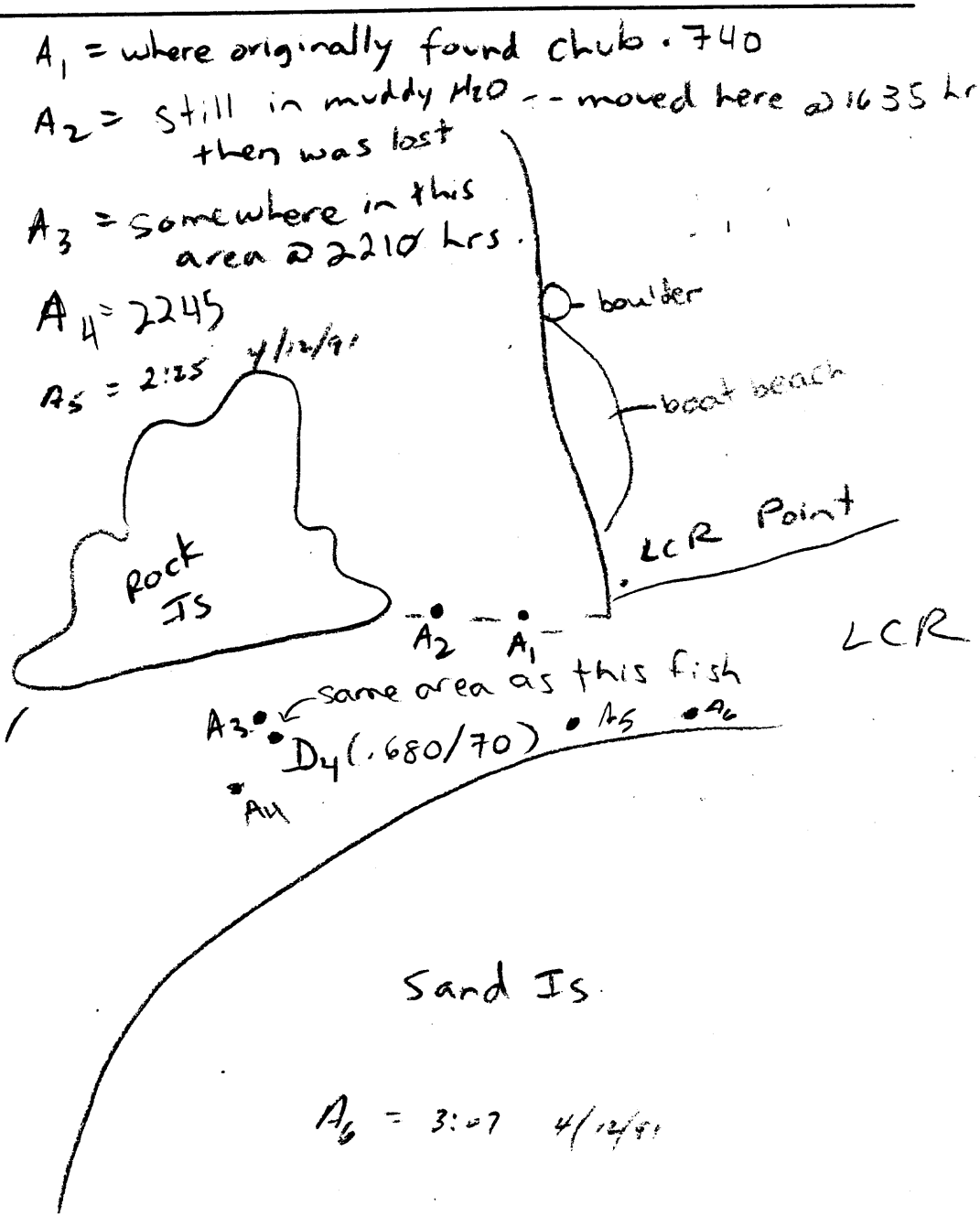
Habitat Sketch:



BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 003 Trip: 04 Reach: 1 CB #: 2 Date: 910412

PIT tag: 7E7F3C2D06 Freq 2: 40.740 Pulse 2: 72

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0352	61.3	SC		216	+1.0		NI	CS	L
COMMENTS same									
0430	61.3	SC		218	+2.0		NI	CS	L
same									
0506	61.3	SC					DD	CS	L
same									
0535	61.3	SC		213.5			DD	CS	L
fish is at very top in clear water [illegible]									
0640	61.3	SC		—			DD		
in plume margin about 30 feet downstream of before									

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 003 Trip: 04 Reach: 1 CB #: 2 Date: 910412

Continuation of 24 hr started 910411

Start Time: ____ End Time: ____ River: GCRM: 61.3 <Locate:_ 2H:_ 24H:✓ Test Flow:_ Implant:_> Mode

Habitat Map #: GCES 37-14 910412 Benchmark: 2.0612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: HY, BL, AH

Fish Information

Species: HB PIT tag: 7F7F3C2D06 TL: 405 Wt.: 669 Radiotag Size: 11 g

Freq 1: 40.740 Freq 2: 40.740 Pulse 1 (#/min): 42 Pulse 2: 42 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0945	61.3	SC	—	—			SU	PC	H
COMMENTS		C1 on map T1 = 283°		T2 = 280°		in eddy w/in mixing zone main channel Rockbar		behind fan point of	
1050			no contact						
1125			no contact						
1225			no contact						
2102	61.3	SC	—	310			NI	CS	L in clear H_2O of MC
T1 = 303°		C2 on map T3 = 228°							
2205	61.3	SC					NI	CS	L
same location									
2305	61.3	SC					NI	CS	L
same location									

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ .1 m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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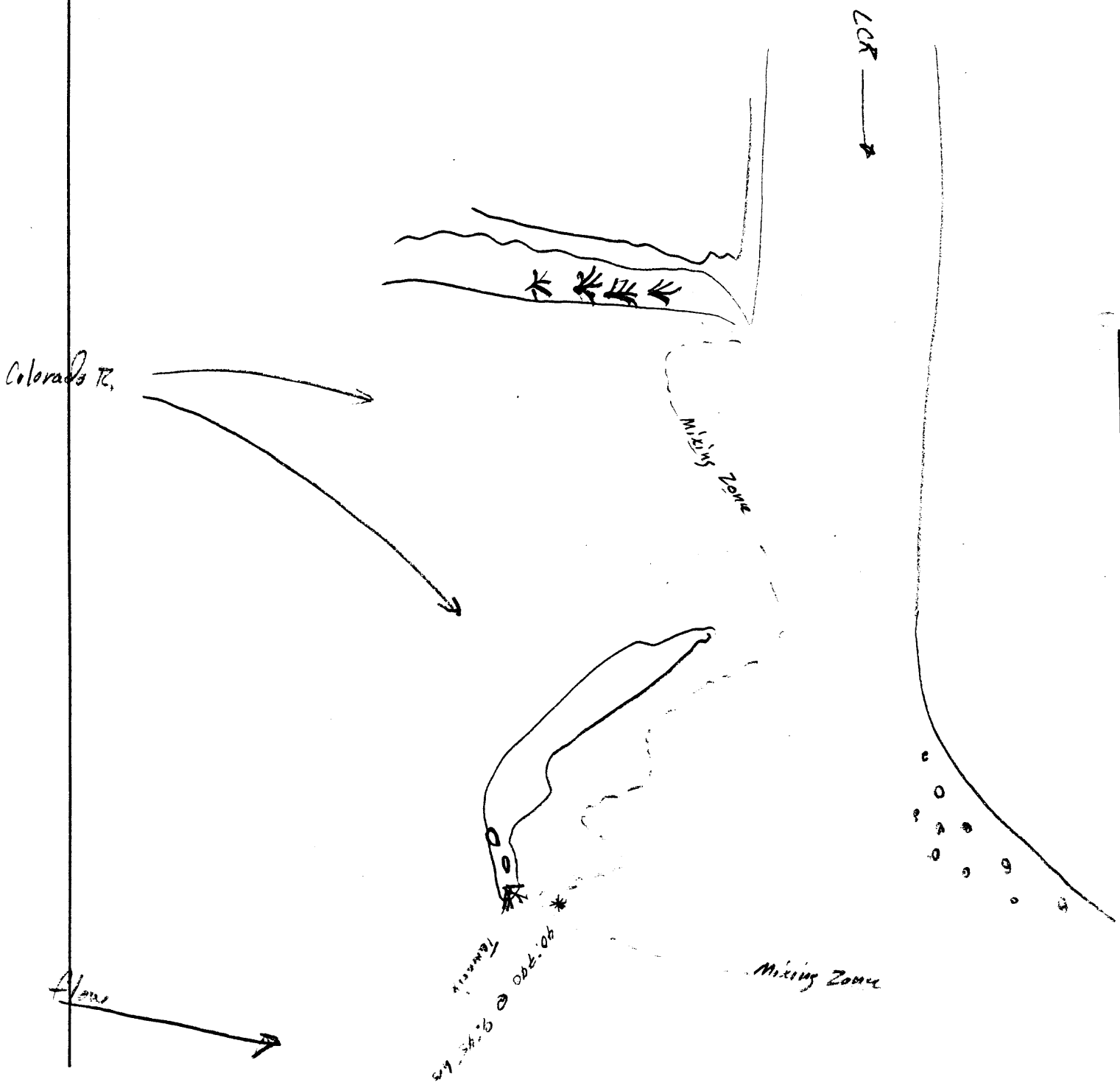
Habitat Sketch:



BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 003 Trip: 04 Reach: L CB #: 2 Date: 9L0413

PIT tag: 7F7F3C2D06 Freq 2: 40.740 Pulse 2: 42

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0011	61.3	SC		37.5			NI	CS	L
			C3 on map	(24.0)					
COMMENTS	$T_1 = 282°$		$T_3 = 222°$						
0105	61.3	SC	8-10M	32.0			NI	CS	L
			C4 on map	(21.7)					
	$T_1 = 314$		$T_3 - 193$	MOVED	TOWARDS		LCR		
0200	61.3			23.0			NI	CS	L
			NO CONTACT						
0300	61.3			23.3			NI	CS	L
			NO CONTACT						
0358	61.3			23.1			NI	CS	L
	NO contact								
0507	61.3			22.8			NI	CS	L
	lost contact								
0600	61.3			22.25			NI	CS	L
	No contact								
0710	No	Contact							
0950	NO Contact								

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 003 Trip: 04 Reach: 1 CB #: 2 Date: 910413

PIT tag: 7F7F3C2D06 Freq 2: 40.740 Pulse 2: 42

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
	1330	61.3	-					SU	CS	Low above LCR High below LCR
COMMENTS	No contact									
	1510	61.3	SC		15.9			SU	PC	H (in LCR)
	Fish is in mixing zone, about 20 m off sand peninsula of LCR point.									
	1714	61.3	SC		37.5	-9.4		SM	PC	L above H below LCR
	Same location as observation above									
(1)	2024	61.3	SC		17.0	-20.5		DD	CS	L
	320° from point T_1; T_3 = 228°									
(2)	2156	61.3	SC		61.7	-8.5		NI	CS	L
	274° from T_1, 224° from T_3									
(3)	2308	61.3	SC		60.0	-1.7		NI	CS	L
	290° from T_1, 226° from T_3 in green water between LCR pt and rock island									
(4)	910414 0010	61.3	SC		8.5	+2.0		NI	CS	L
	296° from T_1; 220° from T_3									
(5)	0120	61.3	SC		16.0	+7.5		NI	CS	L
	290° from T_1 230° from T_3									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 003 Trip: 04 Reach: 1 CB #: 2 Date: 910414

PIT tag: 7F7F3C2D06 Freq 2: 40.740 Pulse 2: 42

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
6	0210	61.3	SC		22.5	+6.5		NI	CS	L
	280° from T1		210° from T3							
	COMMENTS									
7	0312	61.3	SC		27.0	+4.5		NI	CS	L
	T1 = 334°, T3 = no contact									
	0431	61.3	—		27.0	Ø		NI	CS	L
	No contact T1 or T3									
	0600	61.3	—		24.0	-3.0		DD	CS	
	No contact									
	0732	61.3	—		20.5	-3.5		SU	CS	L
	no contact									
	1039	61.3	—		20.5	Ø		SU	CS	L
	no contact									

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 004 Trip: 04 Reach: L CB #: 2 Date: 910411

Start Time: 1635 End Time: ____ River: CO RM: 61.3 <Locate:_ 2H:_ 24H:X Test Flow:_ Implant:_> (Mode)

Habitat Map #: GCES37-14 910412 Benchmark: 2.0612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: AH, GW, EP

Fish Information

Species: H B PIT tag: 7F7F3E3B00 TL: 410 Wt.: 688 Radiotag Size: 11 g

Freq 1: 40.680 Freq 2: 40.682 Pulse 1 (#/min): 66 Pulse 2: 70 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1635	61.3	SC		227.0	–		DD	PC	L

COMMENTS In clear H_2O; just above mixing zone; downstream of LCR Point

1830	61.3	SC		214.0	-13		DD	PC	L

Same location as .670 (see back: D_1)

2000	61.3	SC	1m	215.0	+1		NI	CS	H

Moved down stream ≃ 1 m (see back: D_2)

2048	61.3	SC		241.5	+26.5		NI	CS	H

moved upstream (D_3)

2135	61.3	SC	.5m	241.0	-0.5		NI	CS	H

moved downstream .5m

2210	61.3	SC		247.0	+6.0		NI	CS	H

Same. Fish 740 apparently in same vicinity. H_2O seems to be rising

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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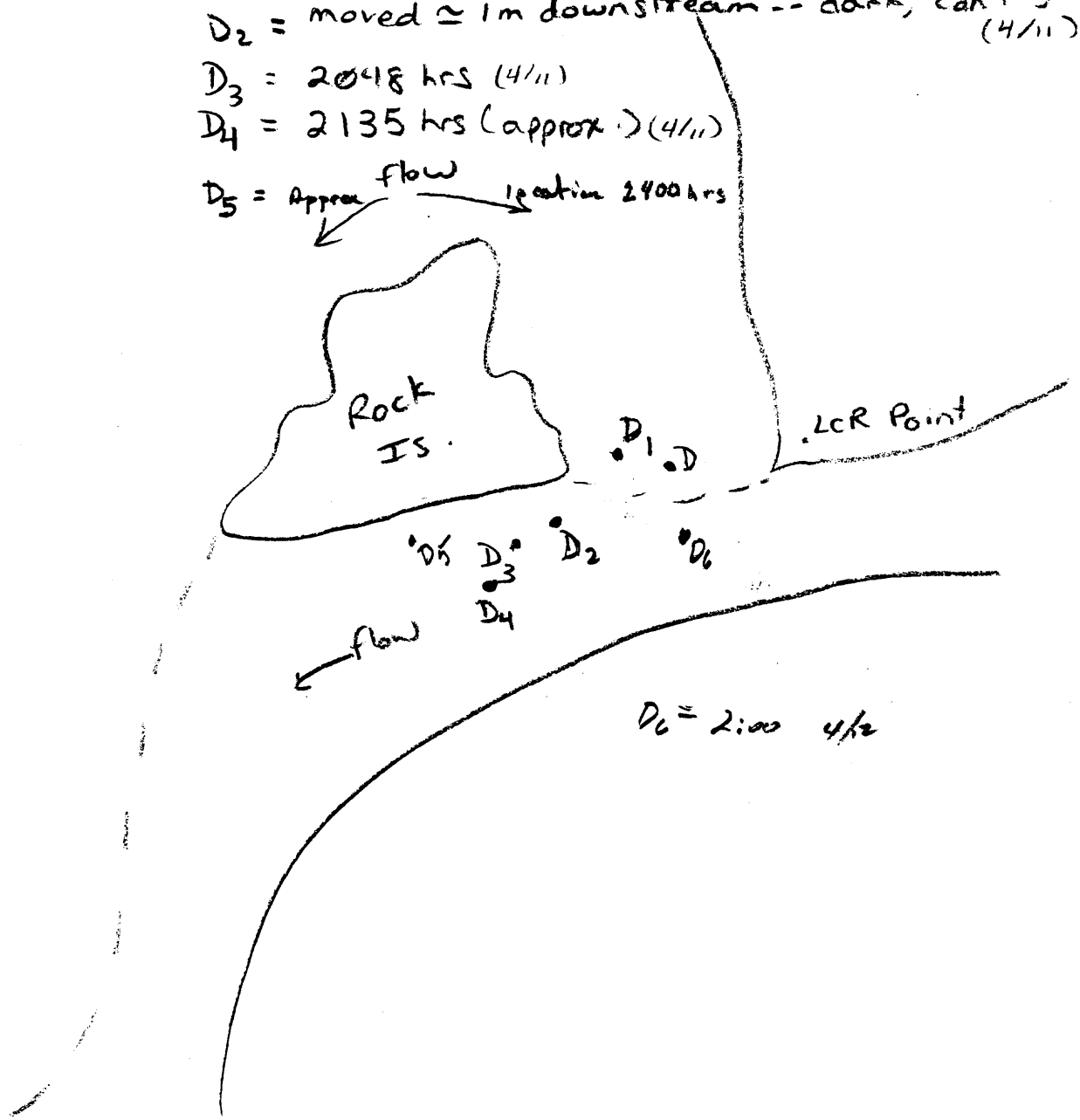
Habitat Sketch:

