

**EL CORONADO RANCH HABITAT CONSERVATION PLAN 2009
FISH MONITORING REPORT**



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Yaqui chub



Yaqui catfish



Mexican stoneroller



longfin dace

INTRODUCTION

In 1998, El Coronado Ranch owners Josiah and Valer Austin entered into Arizona's first Habitat Conservation Plan (HCP), which allowed cattle ranch operations to continue while at the same time instituting conservation measures for the federally endangered Yaqui chub *Gila purpurea*. The El Coronado Ranch HCP and Implementation Agreement (USFWS 1998) require that monitoring and reporting on the success of conservation measures occur annually for the first five years of the permit. Coleman (2002) provided a thorough review of the biogeography of Rio Yaqui fishes in Arizona and the HCP study area (Figure 1), along with recent management efforts and results of fish monitoring conducted in 2000 and 2001. In 2003, the Arizona Fish and Wildlife Conservation Office (previously Fishery Resources Office) assumed responsibility to coordinate HCP fish monitoring efforts with the San Bernardino National Wildlife Refuge, and reports (Brouder 2003, 2004, 2006; Voeltz 2006; Johnson 2007; Voeltz 2009) summarizing these activities were provided to all interested parties. This report summarizes results of the 2009 El Coronado Ranch HCP fish monitoring effort that continued to follow procedures outlined in the finalized El Coronado Ranch HCP Monitoring Plan (Coleman and Minckley 2003). Appendix A provides a summary table comparing this year's results with past monitoring results (Brouder 2005, 2006; Voeltz 2006, Johnson 2007; Voeltz 2009).

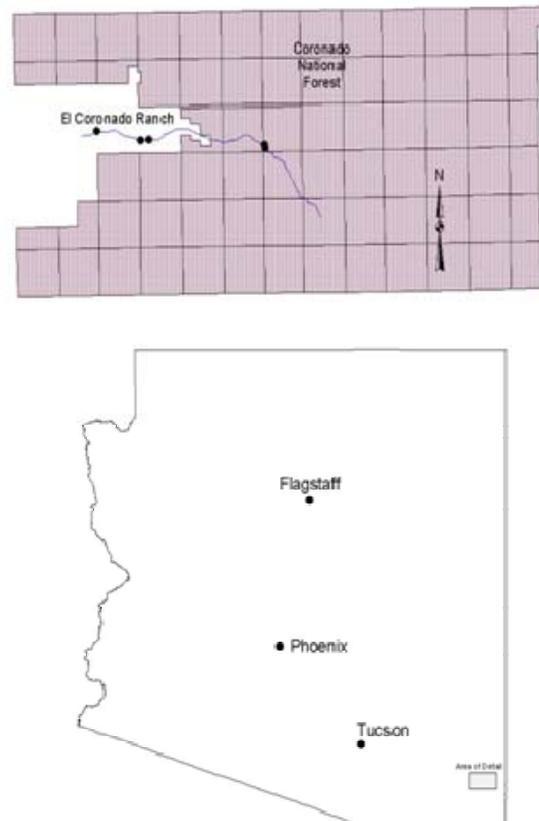


Figure 1. General location of El Coronado Ranch.

EL CORONADO RANCH PONDS SURVEY

Big Tank

Big Tank was not surveyed in October. A spot check of Big Tank occurred June 23-25 2009 to try and determine the extent of the recent invasion of green sunfish, *Lepomis cyanellus*, the population structure of black crappie *Pomoxis nigromaculatus*, and most important, to assess the status of the Yaqui catfish, *Ictalurus pricei*.

Methods

Two 20-m trammel nets and one 50-m trammel net were set in Big Tank @ 1400-hr on 6/23/09. In addition, five 3-net hoop net sets were baited with commercial cheese bait and set from 1600-hr on 6/23/09 until 0900-hr on 6/25/09.

The trammel nets were pulled at 800-hr on 6/24/09, reset at 1630-hr on 6/24/09, ran at 1900-hr on 6/24/09, reset, and pulled completely at 0800-hr on 6/25/09. Between the 1630-hr set and 1900-hr check, a canoe-mounted electrofishing unit was used for 700 shocking seconds in the vicinity of the trammel nets in an effort to get catfish “moving,” thereby hoping to increase our catch.

Yaqui catfish *Ictalurus pricei* captured were measured for total length (TL; mm), weighed (g), and anal and pectoral rays counted. Yaqui catfish captured were also scanned for the presence of a Passive Integrated Transponder (PIT) tag. Black crappie *Pomoxis nigromaculatus* and green sunfish *Lepomis cyanellus* were counted and removed permanently.

Results

During the trammel net runs, a total of 12 Yaqui catfish were caught – eight in the first run, two in the second run, and two in the third run (Tables 1 and 2). Unfortunately, three of the catfish were dead upon pulling the nets (the fish were still processed and are frozen and housed at AGFD). Ninety black crappie were collected in the first trammel net pull, zero in the second, and 16 in the third. An additional 31 black crappie were collected from the hoop net sets. One green sunfish was collected from the third trammel net set and 23 were collected from the hoop net sets.

Table 1. Yaqui catfish captured during El Coronado Ranch monitoring in June 2009.

<u>Date</u>	<u>Mark(M)/ Recapture (R)</u>	<u>PIT Tag #</u>	<u>TL (mm)</u>	<u>WT (g)</u>	<u>Comments</u>
6-24-09	R	442365364E*	400	710	Dead
6-24-09	R	5325795F52	445	870	
6-24-09	R	5326563E27	410	570	
6-24-09	R	53261A784A	355	475	
6-24-09	R	532648322B	401	670	
6-24-09	R	53260B3968	451	1035	
6-24-09	R	5326102A49	436	945	
6-24-09	R	5321251149	388	595	Dead
6-24-09	R	532640627B	388	570	
6-24-09	R	532124424D	394	725	
6-25-09	R	442B3C5349	371	590	
6-25-09	R	5326482255	387	590	Dead

* - no previous history was found for this tag #

Table 2. Mark-recapture history of Yaqui catfish captured during El Coronado Ranch monitoring in June 2009.

<u>Date</u>	<u>Location</u>	<u>Mark(M)/ Recapture (R)</u>	<u>PIT Tag #</u>	<u>TL (mm)</u>	<u>WT (g)</u>
10-26-99	Lisa Tank	M	5325795F52	298	260
6-24-09	Big Tank	R	5325795F52	445	870
10-26-99	Lisa Tank	M	5326563E27	281	230
10-07-00	Lisa Tank	R	5326563E27	333	794
6-24-09	Big Tank	R	5326563E27	410	570
10-26-99	Lisa Tank	M	53261A784A	262	180
10-07-00	Lisa Tank	R	53261A784A	285	652
6-24-09	Big Tank	R	53261A784A	355	475
10-26-99	Lisa Tank	M	532648322B	217	100
10-14-00	Lisa Tank	R	523648322B	282	624
6-24-09	Big Tank	R	523648322B	401	670
10-26-99	Lisa Tank	M	53260B3968	255	160
10-14-00	Lisa Tank	R	53260B3968	298	652
6-24-09	Big Tank	R	53260B3968	451	1035
10-26-99	Lisa Tank	M	5326102A49	308	260
10-14-00	Lisa Tank	R	5326102A49	337	709
6-24-09	Big Tank	R	5326102A49	436	945
10-26-99	Lisa Tank	M	5321251149	272	180
10-14-00	Lisa Tank	R	5321251149	305	680
6-24-09	Big Tank	R	5321251149	388	595

