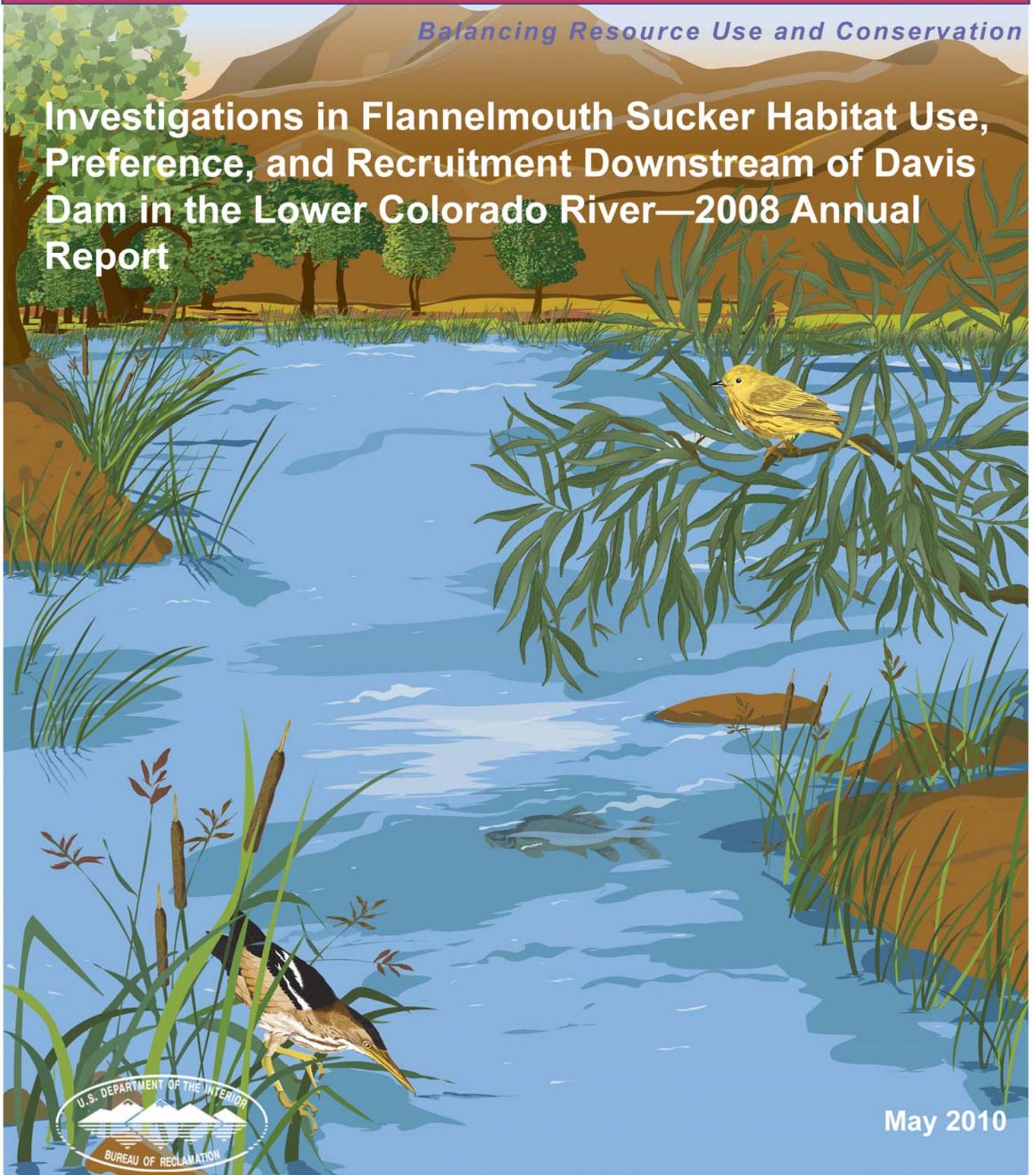




Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Investigations in Flannelmouth Sucker Habitat Use, Preference, and Recruitment Downstream of Davis Dam in the Lower Colorado River—2008 Annual Report



May 2010

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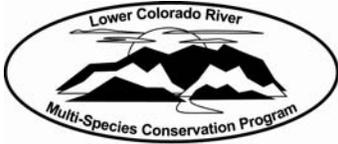
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Lower Colorado River Multi-Species Conservation Program

Investigations in Flannelmouth Sucker Habitat Use, Preference, and Recruitment Downstream of Davis Dam in the Lower Colorado River—2008 Annual Report

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May 2010

Executive Summary

This annual report concludes the third year of a five-year study funded by the Lower Colorado River Multi-Species Conservation Program (MSCP). The study focuses on describing the habitat use, preference, and recruitment of flannelmouth sucker (*Catostomus latipinnis*) below Davis Dam. Ultimately, this information will be used to develop a management needs and strategies plan for this species. Work accomplished in 2008 is representative of conservation measures FLSU-2 and FLSU-3 of the MSCP Habitat Conservation Plan.

Larval and early juvenile (9-62 mm) life stages of flannelmouth suckers were captured and observed along the shoreline in slackwater, eddy, and backwater habitats from April to June 2008. Relative abundance larval surveys located 32 different areas of use from river mile (RM) 272 (near Harrah's Casino in Laughlin, Nevada) to RM 258.5 (Avi, California boat ramp).

Early life stages of flannelmouth sucker were sampled using small-mesh (1/2-inch and 1-inch) trammel nets, seines, and electrofishing gear in an attempt to contact juvenile life stages of flannelmouth suckers. Age-1 to sub-adult (70-350 mm) juveniles have proven difficult to contact. Five fish have been captured over three years of setting trammel nets in backwaters. Thus far, seining and electrofishing of available habitats throughout the study reach have failed to locate any age-1 juveniles or sub-adults.

The collection of adults in 2008 was focused on collections for aging. Nineteen flannelmouth suckers were aged using non-lethal methods; their average age was 15.5 years old with an age range of 7 to 26 years. Aging techniques have been refined and additional sampling will take place in 2009.

A total of 35 flannelmouth suckers were surgically implanted with sonic transmitters. Fifteen males were implanted in 2006, and 10 males and 10 females were implanted in 2007. The movements of these fish were tracked in the Colorado River from Davis Dam to downstream of Needles, California. Movements varied according to individual and by sex. Females ranged approximately 9 miles (1.5-16 miles), while males averaged 4 miles (1-11.5 miles).

Habitat data were collected when transmitter fish were located and when other flannelmouth suckers were observed during surveys. The majority of adult observations were during their non-reproductive season, and occurred between the Laughlin and Avi bridges in areas of the river with cobble substrate (57%), 0.51-1.0 m/s velocities (38%), and depths from 2.1 to 3.0 meters (41%).

Introduction

Habitat degradation and the proliferation of nonnative fish species have resulted in the federal listing of seven of the nine Colorado River native fish species as endangered under the Endangered Species Act. Flannelmouth sucker (*Catostomus latipinnis*) is one of two native species not currently federally protected; however, it is a species of special concern to the Multi-Species Conservation Program (MSCP) and to the states of Nevada, California, and Arizona. Flannelmouth suckers were not historically common in the lower Colorado River below Davis Dam (Minckley 1973). In 1976, Arizona Game and Fish Department personnel successfully captured 611 flannelmouth suckers at the confluence of the Colorado and Paria rivers at Lee's Ferry, Arizona. These fish were transferred to the Colorado River below Davis Dam, which led to their successful reintroduction (Mueller and Wydoski 2004). Mueller and Wydoski (2004) reported that based on mark-recapture estimates, flannelmouth suckers had established an impressive expanding community of more than 2,000 fish. This is remarkable in view of the limited success from 25 years of stocking more than 2.1 million bonytails (*Gila elegans*) and 12 million razorback suckers (*Xyrauchen texanus*) into areas where these species were historically common (Minckley and Deacon 1991). Thus far, this population of flannelmouth suckers represents the most successful introduction of a native, mainstem fish species in the Lower Colorado River Basin.

