

## **Bonita Creek Fish Monitoring November 4 – 6, 2015**



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BONITA CREEK FISH MONITORING  
November 4 to 6, 2015

Marsh & Associates (M&A) with assistance from Bureau of Land Management (BLM) visited lower Bonita Creek, Graham Co., Arizona to sample fishes November 4, 2015 to November 6, 2015. This monitoring is part of a long-term program initiated by BLM to evaluate relationships between populations of native and non-native fishes.

*Methods.* Collections were made by hoop net (0.66 m diameter, 1.2 m long, two-hoop, single throat, 0.6 cm mesh) or minnow trap (standard "Gee," 25 cm diameter, 47 cm long, double throat, 0.6 or 0.3 cm mesh; or collapsible "Promar," 0.3 m diameter, 0.6 and 0.9 m long, double throat, 1.2 cm mesh). Traps were set with an air pocket to prevent inadvertent drowning of non-target air-breathing animals. Netting effort during this trip was distributed throughout Zone 1 (between the 1<sup>st</sup> and 2<sup>nd</sup> road crossings) and Zone 2 (between the 2<sup>nd</sup> and 3<sup>rd</sup> road crossings).

Approximate times of deployment and retrieval for nets and minnow traps were recorded, but effort was summarized as number of overnight sets regardless of actual time fished. All species were identified and enumerated; non-native yellow bullhead *Ameiurus natalis*, green sunfish *Lepomis cyanellus*, fathead minnow *Pimephales promelas*, western mosquitofish *Gambusia affinis*, and Northern crayfish *Orconectes virilis* and native Sonora sucker *Catostomus insignis*, Gila chub *Gila intermedia*, and Sonora mud turtle *Kinosternon sonoriense*. Species that attain relatively larger body size (all but fathead minnow and poeciliids) were further separated into size (age) classes, age-0 for primarily young-of-year smaller than about 5 cm total length, and age-1+ for sub-adults and adults longer than 5 cm. All non-native fishes were removed from the stream; native species were returned near the point of capture. By-catch of aquatic invertebrates (e.g., giant waterbug *Lethocerus* sp.) and non-native bullfrog *Lithobates catesbeianus* adults and tadpoles were not quantified.

Due to the suspicion that the same Sonora suckers were being captured during multiple nights, native fishes caught in Zone 2 were removed from the stream, transported via aerated containers, and relocated upstream of the third crossing. This was done to avoid stress on the fish and remove the chance for multiple recaptures during this and future trips.

*Summary of results.* Total effort was 247, 247, and 23 overnight sets for Gee, Promar, and hoop nets, respectively. Total catch (all netting methods combined) was 444 green sunfish, 260 fathead minnow, 206 western mosquitofish, 116 yellow bullhead, 43 Gila chub, 21 Sonora sucker, 1 Sonora mud turtle, and 1 Northern crayfish. Total catch per unit effort (CPUE) was 2.11 fish per net set. Catch per unit effort for combined native fish species (Sonora sucker and Gila chub) was 0.12 per net set and CPUE for targeted non-native fish species (yellow bullhead and green sunfish) was 1.08 fish per net set.

One Promar trap was removed from catch per unit effort (CPUE) calculations due to predator behavior that resulted in a large hole in the trap. All other traps remained at least partially submerged when run

and most gears held fish unharmed until removal. In order to have a more effective sampling effort, the beaver dam impounding the 4<sup>th</sup> pool upstream of the 2<sup>nd</sup> road crossing (big dam pool) in Zone 2 was removed and water drained into lower pools. A summary of catch by age group and gear type is included in Table 4.

*Narrative accounts of sampling and other activities.* Beginning at 11:51 on November 4, 2015 in Zone 1, a series of 25 Gee and 25 Promar nets were set in the 3<sup>rd</sup> pool (long pool) upstream of the first crossing while an additional 25 Gee and 25 Promar nets were split in the 1<sup>st</sup> pool (cattail pool) and 2<sup>nd</sup> pool upstream of the first crossing at 12:26. In Zone 2, 25 Gee and 25 Promar nets were also split between the 2<sup>nd</sup> pool (leveler pond) and 3<sup>rd</sup> pool (cattail pool) upstream of the second crossing at 13:30. A combined total of 25 Gee, 25 Promar nets and 8 hoop nets were set in the lower half of the 4<sup>th</sup> pool (big dam pool) and another 25 Gee, 25 Promar, and 3 hoop nets were set in the upper half of the 4<sup>th</sup> pool (big dam pool), upstream of the second crossing in Zone 2 between 14:40 and 15:00. All nets and traps were cleared of fishes between 7:30 and 10:16 on November 5, 2015 (Table 1).

