Bonita Creek Fish Monitoring
February 17-20, 2015

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Marsh & Associates (M&A) with assistance from Bureau of Land Management (BLM) visited lower Bonita Creek, Graham Co., Arizona to sample fishes February 17-20, 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 (see cover photo) to prevent inadvertent drowning of non-target air-breathing animals. Netting effort during this trip was distributed throughout Zone 2 (between the 2nd and 3rd road crossings), Zone 3 (between the 3rd and 4th road crossings), Zone 4 (between the 4th and 5th road crossing), and Zone 6 (between the 6th and 7th road crossing) (Figures 1 & 2).

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 fathead minnow *Pimephales promelas*, yellow bullhead *Ameiurus natalis*, western mosquitofish *Gambusia affinis*, and green sunfish *Lepomis cyanellus*, and native Sonora sucker *Catostomus insignis*, Gila chub *Gila intermedia*, Gila topminnow *Poeciliopsis occidentalis*, 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 subadults 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 northern crayfish *Orconectes virilis*) and non-native bullfrog *Lithobates catesbeianus* adults and tadpoles was not quantified.

Summary of results. Total effort was 448, 449, and 58 overnight sets for Gee, Promar, and hoop nets, respectively. Total catch (all netting methods combined) was 1399 fathead minnow, 1026 green sunfish, 590 western mosquitofish, 134 yellow bullhead, 117 Gila chub, 68 Sonora sucker, and 6 Sonora mud turtle. Total catch per unit effort (CPUE) was 3.5 fish per net set. Catch per unit effort for combined native fish species (Sonora sucker and Gila chub) was 0.2 per net set and CPUE for targeted non-native fish species (yellow bullhead and green sunfish) was 1.2 fish per net set.

Two Promar traps were removed from catch per unit effort (CPUE) calculations due to unequal fishing overnight caused by their removal from the water by an unknown animal or improper closure of the net by field personnel. All other nets were still submerged when run and most gears held fish unharmed until removal. A summary of catch by age group and gear type is included in Table 4.

Narrative accounts of sampling and other activities. Beginning at 13:45 on February 17, 2015, a series of 25 Gee, 25 Promar, and 2 hoop nets were set in the most downstream pool of Zone 2. Gear was set into the second and third pool upstream of the second crossing in Zone 2 at 14:15 and 15:00 with 25 Gee, 25 Promar, and 2 hoop nets, and 25 Gee, 25 Promar, and 3 hoop nets, respectively. Fifty Gee, 50 Promar, and 5 hoop nets were set in the lower half of the fourth pool above the second crossing in Zone 2 at 16:00 while 25 Gee, 25 Promar, and 5 hoop nets were set in the upper half of the same pool at 16:45. All nets and traps were cleared of fishes between 8:20 and 13:35 on February 18, 2015 (Table 1).

Table 1. Total catch from all methods, Bonita Creek, Graham Co., Arizona, February 17-18, 2015. CAIN (Sonora sucker); GIIN (Gila chub); AMNA (yellow bullhead); LECY (green sunfish); PIPR (fathead minnow); GAAF (western mosquitofish); KISO (Sonora mud turtle).

	Total Catch Per Species						
Site (Pool)	CAIN	GIIN	AMNA	LECY	PIPR	GAAF	KISO
Zone 2: 1st pool above 2nd crossing river left	2	0	24	108	34	78	0
Zone 2: 2nd pool (cattail pool) above 2nd crossing	0	0	5	39	63	25	0
Zone 2: 3rd pool above 2nd crossing	0	0	1	85	109	20	1
Zone 2: 4th pool (big dam pool) lower half above 2nd crossing	14	1	21	179	74	41	3
Zone 2: 4th pool (big dam pool) upper half above 2nd crossing	6	14	34	239	171	7	0
Total	22	15	85	650	451	171	4

On February 18, 2015 at 8:45, 25 Gee, 25 Promar, and 2 hoop nets were set in the first pool above the second crossing of Zone 2 and at 9:45, 25 Gee, 25 Promar, and 2 hoop nets were set in the second pool above the second crossing of Zone 2. The third pool above the second crossing of Zone 2 was populated with 25 Gee, 25 Promar, and 3 hoop nets at 10:00. Forty-nine Gee, 50 Promar, and 5 hoops nets were set at 11:40 in the lower half of the 4th pool above the second crossing of Zone 2 and 25 Gee, 25 Promar, and 5 hoop nets were set at 14:15 in the upper half of the same pool. Additionally, 3 hoop nets were set at 14:50 in the first pool above the third crossing in Zone 3, 3 hoop nets were set at 15:10 in the gage pool downstream from the seventh crossing in Zone 6, and 2 hoop nets were set at 15:40 in the first pool above the fourth crossing in Zone 4. All nets and traps were cleared of fishes between 8:33 and 15:08 on February 19, 2015 (Table 2).