D = 1st located @ 1635 hrs (4/11)
D_1 = moved near fish .670 @ 1830 hrs (4/11)
D_2 = moved ≃ 1m downstream -- dark, can't give exact location (4/11)
D_3 = 2048 hrs (4/11)
D_4 = 2135 hrs (approx.) (4/11)
D_5 = Approx location 2400 hrs



D_6 = 2:00 4/12

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 004 Trip: 04 Reach: 1 CB #: 2 Date: 910411

PIT tag: 7E7E3E3B00 Freq 2: 40.680 Pulse 2: 70

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2245	61.3	SC		–	–		NI	CS	H
COMMENTS same									
2400	61.3	SC	~ 20m	290.0	+43		NI	CS	H
moved up stream (gage reading taken @ 2345 hrs)									
910412 0050	61.3	SC	0	231.5	+41.5		NI	PC	H
same position									
01:59	61.3	SC		211.0	-120.5		NI	PC	H
MOVED up onto mouth of LCR									
02:55	61.3	SC		215.0	+4.0		NI	PC	H
SAME AS 1:59 observation									
0345	61.3	SC		216.0	+1.0		NI	CS	H
same									
0449	61.3	SC		218.0	+2.0		NI	CS	H
same									
0550	61.3	SC		—			DD	CS	H
fish is in plume margin at top of [illegible]									
0655	no contact								

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

(cont) **Telemetry Observations**

Sample No: 004 Trip: 04 Reach: 1 CB #: 2 Date: 910414

Start Time: ____ End Time: ____ River: CO RM: 61.3 <Locate:_ 2H:_ 24H:✓ Mode Test Flow:_ Implant:_>

Habitat Map #: _____ Benchmark: 2.0612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: ___-__ Crew: GD, __, __

Fish Information

Species: H B PIT tag: 7F7F3E3B00 TL: 410 Wt.: 688 Radiotag Size: 11 g

Freq 1: 40.680 Freq 2: 40.680 Pulse 1 (#/min): 66 Pulse 2: 70 Surgeon: __

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity

COMMENTS

10414

(1) 0145 61.3 SC 20.5 NI CS L

First picked signal up 0015 am

300° from T1 215° from T3 Fish is in green Colo. R. water between LCR Point & Rock Island

(2) 0207 61.3 SC 22.5 +6.5 NI CS L

310° from T1 215° from T3

(3) 0316 61.3 SC 27.0 +4.5 NI CS L

T1 = 322, T3 = 221°

(4) 0426 61.3 SC 27.0 0

T1 = 323 T3 = 230

(5) 0100 SC 24.0 -3.0 NI CS

Not contacted

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

(cont.) **Telemetry Observations**

Sample No: 004 Trip: 04 Reach: L CB #: 2 Date: 910414

Start Time: ____ End Time: ____ River: CO RM: 61.3 <Locate:_ 2H:_ 24H:✓ Mode Test Flow:_ Implant:_>

Habitat Map #: _____ Benchmark: _____ Confidence: _

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: DV, GD, EP

Fish Information

Species: HB PIT tag: 7F7F3E3800 TL: 410 Wt.: 688 Radiotag Size: U g

Freq 1: 40.680 Freq 2: 40.680 Pulse 1 (#/min): 66 Pulse 2: 70 Surgeon: __

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
6	0730	61.3	–	?	20.5	-3.5		SU	CS	Low above LCR High below LCR

COMMENTS no contact

2	1030	61.3	–		20.5	Ø		SU	CS	L

no contact

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 005 Trip: 04 Reach: 1 CB #: 2 Date: 910411

Start Time: 2000 End Time: ____ River: CO RM: 61.3 <Locate:_ 2H:_ 24H:X Mode Test Flow:_ Implant:_>

Habitat Map #: CCFS 37.14 9104/12 Benchmark: 2.0612 Confidence: 2

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: AH, GW, EP

Fish Information

Species: H B PIT tag: 7F7F3F520D TL: 373 Wt.: 604 Radiotag Size: 11 g

Freq 1: 40.630 Freq 2: 40.630 Pulse 1 (#/min): 86 Pulse 2: 88 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2000	61.3	SC		215.0			NI	CS	H
COMMENTS Located fish in same vicinity as .710 ("C" on map label)									
2048	61.3	SC		241.5	26.5		NI	CS	H
Same.									
2135	61.3	SC		241.5	0		NI	CS	H
same									
2210	61.3	SC		247.0	+5.5		NI	CS	H
same. H_2O starting to rise									
2245	61.3	SC					NI	CS	H
Moved to same locality as .680 (D4)									
2400	61.3	SC		290.0	+ 43.0		NI	CS	H
same area (gage reading taken @ 2345 hrs)									

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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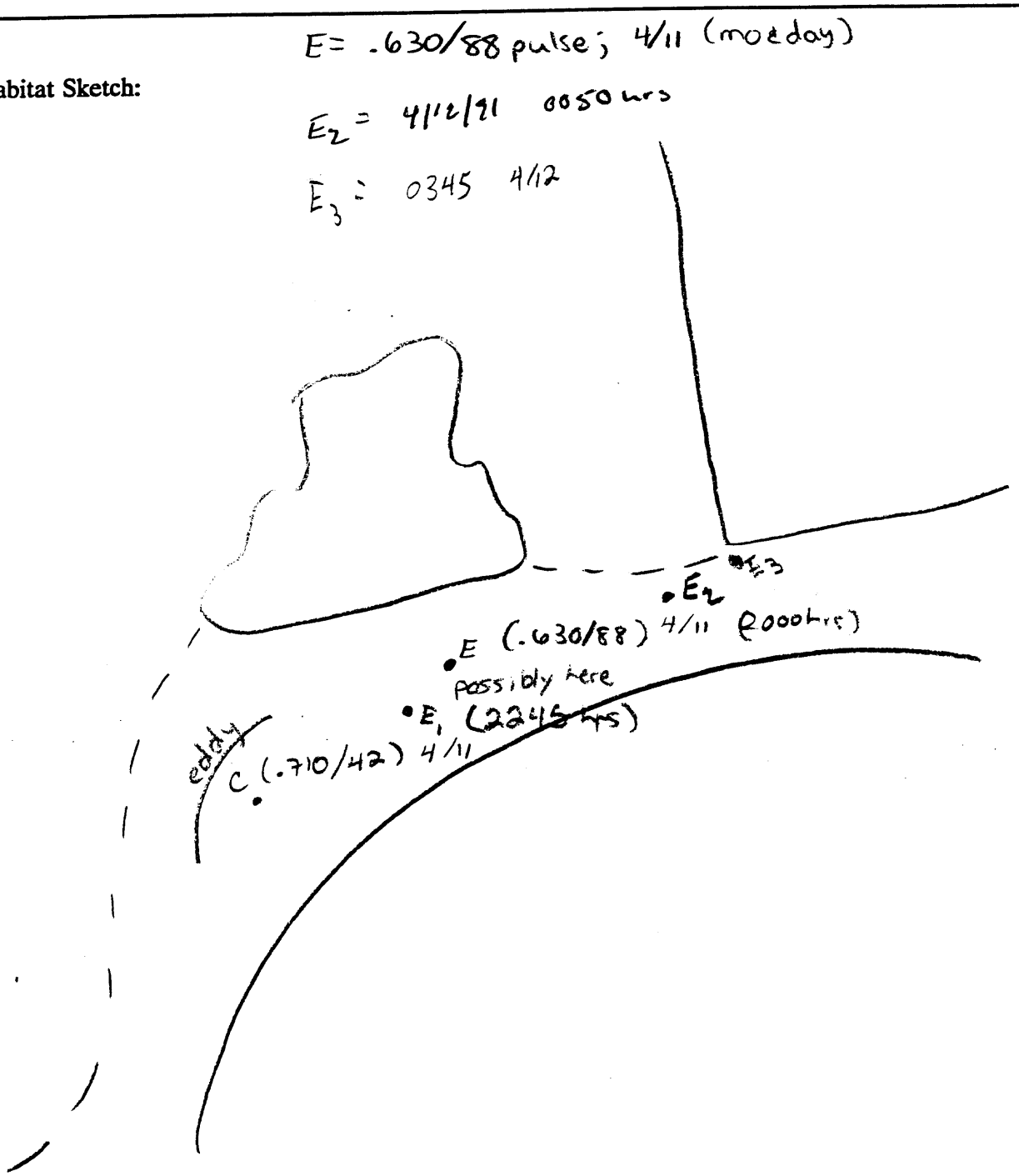
Habitat Sketch:



BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 005 Trip: 04 Reach: 1 CB #: 2 Date: 910412

Start Time: continuation of 3 days End Time: ____ River: CO RM: 61.3 <Locate:_ 2H:_ 24H:X Test Flow:_ Implant:_> Mode

Habitat Map #: GCES-3714 910412 Benchmark: 2.0612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: AH, GW, EP

Fish Information

Species: HB PIT tag: 7F7F3F520D TL: 377 Wt.: 604 Radiotag Size: 11 g

Freq 1: 40.630 Freq 2: 40.630 Pulse 1 (#/min): 86 Pulse 2: 88 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0050	61.3	SC	~20 m	375	+41.5		NI	PC	L
COMMENTS moved downstream into mouth area									
50-1:50 gauge fell down									
01:50	61.3	SC		211.0-12	0.5		NI	PC	L
SAME AREA E2 @ 1:50 4/12									
02:40	61.3	SC		215.0	+4.0		NI	PC	L
Same as E2									
0345	61.3	SC		216.0	+1.0		NI	CS	L
Moving into the LCR, @ LCR point.									
0449	61.3	SC		218	+2.0		NI	CS	L
Same									
0535	61.3	SC		213.5	-4.5		DD	CS	L
Same									

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 005 Trip: 04 Reach: 1 CB #: 2 Date: 910412

continuation of 24hr started 910411

Start Time: ____ End Time: ____ River: CO RM: 61.3 <Locate:_ 2H:_ 24H:✓ Mode Test Flow:_ Implant:_>

Habitat Map #: GCES 37-14 4/12/91 Benchmark: 2.0612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: HY, BL AH

Fish Information

Species: HB PIT tag: 7E7E3E520D TL: 377 Wt.: 604 Radiotag Size: 11 g

Freq 1: 40.630 Freq 2: 40.630 Pulse 1 (#/min): 86 Pulse 2: 88 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2104	61.3	SC	-	310			NI	CS	L
COMMENTS T_1 - 320° T_3 224° - D1 on map Slow run									
2217	61.3	SC	Ø	35.0	+4		NI	CS	L
same position									
2300	61.3	SC	Ø	51.0	+16		NI	CS	L
same position									
910413-0016	61.3	SC		37.5 (24.0)	-13.5		NI	CS	L
T_1 = 312° T_3 = 202° - D2 on map									
910413 0100	61.3	SC	10m	32.0 (21.7)	-5.5		NI	CS	L
run T_1 = 300 T_2 = 203 - D3 on map NEAR SHORE W/IN 50m OF LIGHT									
910413 0200	61.3	SC	Ø	23.0	+13		NI	CS	L
run Same location									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 005 Trip: 04 Reach: L CB #: 2 Date: 910413

PIT tag: 7F7F3F520D Freq 2: 40.630 Pulse 2: 88

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0300	61.3	SC	Ø	233	+3		NI	CS	L
COMMENTS									
0358	61.3	SC	Ø	231	-2		NI	CS	L
0508	61.3	SC	Ø	223	-3		NI	CS	L
0607	61.3	SC	Ø	2225	-5.5		DD	CS	L
0715	no contact								
0950	61.3			223	+.5				
11:44	61.3		no contact						
1331	61.3	MC					SU	CS	Low Above LCR High Below LCR

COMMENTS: same

0358: same location - no movement air temp 7°C CT-8°

0508: no movement - same location

0607: no movement same

0950: NO CONTACT

(1331) Extremely weak contact on ATS. Fish may be upriver toward Surgeon Point / Chub Rock area

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 005 Trip: 04 Reach: 1 CB #: 2 Date: 910413

PIT tag: 7F7F3F520D Freq 2: 40.630 Pulse 2: 88

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1518	61.2	MC					SU	PC	L

COMMENTS Fish appears to be under Chub Rock, but signal is weak & nulls unclear.

1550	61.2	MC		11.0			SU	PC	L

Fish located & triangulated in deep calm, clear water beneath Chub Rock, eddie

1710	61.2	MC	~30m	37.5	-4.9		SH	CS	L

Fish moved ~ 30 m. closer to LCR. Temp LCR = 11°C

① 2020	61.3	SC		17.0	-20.5		DD	CS	L

Moved from chub Rock to 305°, reading taken from Point T_1, T_3 = 214°

② 2150	61.3	SC		61.7	-8.5		NI	CS	L

296° from T_1, 249° from T_3 run

③ 2303	61.3	SC		60.0	-1.7		NI	CS	L

(run) 310° from T_1, parallel null from T_3 in Green Color. water between LCR pt and Chub Rk

910414

④ 0005	61.3	SC		9.5	+2.0		NI	CS	L

344° from T_1 220° from T_3 (run) fish has moved upstream slightly

⑤ 0120	61.3	SC		16.0	+7.5		NI	CS	L

333° from T_1 220° from T_3 (run)

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 005 Trip: 04 Reach: 1 CB #: 2 Date: 9 10 4 14

PIT tag: 7F7F3F 52 0D Freq 2: 40.630 Pulse 2: 88

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
6	0209	61.3	SC		22.5	+6.5		NI	CS	L
	330° from T_1		210° from T_3							
COMMENTS					run					
7	0314	61.3	SC		27	+4.5		NI	CS	L
	T_1 = 320°, T_3 = 210°					run				
1	0426	61.3	MC		27.0	Ø		NI	CS	L
	T_1 = 340		T_2 = 320		Fish moving to Chub Rock			run/eddie		
	0600	61.3	–		24.0	-3.0	-	DD	CS	
	Not contacted									
	0730	61.3	–		20.5	-3.5		SU	CS	L
	NO CONTACT									
	1037	61.3			20.5	Ø		SU	CS	L
	NO CONTACT									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 006 Trip: 04 Reach: 1 CB #: 2 Date: 910415

Start Time: 1845 End Time: ____ River: CO RM: 60.8 <Locate:_ 2H:_ 24H:✓ Mode Test Flow:_ Implant:_>

Habitat Map #: E ESPN ROCK Benchmark: 2.0608 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: AH, BL, GW

Fish Information

Species: HB PIT tag: 7F7F3C243E TL: 382 Wt.: 580 Radiotag Size: 11 g

Freq 1: 40.621 Freq 2: 40.620 Pulse 1 (#/min): 64 Pulse 2: 66 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1845	60.8						DD	CS	L

COMMENTS No Fish on surveillance run

→ $T_2 = 312°$

1950	60.8	MC	—	50.0	—	—	DD	CS	L

$T_1 = 244°$ $T_2 = 228°$

NEAR alcove on River Right next to Tapeats Ledge, in eddy

2030	60.8	MC	Ø	45.0	-5.0	—	NI	CS	L

SAME LOCATION

2100	60.8	MC	Ø	42.0	-3.0	—	NI	CS	L

SAME LOCATION

2135	60.8	MC	Ø	39.5	-2.5	—	NI	CS	L

SAME LOCATION – SIGNAL INCREASES AND DECREASES BUT ALWAYS AUDIBLE.