The purpose of these investigations is to gather data and evaluate flannelmouth sucker habitat use, preference, and recruitment downstream of Davis Dam (Reach 3) as per conservation measures FLSU-2 and FLSU-3 of the Lower Colorado River Multi-Species Conservation Program (LCR MSCP 2004). At the terminus of this work, a report that outlines recommendations and possible threats to the population in Reach 3 will be drafted. Our goals are to: 1) describe community structure, relative abundance, and distribution of flannelmouth sucker, 2) examine flannelmouth sucker seasonal movements and preferred habitats with the aid of sonic telemetry, and 3) examine physical and biological factors contributing to flannelmouth sucker success.

Methods

Study Area

The study reach extends from Davis Dam (River Mile [RM] 276; Lujan 1990) to the California, Arizona, and Nevada state line (RM 257.5; Figure 1). Flannelmouth suckers have unobstructed access to the Colorado River and Lake Havasu, located between Davis and Parker dams; however, previous and ongoing studies show that flannelmouth sucker distribution is highly selective toward the upper river portion of that reach. Field activities have been focused on the reach between the state boundaries to Davis Dam in order to best utilize resources. Additional sampling on the lower reach of river has been

conducted on a limited basis (fall surveys) and is supplemented, in part, by the Lake Havasu Native Fish Round-Up and other on-going studies.

Sampling

Larval to adult life stages of flannelmouth suckers were sampled or observed using a variety of methods, including trammel netting, seining, electrofishing, and dip-netting. For the purpose of this study, adults are described as individuals greater than 350 mm total length, juveniles and sub-adults range from 70 to 350 mm total length (TL), and life stages less than 70 mm TL were considered larvae and young juveniles.

Larval fishes were detected and attracted through the use of underwater lights at night and were collected by two people using small meshed aquarium dip nets (Burke 1995). Catch Per Unit Effort (CPUE) was measured and recorded as the number of larvae captured in 15 minutes of effort (fish/15 minutes). A representative sample (10%) was preserved in 70% isopropyl to confirm identification in the laboratory.

Water clarity allowed for visual surface surveys as a method to determine presence and relative abundance. Visual surveys were conducted during the day as biologists walked the shoreline of the river and backwaters looking for schools of juveniles and estimating their numbers. Sites were randomly selected and initially encompassed several shoreline habitats including rip rap and those with a sweeping laminar flow. If fish were not readily observed in a suspect habitat, then a seine was employed to confirm presence or absence. Fish were measured (mm TL), and general habitat type, flow level, and location were recorded.

Twelve shoreline slackwater sites were selected to be observed/sampled at high and low flows (flow range ~10,000-19,000 cfs) within a 24-hour period. Sites were marked with a GPS and geographical reference was noted to aid in relocation due to differences in appearance as water levels changed. Fish densities and general habitat characteristics were recorded and compared at high and low flows.

We used small mesh (2 m by 22 m by 1.2cm or 2.5 cm center panel) trammel nets to target juvenile and sub-adult (70-350 mm TL) flannelmouth suckers. These nets were set in backwaters, along the shoreline, and in slackwater found downstream of jetties. Nets were set in the evening and retrieved the following morning.

Adults were also sampled using a boat-mounted Smith-Root GPP-7.5 electrofisher. Electroshocking was conducted after dark with a crew of two netters and a boat operator. Fish were sampled along the shoreline, shocking with the flow (downstream). All flannelmouth suckers were measured (mm TL) and weighed (g), and fish greater than 200 mm TL were injected with a passive integrated transponder (PIT) (134 kHz). In addition, a section of pectoral fin ray was collected for age analysis. Flannelmouth suckers were anesthetized in an MS-222 solution until docile and a pair of clipping pliers designed by BIO-WEST was used to remove a small section (1/4 inch) of the left secondary pectoral

fin ray. The wound was then disinfected and the fish placed in fresh river water to recover. A more detailed description of the techniques used can be found in Albrecht et al. (2008).



Figure 1. Aerial image of the study area showing the lower Colorado River between Davis Dam and the state line (AZ-CA-NV).

Sonic Telemetry

In 2006, 15 adult male flannelmouth suckers were surgically implanted with Sonotronics sonic tags. An additional 10 adult males and 10 adult females were surgically implanted in 2007. Detailed information on telemetry equipment, and survey and monitoring techniques are described in LCR MSCP 2007.

Habitat data were collected each time a flannelmouth sucker was located (either with the aid of telemetry or chance observation). Habitat data forms included date, time, waypoint,

number of fish observed, substrate composition, depth, and velocity. Current velocities and depth were taken with a Marsh-McBirney flow meter with a top-set wading rod when circumstances allowed, but were estimated in most cases.

Results

Sampling

Four sampling trips were conducted between river miles 276 and 257, and two sampling trips in addition to the Lake Havasu Native Fish Roundup took place below Needles, California (RM 224-246). Sampling trips were conducted from November 2007 thru June 2008. Larval/early juveniles (n = 183) averaged 23 mm TL (range from 12 to 35 mm TL). A single subadult (TL 321 mm) was contacted at Pulpit Rock (RM 231.5). Adults (n = 29) averaged 565 mm (range from 365 to 620 mm TL) and 1.996 kg (range from 0.585 to 2.862 kg).

We observed an estimated 366 larval/early juvenile flannelmouth suckers with shoreline/backwater visual surveys. In April we collected 98 larvae and young juveniles with underwater lights (average 6.5 fish/15 minutes). In June we collected 183 flannelmouth sucker larvae and early juveniles employing the use of seines. Underwater lights were also utilized in June and flannelmouth suckers up to 30 mm were attracted to the lights, and while several were observed, catch efficiency was poor as young juveniles proved too quick for biologists with dip nets. Using the above-mentioned techniques, we located an estimated 32 habitats that held young flannelmouth suckers. The farthest upstream habitat was at RM 272, located approximately 4 miles below Davis Dam, down to RM 258.5, located at the boat ramp of the AVI Casino (the farthest downstream site sampled). Figure 2 shows general presence/absence locations of larval and young juvenile flannelmouth suckers in 2008.