Table 1. Total catch from all methods, Bonita Creek, Graham Co., Arizona, November 4 to 5, 2015. CAIN (Sonora sucker); GIIN (Gila chub); AMNA (yellow bullhead); LECY (green sunfish); PIPR (fathead minnow); GAAF (western mosquitofish); KISO (Sonora mud turtle); ORVI (Northern crayfish).

Site (pool)	Total Catch per Species							
	CAIN	GIIN	AMNA	LECY	PIPR	GAAF	KISO	ORVI
Zone 1: 1 <sup>st</sup> pool (cattail pool) and 2 <sup>nd</sup> pool upstream of 1 <sup>st</sup> crossing	3	5	8	0	10	7	0	0
Zone 1: 3 <sup>rd</sup> pool (long pool) upstream of 1 <sup>st</sup> crossing	4	0	20	1	5	11	0	0
Zone 2: 2 <sup>nd</sup> (leveler) and 3 <sup>rd</sup> (cattails) pool upstream of 2 <sup>nd</sup> crossing	0	0	13	23	66	6	0	0
Zone 2: 4 <sup>th</sup> pool (big dam pool) upstream of 2 <sup>nd</sup> crossing lower half	1	11	19	75	28	17	0	0
Zone 2: 4 <sup>th</sup> pool (big dam pool) upstream of 2 <sup>nd</sup> crossing upper half	3	11	14	144	9	39	1	0
Total	11	27	74	243	118	80	1	0

On November 5, 2015, a set of 25 Gee and 25 Promar nets were deployed in the 1<sup>st</sup> and 2<sup>nd</sup> pool above the first crossing of Zone 1 at 13:15. The 3<sup>rd</sup> pool (long pool) above the first crossing of Zone 1 was populated with 24 Gee and 24 Promar nets at 13:15. Twenty-four Gee and 24 Promar nets were collectively set at 13:26 in the 2<sup>nd</sup> (leveler pool) and 3<sup>rd</sup> (cattails) pools upstream of the second crossing in Zone 2. At 9:50, the lower half of the 4<sup>th</sup> pool (big dam pool) upstream of the second crossing was populated with 24 Gee, 24 Promar, and 8 hoop nets. The upper half of the 4<sup>th</sup> pool was populated with 25 Gee, 25 Promar, and 4 hoop nets at 10:57. All nets and traps were cleared of fishes between 7:40 and 10:30 on November 6, 2015 (Table 2).

Table 2. Total catch from all methods, Bonita Creek, Graham Co., Arizona, November 5 to 6, 2015. See Table 1 for abbreviations.

<i>Site (pool)</i>	<i>Total Catch per Species</i>							
	CAIN	GIIN	AMNA	LECY	PIPR	GAAF	KISO	ORVI
Zone 1: 1 <sup>st</sup> pool (cattail pool) and 2 <sup>nd</sup> pool upstream of 1 <sup>st</sup> crossing	0	0	3	0	11	11	0	1
Zone 1: 3 <sup>rd</sup> pool (long pool) upstream of 1 <sup>st</sup> crossing	1	0	11	1	9	4	0	0
Zone 2: 2 <sup>nd</sup> (leveler) and 3 <sup>rd</sup> (cattails) pool upstream of 2 <sup>nd</sup> crossing	0	0	4	28	38	17	0	0
Zone 2: 4 <sup>th</sup> pool (big dam pool) upstream of 2 <sup>nd</sup> crossing lower half	4	8	12	53	55	19	0	0
Zone 2: 4 <sup>th</sup> pool (big dam pool) upstream of 2 <sup>nd</sup> crossing upper half	5	8	12	119	29	75	0	0
Total	10	16	42	201	142	126	0	1

*Conclusions and Recommendations.* During the November 2015 sampling trip, catch of target non-native species (green sunfish and yellow bullhead) was nearly an order of magnitude higher (CPUE=1.08) than the catch of the two most common native species (Gila chub and Sonora sucker) (CPUE=0.12). The previous three trips had yielded catch per unit efforts that have been similar between native and non-native catch, but a difference like this has not been noted since February 2015 (CPUE: 0.19, 1.21, respectively) and June 2014 (CPUE: 0.22, 2.09, respectively). This trip involved draining water from the big dam pool, which may have attributed to the increased catch of green sunfish (less water in pools provides a more concentrated area for the scent of bait to attract fish). The last time the dam was removed by M&A personnel was in June 2014.