2200	60.8	MC	Ø	39.0	-0.5	—	NI	CS	L

SAME LOCATION

FORM 4, Page 2

Habitat Measurements:

Hab1: M C Hab2: E D Depth: 1 1 .1 m V 0.2: 0 .03 m/s V 0.6: — . — m/s V 0.8: 0 .04 m/s

V Bottom: — . — m/s AirT(c): 2 2° McT: 1 0 .5 7 HabT: 1 0 .5 7 Sub1: B E Sub2: S L

Cover: Over: 0 B Lat: V W In: N C Turb: C DO: 10 .48 mg/l pH: 6 .19 Cond: 1 0 0 3 umhos/cm

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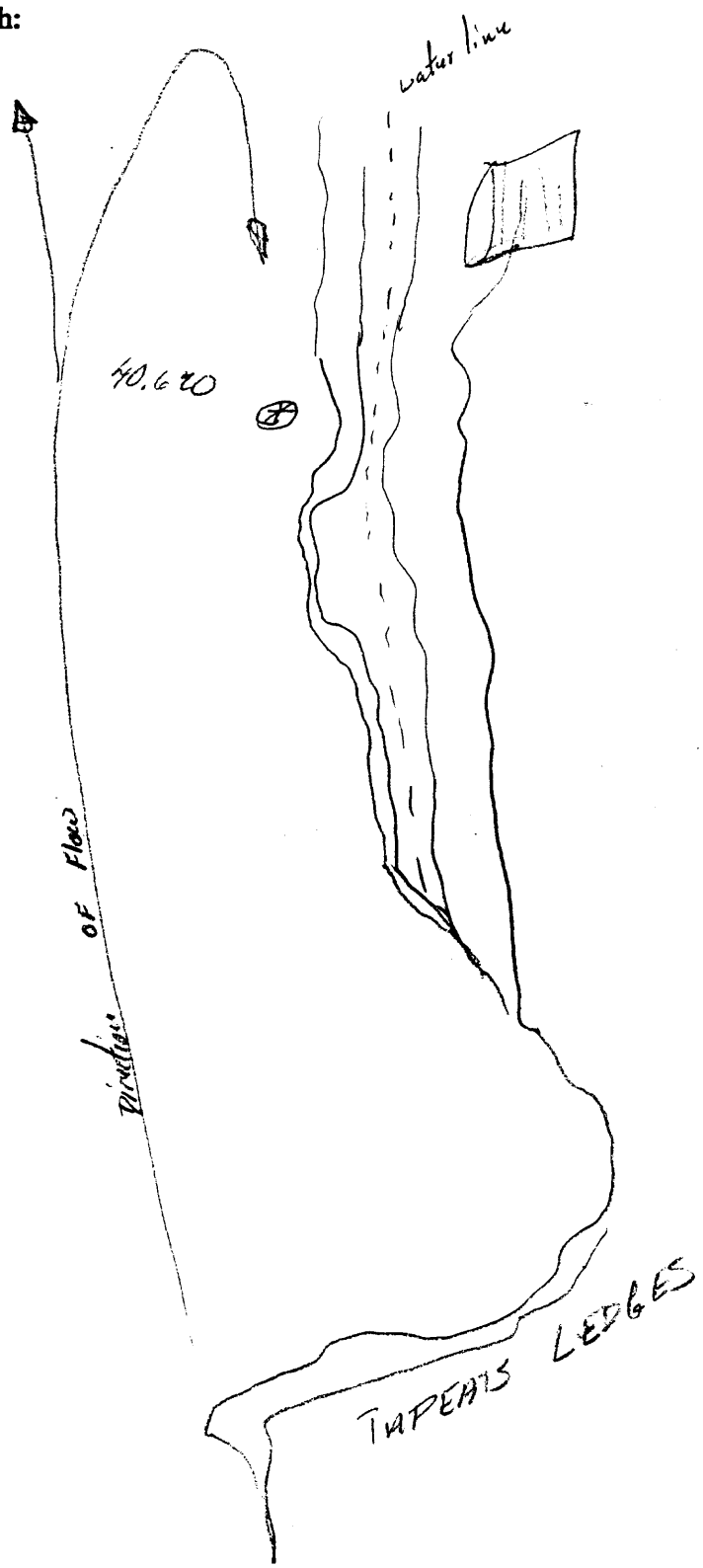
Habitat Sketch:



BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 006 Trip: 04 Reach: 1 CB #: 2 Date: 910415

PIT tag: 7F7E3C243E Freq 2: 40.620 Pulse 2: 66

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2230	60.8	mc	Ø	38.0	-1.0	—	NI	CS	L
COMMENTS			NO MOVEMENT, SAME LOCATION, in eddy						
2300	60.8	mc	Ø	41.5	+3.5	—	NI	CS	L
			SAME LOCATION						
2330	60.8	mc	Ø	47.0	+5.5	—	NI	CS	L
			SAME LOCATION, WINDS CREATING WHITECAPS						
910416 0005	60.8	mc	Ø	60.0	+13.0	—	NI	CS	L
			SAME LOCATION						
0135	60.8	mc	Ø	27.0	+5.0	—	NI	CS	L
			same location ; same wind						
0200	60.8	mc	Ø	39.0	+12.0	-	NI	CS	L
			same location						
0230	60.8	mc	Ø	49.0	+10	—	NI	CS	L
			same location ; same wind ; different sand						
0300	60.8	mc	Ø	54.0	+5	—	NI	CS	L
			same location						

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 006 Trip: 04 Reach: 1 CB #: 2 Date: 910416

PIT tag: 7F7F3C243E Freq 2: 40.620 Pulse 2: 66

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0330	60.8	MC	Ø	4.0	+1.0	—	NI	CS	L
COMMENTS	Same Location, in eddy								
0400	60.8	MC	Ø	4.0	0	—	NI	CS	L
	SAME Location								
0435	60.8	MC	Ø	5.0	+1.0	—	NI	CS	L
	SAME								
0500	60.8	MC	Ø	6.0	+1.0	—	NI	CS	L
	SAME								
0530	60.8	MC	Ø	5.0	-1.0	—	NI	CS	L
	SAME Location								
0600	60.8	MC	Ø	5.0	Ø	—	DD	CS	L
	SAME Location								
0630	60.8	—	Ø	4.0	-1.0	—	DD	CS	L
	No Signal								
0700	60.8	—	—	3.0 (54.0)	-1.0	—	DD	CS	L
			NO	Signal					
0740	60.8	—	—	53.0	-1.0	—	SH	CS	L
0813	60.8	—	—	NO SIGNAL 54.0	+1	—	SH	CS	L
				NO SIGNAL					

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 007 Trip: 04 Reach: 1 CB #: 2 Date: 910416

Start Time: 1953 End Time: 1100 River: CO RM: 57.2 <Locate:_ 2H:_ 24H: ✓ Test Flow:_ Implant:_> Mode

Habitat Map #: Bio-West #4 Benchmark: R0572 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __ Crew: RV, DV, HV

Fish Information

Species: H B PIT tag: 7E7E3E362E TL: 369 Wt.: 497 Radiotag Size: 09 g

Freq 1: 40.640 Freq 2: 40.642 Pulse 1 (#/min): 42 Pulse 2: 36 Surgeon: __

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
	1953	57.2	MC		2019 345			DD	PC	L
COMMENTS	Fish off right shore in Muav boulders - hard to pinpoint location									
1	2220	57.2	MC	0				NI	CS	L
	Signal strength variable. Fish located in large boulder pocket, river right.									
	2039	57.2	MC					NI	CS	L
	Lost contact with fish.									
	2048	57.2	MC					NI	CS	L
	No contact									
	2108	57.2	MC					NI	CS	L
	No contact									
	2129	57.2	MC		240	-105		NI	CS	L
	No contact									

7F7F3E362E

See fallometer readings
See Bench Mark Sheet

FORM 4, Page 2

Habitat Measurements: Readings from boulder #3 – fish location (3)

Hab1: MC Hab2: RU (slow run) Depth: .12.0 (flat) m V 0.2: .05 m/s ~~V 0.6: . . m/s~~ V 0.8: .24 m/s
(V_1=.06, V_2=.07, V_3=.04) (.28, .23, .24)

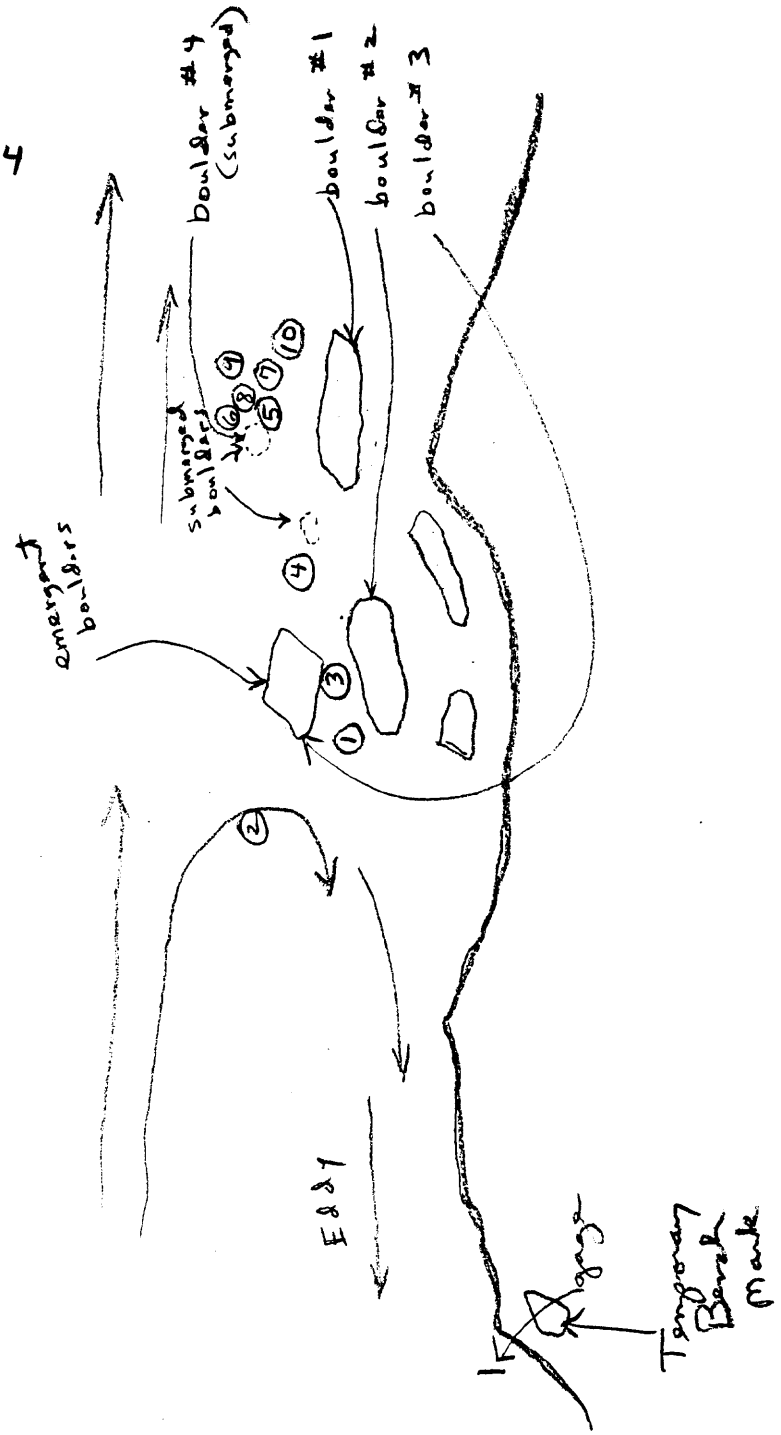
V Bottom: NA m/s AirT(c): NA McT: NA HabT: NA Sub1: BO Sub2: SA

Cover: Over: NC Lat: BO In: BO Turb: C DO: – mg/l pH: – Cond: – umhos/cm

---

Habitat Sketch:

See Black & White Photo Map #4



RM 57.2

Rich Valley
4-17-91

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 007 Trip: 04 Reach: 1 CB #: 2 Date: 910416

PIT tag: 7E7E3E362E Freq 2: 40.642 Pulse 2: 36

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
	2146	57.2	MC	?				NI	CS	L
	COMMENTS NO contact									
(2)	2151	57.2	MC	30m				NI	CS	L
	Relocated near same location - further out into river off main boulders river right. Signal variable									
	2155	57.2	MC	Ø	2			NI	CS	L
	same location									
	2215	57.2	MC	Ø	210			NI	CS	L
	Signal faded - same location									
	2253	57.2	MC		215	+5		NI	CS	L
	NO CONTACT									
	2319	57.2	MC					NI	CS	L
	No contact									
	2345	57.2	MC					NI	CS	L
	Very weak signal									
	0029	57.2	MC		390	+175		NI	CS	L
	No contact									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 002 Trip: 04 Reach: 1 CB #: 2 Date: 910416

PIT tag: 7E7E3E362E Freq 2: 40642 Pulse 2: 36

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0044	57.2	MC		400	+10		NI	CS	L
COMMENTS Brief signal, fish still appears to be under boulders, [illegible] unable to triangulate									
1320	57.2	MC		560	+160		NI	CS	L
No contact									
0051	57.2	MC					NI	CS	L
No contact									
0226	57.2	MC					NI	CS	L
No contact									
0245	57.2	MC					NI	CS	L
No contact									
0254	57.2	MC		Gage B 200			NI	CS	L
Very weak contact									
0311	57.2			A=840 B=230			NI	CS	L
No contact									
0331	57.2	MC		B=260	+30		NI	CS	L
No contact									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 002 Trip: 04 Reach: 1 CB #: 2 Date: 910417

PIT tag: 7E7E3E362E Freq 2: 40642 Pulse 2: 36

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0419	572	MC	–	310			NI	CS	L
not contacted									
0450	572	MC		330			NI	CS	L
no contact									
(3) 0510	572	MC		335			DD	CS	L
Fish recontacted weak signal from between rocks - river right									
(4) 0527	572	MC	20m	327			DD	CS	L
Fish moved to between second and third rock out									
(5) 0600	572	MC	30m	320			DD	CS	L
Fish moved downstream of exposed rocks									
0630	572	MC	0	313			DD	CS	L
Same location – (5)									
0700	572	MC	0	310			DD	CS	L
Same location									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

This fish was tied closely to instream cover - boulders

Telemetry Observations

Sample No: 007 Trip: 04 Reach: 1 CB #: 2 Date: 910417

PIT tag: 7F7F3E362E Freq 2: 40.642 Pulse 2: 36

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
6	0722	572	MC	5m	300			SH	CS	L
	COMMENTS Still near boulder - moved slightly toward center channel - good signal									
7	0800	572	MC	7m	293			SH	CS	L
	moved to downstream end of rock - strong signal									
8	0830	572	MC	5m	285			SH	CS	L
	moved toward main channel - strong signal - good mill									
	0850	572	MC	0	282			SH	CS	L
	same location - 8 strong signal									
	0915	572	MC	0	275		sun just hit the water @ 0915	SU	CS	L
	same location - 8 strong signal - good mill									
9	0945	572	MC	5m	275			SU	CS	L
	moved slightly downstream - very strong signal - good mill									
	1000	572	MC	5m	275			SU	CS	L
	same location as 9 - very strong signal - good mill									
10	1030	572	MC	3m	280			SU	CS	L
	moved to downstream side of submerged boulder - signal strong, good mill									
	1040	572	MC	0	280			SU	CS	L
	same location - 10 - very strong signal - good mill									
	1050	572	MC	0				SU	CS	L

007 Trip 04 Reach 1 CB # 2 910416-17th river right to left
Start 1953 hrs End 1100 hrs CO River RM 57.2 Benchmark R. 05

Fathometer

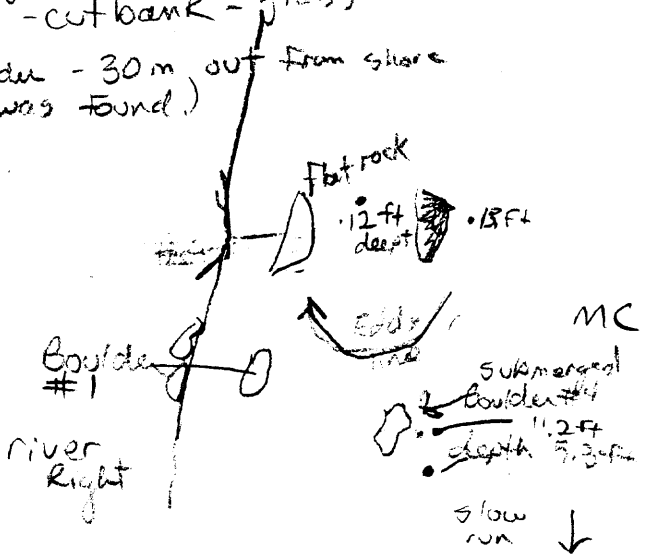
Run #1
Boulder #2 across to boulder 5m. upstream tip of at reattachment bar (on shore)

Run #2
mid eddy - boulder slope to mid eddy on river left (two boulders - travertine)

Run #3 - Downstream of Boulders 1, 2, 3 & 4 - Huge limestone Boulder on shore 20 m.
across to down stream beach at - cut bank - grass

Run #4 (a) Parallel to shore - From Run #3 boulder - 30 m out from shore
80 ft (marks in mid run where fish was found.)
40 ft scale (b) Parallel to shore - 30 m from shore
marks where fish was

Run 5 Between boulders 2+3 + boulder 1
boulder slope to H_2O across to
upstream tip of beach large
boulder on shore



Swoffer readings in wind!