Table 2 (continued). Mark-recapture history of Yaqui catfish captured during El Coronado Ranch monitoring in June 2009

<u>Date</u>	<u>Location</u>	<u>Mark(M)/ Recapture (R)</u>	<u>PIT Tag #</u>	<u>TL (mm)</u>	<u>WT (g)</u>
10-26-99	Lisa Tank	M	532640627B	321	360
10-14-00	Lisa Tank	R	532640627B	348	794
10-14-08	Big Tank	R	532640627B	390	585
6-24-09	Big Tank	R	532640627B	388	570
10-26-99	Lisa Tank	M	532124424D	327	390
10-14-00	Lisa Tank	R	532124424D	353	850
6-24-09	Big Tank	R	532124424D	394	725
10-22-03	Big Tank	M	442B3C5349	367	559
10-10-07	Big Tank	R	442B3C5349	370	470
6-25-09	Big Tank	R	442B3C5349	371	425
10-26-99	Lisa Tank	M	5326482255	246	160
10-14-00	Lisa Tank	R	5326482255	293	624
6-25-09	Big Tank	R	5326482255	387	590

Discussion

Yaqui catfish captures continue to be low; but recaptured fish over the years tend to be unique (meaning, with the exception of two fish [PIT tag #s 442B3C5349 and 532640672B]), we are not recapturing fish that have previously been captured in Big Tank). However, because recaptured fish from Big Tank are rarely encountered, it is difficult to get a population estimate to determine how many of the original 254 Yaqui catfish that were stocked remain, or if any reproduction has occurred (several catfish have been caught over the years without PIT-tags – either they shed their tags or were a result of reproduction as all 254 stocked fish were tagged). Because the fish were from the 1996 year class from the hatchery, they are now ~13 years old, which is near the reported maximum life-span for the related channel catfish *Ictalurus punctatus*, which sometimes lives more than 10 years, but typically does not exceed six or seven years (Pflieger 1997). In addition, the two repeat recaptured fish appear to have reached a maximum length, as their total length has remained nearly identical between capture years 2007 and 2009.

Because of the increase in abundance of both black crappie and green sunfish, as well as the aging catfish population, it may now be appropriate to take action. We recommend pumping Big Tank dry during low water periods to completely remove the nonnative fish; salvaging remaining Yaqui catfish, and depending on numbers, translocating some of the catfish to the pond(s) on the Bar Boot Ranch.

Table 3. Numbers of fish collected between 2003 and 2009 from monitoring at Big Tank (effort and monitoring season is not the same for each year).

Year	<u>Yaqui catfish</u>	<u>Black crappie</u>	<u>Grass carp</u>	<u>Green sunfish</u>
2003	2	20	1	0
2004	1	11	0	0
2005	2	0	0	0
2006	3	5	0	0
2007	3	0	0	0
2008	2	15	0	3
2009	12	137	0	24

Tennis Court Pond

Methods

Twelve minnow traps were fished overnight (1500-hr to 0800-hr) on October 13-14, 2009 in the Tennis Court Pond. A sub-set of chub captured were measured for total length (mm; TL) and immediately released back into Tennis Court Pond. Catch per unit effort (CPUE) was calculated as the number of fish/total hours of netting.

Results

A total of 1264 Yaqui chub were collected in approximately 17 hours of sampling. Mean CPUE of Yaqui chub collected in minnow traps was 6.20 fish/hour. Mean total length of the sub-sample of Yaqui chub measured was 58.5 mm and ranged in size from 35 to 95 mm. The majority of fish in the measured sub-sample were of the 50 to 59 mm modal length class (Figure 2).

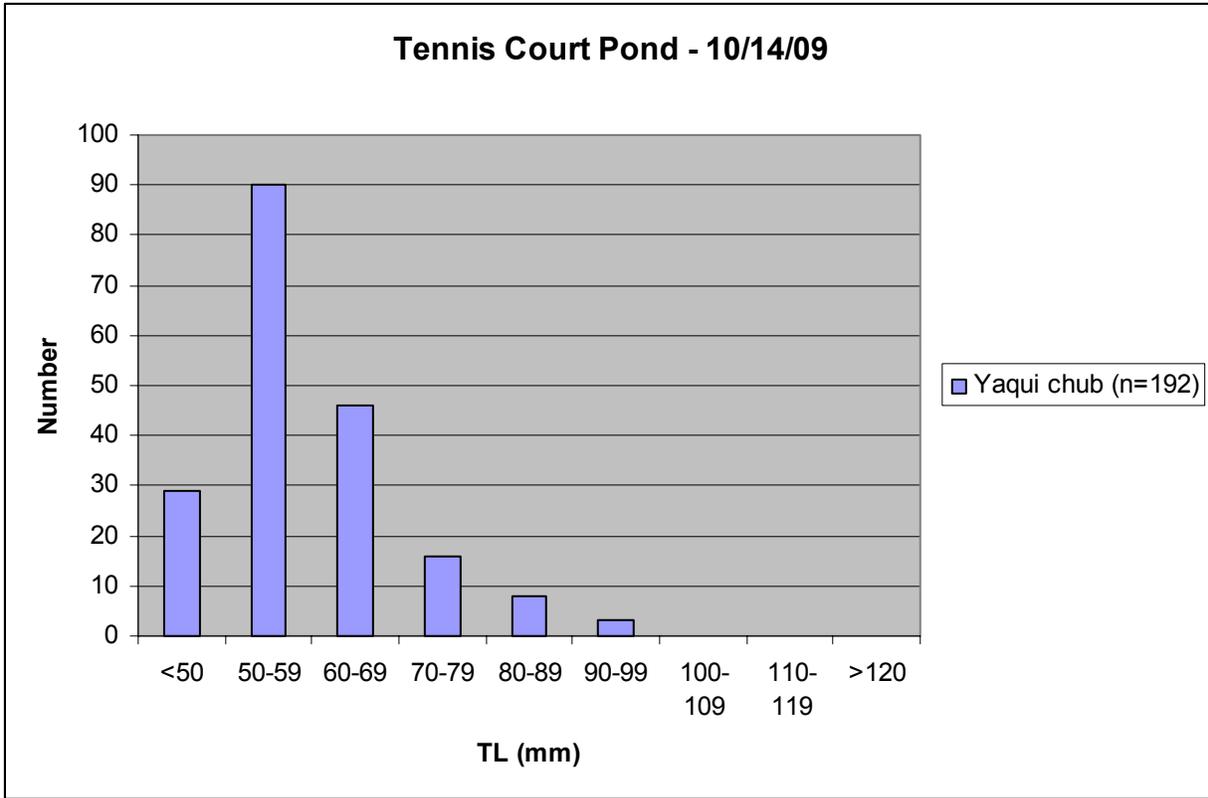


Figure 2. Length-frequency histogram of a sub-sample of Yaqui chub collected in Tennis Court Pond during El Coronado Ranch HCP monitoring in October 2009.

Discussion

Tennis Court Pond has high numbers of Yaqui chub when the pond consistently holds water (Table 4). However, the pond dried in 2006, and no fish were collected in 2006 or 2007. In October 2007 (following the fall monitoring effort), 68 Yaqui chub were relocated from Lower Guesthouse Pond to re-establish the population in Tennis Court Pond. The explosion in population size between 2008 and 2009 can be attributed to consistent water levels in the pond.