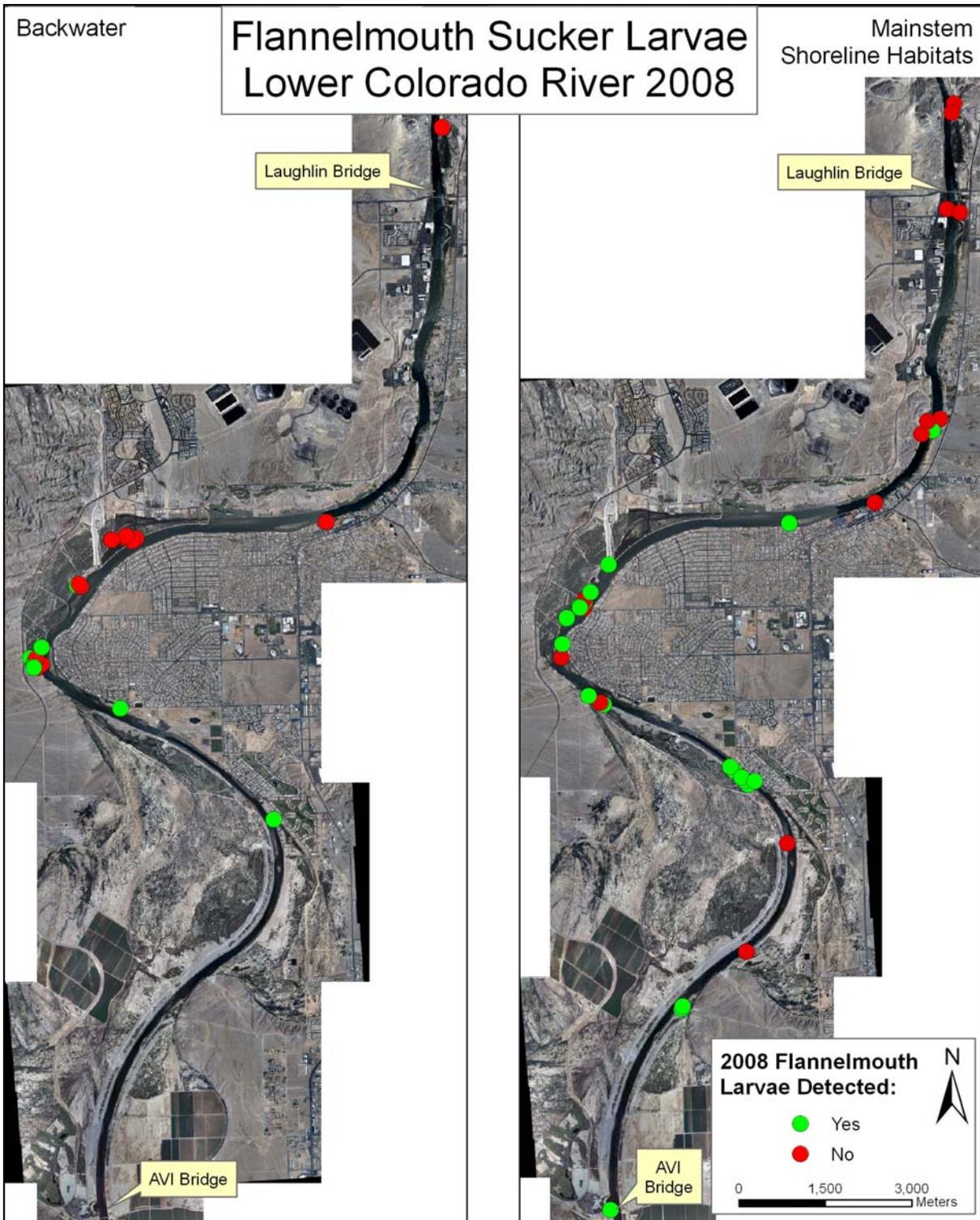


Figure 2. Photograph of the study area depicting locations where flannemouth sucker larvae and early juveniles were detected or not detected.

Twelve shoreline slackwater sites were selected and observed/sampled at high and low water elevations (flow range ~10,000-19,000 cfs) (Table 1). Sites that harbored the greatest number of young maintained their slackwater habitat characteristics, and those that lost their slackwater habitat characteristics at either high or low elevation had few or no larvae or young juveniles present.

Table 1. Sample sites evaluated at high and low flows for presence of flannelmouth sucker larvae and young juveniles.

Site #	High flow presence of young?	Low flow presence of young?	Estimated # of flannelmouth observed	Site maintained habitat characteristics?
RM 261.5	No	No	0	No
RM 263	No	No	0	No
RM 264-A	Yes	No	1	No
RM 264-B	Yes	No	1	No
RM 264-C	Yes	Yes	7	Yes
RM 264-D	Yes	Yes	20	Yes
RM 265.5	Yes	Yes	10	Yes
RM 267-A	No	No	0	No
RM 267-B	Yes	Yes	20	Yes
RM 267-C	No	No	0	No
RM 267-D	No	Yes	2	No
RM 267-E	Yes	Yes	50	Yes

The trammel net effort consisted of a total of 115 sets; 30 net sets were located near Laughlin, Nevada, and 85 nets were set from Park Moabi downstream to Clear Bay in Topock Gorge. The Laughlin sets yielded 146 fish representing 11 species, which included a single adult (605 mm TL) flannelmouth sucker taken from Laughlin Lagoon. Eighty-five overnight trammel nets set from Park Moabi to Clear Bay in Topock Gorge yielded 2,184 fish representing 17 species. A single young adult (365 mm) and a subadult (321 mm) flannelmouth sucker were captured.

Boat electrofishing was conducted on three evenings near Laughlin for a total of 6,293 generator seconds and collected 27 adult flannelmouth suckers. Adults averaged 570 mm TL (range 515-620 mm TL) and 1.994 kg (range 1.360-2.755 kg)

We collected fin clips from 19 adults for aging analysis by BIO-WEST. Fourteen females averaged 15 years of age (range 7-26 years). Five males averaged 17 years of age (range 10-21 years). A table of clipped flannelmouth sucker information including previous capture history can be viewed in Appendix A.

Sonic Telemetry

Ten telemetry surveys were conducted between October 2007 and September 2008. Telemetry surveys produced 62 detections during the 2008 field season (Table 2). Several flannelmouth suckers tagged in 2006 (14 month tags model CT-82-2-I) were detected into early September surveys, a full 17 months longer than the estimated tag life. A minimum of seven tags are thought to still be active from fish tagged in 2007.

Tagged females in 2008 ranged an average of 9 miles (1.5-16 miles) and males ranged an average of 4 miles (1-11.5 miles). Graphs of flannelmouth sucker movements from fish detected in 2008 are in Appendix B and include data from all years of the study to date.

Table 2. General tracking data for sonic-tagged flannelmouth suckers (October 2007 to September 2008).

Fish #	Code	Sex	Date tagged	General capture location	*Release location	# Contacts manual tracking	Range of movement (miles)
2006-13	333	M	2/1/06	BB	BB	4	1.5
2006-11	335	M	2/1/06	LL	LB	6	5
2006-10	336	M	2/1/06	BB	LB	3	1
2006-09	344	M	2/1/06	BB	BB	5	1.5
2006-08	345	M	2/1/06	BS	BS	3	6.5
2006-04	444	M	3/2/06	BB	BB	3	7
2007-30	4748	M	12/21/06	Avi	Avi	4	11.5
2007-33	5767	M	2/1/07	Avi	BB	4	1.5
2007-07	488	F	2/1/07	Avi	BB	4	16
2007-11	3354	F	1/31/07	LB	BB	6	12
2007-48	3366	F	1/31/07	BB	BB	7	7
2007-49	3437	F	2/1/07	LB	BB	6	8
2007-52	3475	F	1/31/07	BB	BB	7	1.5

* LB = Laughlin Bridge RM 274, LL = Laughlin Lagoon RM 268, BB = Big Bend boat ramp RM 267, BS = Boy Scout Camp RM 266, Avi = RM 258.

Discussion

Sampling and tracking during the 2008 field season has added to our database with regard to larval and early juvenile adult habitat use, as well as adult movements and preferred habitats. Age-1 to subadult (70-350 mm TL) juveniles continue to be rare in collections. Fin clips collected in 2008 provided limited information on population age structure and will be supplemented with additional samples in 2009.

We located three congregations of young juveniles in 2007. It was noted that these fish were directly adjacent to spawning areas, and we consider that there may be a relationship. More formal surveys were conducted in 2008; 29 rearing areas were located and many of these were not associated with known spawning groups. Several shoreline habitats adjacent to spawning groups appeared suitable, but harbored few or no flannelmouth sucker young. As we sampled at varying water levels, it became apparent that we were consistently locating fish in areas that appeared to have a jetty or structural element that allowed for a habitat to remain a slackwater regardless of river elevation. Photos taken throughout the day of a shoreline slackwater habitat that harbored young juvenile flannelmouth suckers can be viewed in Appendix E. Habitats of larval and young juvenile flannelmouth suckers were characteristic of backwaters and near-shore slackwaters with little or no flow and at depths generally less than 0.5 meters. Substrates varied and ranged from cobble to silt, and were often a function of water level at the time of sampling.

Age-1 to subadult (70-350 mm) juveniles have proven difficult to contact. We captured five fish over three years of setting trammel nets in backwaters. Thus far, seining and electrofishing of available habitats throughout our study reach have failed to locate any age-one juveniles or sub-adults. However, as we continue to sample available habitats with different techniques, there is growing evidence that they may simply not be in numbers sufficient enough to provide meaningful information.

Our sonic tracking data provided us with some interesting information on flannelmouth sucker habits. Adult flannelmouth suckers in our study reach have notable schools or aggregations. Many of these aggregations are found year round. These preferred habitats are characteristic of channel habitats with current velocities greater than 0.5 m/s, depths ranging from 2 to 3 m, and substrates composed primarily of cobble. Appendix C shows a map of 14 of our tagged fish that had multiple detections in 2008. We noted that the majority of our detections were found in these common areas and that adults appear to migrate between schools where they spend most of their time.

Movements of individual fish are difficult to pattern. Appendix B depicts graphs of individual fish movements over at least a two-year period. Flannelmouth sucker movements are highly individual. Some fish appear to show a strong fidelity to seasonal locations while others do not, regardless of sex. The data hint at seasonal trends in upstream and downstream movement—most notably, the larger movements observed in the spring.

The majority of these congregations show some proximity to backwater or slackwater habitats. We have observed flannelmouth suckers resting in slackwater habitats during the spawning season. Also, trammel net catch per unit effort from previous years increased as the spawning season progressed, probably the result of increasing rest requirements due to the rigors of spawning.