#1 12 ft from surface - back side of submerged boulder #4 toward MC where fish was in Am

.52
.22
.16
.21

#2 Between Rocks 3+4 (upstream boulders where fish was 1st)

	.2	.8
1	.06	.28
2	.07	.22
3	.04	.24
		74

$\frac{74}{3} = 24$

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 100 Trip: 04 Reach: 1 CB #: 1 Date: 9L0412

Start Time: 1300 End Time: 1430 River: LCR RM: 500 m <Locate: ✓ 2H:_ 24H:_ Test Flow:_ Implant:_> Mode

Habitat Map #: GCES-016 Benchmark: _____ Confidence: L

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: HY, __, __

Fish Information

Species: H B PIT tag: 7F7F3E372A TL: 387 Wt.: 599 (at time of implant) Radiotag Size: 11 g

Freq 1: 40.600 Freq 2: 40.600 Pulse 1 (#/min): 85 Pulse 2: 88 Surgeon: BM

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1330	500m	TS	Ø	—	—	—	SU	CS	H

COMMENTS Fish located ≈ 20 m upstream of Beamer's cabin in a slow run at cut bank w/Phrdgmites above - River left

Coffee →

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 10 L Trip: 04 Reach: L CB #2 Date: 910411

Start Time: 2048 End Time: ____ River: CO RM: 61.3 Locate: ✓ Mode 2H: _ 24H: _ Test Flow: _ Implant: _

Habitat Map #: GCES 3714 910412 Benchmark: 2.0612 Confidence: 2 (Night time)

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: AH, GW, EP

Fish Information

Species: H B PIT tag: 7F7E3C4452 TL: 404 Wt.: 670 Radiotag Size: 11 g

Freq 1: 40.600 Freq 2: 40.600 Pulse 1 (#/min): 62 Pulse 2: 68 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2048	61.3	SC		241.5			NI	CS	L
COMMENTS Located upstream of fish #.710 (see back)									
2135	61.3	SC		241.5	0		NI	CS	L
same -- very distant pulse									
2210	61.3	SC		247.0	+5.5		NI	CS	L
same. H_2O is rising									
2245	61.3	SC					NI	CS	L
moved to same locality as .740 (A4)									
2400	61.3	SC	0	290.0			NI	CS	L
same area (gage reading @ 2345 hrs)									
0050	61.3	SC	0	331.5	+41.5		NI	PC	L
same area									

0155 – 1:45 gauge fell down

1:45 211

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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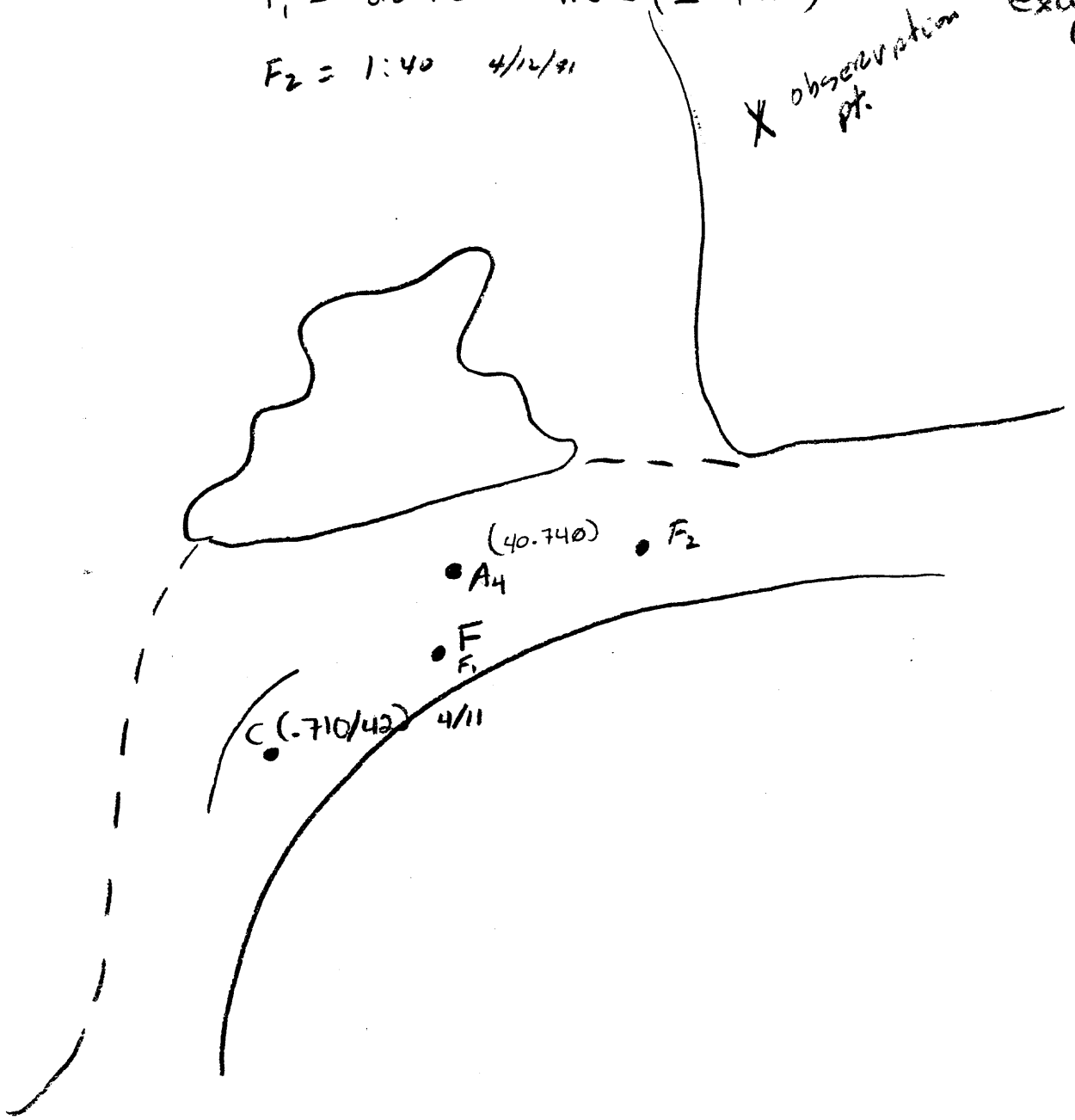
Habitat Sketch:

F = .710/42 pulse 4/11 (month & day)

F_1 = 2245 hrs moved (≃ 1 m)

F_2 = 1:40 4/12/81

Not for sure exact location



BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 101 Trip: 04 Reach: 1 CB #: 2 Date: 91 04 12

Start Time: continuation of 3 days End Time: ____ River: CO RM: 61.3 <Locate: ✓ 2H: _ 24H: _ Test Flow: _ Implant: _> Mode

Habitat Map #: GCES 3714 Benchmark: 20612 Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: GW, EP, AH

Fish Information

Species: H B PIT tag: 7E7E3C4452 TL: 404 Wt.: 620 Radiotag Size: 11 g

Freq 1: 40.600 Freq 2: 40.600 Pulse 1 (#/min): 62 Pulse 2: 68 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
01:40	61.3	SC	F2	211	-120.5		NI	PC	L

COMMENTS

02:30	61.3			211	Ø		NS	PC	
No Signal									
0337	61.3	SC		216	+5.Ø		NI	CS	L
Faint signals detected (near LCR point)									
Ø449	61.3	SC		218	+2.Ø		NI	CS	L
In LCR strong signals around "Martiner Rock"									
0605	61.3		no contact				DD	CS	
0650			no contact						

Not Signal (faint) no pulse tuner or either

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 102 Trip: 04 Reach: L CB #: 1 Date: 910412

Start Time: 1415 End Time: 1620 River: LCR RM: 500m _ <Locate: 1/2H: _ 24H: _ Test Flow: _ Implant: _> Mode

Habitat Map #: 6CE#016 _ Benchmark: _ _ _ _ _ _ Confidence: 1

Habitat Photo: Camera _ _ Roll: _ _ Frame: _ _-_ _ Crew: HV, _ _, _ _

Fish Information

Species: H B PIT tag: 7E7E3E372A TL: 387 Wt.: 599 Radiotag Size: 11 g

Freq 1: 40.600 Freq 2: 40.600 Pulse 1 (#/min): 85 Pulse 2: 88 Surgeon: BM

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1440	500m	TS	0	—	—	—	CS	OV	H

COMMENTS Found at same location as 4/11/90 just upstream of Beamers cabin - cut bank - phragmites - fast run river left - upstream side of

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 103 Trip: 04 Reach: 1 CB #: 1 Date: 910412

Start Time: 1450 End Time: 1720 River: CO RM: 60.9 <Locate:_ 2H:X 24H:_ Test Flow:_ Implant:_> (Mode)

Habitat Map #: B_____ Benchmark: _____ Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: EP, __, __

Fish Information

Species: HB PIT tag: 7F7F3C243E TL: 382 Wt.: 580 Radiotag Size: 11 g

Freq 1: 40.621 Freq 2: 40.620 Pulse 1 (#/min): 64 Pulse 2: 66 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1450	60.9	MC					SH	OV	L (1.0m)

COMMENTS River left, @ base of drainage & downriver @ boulder (on land)

1720	60.9	MC					DD	OV	L (1.0m)

Same.

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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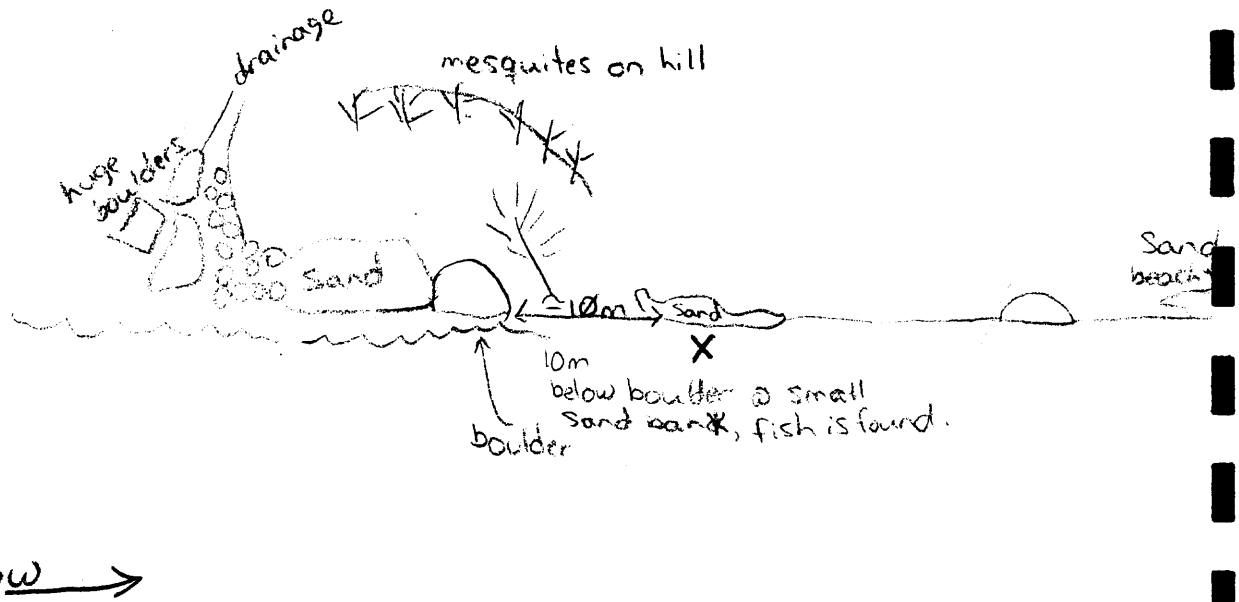
Habitat Sketch:



FORM 4

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 104 Trip: 04 Reach: 1 CB #: 1 Date: 910412

Start Time: 1450 End Time: 1720 River CO RM: 60.8 <Locate:_ 2H:X 24H:_ Test Flow:_ Implant:_> (Mode)

Habitat Map #: _____ Benchmark: _____ Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: EP, __, __

Fish Information

Species: H B PIT tag: _____ TL: ___ Wt.: ____ Radiotag Size: __ g

Freq 1: 40.660 Freq 2: 40.660 Pulse 1 (#/min): __ Pulse 2: __ Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1450	60.8	MC					SH	OV	L (1.0m)

COMMENTS 0 ESPN Rock, never moved!

FORM 4

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 105 Trip: 04 Reach: 1 CB #: 2 Date: 910413

Start Time: 1300 End Time: 1600 River: LC RM: 61.3 <Locate: ✓ 2H: 24H: Test Flow: Implant: Mode>

Habitat Map #: _____ Benchmark: _____ Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: GD, __, __

Fish Information

Species: HB PIT tag: 7F7F3E3F2A TL: 387 Wt.: 599 Radiotag Size: 11 g

Freq 1: 40.600 Freq 2: 40.600 Pulse 1 (#/min): 85 Pulse 2: 88 Surgeon: BM

	Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
	1300	LCR 0.2	TS					SU	CS	H
COMMENTS	fish located on LCR left side ≈ 20 m above Beamer's Cabin									
	1620	LCR 0.2	TS	10 m				SU	CS	H
	fish still on LCR left ≈ 10 m above Beamer's Cabin									
910414	0800	LCR 0.2	TS	10 m				SU	CS	H
	fish is near top end of Phragmites bed and ≈ 2 m offshore									

FORM 4

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 106 Trip: 04 Reach: 1 CB #: 2 Date: 921013

Start Time: 1710 End Time: 1733 River: CO RM: 060.6 <Locate: ✓ Mode 2H:_ 24H:_ Test Flow:_ Implant:_>

Habitat Map #: _____ Benchmark: _____ Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: BL, AH, __

Fish Information

Species: H B PIT tag: 7F7E3C4208 TL: 400 Wt.: 634 Radiotag Size: 1L g

Freq 1: 40.660 Freq 2: 40.660 Pulse 1 (#/min): 64 Pulse 2: 58 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1733	60.6	MC	~	✓			DD	PC	L