Table 4. Numbers of fish collected between 2003 and 2009 from Tennis Court Pond.

Year	Longfin dace	Yaqui chub
2003	0	799
2004	0	413
2005	0	363
2006	0	0
2007	0	0
2008	0	70
2009	0	1264

Lodge Pond

Methods

Twelve minnow traps were fished overnight (1530-hr to 0900-hr) on October 13-14, 2009 in the Lodge Pond. A sub-sample of fish collected were measured and immediately released back into Lodge Pond. CPUE was calculated as the number of fish/total hours of netting.

Results

A total of 1531 Yaqui chub were collected in approximately 17.5 hours of sampling. Mean CPUE of Yaqui chub collected in minnow traps was 7.29 fish/hour. Mean total length of the sub-sample of Yaqui chub measured was 50.2 mm and ranged in size from 27 to 93 mm. The vast majority (71%) of fish in the measured sub-sample were of the <50 mm modal length class (Figure 3).

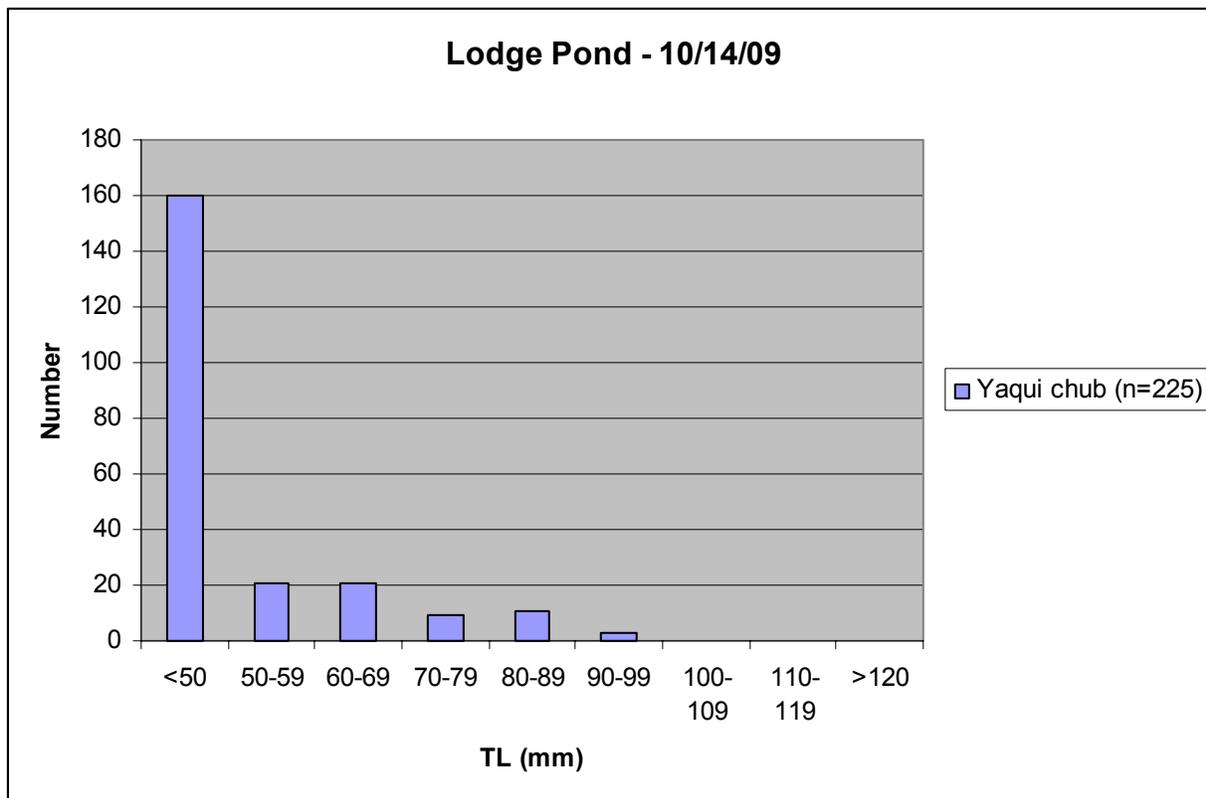


Figure 3. Length-frequency histogram of a sub-sample of Yaqui chub collected in Lodge Pond during El Coronado Ranch HCP monitoring in October 2009.

Discussion

Although not a traditional standard sampling site, Lodge Pond has been monitored in October 2006 – 2009 (Table 5) due to salvage efforts that occurred on May 31, 2006 (Voeltz 2006, Johnson 2007) and the restocking of 42 Yaqui chub on November 7, 2006 (Johnson 2007). Lodge Pond should continue to be sampled every year from now on, and fish used for re-establishment throughout the ranch, as needed. In addition, Yaqui

topminnow should be stocked under the AGFD's (Arizona Game and Fish Department) Safe Harbor Agreement for topminnows and pupfish in Arizona (AGFD 2007).

Table 5. Numbers of fish collected between 2006 and 2009 from Lodge Pond.

Year	<u>Longfin dace</u>	<u>Yaqui chub</u>	<u>Mexican stoneroller</u>
2006	0	0	-
2007	0	4	0
2008	0	237	1
2009	0	1531	0

Upper Guesthouse Pond

Methods

Twelve minnow traps were fished overnight (1600-hr to 1000-hr) on October 13-14, 2009 in the Upper Guesthouse Pond. A sub-sample of Yaqui chub collected were measured and immediately released back into Upper Guesthouse Pond. CPUE was calculated as the number of fish/total hours of netting. CPUE was calculated as the number of fish/total hours of netting. Longfin dace, *Agosia chrysogaster*, were counted and released.

Results

A total of 2151 Yaqui chub were collected in approximately 18 hours of sampling. Mean CPUE of Yaqui chub collected in minnow traps was 9.69 fish/hour. Mean total length of the sub-sample of Yaqui chub measured was 6.13 mm and ranged in size from 39 to 113 mm. The majority (52%) of fish in the measured sub-sample were of the 50 to 59 mm modal length class (Figure 4). Six longfin dace were collected.