Habitat use of flannelmouth sucker is within the range reported by Beyers et al. (2001) in the Colorado River near Grand Junction, Colorado, although they found the majority of

their fish at depths of 1.5 meters. Frequency curves of habitat utilization can be viewed in Appendix D. Our habitat data show that a majority of flannelmouth suckers utilize depths of 2.5-3.0 meters. This may be a function of several factors, including deeper habitats being available in our study reach, and water clarity that allows for greater visibility into deeper habitats, such that depth may not provide the cover requirements that flannelmouth suckers prefer. However, this may simply be an artifact of when telemetry surveys were conducted rather than a true indication of fish habitat use. Surveys never took place during crepuscular periods or at night. The movement into shallower habitats near shore as dusk approaches is quite apparent based on our electrofishing efforts becoming more effective towards dusk. It appears that there is a pattern of habitat use, even though it is not obvious when solely analyzing the telemetry habitat data.

This portion of river is highly regulated and daily deviations in flow commonly range more than 15,000 cfs, which corresponds to changes in elevations greater than 1 meter. We speculate that the highest densities of benthic invertebrates would be found in the portion of the river that remains inundated (main channel), and flannelmouth suckers in this reach may have become accustomed to deeper, more productive habitat.

Future Work

Proposed activities for 2009 include continuing the monthly tracking effort of sonic-tagged flannelmouth sucker through the spawning season to expand our habitat utilization database. Frequency curves of habitat utilization during the spawning season will be incorporated. We will also begin mapping locations of contacted life stages to look at distribution throughout our study area to determine habitat preferences. We will look into fin-ray aging as a means to resolve any possible concerns of an aging population and to better detect other pulses in this population. Accurate aging data will allow us to look at conditions from previous years and possibly determine what favorable conditions promoted a strong year class. Continuation of sampling is planned, using beach seines and light collection techniques to further assess numbers and distribution of larvae and juvenile life stages.

Acknowledgements

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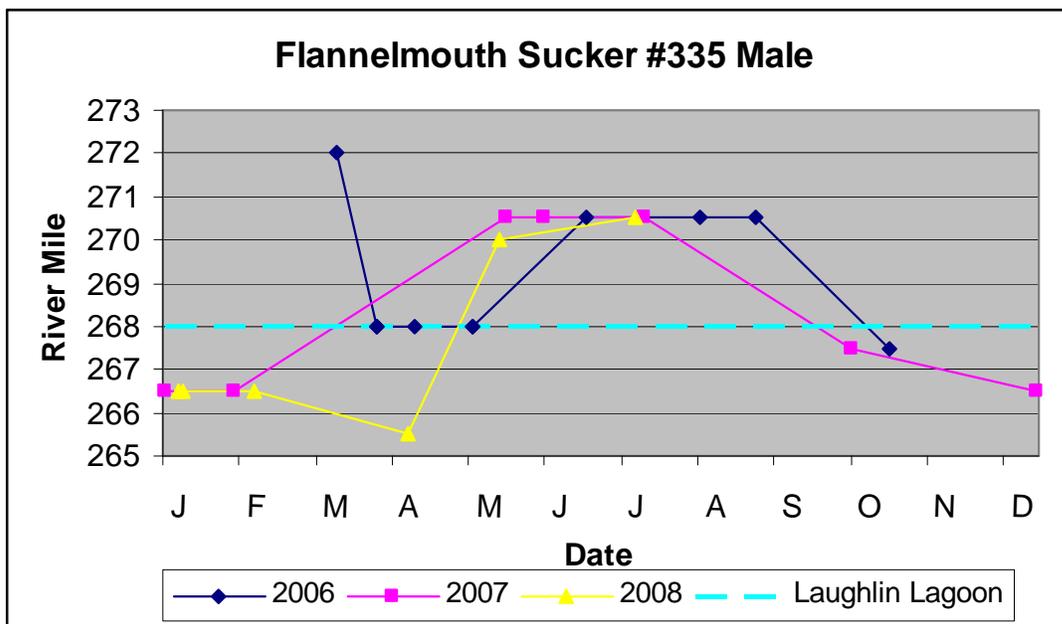
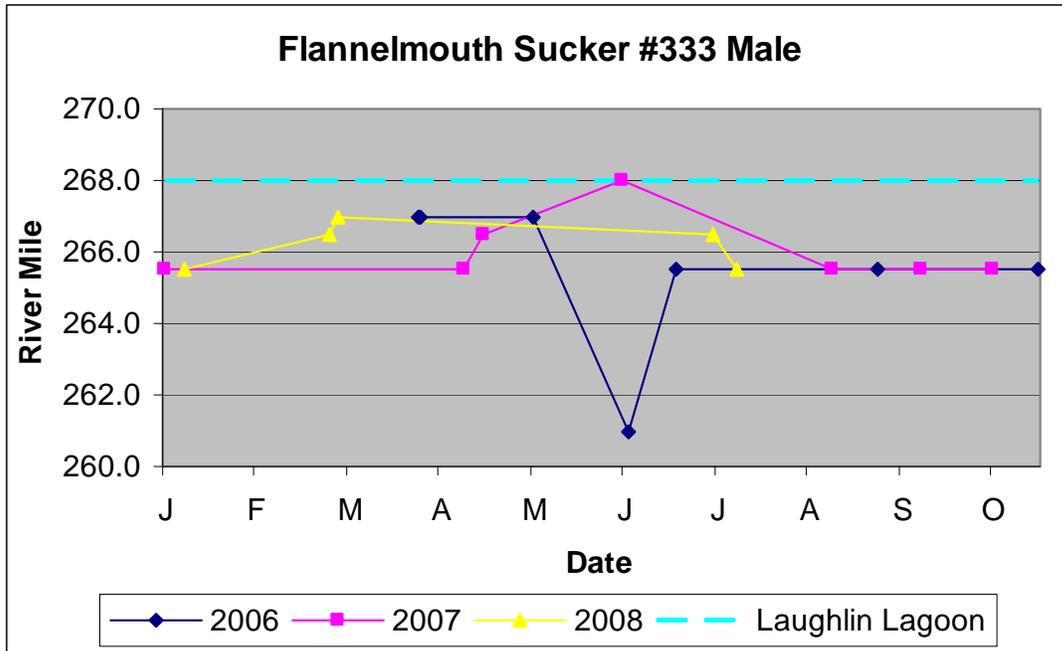
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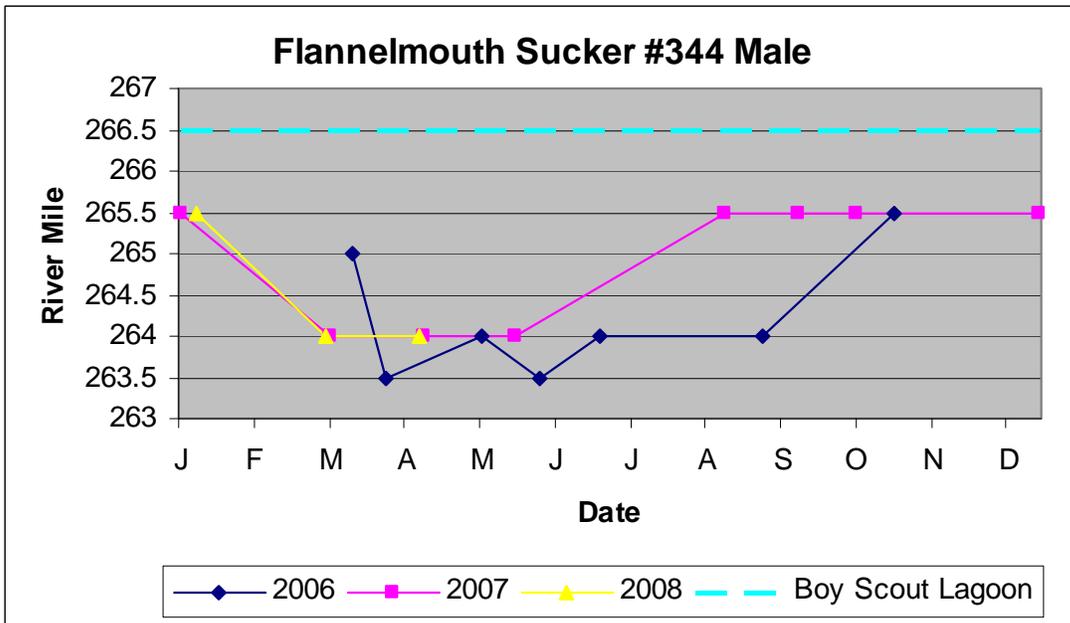
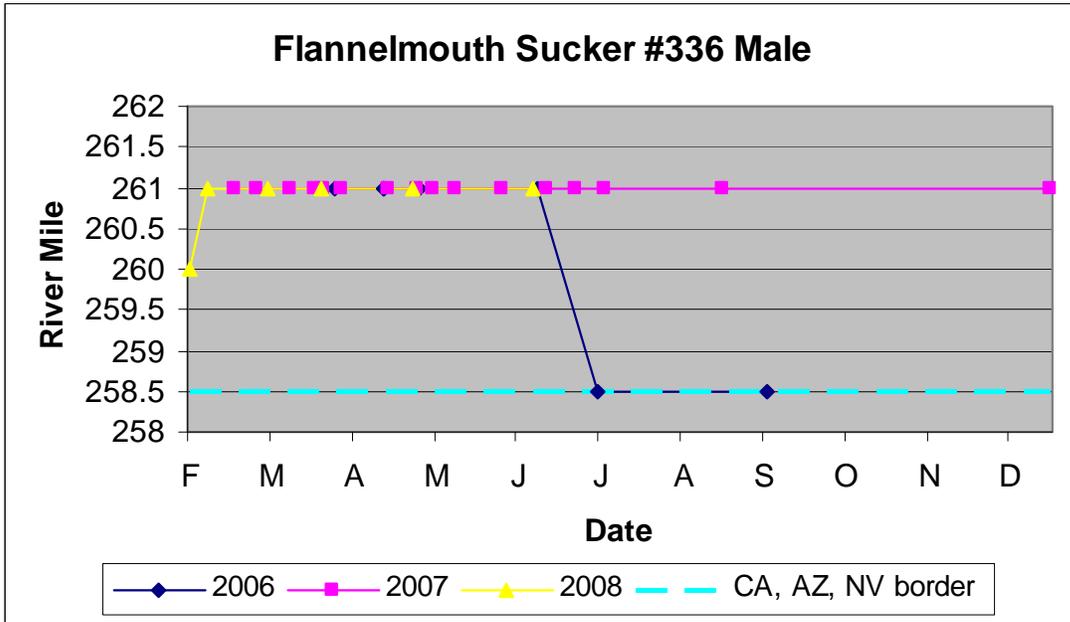
Appendix A. Summary of Flannemouth Suckers Clipped for Aging Analysis in 2008.