Sampling effort for the last two years has focused in Zone 2, where previous sampling reported higher densities of target non-native species. Total number of green sunfish captured in Zone 2 this trip was lower than at the beginning of this year, though numbers were still an average of three times greater than values during early spring through early fall sampling. This suggests that green sunfish abundance may have been negatively impacted by the consistent effort. Catches from the current sampling trip provided a better understanding of the population due to the decrease in water level in target pools as a result of dam removal. Two green sunfish were caught in Zone 1 by Gee and Promar nets, which may be attributed to increased flow from dam removal in Zone 2. We suggest that additional sampling efforts in the coming year continue to focus on lower zones of Bonita Creek (Zones 1-3), though efforts in other zones should not be abandoned.

Total length used as a reference for age class indicates that catch of age-1+ adult green sunfish was 8% of total green sunfish count (Table 4). All sampling trips from earlier this year (excluding the September/October trip) differ from these data, showing greater catches of age-1+ compared to age-0 green sunfish. Previous autumn sampling in 2011, 2012, and 2013 however, were more similar to the two most recent (November, September/October) sampling efforts, showing greater proportions of age-0 compared to age-1+ green sunfish. The throat diameter difference between Gee and Promar traps imparts some size selectivity to the gear and thus can also be used to select size classes of fishes. Consistent with total length data, a greater number of green sunfish was captured in smaller diameter Gee traps (394) compared to larger diameter Promar traps (15).

The total catch for age-0, young-of-year yellow bullhead was greater than that of age-1+ adults, contrasting data from within the past year, 78 and 38, respectively. Promar traps continue to be more effective in capturing yellow bullhead (87) compared to Gee traps (23). The use of multiple sampling techniques is beneficial in targeting different non-native species.

Consistent with the last sampling effort, size ratios of green sunfish have continued to shift toward smaller fish. There has also been a notable increase in catch of age-0 yellow bullhead over the last three sampling efforts: 51% of total yellow bullhead were age-0 in June, 63% in August/September, and 67% in November. Fecundity generally decreases with size (Bagenal and Braum, 1971) so reducing the size of non-native species may reduce total reproductive output and subsequent recruitment. Continued use of a total length reference measurement for target species and net throat diameter classification will provide data that can be used to support a future quantitative analysis of this shift.

We continue to recommend that effort be restricted at any given location to no more than three consecutive nights so as to not overly impact resident native fishes by repeated sampling. We also suggest that any natives captured in Zones 1-3 may be transported upstream, not only to reduce stress and avoid recapture of these fishes, but also allow for more intensive non-native sampling effort. For the same reason, care should be taken to avoid temporal overlap in areas sampled by different entities (i.e., BLM and M&A). Small pools, runs, stagnant ponded areas, and isolated off-channel pools should not be overlooked because data indicate these habitats have potential to hold a great number of invasive fish. However, nets set in any stagnant or off-channel ponds should be checked regularly (i.e., every 2-4 hours) to limit potential fish stress and mortality due to low dissolved oxygen levels. During summer months when high water temperature and low dissolved oxygen may contribute to stressful conditions even in larger, regularly sampled pools, technicians may consider setting nets in early evening to avoid trapping native species in potentially hypoxic conditions of the afternoon.

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Table 4. Catch (number) by species and age from all capture methods for Bonita Creek, Graham Co., Arizona, November 4 to 6, 2015.