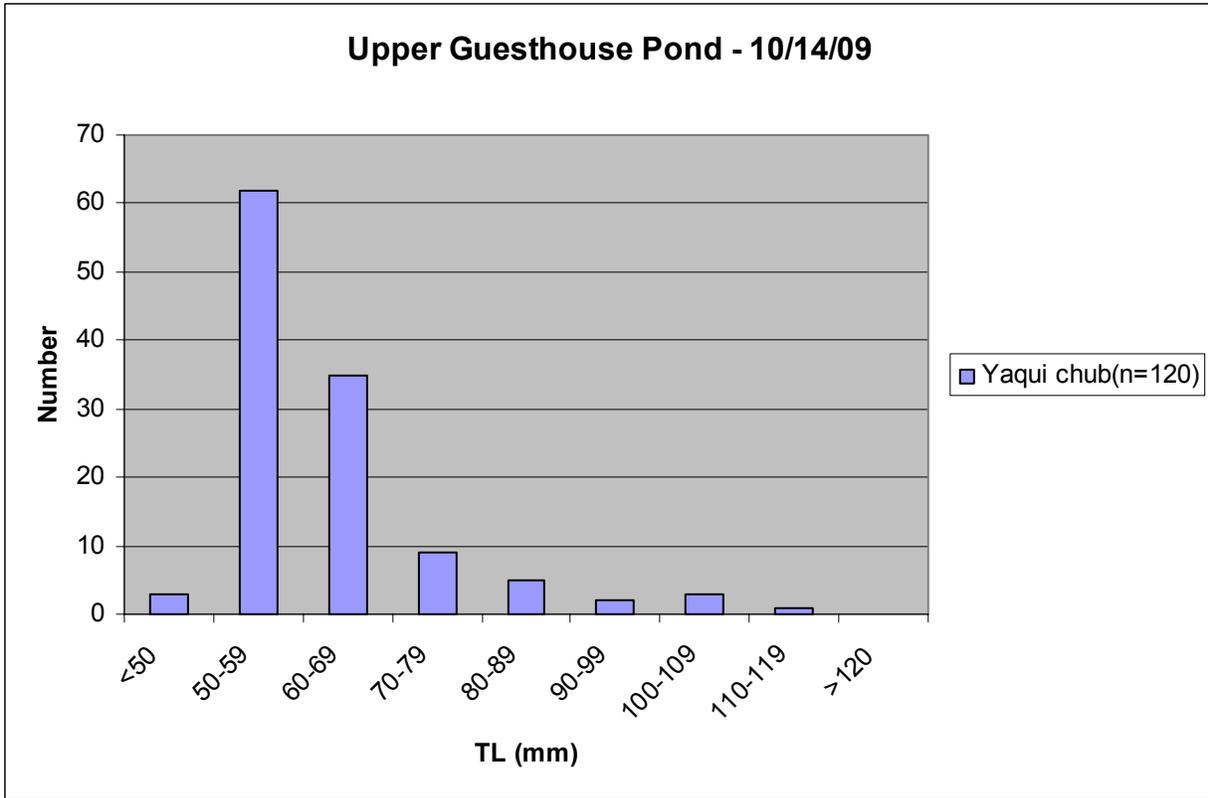


Figure 4. Length-frequency histogram of Yaqui chub collected in Upper Guesthouse Pond during EI Coronado Ranch HCP monitoring in October 2009.

Discussion

The surge in the population of Yaqui chub in Upper Guesthouse Pond is good news, as chub numbers had been very low in Upper Guesthouse Pond since the 2006 drought (Table 6). Before 2007, Upper Guesthouse pond was sampled using seines; however, to make future data comparable between the ponds on the ranch, the decision was made in 2007 to sample with minnow traps.

Table 6. Numbers of fish collected between 2003 and 2009 from Upper Guesthouse Pond.

Year	<u>Longfin dace</u>	<u>Yaqui chub</u>
2003	0	1
2004	0	0
2005	11	240
2006	110	0
2007	0	0
2008	0	52
2009	6	2151

Lower Guesthouse Pond

Methods

Twelve minnow traps were fished overnight (1600-hr to 1030-hr) on October 13-14, 2009 in the Lower Guesthouse Pond. A sub-sample of Yaqui chub collected were measured and immediately released back into Upper Guesthouse Pond. CPUE was calculated as the number of fish/total hours of netting. CPUE was calculated as the number of fish/total hours of netting. CPUE was calculated as the number of fish/total hours of netting.

Results

A total of 616 Yaqui chub were collected in about 18.5 hours of sampling. Mean CPUE of Yaqui chub collected in minnow traps was 2.77 fish/hour. Mean total length of the sub-sample of Yaqui chub measured was 51.8 mm and ranged in size from 36 to 94 mm. The majority (51%) of fish in the measured sub-sample were of the 50 to 59 mm modal length class (Figure 5)

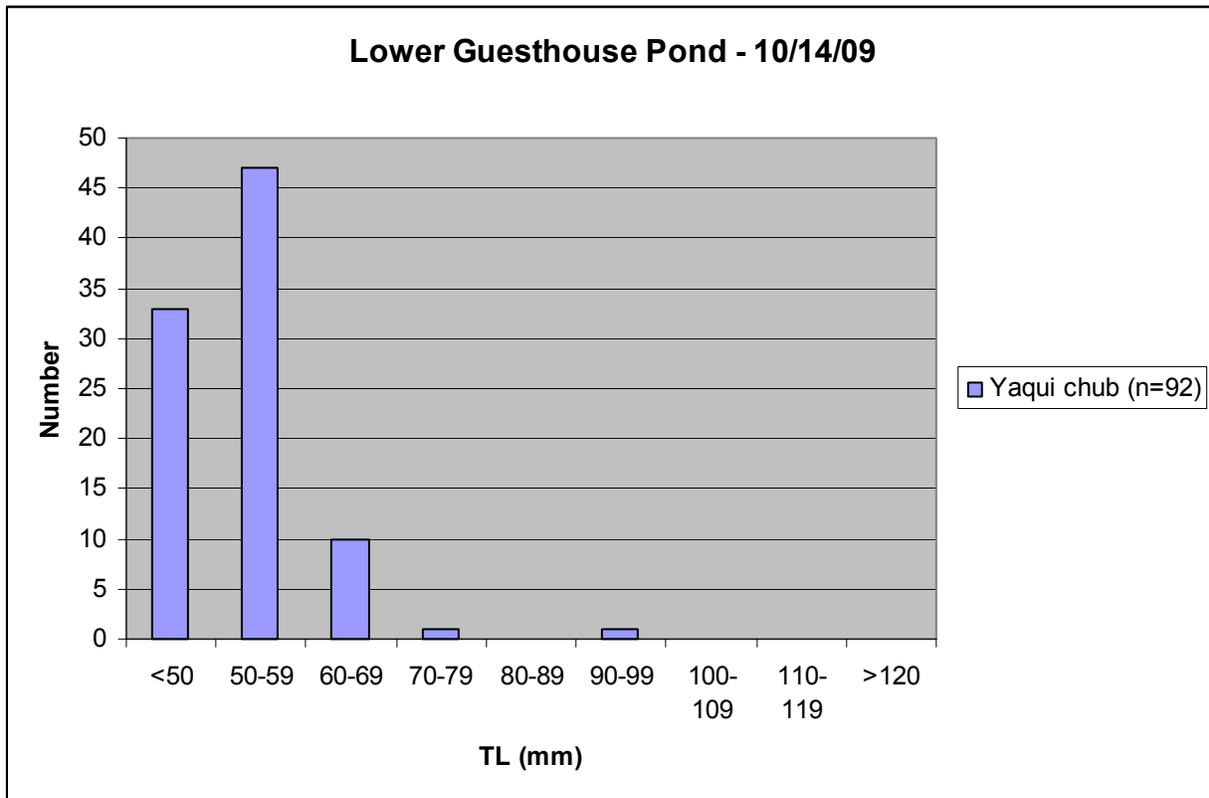


Figure 5. Length-frequency histogram of Yaqui chub collected in Lower Guesthouse Pond during El Coronado Ranch HCP monitoring in October 2009.

Discussion

The surge in the population of Yaqui chub in Lower Guesthouse Pond is good news, as chub numbers had been slowly rebounding in Lower Guesthouse Pond since the 2006 drought (Table 7). Before 2007, Lower Guesthouse pond was sampled using seines;

however, to make future data comparable between the ponds on the ranch, the decision was made in 2007 to sample with minnow traps.

Table 7. Numbers of fish collected between 2004 and 2009 from Lower Guesthouse Pond.