Date	Approximate RM Collected	TL	WT	Sex	PIT	Re-cap	Previous Date(s)	RM	Length	Weight	Age
6/2/2008	265	565	1655	f	1c2c84522e	n					20
6/2/2008	265	550	1725	f	1c2c83c986	n					11
6/2/2008	265	555	1845	f	1c2c843f7e	n					26
6/2/2008	265	590	2380	f	1c2c840821	n					14
6/2/2008	265	595	2145	f	1c2c83ca53	n					18
6/2/2008	265	560	1925	f	1c2c84074e	n					7
6/2/2008	265	520	1560	f	1c2c83beba	n					10
4/29/2008	268	605	2862	f	1c2c3669c0	n					7
6/2/2008	265	565	1655	m	1c2c840f4a	n					21
6/2/2008	265	550	1805	m	1c2c840cbf	n					20
2/25/2008	254	590	2570	f	424d5e5632	y	03/28/02	268	584	2150	12
							3/9/2006	265	619	2777	
							4/17/2006	262	610	2345	
6/2/2008	265	590	2260	f	4252300f79	y	3/22/2006	264	615	2496	23
6/2/2008	265	575	2285	f	4255015136	y	3/21/2006	265	566	2240	23
6/2/2008	265	620	2330	f	425511653d	y	3/22/2006	264	605	2340	18
6/3/08	275	610	2330	f	451f376e06	y	3/7/2006	272	612	2720	15
6/3/08	275	599	2000	f	42524a0521	y	3/9/2006	264	577	2007	7
6/2/2008	265	515	1360	m	257c611395	y	5/1/2007	265	505	1295	18
6/2/2008	265	560	1970	m	4255164775	y	3/22/2006	264	570	2290	10
							4/18/2006	265	560	2110	
6/2/2008	265	525	1705	m	422e3b2e27	y	4/19/2006	265	492	1443	15

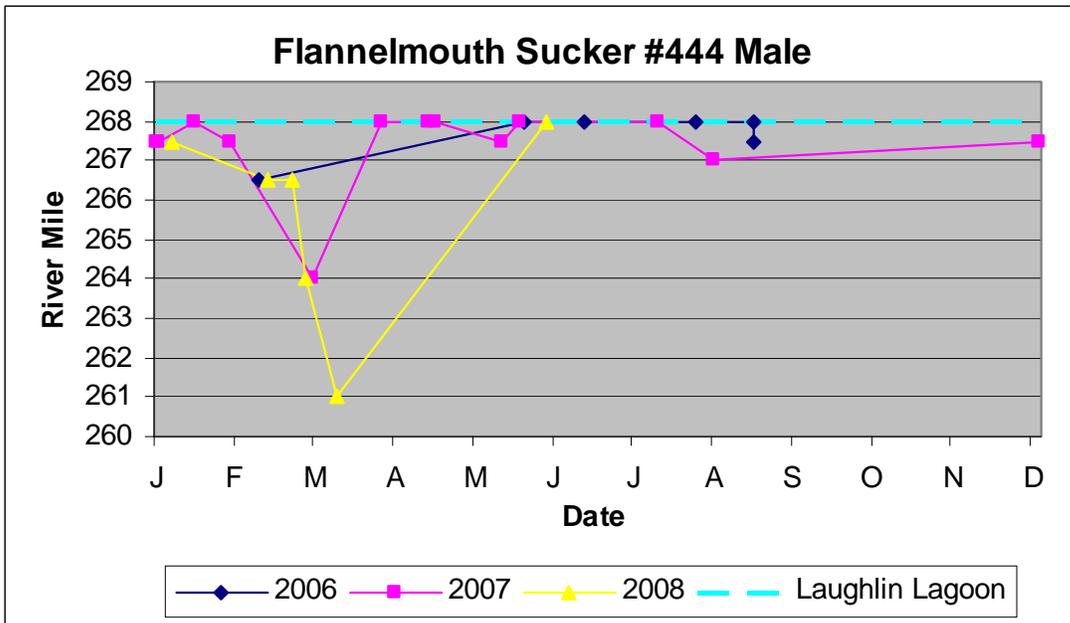
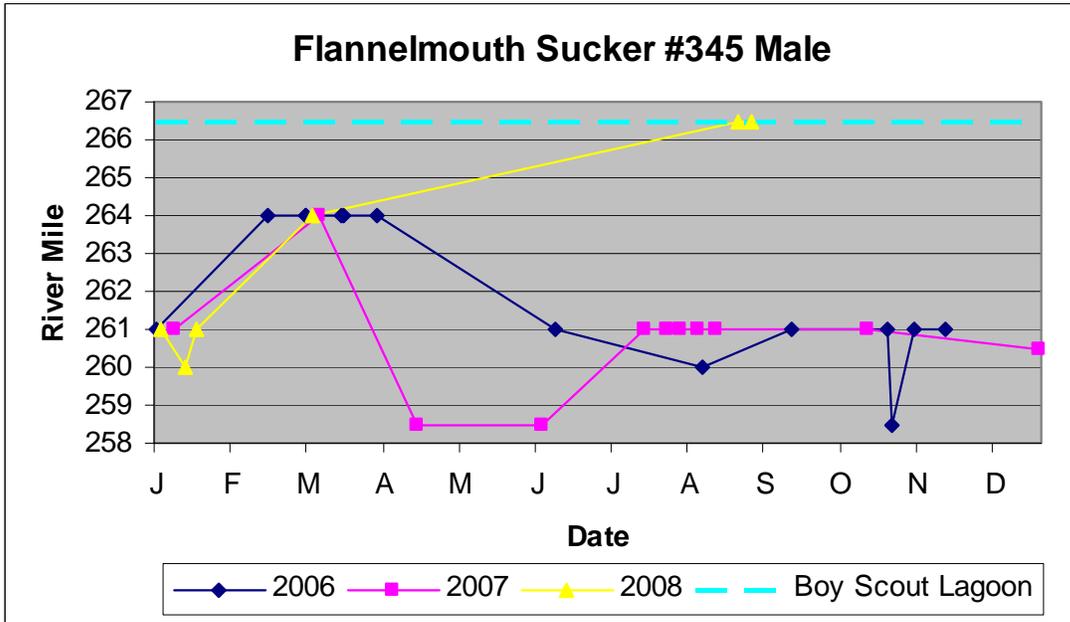
Appendix B. Seasonal movements of flannelmouth suckers tagged in 2006 and 2007. Sex is indicated next to fish number.