Gear Type	Sonora sucker		Gila chub		Yellow bullhead		Green sunfish		Fathead minnow	Western mosquitofish	Sonora mud turtle	Northern crayfish
	0	1+	0	1+	0	1+	0	1+				
Hoop	4	4	2	16	5	1	18	17	4	1	0	0
Gee	2	0	8	7	22	1	386	8	255	205	0	1
Promar	2	9	0	10	51	36	6	9	1	0	1	0
Total	8	13	10	33	78	38	410	34	260	206	1	1



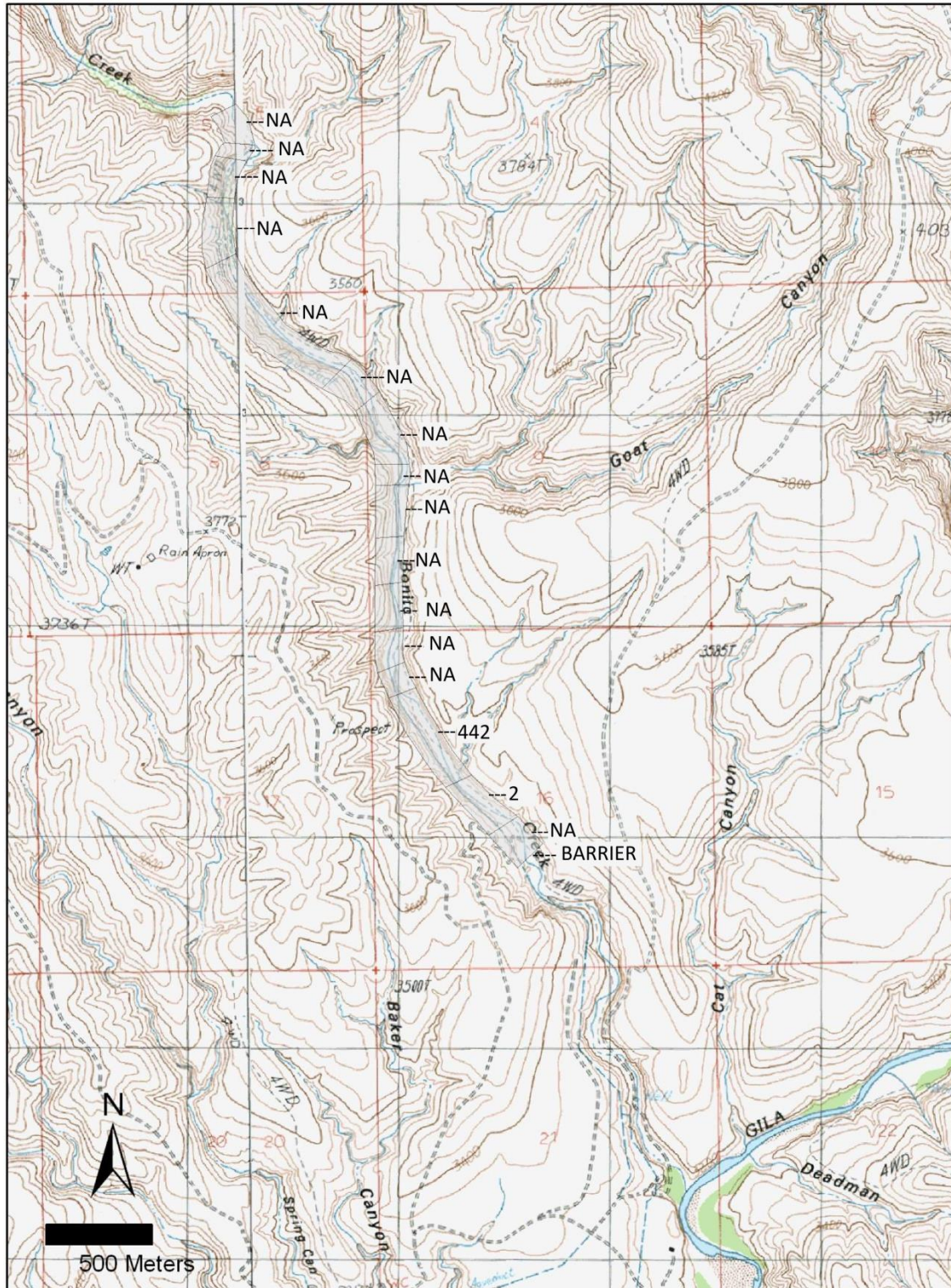


Figure 1. Green sunfish captures for Bonita Creek, Graham Co., Arizona, sampling November 4 to 6, 2015. Totals were divided among stream reaches bounded by road crossings between the fish barrier (BARRIER) and the known upper extent of green sunfish occupancy. Reaches without effort during this sample period are labeled 'NA.'