COMMENTS Fish in eddy behind ESPN rock. Difficult to wall river left

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ 18 McT: _ 9 .5 HabT: _ 8 .5 Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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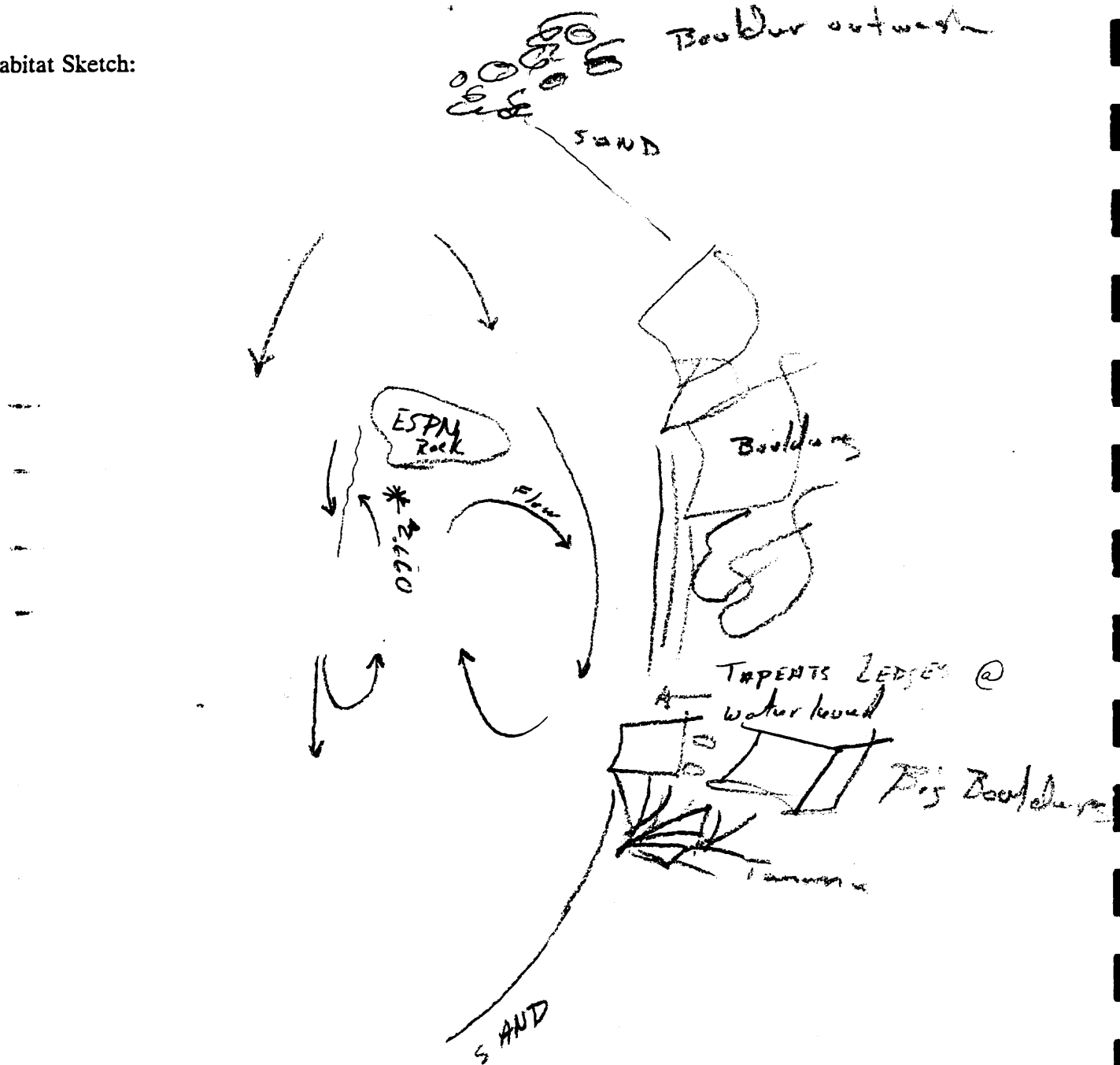
Habitat Sketch:



BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 107 Trip: 04 Reach: 1 CB #: 3 Date: 910415

Start Time: 1300 End Time: 1518 River: CO RM: 61.7 <Locate:_ 2H:X 24H:_ Test Flow:_ Implant:_> Mode

Habitat Map #: GCES37-14 Benchmark: 145cm Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: DV, AH, EP

Fish Information

Species: HB PIT tag: 7F7F3E3D23 TL: 394 Wt.: 635 Radiotag Size: 11 g

Freq 1: 40.670 Freq 2: 40.670 Pulse 1 (#/min): 84 Pulse 2: 98 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1300	61.7	mc		192			PC	PC	H
COMMENTS T_1 = 247°, T_2 = 200°. In muddy H_2O near sandy beach									
1406	61.7	mc		192			PC	PC	H
T_2 = 218° T_3 = 332°									
1437	61.7	mc		192			PC	PC	H
T_1 = 220° T_2 = 246° T_3 = 338°									
1518	61.7	mc		190.5			PC	PC	H
T_1 = 220° T_2 = 208° T_3 = 350°; muddy H_2O (Seems to be nearer to shor									

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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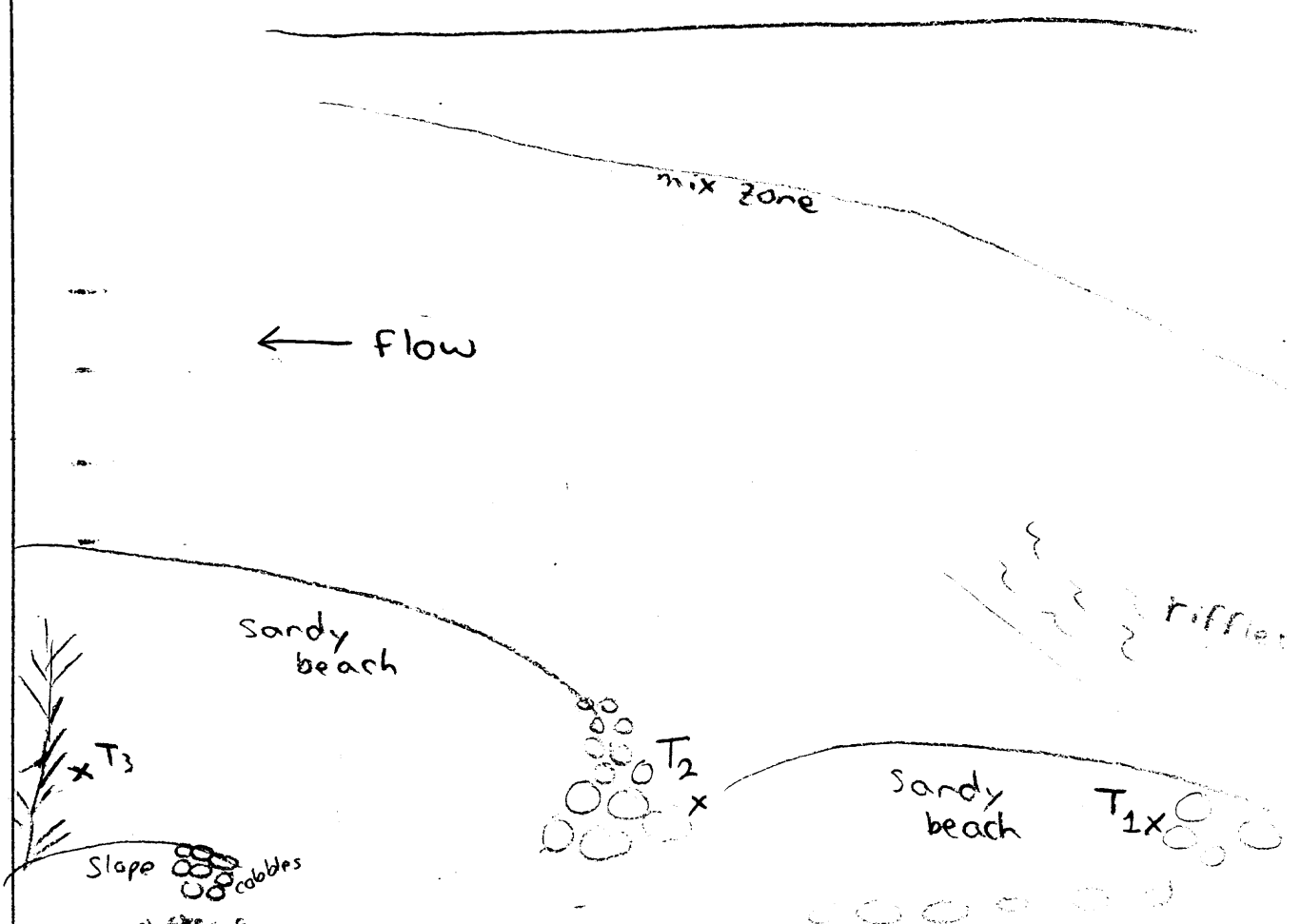
$T_1 \rightarrow T_2 = 225°$

Habitat Sketch: $T_2 \rightarrow T_3 = 166°$



T_3 = by clump of Tamarask on slope

T_2 = @ cobble point dividing 2 beaches

FORM 4

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 108 Trip: 04 Reach: 1 CB #: 3 Date: 910415

Start Time: 1300 End Time: 1518 River: CO RM: 61.7 <Locate:_ 2H:X 24H:_ Test Flow:_ Implant:_> Mode

Habitat Map #: GCES37-14 Benchmark: 145cm Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: DV, AH, EP

Fish Information

Species: HB PIT tag: 7F7F3F3A5C TL: 385 Wt.: 594 Radiotag Size: 1L g

Freq 1: 40.710 Freq 2: 40.710 Pulse 1 (#/min): 41 Pulse 2: 46 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1300	61.7	mc		192			PC	PC	H

these #s do not triangulate

COMMENTS $T_1 = 270°$ $T_2 = 261°$ In muddy H_2O near sandy beach.

1406	61.7	mc		192			PC	PC	H

still in muddy water. $T_2 = 232°$ $T_3 = 332°$

1437	61.7	mc		192					

$T_1 = 222°$ $T_2 = 220°$ $T_3 = 318°$

1518	61.7	mc		190.5			PC	PC	H

$T_1 = 222°$ $T_2 = 220°$ $T_3 = 332°$

FORM 4

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 109 Trip: 04 Reach: 1 CB #: 3 Date: 910415

Start Time: 1400 End Time: 1410 River: LCR RM: 500m <Locate: ✓ 2H: _ 24H: _ Test Flow: _ Implant: _> (Mode)

Habitat Map #: _____ Benchmark: _____ Confidence: L

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: GD, __, __

Fish Information

Species: H B PIT tag: 7F7F3E3F2A TL: 387 Wt.: 599 Radiotag Size: 11 g

Freq 1: 40.600 Freq 2: 40.600 Pulse 1 (#/min): 55 Pulse 2: 88 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1400	LCR	TS	0	192			SU	PC	H

COMMENTS Fish is in same location ≈ 20 m upstream of Beaver Cabin on left side just offshore of Phragmites bed

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 10 Trip: 04 Reach: 1 CB #: 3 Date: 91 04 15

Start Time: 1430 End Time: 1440 River: CO RM: 61 3 <Locate: ✓ Mode 2H: 24H: Test Flow: Implant: >

Habitat Map #: _____ Benchmark: _____ Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: GD, __, __

Fish Information

Species: H B PIT tag: 7F7F3C2D06 TL: 405 Wt.: 669 Radiotag Size: 11 g

Freq 1: 40.740 Freq 2: 40.740 Pulse 1 (#/min): 42 Pulse 2: 42 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1430	61.3	SC		192			SU	PC	L

COMMENTS Fish is in green Colo. R. side channel just above mouth of LCR

Appears to be mid-channel in deeper water - signal comes & goes but good nulls

FORM 4, Page 2

Habitat Measurements:

Hab1: _ _ Hab2: _ _ Depth: _ _ ._m V 0.2: _ ._ m/s V 0.6: _ ._ m/s V 0.8: _ ._ m/s

V Bottom: _ ._ m/s AirT(c): _ _ _ McT: _ _ ._ HabT: _ _ ._ Sub1: _ _ Sub2: _ _

Cover: Over: _ _ Lat: _ _ In: _ _ Turb: _ DO: _ _ mg/l pH: _ ._ Cond: _ _ _ _ umhos/cm

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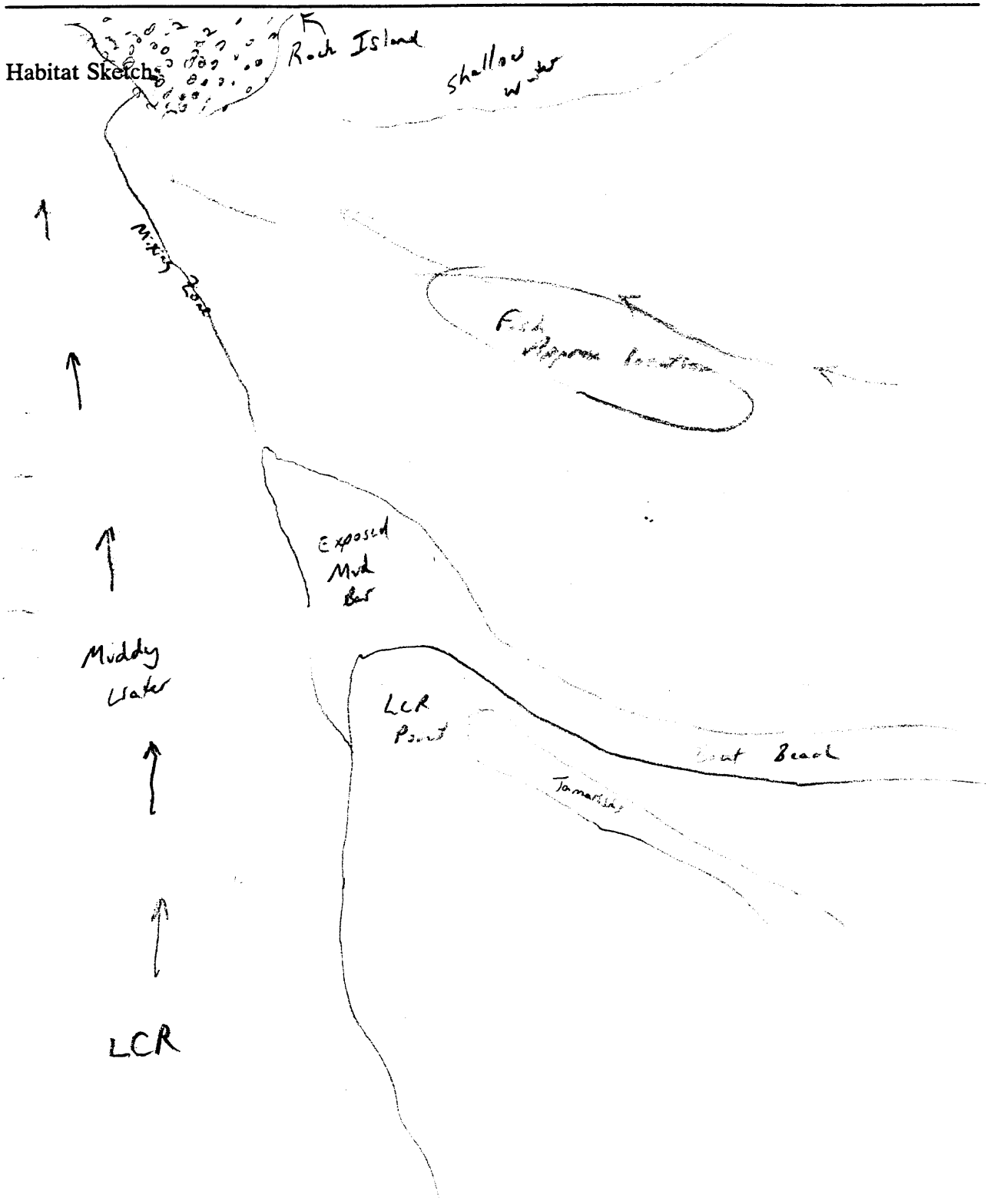
Habitat Sketch:



BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 111 Trip: 04 Reach: 1 CB #: _ Date: 910415

Start Time: 1720 End Time: 1725 River: CO RM: 61.2 <Locate: ✓ 2H: _ 24H: _ Test Flow: _ Implant: _> (Mode)

Habitat Map #: _____ Benchmark: _____ Confidence: 1

Habitat Photo: Camera __ Roll: __ Frame: __-__ Crew: GD, __, __

Fish Information

Species: H B PIT tag: 7F7F3E2661 TL: 399 Wt.: 577 Radiotag Size: 11 g

Freq 1: 40.600 Freq 2: 40.600 Pulse 1 (#/min): 34 Pulse 2: 40 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1715	61.2	MC					OV	PC	L

COMMENTS Fish located near chub rock immediately across from LCR camp

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 112 Trip: 04 Reach: 1 CB #: 1 Date: 910416

Start Time: 4/16 2335 End Time: 0826 4/17 River: LCR RM: 500m <Locate:_ 2H:✓ 24H:_ Mode Test Flow:_ Implant:_>