Year	<u>Longfin dace</u>	<u>Yaqui chub</u>
2004	0	0
2005	27	19
2006	11	0
2007	2	66
2008	35	132
2009	0	616

Ponds Summary

Following the severe drought conditions that dried, or nearly dried, all of the ponds on the ranch in 2006, the Yaqui chub populations have rebounded in all four regularly sampled ponds in 2009 (Figure 6). This was a result of restocking Tennis Court and Lodge ponds in 2007, and natural dispersal to Upper and Lower Guesthouse ponds.

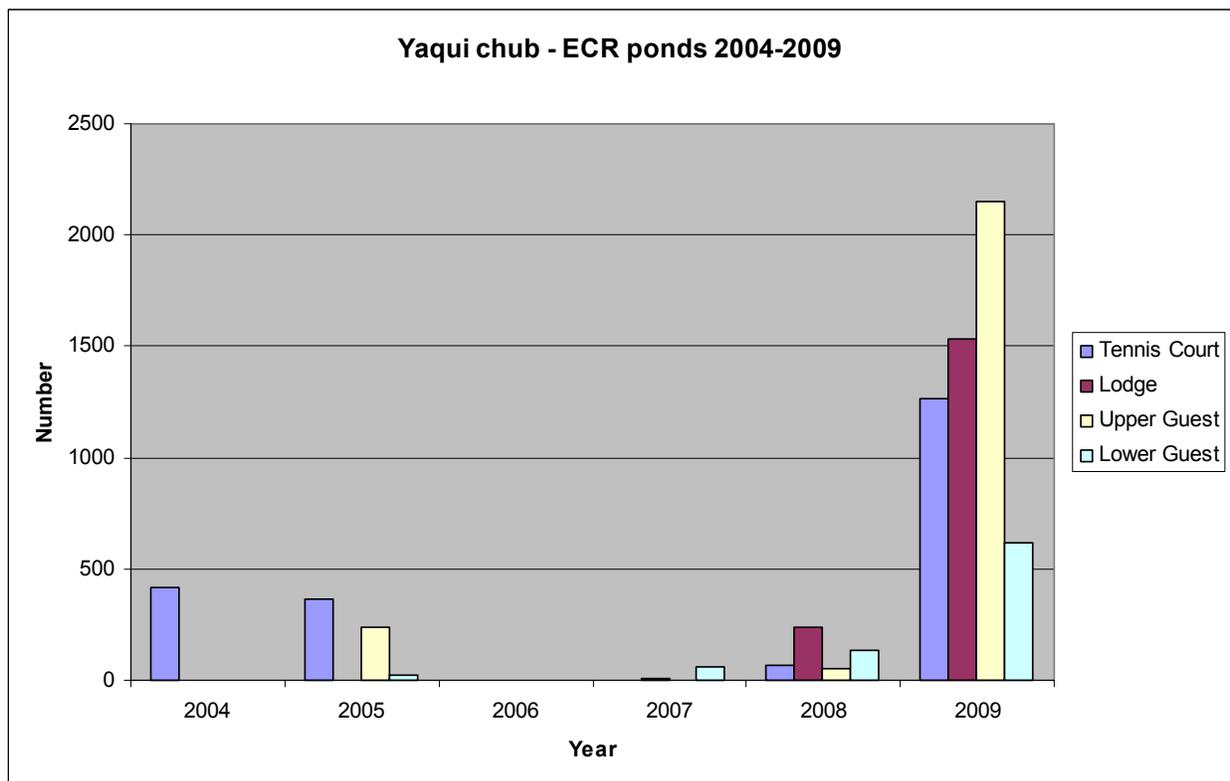


Figure 6. Total numbers of Yaqui chub collected from four ponds during El Coronado Ranch HCP monitoring in October 2004 - 2009.

WEST TURKEY CREEK SURVEY

Methods

A Smith-Root, Inc. Model LR-24 backpack electrofishing unit (settings: 150-200 volts, 30 Hz, output ~0.4 amps) was used to sample all three standard monitoring sites of West Turkey Creek, and all three standard sites on the USFS (U.S. Forest Service) lands on October 13 and 14, 2009 (Appendix B). Each standard site is 100-m long and was shocked from downstream to upstream, with actual shocking seconds recorded. All fish captured were identified to species, measured (longfin dace and green sunfish were just counted), and native fish returned alive to West Turkey Creek (green sunfish were removed). CPUE was calculated as the number of fish/minute of shocking.

U.S. Forest Service Site 1

[(USFS-1) – Dispersed Campsite]

Results

Zero fish were collected in 186 seconds of effort.

Discussion

This site has not contained suitable fish habitat the last three fall monitoring trips due to drought conditions. Brouder (2003) collected one adult Yaqui chub and two juvenile longfin dace in 2003. Coleman (2002) collected a total of six adult Yaqui chub and one adult longfin dace in two sampling trips in 2001. Lack of habitat due to low flows continues to be an issue. This site should be considered as a future reestablishment site if fish, and when water, are available.

U.S. Forest Service Site 2

[(USFS-2) – Upper Sycamore Campground]

Results

Zero fish were collected in 201 seconds of effort.

Discussion

Current low water levels, few isolated pools and lack of flow within this reach of West Turkey Creek make it difficult for fishes to persist for any length of time, with the exception of the plunge pool below the waterfall.

U.S. Forest Service Site 3

[(USFS-3) – Lower Sycamore Campground]

Results

Zero fish were collected in 99 seconds of effort.

Discussion

Current low water levels, few isolated pools and lack of flow within this reach of West Turkey Creek make it difficult for fishes to persist for any length of time, with the

exception of the plunge pool below the waterfall. The one stoneroller collected was moved upstream to USFS-2 to be with his friend in the plunge pool.

El Coronado Ranch Site 1

Results

A total of 67 longfin dace, 30 Mexican stoneroller, and 23 Yaqui chub were collected during 242 seconds of effort at ECR-1. Longfin dace, Mexican stoneroller, and Yaqui chub CPUE at this site was 16.61 fish/min., 7.44 fish/min., and 5.70 fish/min., respectively. Mean total length of Mexican stoneroller was 70.8 mm and ranged in size from 40 to 117 mm. Mean total length of Yaqui chub was 58.7 mm and ranged in size from 42 to 84 mm (Figure 7).

Discussion

The capture of stoneroller and chub <50 mm is encouraging, as it means that reproduction is occurring. In addition, the abundance of longfin dace and multiple age classes of Yaqui chub is a positive sign that the populations are recovering following the 2006 drought.