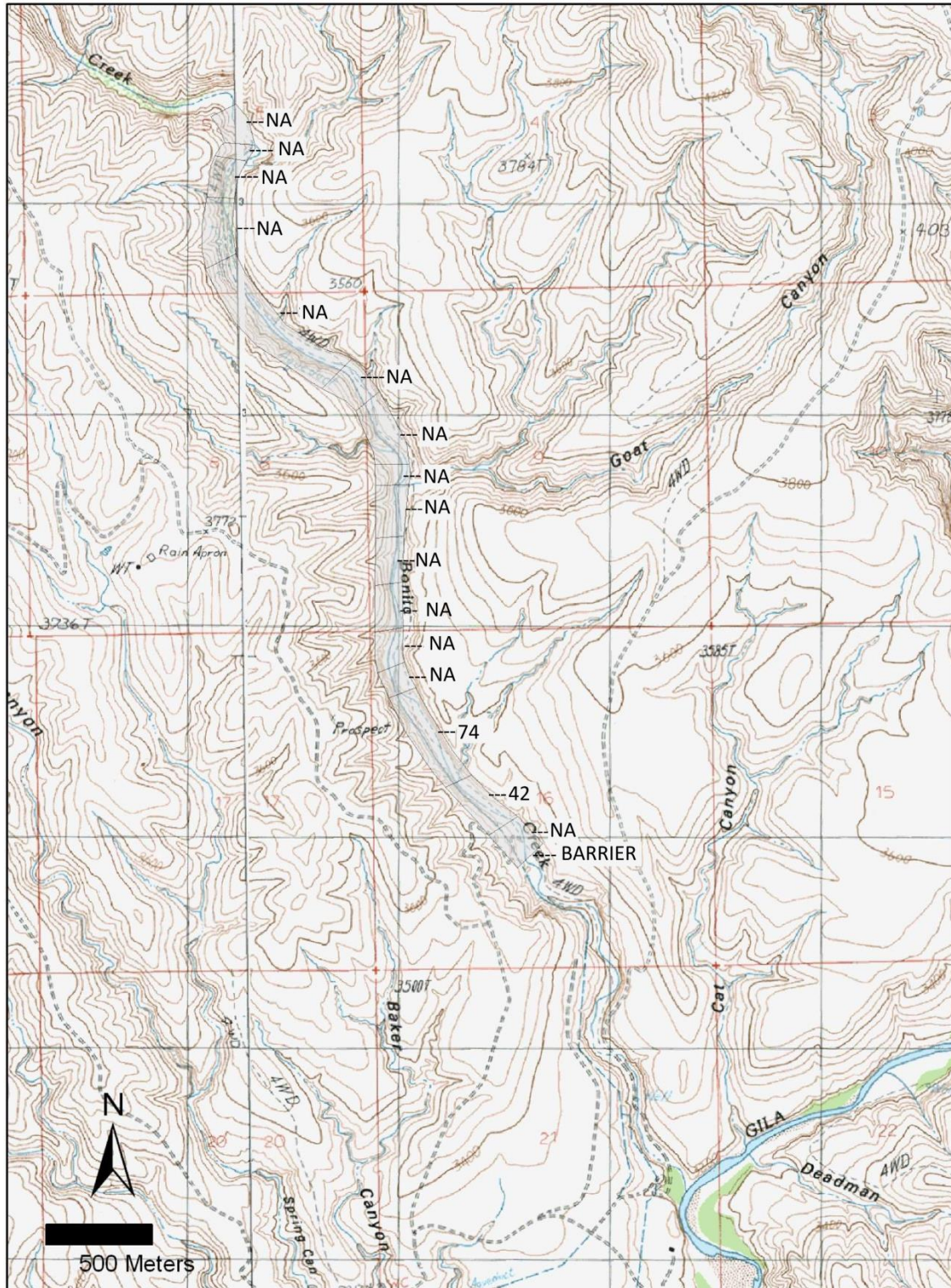


Figure 2. Yellow bullhead captures for Bonita Creek, Graham Co., Arizona, sampling November 4 to 6, 2015. Totals were divided among stream reaches bounded by road crossings between the fish barrier (BARRIER) and the known upper extent of yellow bullhead occupancy. Reaches without effort during this sample period are labeled 'NA.'