Habitat Map #: _____ Benchmark: _____ Confidence: 1

Habitat Photo: Camera 1 Roll: 1 Frame: 6-7 Crew: EP, GD, __

Fish Information

Species: HB PIT tag: 7F7F3C2D06 TL: 405 Wt.: 669 Radiotag Size: 11 g

Freq 1: 40.740 Freq 2: 40.740 Pulse 1 (#/min): 42 Pulse 2: 43 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2335	500m up LCR	TS					NI	CS	H
COMMENTS									
2355	500m up LCR	TS					NI	CS	H
ALL 3 in same spot (.630, .600, .740), directly on opposit side of boulder in Hwy [illegible] LCR left									
4/17 010	500m up LCR	TS					NI	CS	H
same									
0130	500m up LCR	TS					NI	CS	H
same									
0340	500m up LCR	TS					NI	CS	H
same									
0535	500m up LCR	TS					DD	CS	H
same									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 112 Trip: 04 Reach: 1 CB #: 1 Date: 910417

PIT tag: 7F7F3C2D06 Freq 2: 40.740 Pulse 2: 43

18.5° = Air T
15.5° = Hab T
= Mc T
0654 hrs 4/17

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0554	LCR	TS	5m				DD	CS	H

COMMENTS moved upriver in eddie, river left

0615	LCR	TS					DD	CS	H

In eddie Ri left (19m above railroad tide) Fish moving upriver fast Reached here @ 0632 hr (across from small sand bank)

0647	LCR	2m					DD	CS	H

Same: In eddie river left below small sand bank & in front of dead mesquites along

0659	LCR	TS	4m				DD	CS	H

moving upriver along left shore, just above riffles in eddy (directly above 3 rocks lined up)

0716	LCR	TS					SH	CS	H

Same

0826	LCR	TS					SU	CS	H

Same. Fish checked every 15 min

1100	700m up LCR	TS					SU	CS	H

fish @ 200 m above Beamer Cabin [illegible]

have been stalled by [illegible] while [illegible]

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 113 Trip: 04 Reach: L CB #: 1 Date: 910416

Start Time: 2335 (4/16) End Time: 0826 (4/17) River: LCR RM: 500m <Locate:_ 2H:_ 24H:✓ Test Flow:_ Implant:_> Mode

Habitat Map #: _____ Benchmark: _____ Confidence: 1

Habitat Photo: Camera 1 Roll: 1 Frame: 3-5 Crew: EP, GD, __

Fish Information

Species: H B PIT tag: 7F7F3F520D TL: 377 Wt.: 604 Radiotag Size: 1L g

Freq 1: 40.630 Freq 2: 40.630 Pulse 1 (#/min): 86 Pulse 2: 90 Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2335	500m up LCR	TS					NI	CS	H
COMMENTS									
2355	LCR	TS					NI	CS	H
All 3 in same spot (Freq. 630, 600, & 740)! @ upper end of reeds LCR									
4/17 010	500m up LCR	TS					NI	CS	H
same									
0130	500m up LCR	TS					NI	CS	H
same									
0340	500m up LCR	TS					NI	CS	H
same									
0535	500m up LCR	TS	3m				DD	CS	H
moved downstream									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 113 Trip: 04 Reach: 1 CB #: 1 Date: 910417

PIT tag: 7F7F3F520D Freq 2: 40.630 Pulse 2: 90

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0554	500m up LCR	TS					DD	CS	H
COMMENTS same									
0709	500m up LCR	TS					SH	CS	H
Same									
0739	500m up LCR	TS					SU	CS	H
Moved downriver a bit, to lower tip of reeds.									
0826	500m up LCR	TS					SU	CS	H
Same.									
1100	500m up LCR	TS	10 m				SU	CS	H
Fish is near upstream end of phragmites bed									

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 114 Trip: 04 Reach: 1 CB #: 1 Date: 910416

Start Time: 4/16 2335 End Time: 0826 4/17 River: LCR RM: 500m Locate:_ 2H:✓ 24H:_ Test Flow:_ Implant:_ Mode

Habitat Map #: _____ Benchmark: _____ Confidence: 1

Habitat Photo: Camera 1 Roll: 1 Frame: 3-5 Crew: EP, GD, ___

Fish Information

Species: H B PIT tag: 7F7F3E372A TL: 387 Wt.: 599 Radiotag Size: 11 g

Freq 1: 40.600 Freq 2: 40.600 Pulse 1 (#/min): 85 Pulse 2: 88 Surgeon: ___

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
2335	500m up LCR	TS					NI	CS	H

COMMENTS

2355	500m up LCR	TS					NI	CS	H

All 3 in same spot! @ upper end of reeds LCR left

4/17 0102	500m up LCR	TS					NI	CS	H

same

0130	500m up LCR	TS					NI	CS	H

same

0340	500m up LCR	TS					NI	CS	H

same

0535	500m up LCR	TS					DD	CS	H

same

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Observations

Sample No: 114 Trip: 04 Reach: 1 CB #: 1 Date: 910417

PIT tag: 7F7F3E372A Freq 2: 40.600 Pulse 2: 88

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
0554	500m up LCR	TS					DD	CS	H
COMMENTS same									
0709	500m up LCR	TS					SH	CS	H
same.									
0739	500m up LCR	TS					SU	CS	H
moved downstream to mid-lower part of reeds									
1100	500m up LCR	TS					SU	CS	[illegible]
fish near upper end of reed bed .630/88 15 5m downstream (photos)									

40.600 / 72 pulse

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Telemetry Observations

Sample No: 115 Trip: 4 Reach: 1 CB #: - Date: 910417

Start Time: 1030 End Time: 1700 River: LCR RM: ___.__ <Locate: ✓ 2H: 24H: Test Flow: Implant: >

Mode

Habitat Map #: _____ Benchmark: _____ Confidence: 1

Habitat Photo: Camera 1 Roll: 1 Frame: 1-2 Crew: GD, ___, ___

Fish Information

Species: H B PIT tag: _____ TL: ___ Wt.: ____ Radiotag Size: __ g

Freq 1: 40.600 Freq 2: 40.___ Pulse 1 (#/min): 72 Pulse 2: __ Surgeon: __

Time	RM	Hab	Distance Moved	Gage	Rel Stage	Abs. Stage	Ambient Light	Weather	Turbidity
1030	LCR 150 up	TS					SU	CS	H
COMMENTS	Fish in eddy behind boulders near river left (photo [illegible])								
1700	LCR 150 up	TS					SU	CS	H
	Fish still in same vicinity								

INCIDENTAL DATA

FORM 5

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Telemetry Surveillance

Sample No: N/A Trip: 04 Reach: 1 CB#: __ <Aerial: N Boat: ✓>

Date: 9 1 0 4 1 0 (Y Y M M D D) Time: Start 1345 End 1655 RM 52.3 to 61.3

Ambient Light: SU (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather PC Turbidity L (Low, Moderate, High, Clear) Sechi Disk __ m Fluctuations: FA

Crew: GD, GW, CH

Time	RM	Side	Frequency	Pulse	Confidence	Description
Survey from Nankoweap Ck. to LCR camp from 37' O.A.R.S raft						
1416	56.7-58.0		40.640	36	3 definite contact did not pinpoint location (could not null signal)	picked up on ATS w/ paddle but not SR-40 w/ whip
1443	60.4		40.710	≈60 ?	faint signal 3	
1450	61.0		40.620	≈80	3	
1450	61.1		40.630	≈80	3	
1450	61.1		40.630	≈60	3	
1525	61.3		40.710	42	3 somewhere along mixing zone, upper LCR channel	
1526	61.3		40.740	42	3 somewhere along mixing zone, upper LCR channel	
1527	61.3		40.630	88	3 mouth area	
1528	61.3		40.670	42	3 in green water side channel just above LCR mouth	
1529	61.3		40.680	68	3 mouth area	
1600	61.3		40.670	70	somewhere along mixing zone, upper LCR channel	
1615	LCR		40.600	90	0.2 mi up LCR from mouth on River left just above Beaver cabin near upstream end of reeds	

FORM 1

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SET D

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

Sample Type: N Trip: 04 Reach: 1 CB #: 3 Date: 910414 (YYMMDD) RM: 61.1 Gear: TL

Hab1: MC Hab2: ED Hab3: SA/BO Side: L Profile (Y/N): N Max Depth: ___.__m Fish Pres (Y/N): N No. Bottles: Ø

Habitat Photo: Camera: __ Roll: __ Frame: __-__ Crew: HY, DV, CH

Comments: Boulder slope down to very small beach just upstream of LCR USGS cable

Sample #:	004	008	---	---	---	---
Start Time:	1750	1841	----	----	----	----
End Time:	1840	2114	----	----	----	----
Elapsed Time:	50min	2.3 HR	net pulled	----	----	----
Ambient Light:	DH	DD	--	--	--	--
Weather:	CS	CS	--	--	--	--
Turbidity:	L	L	2.30 / 0.83 / 3.13	-	-	-
AirT(c):	24.0	22.0	--.-	--.-	--.-	--.-
McT:	10.0	10.0	--.-	--.-	--.-	--.-
HabT:	10.0	10.0	--.-	--.-	--.-	--.-
Fluctuations:	ST	ST	--	--	--	--

SUMMARY

SPECIES	Y J A	Y J A	Y J A	Y J A	Y J A	Y J A
HB	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
FM	--- ---	--- 4	--- ---	--- ---	--- ---	--- ---
BH	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
RB	--- ---	--- 4	--- ---	--- ---	--- ---	--- ---
BR	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
CC	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
CP	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
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NO Fish

INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT gr	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
008	FM	497	419	1270		N				M	Iu	RA	
	FM	511	432	1477						M	Iu	RA	
	FM	440	372	819						M	IU	RA	
	FM	486	414	1334						F	IU	RA	
	RB	415	344	410						F	'IIS	RA	
	RB	404	335	460						F		RA	
	RB	303	247	290						U		RA	
	RB	384	311	444						U		RA	

[1]- Photo / [2]- Video

FORM 1

Page __ of __
SET C

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

Sample Type: N Trip: 04 Reach: 1 CB #: 3 Date: 910414 (Y YMM DD) RM: 61.2 Gear: GP

Hab1: MC Hab2: ED Hab3: SA Side: R Profile (Y/N): N Max Depth: __.__m Fish Pres (Y/N): N No. Bottles: 0

Habitat Photo: Camera: __ Roll: __ Frame: __-__ Crew: HY, DV, SA

Comments: At usual LCR camp (at chub base 1) (sand/ledge)

Sample #:	003	007	---	---	---	---
Start Time:	1740	1838	----	----	----	----
End Time:	1836	2100	----	----	----	----
Elapsed Time:	56min	162min	----	----	----	----
Ambient Light:	SH	DD	--	--	--	--
Weather:	CS	CS	--	--	--	--
Turbidity:	L	L	-	-	-	-
AirT(c):	24.0	22.0	--.-	--.-	--.-	--.-
McT:	10.0	10.0	--.-	--.-	--.-	--.-
HabT:	10.0	10.0	--.-	--.-	--.-	--.-
Fluctuations:	ST	ST	--	--	--	--

12:00 1/2 1:00 1/2 (3.63 hrs) net pulled

SPECIES	Y J A	Y J A	SUMMARY Y J A	Y J A	Y J A	Y J A
HB	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
FM	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
BH	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
RB	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
BR	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
CC	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
CP	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
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no fish

no fish

INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
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[1]- Photo / [2]- Video

FORM 1

Page __ of __
SET _____

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

Sample Type: N Trip: 04 Reach: L CB #: 3 Date: 910415 (YYMMDD) RM: 61.3 Gear: HS

Hab1: TS Hab2: ED Hab3: LE Side: R Profile (Y/N): N Max Depth: ___.__m Fish Pres (Y/N): N No. Bottles: 0

Habitat Photo: Camera: __ Roll: __ Frame: __-__ Crew: GD, DK, EP

Comments: Set net in LCR in between boulders in water & below riffles (1 300 m up from confluence)

Sample #:	010	011 4/16	---	---	---	---
Start Time:	4/15 2020	0911	----	----	----	----
End Time:	4/16 0907	1941 4/16	----	----	----	----
Elapsed Time:	----	10.67 hrs	----	----	----	----
Ambient Light:	DD	SU	--	--	--	--
Weather:	CS	CS	--	--	--	--
Turbidity:	H	H	-	-	-	-
AirT(c):	--.-	--.-	--.-	--.-	--.-	--.-
McT:	--.-	--.-	--.-	--.-	--.-	--.-
HabT:	16.0	--.-	--.-	--.-	--.-	--.-
Fluctuations:	FA (CORI)	--	--	--	--	--

3.40
3.67
9.12
12.89 hrs

SUMMARY

SPECIES	Y J A	Y J A	Y J A	Y J A	Y J A	Y J A
HB	-- 1 --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
FM	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
BH	-- 1 --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
RB	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
BR	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
CC	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
CP	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
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No Fish (not fishing well)

INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT gr	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
ØLØ	BH	161	138	45	----------	N	------	-	-	U	RA	--	---
ØIØ	HB	249	197	116	7F7DØ75D72	N	------	-	-	F	lerned a) RA	--	base of dorsal / dorsa
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[1]- Photo / [2]- Video

FORM 1

Page __ of __
SET A

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

Sample Type: N Trip: 04 Reach: 1 CB #: 3 Date: 910417 (Y YMM DD) RM: 61.3 Gear: TK

Hab1: TS Hab2: ED Hab3: BO Side: L Profile (Y/N): N Max Depth: __.__m Fish Pres (Y/N): N No. Bottles: 0

Habitat Photo: Camera: __ Roll: __ Frame: __-__ Crew: BL, EP, __

Comments: set "Parallel Trammel", @ mouth of LCR. Left Side of channel

Sample #:	013	014	017	---	---	---
Start Time:	1059	1325	1545	----	----	----
End Time:	1150	1545	1721	----	----	----
Elapsed Time:	51min	2.20min	1.24min	----	----	----
Ambient Light:	SU	SU	SU	--	--	--
Weather:	CS	CS	CS	--	--	--
Turbidity:	H	H	H	-	-	-
AirT(c):	--.-	--.-	--.-	--.-	--.-	--.-
McT:	--.-	--.-	--.-	--.-	--.-	--.-
HabT:	--.-	--.-	--.-	--.-	--.-	--.-
Fluctuations:	FA	FA	FA	--	--	--

SUMMARY

SPECIES	Y J A	Y J A	Y J A	Y J A	Y J A	Y J A
HB	--- 2	--- 2	--- 1	--- ---	--- ---	--- ---
FM	--- 4	--- 2	--- ---	--- ---	--- ---	--- ---
BH	--- ---	--- ---	--- 1	--- ---	--- ---	--- ---
RB	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
BR	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
CC	--- 2	--- 1	--- ---	--- ---	--- ---	--- ---
CP	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
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4.58 hours

INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT g	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
013	HB	345	289	424	7F7D085054	N	------	-	-	F	--	RA	---.-
013	HB	411	330	706	7F7D07645B	N	------	-	-	F	--	RA	8 perch ---.-
013	FM	570	484	1830	clip dorsal	N	------	-	-	F	TU	RA	---.-
013	FM	521	435	1262	clip dorsal	N	------	-	-	F	TU	RA	---.-
013	FM	502	432	1617	clip dorsal	N	------	-	-	F	TU	RA	---.-
013	FM	540	460	1553	Yell A7GF 30117	Y	------	-	-	F	--	RA	---.-
013	CC	305	238	238	----------	N	------	-	-	F	--	RD	---.-
013	CC	270	215	164	----------	N	------	-	-	F	--	RD	---.-
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014	FM	465	392	960	----------	N	------	-	-	M	TU	RA	---.-
014	FM	309	255	316	----------	N	------	-	-	F	--	RA	---.-
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014	CC	295	230	218	----------	N	------	-	-	-	--	RD	---.-
014	HB	342	265	377	7F7D075C32	N	------	-	-	M	TU	RA	61.3
014	HB	325	265	360	7F7D025F29	N	------	-	-	F	--	RA	61.3
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017	BH	318	279	328	----------	N	------	-	-	F	--	RA	61.3
017	HB	291	231	209	7F7D084362	N	------	-	-	M	TU	RA	61.3
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[1]- Photo / [2]- Video

FORM 1

Page __ of __
SET C

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

Sample Type: _ Trip: 04 Reach: 1 CB #: 3 Date: 910417 (Y YMM DD) RM: 61.6 Gear: TL