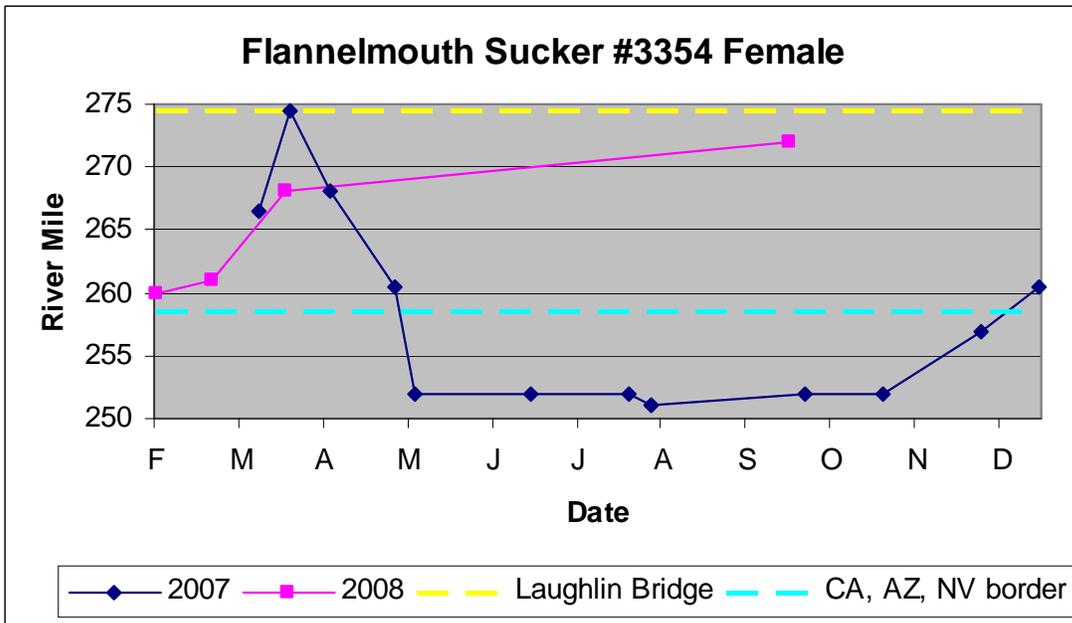
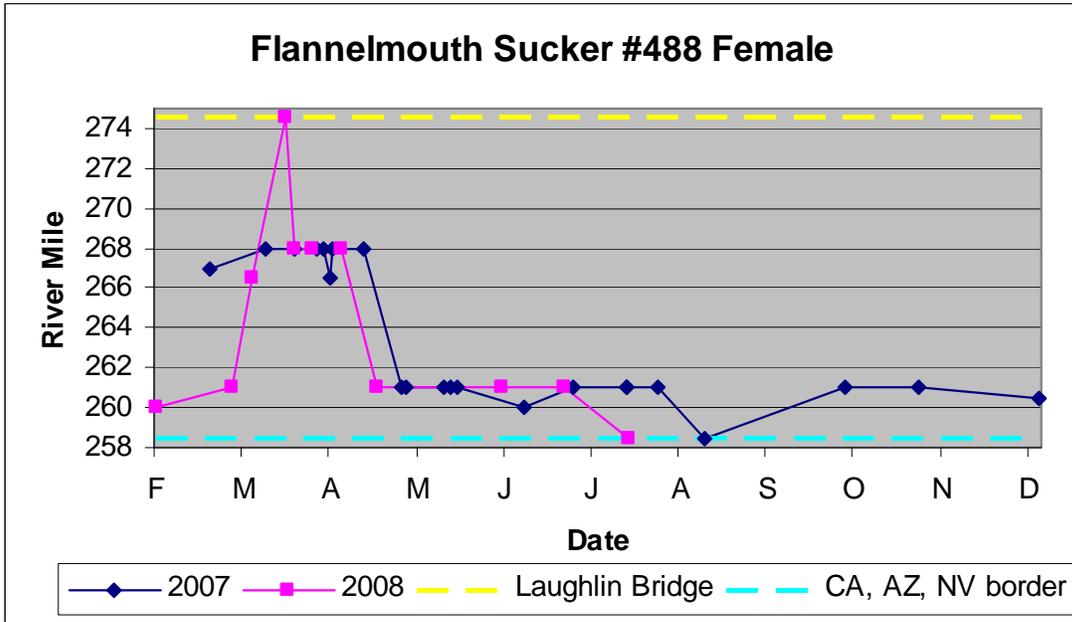
Appendix B. Continued.



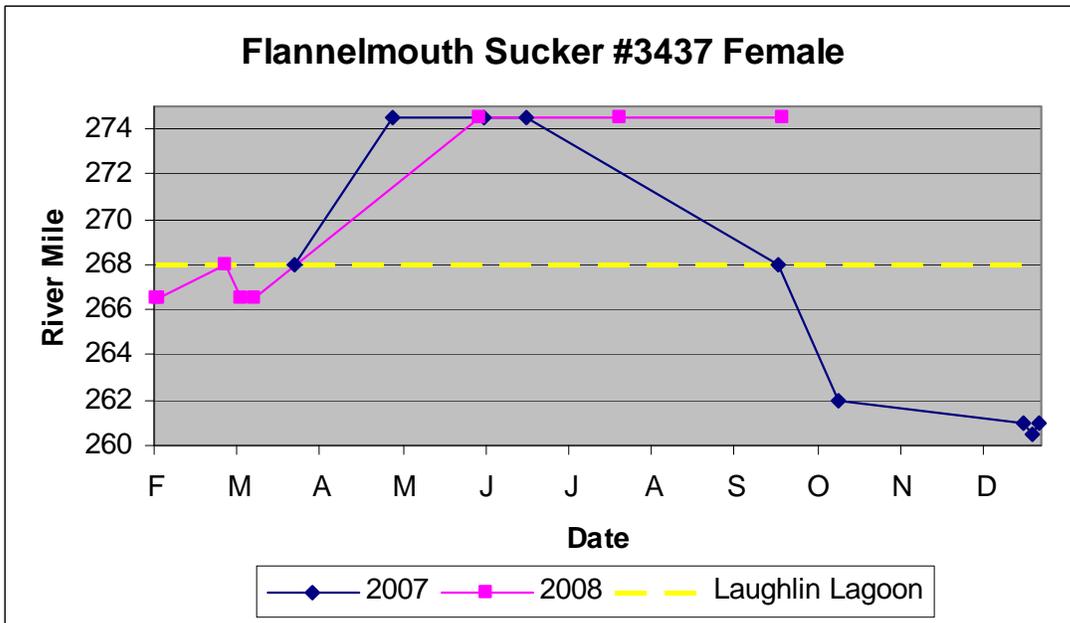
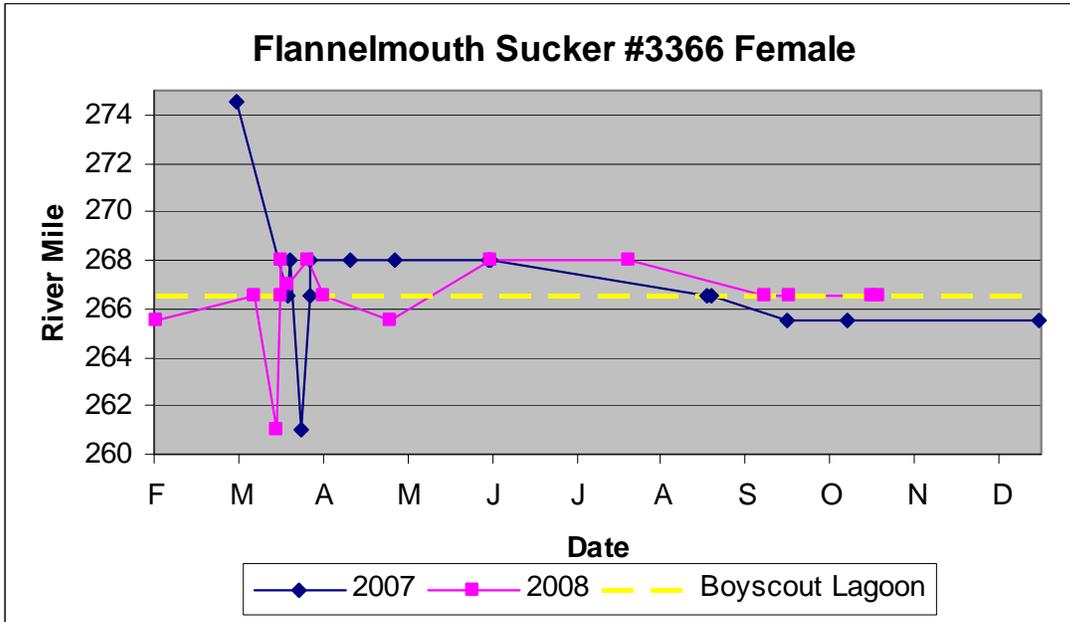
Appendix B. Continued.