Table 2. Total catch from all methods, Bonita Creek, Graham Co., Arizona, February 18-19, 2015. See Table 1 for abbreviations.

	Total Catch Per Species						
Site (Pool)	CAIN	GIIN	AMNA	LECY	PIPR	GAAF	KISO
Zone 2: 1st pool above 2nd crossing river left	0	0	0	38	45	89	0
Zone 2: 2nd pool (cattail pool) above 2nd crossing	0	0	0	10	23	70	0
Zone 2: 3rd pool above 2nd crossing	0	0	0	31	88	51	0
Zone 2: 4th pool (big dam pool) lower half above 2nd crossing	2	0	10	121	76	78	0
Zone 2: 4th pool (big dam pool) upper half above 2nd crossing	5	3	3	43	135	23	0
Zone 3: 1st pool (cliff pool) above 3rd crossing	0	11	0	0	1	0	0
Zone 6: gage pool downstream 7th crossing	2	30	0	0	3	0	1
Zone 4: 1st pool (cliff pool) above 4th crossing	0	4	0	0	0	0	0
Total	9	48	13	243	371	311	1

Beginning at 10:45 on February 19, 2015, 49 Gee, 49 Promar, and 5 hoop nets were set in the lower half of the fourth pool above the second crossing of Zone 2 while 25 Gee, 25 Promar, and 5 hoop nets were set in the upper half of the same pool at 11:30. Gear was set in the third pool downstream from the third crossing in Zone 2 with 20 Gee, 20 Promar, and 2 hoop nets at 13:30. At 14:20, the fifth and second pool downstream from the third crossing in Zone 2 were populated with 10 Gee and 10 Promar, and 25 Gee, 25 Promar, and 3 hoop nets, respectively. Twenty Gee, 20 Promar, and 1 hoop nets were set at 14:30 in the fourth pool downstream from the third crossing in Zone 2. All traps and nets were removed from the creek on Friday, February 20, 2015 between 8:30 and 11:25 (Table 3).

Table 3. Total catch from all methods, Bonita Creek, Graham Co., Arizona, February 19-20, 2015. See Table 1 for abbreviations.

	Total Catch Per Species						
Site (Pool)	CAIN	GIIN	AMNA	LECY	PIPR	GAAF	KISO
Zone 2: 4th pool (big dam pool) lower half above 2nd crossing	1	4	7	35	73	61	0
Zone 2: 4th pool (big dam pool) upper half above 2nd crossing	7	9	7	53	97	18	1
Zone 2: 3rd pool (river left) downstream of 3rd crossing	2	4	10	9	33	6	0
Zone 2: 2nd pool downstream of 3rd crossing	8	11	7	10	25	2	0
Zone 2: 5th pool downstream of 3rd crossing	0	2	0	3	208	2	0
Zone 2: 4th pool downstream of 3rd crossing	19	24	5	23	141	19	0
Total	37	54	36	133	577	108	1

Conclusions and Recommendations. Consistent with sampling events in 2014, during the February 2015 sampling trip, catch of target non-native species (green sunfish and yellow bullhead) was greater than catch of the two most common native species (Gila chub and Sonora sucker), mainly due to the high catch of green sunfish. Total length used as a reference for age class indicates that catch of age-0,

young-of-year green sunfish was close to half that of age-1+ adult green sunfish (Table 4). The throat diameter difference between Gee and Promar traps imparts some size selectivity to the gear and can also be used to discriminate size classes of fishes. For example, one and a half times (a lesser difference than in previous sampling of 2014) as many green sunfish were caught in Gee traps (586), of the smaller diameter, than in Promar traps (353). These data indicate that efforts this winter season may have been applied before the initiation of green sunfish spawning.

While Gee traps have caught greater overall numbers of green sunfish, this has not been observed with yellow bullhead for which Promar traps currently appear to be more effective than other gears. For example, Promar traps in February caught 124 yellow bullhead, close to 14 times as many as Gee traps, which captured only 9. Use of multiple sampling techniques may still be necessary to target different non-native species.

Efforts during this and recent winter sampling were focused in Zone 2, where previous sampling reported greater densities of target non-native species. Recent reports of smaller catches of non-native species in upper reaches (Heidi Blasius, BLM, personal communication) suggest that sampling efforts over the past few years have been effective in keeping non-native fish numbers manageable at these locations, which in turn has allowed greater recruitment of native species. No target non-native species were captured in Zone 6 during this sampling trip compared to five green sunfish captured in Zone 6 in February of 2014, though greater effort was applied in the previous winter sampling event. We suggest that the focus of sampling effort continue to shift to the lower zones of Bonita Creek (Zones 1-3) because we expect recruitment and numbers of non-native species to be reduced significantly there.

We 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. 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 fish mortality due to low dissolved oxygen levels.