Hab1: SC Hab2: ED Hab3: LE Side: L Profile (Y/N): N Max Depth: __.__m Fish Pres (Y/N): N No. Bottles: 0

Habitat Photo: Camera: __ Roll: __ Frame: __-__ Crew: DV, BL, AH, EP

Comments: Backchannel set

Sample #:	016	---	---	---	---	---
Start Time:	1445	----	----	----	----	----
End Time:	1651	----	----	----	----	----
Elapsed Time:	126 min	----	----	----	----	----
Ambient Light:	SU	--	--	--	--	--
Weather:	CS	--	--	--	--	--
Turbidity:	H	-	-	-	-	-
AirT(c):	N/A	--.-	--.-	--.-	--.-	--.-
McT:	N/A	--.-	--.-	--.-	--.-	--.-
HabT:	N/A	--.-	--.-	--.-	--.-	--.-
Fluctuations:	FA	--	--	--	--	--

2/hr

pulled

SUMMARY

SPECIES	Y J A	Y J A	Y J A	Y J A	Y J A	Y J A
HB	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
FM	--- 6	--- ---	--- ---	--- ---	--- ---	--- ---
BH	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
RB	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
BR	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
CC	--- 1	--- ---	--- ---	--- ---	--- ---	--- ---
CP	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
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INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT gr	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
016	CC	532	425	1639	----------	N	------	-	-	M	-	RD	---
016	EM	535	462	1744	----------	N	------	-	-	M	-	RA	61.6
016	EM	405	348	737	----------	N	------	-	-	F	TU	RA	61.6
016	EM	492	420	1202	----------	N	------	-	-	F	TU	RA	61.6
016	EM	467	403	1093	----------	N	------	-	-	M	TU	RA	61.6
016	EM	411	341	695	----------	N	------	-	-	F	--	RA	61.6
016	EM	369	320	503	----------	N	------	-	-	F	TU	RA	61.6
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[1]- Photo / [2]- Video

FORM 1

Page __ of __
SET B

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

Sample Type: N Trip: 04 Reach: L CB #: 3 Date: 910417 (YYMMDD) RM: 61.6 Gear: GP

Hab1: SC Hab2: ED Hab3: SA Side: R Profile (Y/N): N Max Depth: ___.__m Fish Pres (Y/N): N No. Bottles: 0

Habitat Photo: Camera: __ Roll: __ Frame: __-__ Crew: DV, BL, AH, EP

Comments: The Island Set (left channel of LCR) western tip of sand island

Sample #:	015	---	---	---	---	---
Start Time:	1430	----	----	----	----	----
End Time:	1545	----	----	----	----	----
Elapsed Time:	1.25 hrs	----	----	----	----	----
Ambient Light:	SU	--	--	--	--	--
Weather:	CS	--	--	--	--	--
Turbidity:	H	-	-	-	-	-
AirT(c):	N/A	--.-	--.-	--.-	--.-	--.-
McT:	N/A	--.-	--.-	--.-	--.-	--.-
HabT:	N/A	--.-	--.-	--.-	--.-	--.-
Fluctuations:	FA	--	--	--	--	--

pulled

SPECIES	Y J A	Y J A	SUMMARY Y J A	Y J A	Y J A	Y J A
HB	No Fish	--- ---	--- ---	--- ---	--- ---	--- ---
FM	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
BH	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
RB	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
BR	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
CC	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
CP	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
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INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
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[1]- Photo / [2]- Video

FORM 1

Page __ of __
SET A

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

Sample Type: N Trip: 04 Reach: 1 CB #: 3 Date: 910414 (Y YMM DD) RM: 61.7 Gear: TK

Hab1: MC Hab2: ED Hab3: SA Side: R Profile (Y/N): N Max Depth: __.__m Fish Pres (Y/N): N No. Bottles: 0

Habitat Photo: Camera: __ Roll: __ Frame: __-__ Crew: DV, HY, CH

Comments: across from sand island "plume set". small sand beach / Marcots lodge - boulders

Sample #:	001	005	---	---	---	---
Start Time:	1715	1822	----	----	----	----
End Time:	1820	2032	----	----	----	----
Elapsed Time:	65min	130min	----	----	----	----
Ambient Light:	SH	DD	--	--	--	--
Weather:	CS	CS	--	--	--	--
Turbidity:	M	M	-	-	-	-
AirT(c):	24.0	22.0	--.-	--.-	--.-	--.-
McT:	10.0	10.0	--.-	--.-	--.-	--.-
HabT:	10.0	10.0	--.-	--.-	--.-	--.-
Fluctuations:	ST	ST	--	--	--	--

pulled 3.25 hrs

SPECIES	Y J A	Y J A	SUMMARY Y J A	Y J A	Y J A	Y J A
HB	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
FM	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
BH	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
RB	--- ---	--- 4	--- ---	--- ---	--- ---	--- ---
BR	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
CC	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---
CP	--- ---	--- 1	--- ---	--- ---	--- ---	--- ---
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NO FISH

Skunked!

INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT (grams)	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
005	CP	608	480	3347	—	N	------	-	-	-	--	RA	61.7
005	RB	393	320	517	----------	N	------	-	-	-	--	RA	61.7
005	RB	207	170	97	----------	N	------	-	-	-	--	RA	61.7
005	RB	282	226	201	----------	N	------	-	-	-	--	RA	61.7
005	RB	215	177	101	----------	N	------	-	-	-	--	RA	61.7
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[1]- Photo / [2]- Video

FORM 1

Page __ of __
SET B

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

120
17
137

Sample Type: N Trip: 04 Reach: 1 CB #: 3 Date: 9104 14 (Y YMM DD) RM: 61.8 Gear: GP

Hab1: MC Hab2: ED Hab3: SA Side: L Profile (Y/N): N Max Depth: ___.__m Fish Pres (Y/N): N No. Bottles: Ø

Habitat Photo: Camera: __ Roll: __ Frame: ___-___ Crew: HY, DV, CH

Comments: small sand beach, river left, boulder slope to Tapeats below just below boulder bar past LCR downstream channel

Sample #:	002	006	---	---	---	---
Start Time:	1730	1830	----	----	----	----
End Time:	1827	2048	----	----	----	----
Elapsed Time:	57min	137 min	not pulled	----	----	----
Ambient Light:	SH	DD	--	--	--	--
Weather:	CS	CS	--	--	--	--
Turbidity:	H	H	-	-	-	-
AirT(c):	24.0	22.0	--.-	--.-	--.-	--.-
McT:	10.0	10.0	--.-	--.-	--.-	--.-
HabT:	10.0	10.0	--.-	--.-	--.-	--.-
Fluctuations:	ST	ST	--	--	--	--

3.23 hours

SUMMARY

SPECIES	Y J A	Y J A	Y J A	Y J A	Y J A	Y J A
HB	-- -- --	-- -- 1	-- -- --	-- -- --	-- -- --	-- -- --
FM	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
BH	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
RB	-- -- 1	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
BR	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
CC	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
CP	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
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FL 273

INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT gr.	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
002	RB	365	294	432	----------	N	------	-	-	U	--	RA	6L8
006	HB	305	247	248	7F7D084A7E	N	------	-	-	M	IU	RA	6L8
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[1]- Photo / [2]- Video

FORM 1

Page __ of __
SET _____

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

Sample Type: N Trip: 04 Reach: 1 CB #: 3 Date: 91 04 17 (Y Y MM DD) RM: LCR 170m Gear: HS

Hab1: TD Hab2: RU Hab3: LE Side: R Profile (Y/N): N Max Depth: ___.__m Fish Pres (Y/N): N No. Bottles: Ø

Habitat Photo: Camera: __ Roll: __ Frame: __-__ Crew: BL, EP, __

Comments: 170m upriver of LCR, LCR R: Right

Sample #:	012	---	---	---	---	---
Start Time:	1120	----	----	----	----	----
End Time:	? 1720	----	----	----	----	----
Elapsed Time:	6.0hr	----	----	----	----	----
Ambient Light:	CS	--	--	--	--	--
Weather:	SU	--	--	--	--	--
Turbidity:	H	-	-	-	-	-
AirT(c):	--.-	--.-	--.-	--.-	--.-	--.-
McT:	--.-	--.-	--.-	--.-	--.-	--.-
HabT:	--.-	--.-	--.-	--.-	--.-	--.-
Fluctuations:	EA	--	--	--	--	--

SUMMARY

SPECIES	Y J A	Y J A	Y J A	Y J A	Y J A	Y J A
HB	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
FM	-- fish --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
BH	NO -- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
RB	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
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CC	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
CP	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
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INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
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[1]- Photo / [2]- Video

FORM 1

Page __ of __
SET _____

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

Sample Type: N Trip: 04 Reach: 1 CB #: 3 Date: 910414 (Y YMM DD) RM: LCR 300M Gear: HM

Hab1: TS Hab2: RU Hab3: LE Side: R Profile (Y/N): N Max Depth: __.__m Fish Pres (Y/N): N No. Bottles: Ø

Habitat Photo: Camera: __ Roll: __ Frame: __-__ Crew: HY, DV, __

Comments: 300m up LCR - Hoop set on downstream side of large Tapeats boulder 1 meter from shore

Sample #:	009	---	---	---	---	---
Start Time:	4/14 2010	----	----	----	----	----
End Time:	4/15 1047	----	----	----	----	----
Elapsed Time:	----	----	----	----	----	----
Ambient Light:	NI	--	--	--	--	--
Weather:	CS	--	--	--	--	--
Turbidity:	H	-	-	-	-	-
AirT(c):	19.0°	--.-	--.-	--.-	--.-	--.-
McT:	--.-	--.-	--.-	--.-	--.-	--.-
HabT: LCR	14.0°	--.-	--.-	--.-	--.-	--.-
Fluctuations:	SI	--	--	--	--	--

SPECIES	Y J A	Y J A	SUMMARY Y J A	Y J A	Y J A	Y J A
HB	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
FM	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
BH	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
RB	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
BR	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
CC	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
CP	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
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NO Fish

INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
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[1]- Photo / [2]- Video

FORM 1

Page __ 0
SET ____

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Netting and Trapping

Sample Type: N Trip: 04 Reach: 2 CB #: 3 Date: 910420 (Y YMM DD) RM: 144.0 (400m up from mouth) Kanab Crk Gear: #5

Hab1: TS Hab2: RU Hab3: BOULE Side: R Profile (Y/N): N Max Depth: __._m Fish Pres (Y/N): N No. Bottles: Ø

Habitat Photo: Camera: 04 Roll: 01 Frame: __-__ Crew: HY, GD, GW

Comments: Small hoop net set same as trip in March

Sample #:	001	---	---	---	---	---
Start Time: 910419	1830	----	----	----	----	----
End Time: 910420	0942	----	----	----	----	----
Elapsed Time:	15.2 hrs	----	----	----	----	----
Ambient Light:	SU	--	--	--	--	--
Weather:	CS	--	--	--	--	--
Turbidity:	C	-	-	-	-	-
AirT(c):	24.0	--.-	--.-	--.-	--.-	--.-
McT: Kanab Ck.	14.0	--.-	--.-	--.-	--.-	--.-
HabT:	14.0	--.-	--.-	--.-	--.-	--.-
Fluctuations:	SI	--	--	--	--	--

SPECIES	Y J A	Y J A	SUMMARY Y J A	Y J A	Y J A	Y J A
HB	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
FM	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
BH	Ø 4 5	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
RB	-- -- 1	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
BR	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --
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INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
---	BH	315	276	9 OUN	---	-	---	-	-	M	CO MI	RA	---
---	BH	240	200	4 OUN	---	-	---	-	-	M	TUC MI	RA	---
---	BH	322	285	12 OUN	---	-	---	-	-	F	CO --	RA	---
---	BH	347	304	# 1.1 OUN	---	-	---	-	-	F	CO EG	RA	---
---	BH	306	264	8 OUN	---	-	---	-	-	M	CO --	RA	---
---	BH	222	184	2 OUN	---	-	---	-	-	F	CO EG	RA	---
---	BH	320	272	12 OUN	---	-	---	-	-	M	CO TU MI	RA	---
---	BH	197	170	1 OUN	---	-	---	-	-	M	TU CO	RA	---
---	RB	391	325	13 OUN	---	-	---	-	-	F	EG	RA	---
---	BH	224	191	2 OUN	---	-	---	-	-	M	TU CO	RA	---
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[1]- Photo / [2]- Video

Form 6

BIO/WEST GRAND CANYON STUDY
Chub Meristics

PITTag No.: 7F7D075D72 DATE: 91-04-16 SAMPLE #: N-010-04-1-3 TL (mm): 249 FL: 219 SL: 197 WT (g): 116
SEX: F RIPE: ND P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: 09 A: 10 RECAP: N TAG: _____ DISP: RA CAM: 04 ROLL: 01 FRAME: 03-06 VIDEO: 01 RM RELEASE: 61.3 RADIOTAG (Y/N): N
LCR-170 meters up from mo

PITTag No.: 7F7D085054 DATE: 91-04-17 SAMPLE #: N-013-04-1-3 TL (mm): 345 FL: 316 SL: 289 WT (g): 424
SEX: F RIPE: NO P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: 09 A: 10 RECAP: N TAG: _____ DISP: RA CAM: 04 ROLL: 01 FRAME: 9-10 VIDEO: 01 RM RELEASE: 61.3 RADIOTAG (Y/N): N
Parallel Tramme

PITTag No.: 7F7D076458 DATE: 91-04-17 SAMPLE #: N-013-04-1-3 TL (mm): 411 FL: 368 SL: 330 WT (g): 706
SEX: F RIPE: NO P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: 09 A: 09 RECAP: N TAG: _____ DISP: RA CAM: 04 ROLL: 01 FRAME: 11-14 VIDEO: 01 RM RELEASE: 61.3 RADIOTAG (Y/N): N
Parallel Tramme

PITTag No.: 7F7D075C32 DATE: 91-04-17 SAMPLE #: N-014-04-1-3 TL (mm): 342 FL: 290 SL: 265 WT (g): 377
SEX: M RIPE: TU P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: 09 A: 09 RECAP: N TAG: _____ DISP: RA CAM: 04 ROLL: 01 FRAME: 15-16 VIDEO: 01 RM RELEASE: 61.3 RADIOTAG (Y/N): N

PITTag No.: 7F7D025F29 DATE: 91-04-17 SAMPLE #: N-014-04-1-3 TL (mm): 325 FL: 298 SL: 267 WT (g): 360
SEX: F RIPE: TU P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: 09 A: 10 RECAP: N TAG: _____ DISP: RA CAM: 04 ROLL: 01 FRAME: 17-18 VIDEO: 01 RM RELEASE: 61.3 RADIOTAG (Y/N): N

PITTag No.: 7F7D084362 DATE: 91-04-17 SAMPLE #: N-017-04-1-3 TL (mm): 291 FL: 260 SL: 231 WT (g): 209
SEX: M RIPE: CO P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: 09 A: 10 RECAP: N TAG: _____ DISP: RA CAM: 04 ROLL: 01 FRAME: 19-20 VIDEO: 01 RM RELEASE: 61.3 RADIOTAG (Y/N): N

PITTag No.: _____ DATE: __-__-__ SAMPLE #: __-____-___-__-__ TL (mm): ___ FL: ___ SL: ___ WT (g): ____
SEX: _ RIPE: __ P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: __ A: __ RECAP: _ TAG: _____ DISP: __ CAM: __ ROLL: __ FRAME: __-__ VIDEO: __ RM RELEASE: ____.__ RADIOTAG (Y/N): _

Form 6

BIO/WEST GRAND CANYON STUDY
Chub Meristics

PITTag No.: 7F7D084A7E DATE: 91-04-14 SAMPLE #: N-006-04-1-3 TL (mm): 305 FL: 273 SL: 247 WT (g): 248
SEX: M RIPE: TU P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: 9 A: 9 RECAP: N TAG: _____ DISP: RA CAM: 4 ROLL: 1 FRAME: 1-2 VIDEO: 1 RM RELEASE: 61.8 RADIOTAG (Y/N): N

PITTag No.: _____ DATE: __-__-__ SAMPLE #: __-____-__-__-__ TL (mm): ___ FL: ___ SL: ___ WT (g): ____
SEX: _ RIPE: __ P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: __ A: __ RECAP: _ TAG: _____ DISP: __ CAM: __ ROLL: __ FRAME: __-__ VIDEO: __ RM RELEASE: ____.__ RADIOTAG (Y/N): _