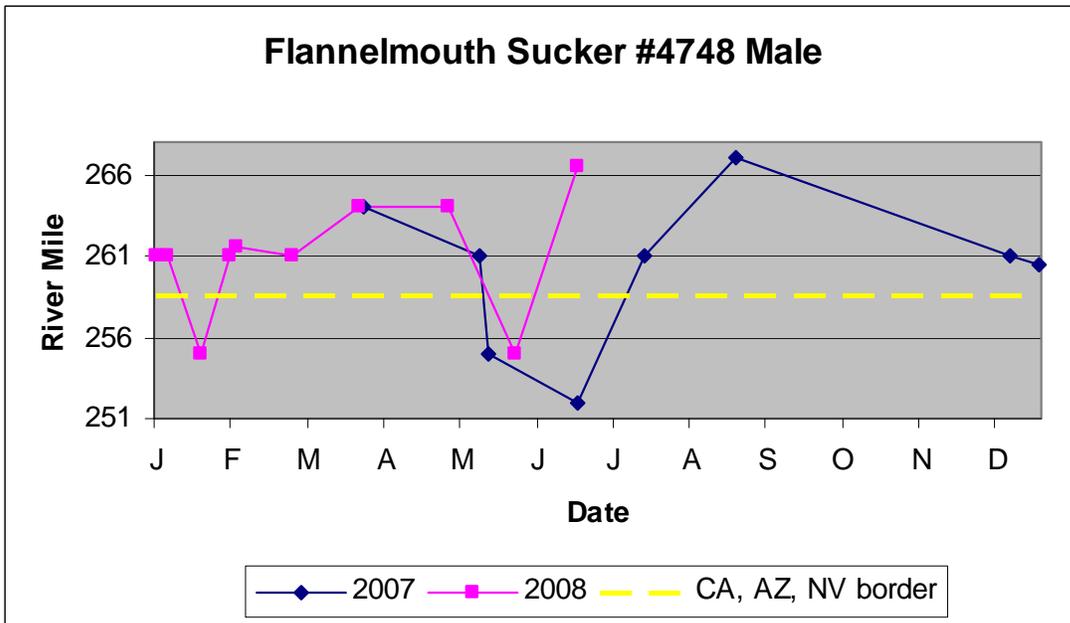
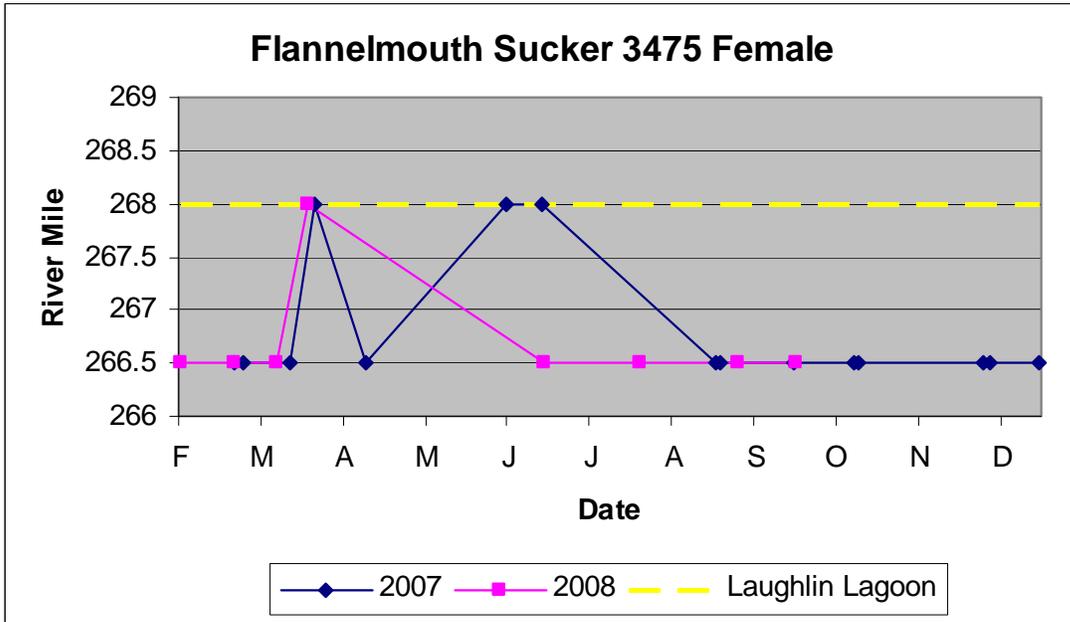
Appendix B. Continued.



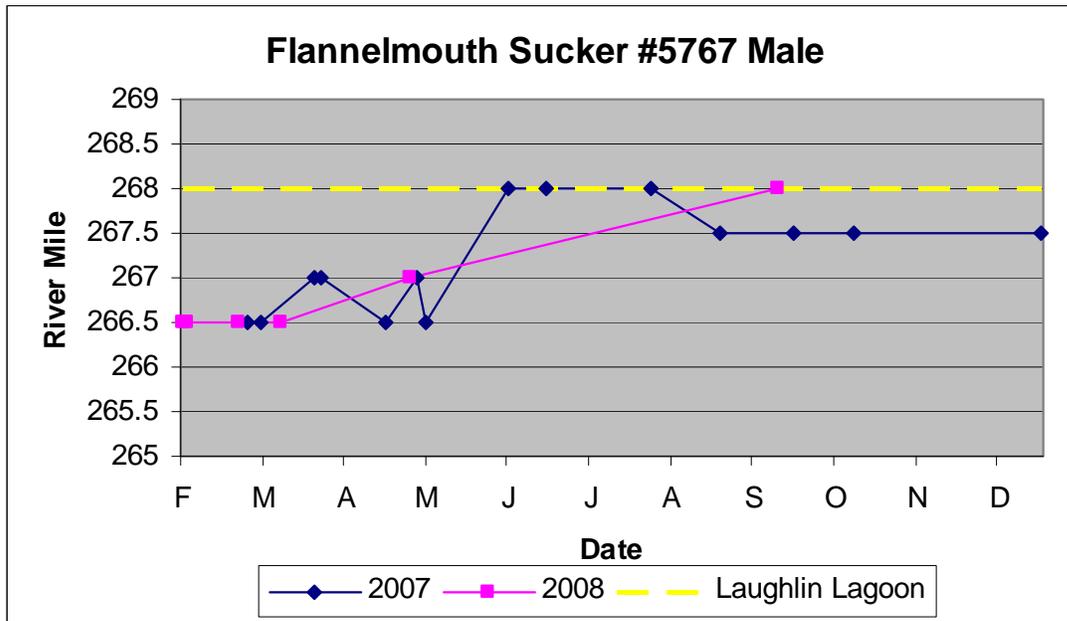
Appendix B. Continued.