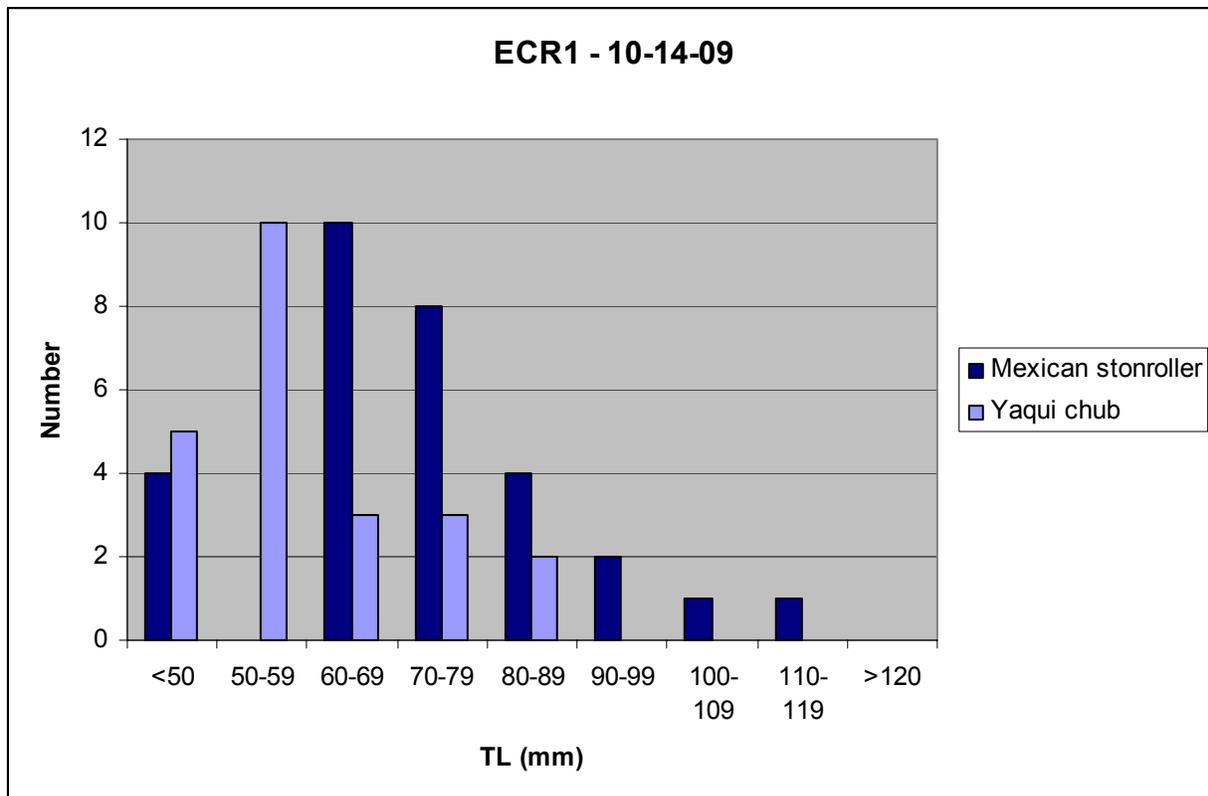


Figure 7. Length frequency histogram of Yaqui chub and Mexican stoneroller collected from ECR-1 during El Coronado Ranch HCP monitoring in October 2009.

Table 8. Numbers of fish collected between 2003 and 2009 from ECR-1.

Year	<u>longfin dace</u>	<u>Yaqui chub</u>	<u>Mexican stoneroller</u>
2003	0	19	-
2004	1	25	-
2005	12	32	-
2006	1	12	-
2007	55	25	7
2008	72	16	36
2009	67	23	30

El Coronado Ranch Site 2

Results

A total of 37 longfin dace and 19 Mexican stoneroller were collected during 163 seconds of effort at ECR-2. Longfin dace and Mexican stoneroller CPUE at this site was 13.62 fish/min. 6.99 fish/min., respectively. Mean total length of Mexican stoneroller was 77.5 mm and ranged in size from 39 to 120 mm (Figure 8).

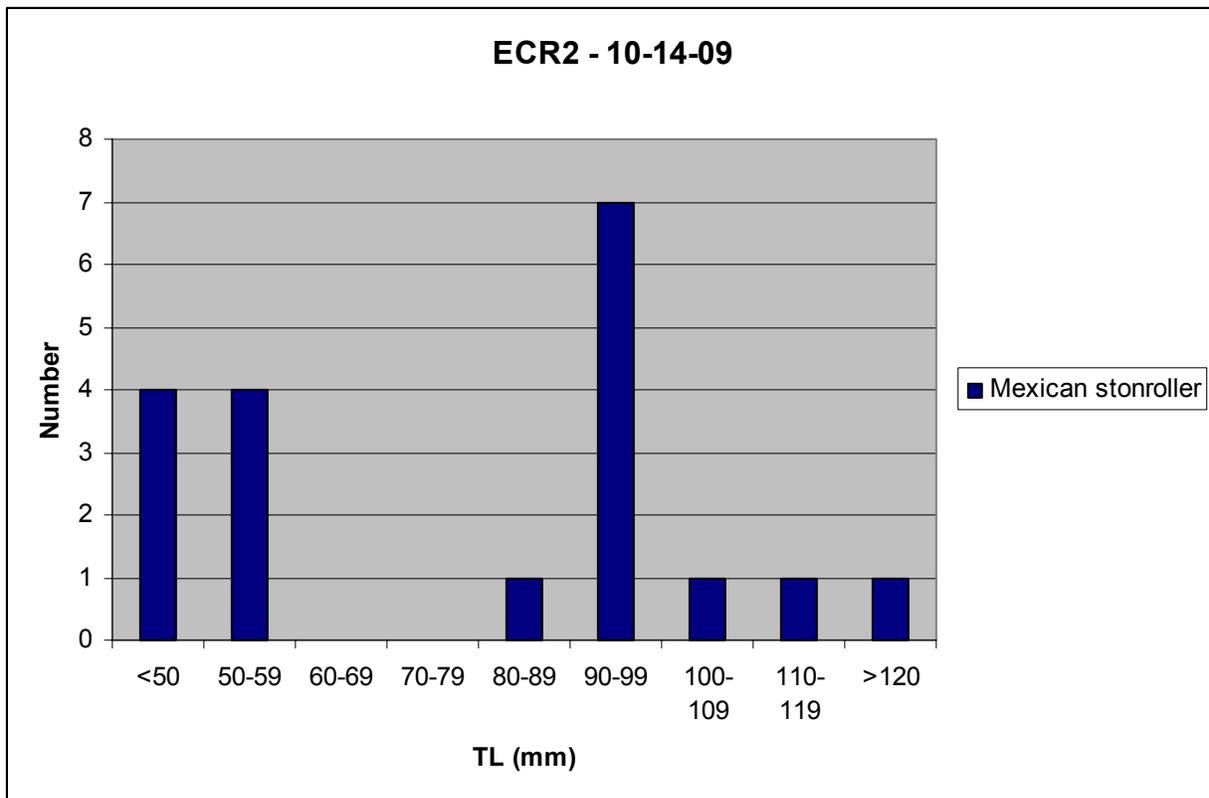


Figure 8. Length frequency histogram of Mexican stoneroller collected from ECR-2 during El Coronado Ranch HCP monitoring in October 2009.

Discussion

The presence of multiple age classes of Mexican stoneroller is an encouraging sign as the population continues to expand in West Turkey Creek following the 2007 stocking (Kline 2007).

Table 9. Numbers of fish collected between 2003 and 2009 from ECR-2.

Year	<u>longfin dace</u>	<u>Yaqui chub</u>	<u>Mexican stoneroller</u>
2003	2	0	-
2004	3	5	-
2005	45	0	-
2006	0	0	-
2007	32	0	1
2008	47	17	31
2009	37	0	19

El Coronado Ranch Site 3

Results

A total of 326 longfin dace, 14 Mexican stoneroller, and three green sunfish were collected during 415 seconds of effort at ECR-3. Longfin dace and Mexican stoneroller CPUE at this site was 47.13 fish/min. and 2.12 fish/min., respectively. Mean total length of Mexican stoneroller was 75.2 mm and ranged in size from 44 to 109 mm.