PITTag No.: _____ DATE: __-__-__ SAMPLE #: __-____-__-__-__ TL (mm): ___ FL: ___ SL: ___ WT (g): ____
SEX: _ RIPE: __ P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: __ A: __ RECAP: _ TAG: _____ DISP: __ CAM: __ ROLL: __ FRAME: __-__ VIDEO: __ RM RELEASE: ____.__ RADIOTAG (Y/N): _

PITTag No.: _____ DATE: __-__-__ SAMPLE #: __-____-__-__-__ TL (mm): ___ FL: ___ SL: ___ WT (g): ____
SEX: _ RIPE: __ P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: __ A: __ RECAP: _ TAG: _____ DISP: __ CAM: __ ROLL: __ FRAME: __-__ VIDEO: __ RM RELEASE: ____.__ RADIOTAG (Y/N): _

PITTag No.: _____ DATE: __-__-__ SAMPLE #: __-____-__-__-__ TL (mm): ___ FL: ___ SL: ___ WT (g): ____
SEX: _ RIPE: __ P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
D: __ A: __ RECAP: _ TAG: _____ DISP: __ CAM: __ ROLL: __ FRAME: __-__ VIDEO: __ RM RELEASE: ____.__ RADIOTAG (Y/N): _

PITTag No.: _____ DATE: __-__-__ SAMPLE #: __-____-__-__-__ TL (mm): ___ FL: ___ SL: ___ WT (g): ____
SEX: _ RIPE: __ P_1-P_2: ___.__ ND: ___.__ CPL: ____.__ CPMD: ___.__ CPND: ___.__ HL: ___.__ SNL: ___.__ DFB: ___.__ AFB: ___.__ BD: ____.__
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PITTag No.: _____ DATE: __-__-__ SAMPLE #: __-____-__-__-__ TL (mm): ___ FL: ___ SL: ___ WT (g): ____
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D: __ A: __ RECAP: _ TAG: _____ DISP: __ CAM: __ ROLL: __ FRAME: __-__ VIDEO: __ RM RELEASE: ____.__ RADIOTAG (Y/N): _

FORM 3 Page __ of __

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Seining

Sample Type: S Sample No: 003 Trip: 04 Reach: L CB #: 2 Date: 9/04/17

RM: 61.0 Gear: SA Start Time: 1668 Hab1: TR Hab2: ED Sub1: SI Sub2: __

AirT(c): 21° McT: 10.0° HabT: 16.0

Ambient Light: SU (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather: CS Turb HI Fluct: __ BA L: ___.__ BA W: ___.__ SA L: ___.__ SA W: ___.__

MaxDepth: __.__ D_1: __.__ D_2: __.__ Fish Pres (Y/N): N No. Bottles: Ø

Habitat Photo: Camera: __ Roll: __ Frame: __ Crew: BL, RV, EP

Comments: LCR LEFT CHANNEL AGAINST Tapeats ledges 70 - upstream of C. River.

3 x 15m = 45m, + 3 x 20m = 60m +, 3x20m = 60m

Species	LAR	YOY	JUV	ADU	Total
HB	----	----	----	----	----
FM	----	----	----	----	----
BH	----	----	----	----	----
RB	----	----	----	----	----
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INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
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[1]- Photo / [2]- Video

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Seining

Sample Type: S Sample No: 002 Trip: 04 Reach: L CB #: 2 Date: 910417

RM: 61.6 Gear: SA Start Time: 1600 Hab1: TR Hab2: BW Sub1: SI Sub2: __

AirT(c): 21.0 McT: 10.__ HabT: 16.__

Ambient Light: SU (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather: CS Turb HI Fluct: __ BA L: ___.__ BA W: ___.__ SA L: ___.__ SA W: ___.__

MaxDepth: __.__ D_1: __.__ D_2: __.__ Fish Pres (Y/N): N No. Bottles: Ø

Habitat Photo: Camera: __ Roll: __ Frame: __ Crew: BL, RV, EP

Comments: BACK WATER, CONNECTED TO LCR LEFT CHANNEL
ABOUT 70m upstream of C. River
30m x 1m = Near Spot 'C'

Species	LAR	YOY	JUV	ADU	Total
HB	____	____	____	____	____
FM	____	____	____	____	____
BH	____	____	____	____	____
RB	____	____	____	____	____
BR	____	____	____	____	____
CC	____	____	____	____	____
CP	____	____	____	____	____
SD	____	1	____	____	____
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INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
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[1]- Photo / [2]- Video

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)

Seining

Sample Type: S Sample No: 001 Trip: 04 Reach: 1 CB #: 2 Date: 910417

RM: 61.6 Gear: SA Start Time: 1355 Hab1: TR Hab2: LB Sub1: SL Sub2: __

AirT(c): 21.0 McT: 10._ HabT: 16._

Ambient Light: SU (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather: CS Turb H L Fluct: / BA L: ___._ BA W: ___._ SA L: ___._ SA W: ___._

MaxDepth: ___._ D_1: ___._ D_2: ___._ Fish Pres (Y/N): N No. Bottles: Ø

Habitat Photo: Camera: __ Roll: __ Frame: __ Crew: BL, RV, EP

Comments: ISOLATED channel in LCR LEFT CHANNEL

20m x 0.5m Seine

Species	LAR	YOY	JUV	ADU	Total
H B	____	____	____	____	____
F M	NO	FISH	____	____	____
B H	____	____	____	____	____
R B	____	____	____	____	____
B R	____	____	____	____	____
C C	____	____	____	____	____
C P	____	____	____	____	____
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INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
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[1]- Photo / [2]- Video

FORM 3 Page __ of __

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Seining

Sample Type: S Sample No: 005 Trip: 04 Reach: 1 CB #: 2 Date: 9 10 97

RM: 61.6 Gear: SA Start Time: 1640 Hab1: TR Hab2: RU Sub1: SI Sub2: __

AirT(c): 21° McT: 10.__ HabT: 16.__

Ambient Light: PC (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather: PC Turb 41 Fluct: __ BA L: ___.__ BA W: ___.__ SA L: ___.__ SA W: ___.__

MaxDepth: __.__ D_1: __.__ D_2: __.__ Fish Pres (Y/N): N No. Bottles: Ø

Habitat Photo: Camera: __ Roll: __ Frame: __ Crew: BL, RU, EP

Comments: LCR LEFT CHANNEL NEAR TAPEATS LEDGE.
FAST RUN INTO SLACK EDDY. CASCADING H_2O FALL INTO SLACK POOL 3x 4m = 12m
3m x 4m = 12m + 1 SD.
Ø FISH
SLACK POOL AGAINST TAPEATS LEDGE .75m x 15m =

Species	LAR	YOY	JUV	ADU	Total
HB	----	----	----	----	----
FM	----	----	----	----	----
BH	----	----	----	----	----
RB	----	----	----	----	----
BR	----	----	----	----	----
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SD	----	----	----	1	----
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INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
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[1]- Photo / [2]- Video

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)

Seining

Sample Type: S Sample No: 004 Trip: 04 Reach: L CB #: 2 Date: 910417

RM: 61.6 Gear: SA Start Time: 1620 Hab1: TR Hab2: RU Sub1: S1 Sub2: __

AirT(c): 21° McT: 10.__ HabT: 16.0

Ambient Light: SU (SU=sunny CL=cloudy PC=partly cloudy SH=shadow NI=night ML=moonlight DD=dawn/dusk)

Weather: CS Turb H1 Fluct: __ BA L: ___.__ BA W: ___.__ SA L: ___.__ SA W: ___.__

MaxDepth: __.__ D_1: __.__ D_2: __.__ Fish Pres (Y/N): N No. Bottles: Ø

Habitat Photo: Camera: __ Roll: __ Frame: __ Crew: BL, RV, EP

Comments: LCR LEFT CHANNEL ABOUT 200m — m above C. River.

3x Backwater Across channel partially + 3m x 20m = 60m + 3x15m = 45m
Ø FISH Ø FISH Ø FISH

Species	LAR	YOY	JUV	ADU	Total
H B	----	----	----	----	----
F M	----	----	----	----	----
B H	----	----	----	----	----
R B	----	----	----	----	----
B R	----	----	----	----	----
C C	----	----	----	----	----
C P	----	----	----	----	----
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INDIVIDUAL FISH LENGTHS

Sample #	Species	TL	SL	WT	PIT Tag No.	Recap (Y/N)	Old Tag	P[1]	V[2]	Sex	Ripe	Disp	Rel. Loc.
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[1]- Photo / [2]- Video

FORM 7

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)
Water Quality

Location: MC RM: 61.2 (Mainstem) Date: 910417 Time: 1819 Weather: CS

Fluctuation: FA Sechi Disc: NT .__ AirT(C): ___ McT: 10.6 HabT: 10.6

D.O.(mg/l): 10.5 pH 8.2 Cond. (mmhos) 1.004 Redox: 0.076

Comments: across from LCR @ Camp. H_2O still clear. Battery 12.02

Location: __ RM: ___.__ (Mainstem) Date: _____ Time: ____ Weather: __

Fluctuation: __ Sechi Disc: __.__ AirT(C): ___ McT: __.__ HabT: __.__

D.O.(mg/l): __.__ pH __.__ Cond. (mmhos) __.___ Redox: ____

Comments:

Location: __ RM: ___.__ (Mainstem) Date: _____ Time: ____ Weather: __

Fluctuation: __ Sechi Disc: __.__ AirT(C): ___ McT: __.__ HabT: __.__

D.O.(mg/l): __.__ pH __.__ Cond. (mmhos) __.___ Redox: ____

Comments:

Location: __ RM: ___.__ (Mainstem) Date: _____ Time: ____ Weather: __

Fluctuation: __ Sechi Disc: __.__ AirT(C): ___ McT: __.__ HabT: __.__

D.O.(mg/l): __.__ pH __.__ Cond. (mmhos) __.___ Redox: ____

Comments:

FORM 7

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)
Water Quality

Location: MC RM: 61.2 (Mainstem) Date: 910416 Time: 1521 Weather: PC

Fluctuation: FA Sechi Disc: ___ AirT(C): ___ McT: 10.6 HabT: 10.6

D.O.(mg/l): 10.5 pH 8.2 Cond. (mmhos) 1.003 Redox: 0.079

Comments: Battery 12.05 Turbidity is low - not deep enough to take accurate readings.

Location: TS RM: 61.3 (Mainstem) Date: 910416 Time: 1621 Weather: PC

Fluctuation: FA Sechi Disc: high turbidity AirT(C): ___ McT: 10.6 HabT: 16.9

D.O.(mg/l): 8.8 pH 8.2 Cond. (mmhos) 1.425 Redox: 0.071

Comments: 100 yds up LCR. Battery 12.06

Location: MC RM: 61.2 (Mainstem) Date: 910416 Time: 2006 Weather: PC

Fluctuation: FA Sechi Disc: Night AirT(C): ___ McT: 10.6 HabT: 10.6

D.O.(mg/l): 10.2 pH 8.1 Cond. (mmhos) 0.997 Redox: 0.080

Comments: 12.03 battery. Readings taken across from LCR, camp (river right). H_2O still clear, night time readings.

Location: TS RM: 61.6 (Mainstem) Date: 910417 Time: 1714 Weather: SS

Fluctuation: __ Sechi Disc: 5 cm AirT(C): ___ McT: 10.6 HabT: 16.5

D.O.(mg/l): 8.8 pH 8.2 Cond. (mmhos) 1.71 Redox: 0.079

Comments: Left side channel of LCR. Muddy H_2O ≈ 5 cm

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)
Water Quality

Location: MC RM: 61.2 (Mainstem) Date: 910414 Time: 1005 Weather: CS
Fluctuation: RI Sechi Disc: 2.0 m AirT(C): ___ McT: 8.5 HabT: 8.5
D.O.(mg/l): 10.6 pH 8.07 Cond. (mmhos) 1.022 Redox: 0.14
Comments:

Location: IS RM: 61.3 (Mainstem) Date: 910414 Time: 1046 Weather: CS
Fluctuation: __ Sechi Disc: <.1 cm AirT(C): ___ McT: 8.5 HabT: 12.18
.O.(mg/l): 9.87 pH 8.08 Cond. (mmhos) 0.882 Redox: 0.118
Comments: 100 yds up LCR, Water still very muddy
Batt 11.96

Location: MC RM: 61.2 (Mainstem) Date: 910415 Time: 1025 Weather: CS
Fluctuation: RI Sechi Disc: 3.4 AirT(C): ___ McT: 9.3 HabT: 9.3
D.O.(mg/l): 10.6 pH 8.0 Cond. (mmhos) 1.052 Redox: 0.084
Comments: Battery 11.98

Location: MC RM: 61.2 (Mainstem) Date: 910415 Time: 2057 Weather: CS
Fluctuation: __ Sechi Disc: NI AirT(C): ___ McT: 10.6 HabT: 10.6
D.O.(mg/l): 10.5 pH 8.1 Cond. (mmhos) 1.041 Redox: 0.083
Comments: Battery 12.05 Night sample, turbidity is lower. Water seems to be falling

FORM 7

BIO/WEST GRAND CANYON STUDY

(Colorado River Mainstem)
Water Quality

Location: TS RM: 61.3 (Mainstem) Date: 910412 Time: 1811 Weather: __

Fluctuation: FA Sechi Disc: <.1cm AirT(C): 12.05 McT: 8.3 HabT: 10.3

D.O.(mg/l): 10.23 pH 8.06 Cond. (mmhos) 0.797 Redox: ____

Comments: 100 yds up LCR

Location: TS RM: 61.3 (Mainstem) Date: 910413 Time: 0730 Weather: __

Fluctuation: FA Sechi Disc: <.1cm AirT(C): ___ McT: 8.3 HabT: 10.35

D.O.(mg/l): 10.16 pH 8.12 Cond. (mmhos) 0.863 Redox: 0.082

Comments: 100 yds up LCR

Location: MC RM: 61.2 (Mainstem) Date: 910413 Time: 0930 Weather: __

Fluctuation: FA Sechi Disc: 2.2m AirT(C): ___ McT: 8.32 HabT: 8.32

D.O.(mg/l): 10.6 pH 8.1 Cond. (mmhos) 0.998 Redox: .092

Comments:

Location: MC RM: 61.2 (Mainstem) Date: 910413 Time: 1522 Weather: __

Fluctuation: FA Sechi Disc: 1.9m AirT(C): ___ McT: 8.71 HabT: 8.71

D.O.(mg/l): 10.92 pH 8.07 Cond. (mmhos) 0.987 Redox: ____

Comments:

FORM 7

See notebook for additional readings... [illegible]

Page __ of __

BIO/WEST GRAND CANYON STUDY
(Colorado River Mainstem)
Water Quality

Location: MC RM: 61.2 (Mainstem) Date: 910411 Time: 0915 Weather: CS

Fluctuation: RI Sechi Disc: 1.5 AirT(C): ___ McT: 8.8 HabT: 8.8

D.O.(mg/l): 11.1 pH 8.8 Cond. (mmhos) 1.023 Redox: 0.08

Comments: Readings taken from camp across from LCR, river right. Water @ high stage, but still rising

Location: MC RM: 61.2 (Mainstem) Date: 910412 Time: 0951 Weather: SU

Fluctuation: EA Sechi Disc: 1.7 AirT(C): ___ McT: 8.3 HabT: 8.3

D.O.(mg/l): 10.40 pH 7.88 Cond. (mmhos) 1.023 Redox: 0.08

Comments: Battery 11.98

Location: MC RM: 61.2 (Mainstem) Date: 910412 Time: 1217 Weather: OV

Fluctuation: EA Sechi Disc: 1.0m AirT(C): ___ McT: 8.28 HabT: 8.28

D.O.(mg/l): 10.82 pH 8.03 Cond. (mmhos) 1.03 Redox: 0.11

Comments: Battery 11.27

Location: TS RM: 60.3 (Mainstem) Date: 910412 Time: 1423 Weather: OV

Fluctuation: EA Sechi Disc: <1.1cm AirT(C): ___ McT: 8.3 HabT: 11.2

D.O.(mg/l): 9.9 pH 8.1 Cond. (mmhos) 0.880 Redox: .084

Comments: LCR, ≈ 100 yds up LCR