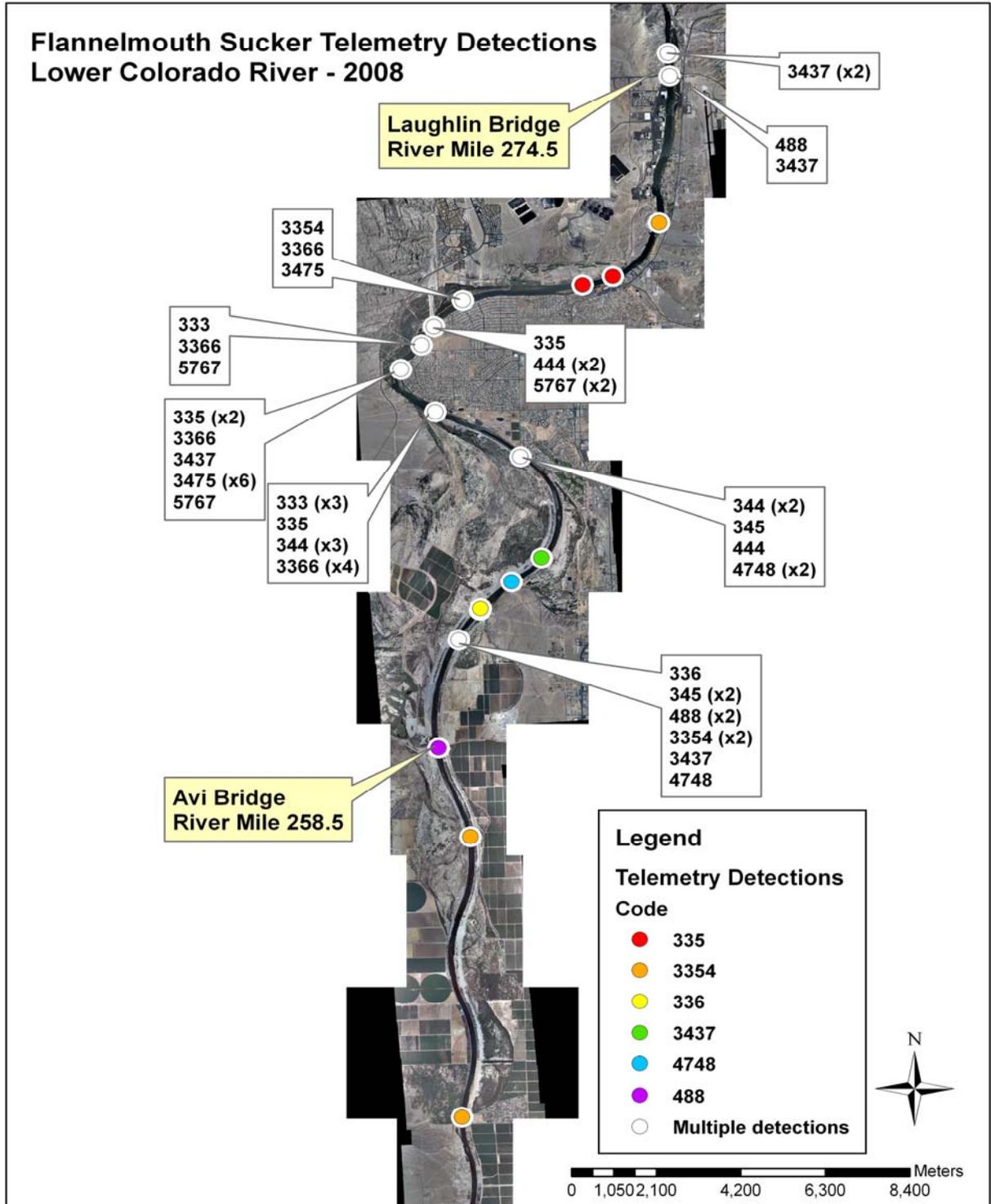
Appendix B. Continued.



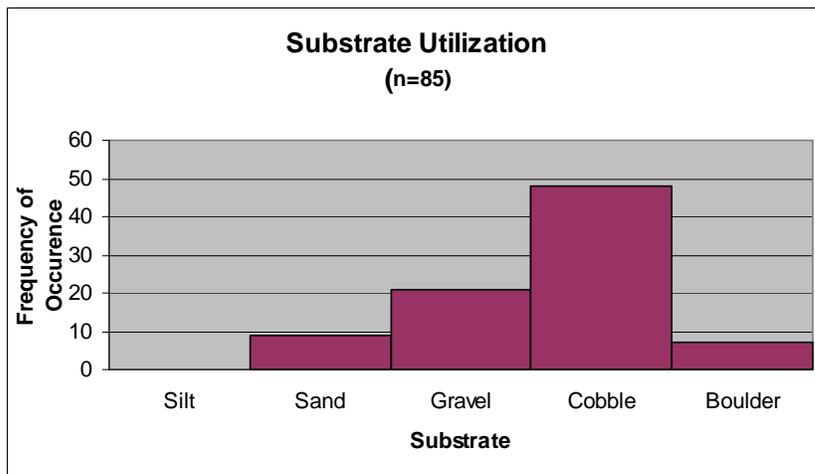
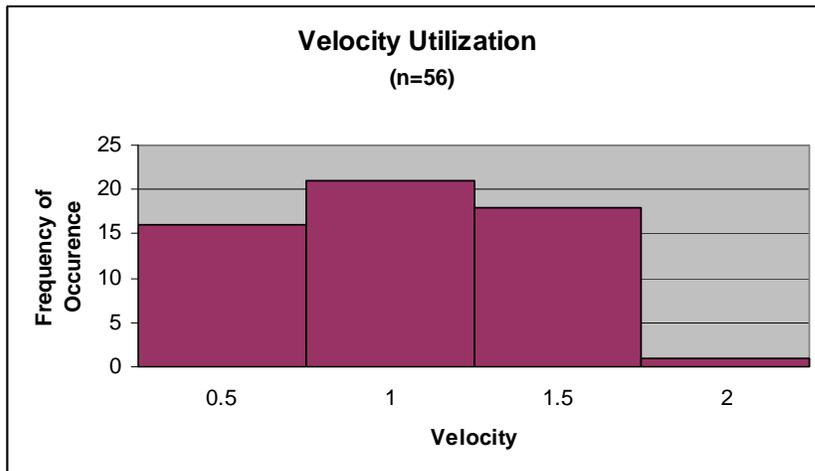
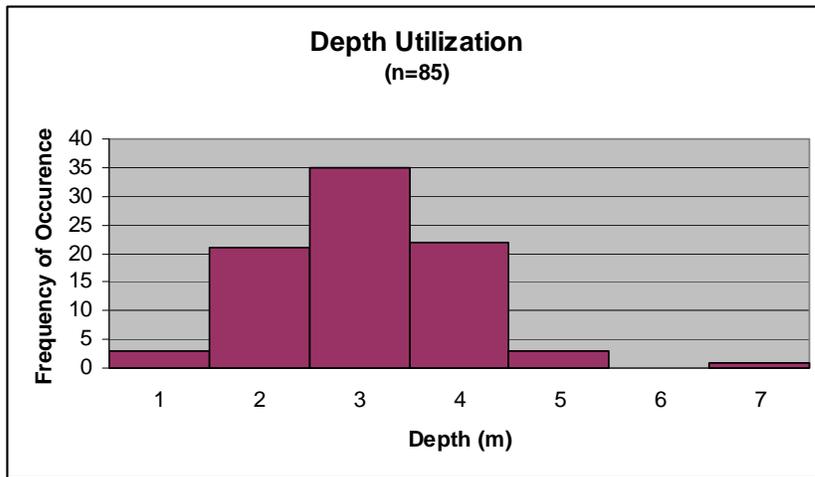
Appendix B. Continued.



Appendix C. Flannelmouth suckers with multiple detections in 2008.



Appendix D. Habitat Utilization Frequency Curves for flannelmouth sucker. Data do not include those fish recorded during the spawning season (March–May).



Appendix E. Photos of a Slackwater Habitat at RM 266.5 as flows increase on June 24, 2009. Arrow indicates the location of a slackwater inhabited by a school of young juvenile flannelmouth suckers.



Photo #1: June 24, 2009, 11:39 a.m., gauge height – 13.00, CFS – 14,400



Photo #2: June 24, 2009, 12:59 p.m., gauge height – 14.13, CFS – 18,600



Photo #3: June 24, 2009, 2:27 p.m., gauge height – 14.32, CFS – 19,400



Photo #4: June 24, 2009, 8:45 p.m., gauge height – 15.93, CFS – 26,900