Discussion

Small numbers of green sunfish continue to be collected (and removed) in this reach; indicating the species is still present in the creek below the fish barrier. The presence of and Mexican stoneroller, and abundance of longfin dace this year, is a good sign that the populations of native fish are recovering following the drought. In the future, any Yaqui chub and Mexican stoneroller collected below the barrier should be translocated above the barrier following the monitoring.

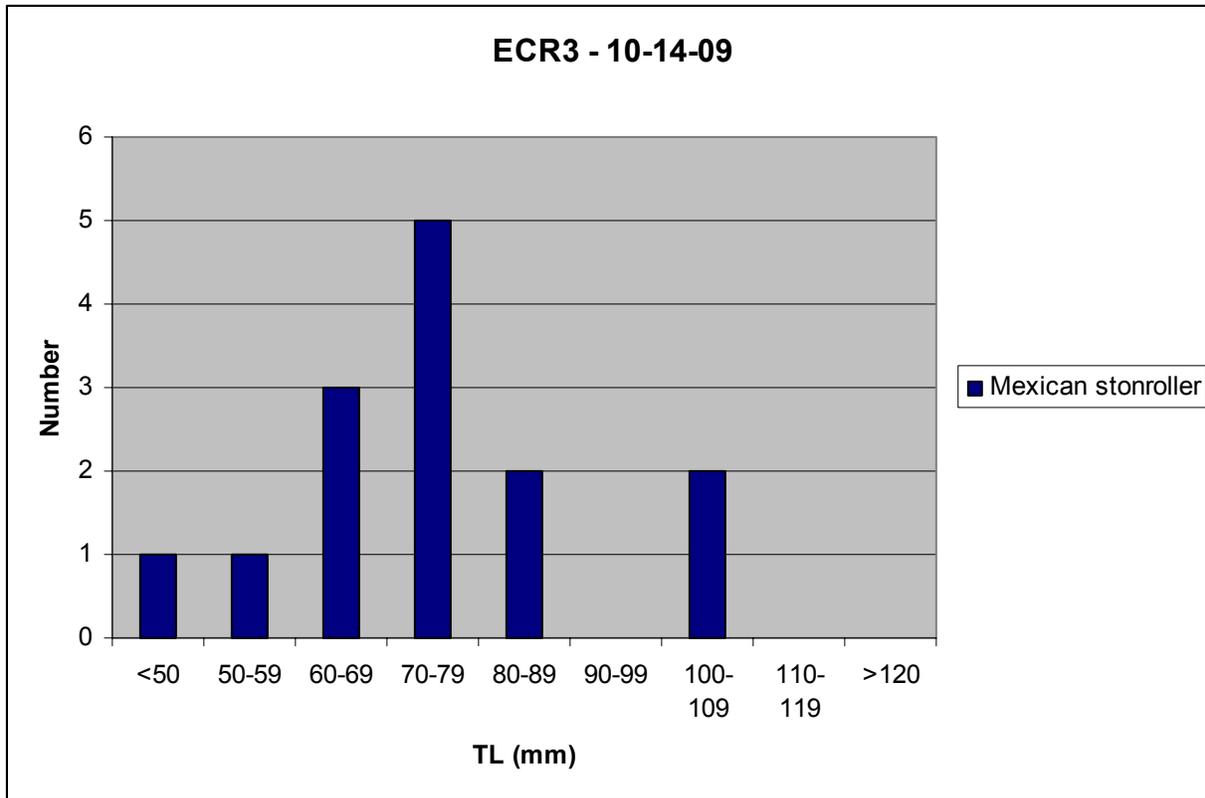


Figure 9. Length frequency histogram of Mexican stoneroller collected from ECR-3 using El Coronado Ranch HCP monitoring in October 2009.

Table 10. Numbers of fish collected between 2003 and 2009 from ECR-3.

Year	<u>longfin dace</u>	<u>Yaqui chub</u>	<u>green sunfish</u>	<u>Mexican stoneroller</u>
2003	134	0	1	-
2004	31	1	22	-
2005	321	0	18	-
2006	0	0	4	-
2007	78	1	8	0
2008	362	1	2	7
2009	326	0	3	14

NOVEMBER FISH SALVAGE DUE TO ON-GOING DROUGHT

In response to the on-going drought, SBNWR and AGFD salvaged approximately 3,000 Yaqui chub from Tennis Court, Lodge, Dale’s, Upper Guesthouse, and Lower Guesthouse ponds on November 16-17, 2009. The fish were transported in the SBNWR fish transport truck and stocked into Upper Chalk Tank on the Bar Boot Ranch to establish a new population of Yaqui chub permitted through the Leslie Canyon (Bar Boot Ranch/99 Bar Ranch) Safe Harbor Agreement (USFWS 2008). The ponds did not completely dry, as ECR received nearly 9 inches of precipitation in January – March 2010 (J. Austin, pers. comm.).

FUTURE MONITORING AND MANAGEMENT RECOMMENDATIONS

Monitoring

- In addition to sampling the six fixed monitoring sites on West Turkey Creek, continue sampling random sites to document the expansion/contraction of fish populations and to detect any new species that may not be found in the fixed sites.

- Continue to record each sampling gear and more importantly the number of each species collected in that gear separately. This is needed so that a mean CPUE, variance, and confidence intervals can be generated for each gear type and species. Mean CPUEs and confidence intervals are needed to detect changes in population trends. CPUEs generated from “pooled” data (i.e., 10 traps catching 10 fish over a period of 10 hours equaling a CPUE of 10fish/100 hours) do not allow for means, variances, and confidence intervals to be calculated.

- Continue to measure and record total length of all native fishes collected to allow for the development and interpretation of length-frequency histograms. Length-frequency histograms will also reduce biologist subjectivity with regards to categorizing fish as either juvenile or adult. Having multiple measuring boards and data books will allow for quicker processing as well.

- All Yaqui catfish captured should continue to be measured for total length, weighed, and scanned for the presence of a PIT tag. All “unmarked” catfish should have a PIT tag inserted and PIT tag number recorded.

- Continue implementing HACCP policy of disinfecting sampling gear used at one site before the use at another site in an effort to reduce inadvertent introductions of parasites or pathogens into uninfected waters. To date, Asian fish tapeworm has not been documented from any fish collected from West Turkey Creek or El Coronado Ranch.

Management

- During suitable water levels, pump Big Tank dry. Salvage all Yaqui catfish during the project, and eliminate all green sunfish and black crappie. Depending on numbers of Yaqui catfish, translocate some to pond(s) on the Bar Boot Ranch, or return them to Big Tank when it fills.

- During annual monitoring efforts (if sufficient numbers of fish are available and suitable habitat present) translocate Yaqui chub, longfin dace, and Mexican stoneroller (n = 25-50; each) from either West Turkey Creek or El Coronado Ranch ponds to West Turkey Creek on Forest Service lands, upstream of El Coronado Ranch boundary.

- During annual monitoring efforts, translocate any Mexican stoneroller and Yaqui chub from below the fish barrier to above the fish barrier.
- Yaqui topminnow should be stocked into at least Lodge Pond under AGFD's Safe Harbor Agreement for topminnows and pupfish in Arizona (AGFD 2007).
- Explore adding and anchoring woody debris in areas of West Turkey Creek to increase pool habitat favored by Yaqui chub.

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Appendix A. El Coronado Ranch HCP fish monitoring 2009 results compared with El Coronado Ranch HCP fish monitoring between 2004 and 2009 (Brouder 2005, 2006, Voeltz 2006, Johnson 2007, Voeltz 2009). Values presented are number of fish caught. Sampling methods: ES=backpack electroshocking; DN=dip net; VO = visual observation; MT=minnow trap; TN=trammel net; GN=experimental gill net; S=seining; HN=hoop net, MHN = mini-hoop net; DNS = did not sample.

Site	Year	Method	Total effort	Yaqui chub	longfin dace	green sunfish	Mexican stoneroller
ECR-1	2004	ES	1800 s	25	1	-	-
	2005	ES	390 s	32	12	-	-
	2006	ES	791 s	12	1	-	-
	2007	ES	759 s	25	55	-	7
	2008	ES	605 s	16	72	-	36
	2009	ES	242 s	23	67	-	30
ECR-2	2004	ES	827 s	5	3	-	-
	2005	ES	-	-	45	-	-
	2006	ES	486 s	-	-	-	-
	2007	ES	510 s	-	32	-	1
	2008	ES	557 s	17	47	-	31
	2009	ES	163 s	-	37	-	19
ECR-3	2004	ES	928 s	1	31	22	-
	2005	ES	1405 s	5	45	13	-
	2006	ES	569 s	1	-	3	-
	2007	ES	673 s	1	78	8	-
	2008	ES	951 s	1	362	2	7
	2009	ES	415 s	-	326	3	14

Appendix A (continued). El Coronado Ranch HCP fish monitoring 2009 results compared with El Coronado Ranch HCP fish monitoring between 2004 and 2009 (Brouder 2005, 2006, Voeltz 2006, Johnson 2007, Voeltz 2009). Values presented are number of fish caught. Sampling methods: ES=backpack electroshocking; DN=dip net; VO = visual observation; MT=minnow trap; TN=trammel net; GN=experimental gill net; S=seining; HN=hoop net, MHN = mini-hoop net; DNS = did not sample.

Site	Year	Method	Total effort	Yaqui chub	longfin dace	green sunfish	Mexican stoneroller
Tennis Court Pond	2004	HN	32.0 h	-	-	-	-
		MT	96.0 h	413	-	-	-
	2005	MT	177.0 h	363	-	-	-
	2006	MT	216.0 h	-	-	-	-
	2007	MT	198.0 h	-	-	-	-
	2008	MT	210.0 h	70	-	-	-
	2009	MT	204.0 h	1264	-	-	-
Lodge Pond	2004	DNS	-	-	-	-	-
	2005	DNS	-	-	-	-	-
	2006	MT	100.2 h	-	-	-	-
	2007	MT	198.0 h	4	-	-	-
	2008	MT	216.0 h	237	-	-	1
	2009	MT	210.0 h	1531	-	-	-
Upper Guest House Pond	2004	HN	42.0 h	-	-	-	-
		MT	84.0 h	-	-	-	-
	2005	S	702 m ²	240	11	-	-
	2006	S	600 m ²	-	110	-	-
	2007	MT	189.0 h	-	-	-	-
	2008	MT	216.0 h	52	-	-	-
2009	MT	222.0 h	2151	6	-	-	
Lower Guest House Pond	2004	HN	45.0 h	-	-	-	-
	2005	S	180 m ²	19	27	-	-
	2006	S	230 m ²	-	11	-	-
	2007	MT	173.3 h	66	2	-	-
	2008	MT	222.0 h	132	35	-	-
	2009	MT	222.0 h	616	-	-	-

Appendix B. Locations of monitoring sites on the El Coronado Ranch.

Tennis Court Pond. Located upstream of the Austin's office. Drive east along the road past the basketball court and tennis court. UTM (NAD83/WGS84) 3526947 N 654567 E

Lodge Pond. Located at the Austin's main building. UTM (NAD83/WGS84) 3527020 N 654387 E

Upper Guesthouse Pond. Located next to the guesthouses across the street from the El Coronado Ranch driveway. The upper pond is at the end of the circular driveway and has a stone dock. UTM (NAD83/WGS84) 3526867 N 653518 E

Lower Guesthouse Pond. Located immediately downstream of Upper Guesthouse Pond. UTM (NAD83/WGS84) 3526816 N 653405 E

Big Tank. Drive through the lower-most iron pipe gate on the north side of Turkey Creek road. Follow road to the tank. UTM (NAD83/WGS84) 3527188 N 651093 E

El Coronado Ranch Site 1. (ECR-1) Drive to the El Coronado Ranch guest houses. Follow the road through the turnaround by the last two houses, you will see the Upper Guesthouse pond. The road continues along the pasture fence where you will see the lower guesthouse pond. After the pasture, the road turns sharply to the left. Approximately 50m after the turn you will see another road on the right, turn right onto the orchard road. It will go down a hill, past an open field and a stock tank on the left. As you pass the western embankment of the stock tank the road will slope downward. Stop there. There will be a low point where a small outflow from the tank crosses the road. Follow the outflow NW until it meets West Turkey Creek. This is the upper point of the reach. Walk 100-m downstream and shock upstream. UTM (NAD83/WGS84) 3526655 N 652757 E.

El Coronado Ranch Site 2. [(ECR-2) – below Big Tank diversion] Begin below Big Tank infiltration intake (diversion). This site can be reached two different ways. First, is to drive down the orchard road past the ECR-1 site, and turning right before the road crosses the Cold Pit drainage. The road will cross West Turkey Creek just above the diversion. Second, drive down Turkey Creek road from the Austin's driveway to the first cattle guard. Go through a Texas gate (barbed wire gate) on the south side of the road before the cattle guard and follow the two-track road to the diversion site. UTM (NAD83/WGS84) 3526638 N 652468 E.

El Coronado Ranch Site 3. [(ECR-3) – Big Tank outflow barrier to lower boundary] Lowest barrier. Park at the very first cattle guard as you drive onto the El Coronado Ranch from Turkey Creek road, this is also the first cattle guard after Sander's house. There is a Texas gate (barb wire gate) on the north side of the road by the cattle guard. Go through the gate and walk down to the creek bottom. Follow the creek upstream

until you reach the barrier. Walk 100-m downstream and shock upstream. UTM (NAD83/WGS84) 3526932 N 651015 E

U.S. Forest Service Site 1. [(USFS-1) – Dispersed Campsite] This sample site is approximately 0.40 miles from the end of West Turkey Creek road, below the junction of Morse Canyon and West Turkey Creek. The area was a small campsite that is being restored by USFS. It has sediment barrier fencing and has been seeded. UTM (NAD83/WGS84) 3525431 N 658180 E.

U.S. Forest Service Site 2. [(USFS-2) – Upper Sycamore Campground] Sycamore Campground upper waterfall. Park in Sycamore Campground and walk east until you reach West Turkey Creek. Follow the creek upstream to the base of the uppermost waterfall continuing downstream. UTM (NAD83/WGS84) 3526021N 657749 E.

U.S. Forest Service Site 3. [(USFS-3) – Lower Sycamore Campground] Sycamore Campground lower waterfall. From Sycamore Campground, follow the creek downstream until you reach a rock face (river left) along the stream below campground. Show downstream from that point. UTM (NAD83/WGS84) 3526254 N 657399 E.