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Table 4. Catch (number) by species and age from all capture methods for Bonita Creek, Graham Co., Arizona, February 17-20, 2015.

Gear Type	Sonora sucker		Gila chub		Yellow bullhead		Green sunfish		Fathead minnow	Western Mosquitofish	Sonora mud turtle
	0	1+	0	1+	0	1+	0	1+			
Hoop	1	15	2	46	0	1	22	65	45	10	1
Gee	1	1	13	6	8	1	279	307	1269	578	0
Promar	3	47	5	45	43	81	66	287	85	2	5
Total	5	63	20	97	51	83	367	659	1399	590	6

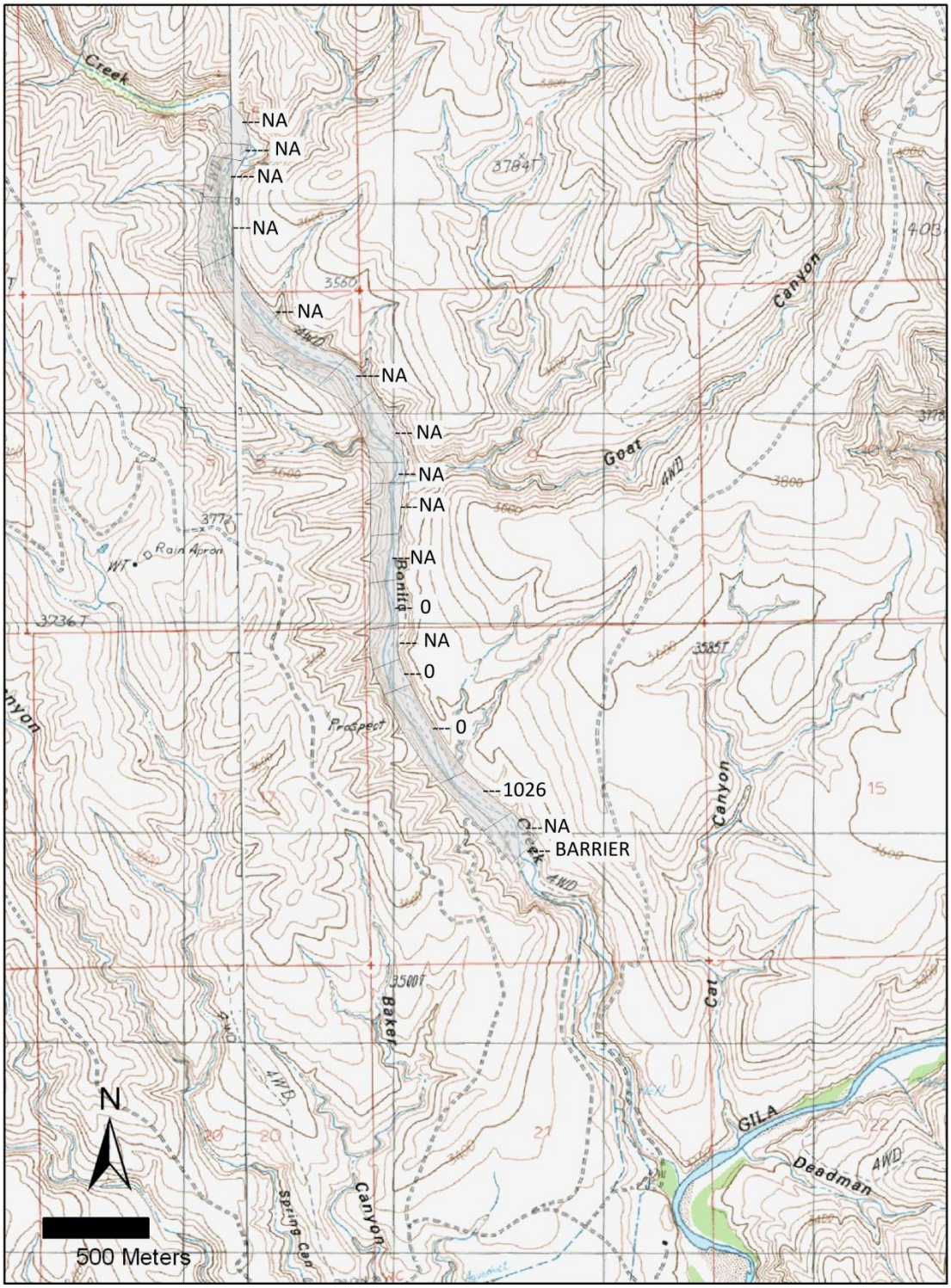

Figure 1. Green sunfish captures for Bonita Creek, Graham Co., Arizona, sampling February 17-20, 2015. Totals were divided among stream reaches bounded by road crossings between the fish barrier (BARRIER) and the known upper extent of green sunfish occupancy. Reaches without effort during this sample period are labeled 'NA.'

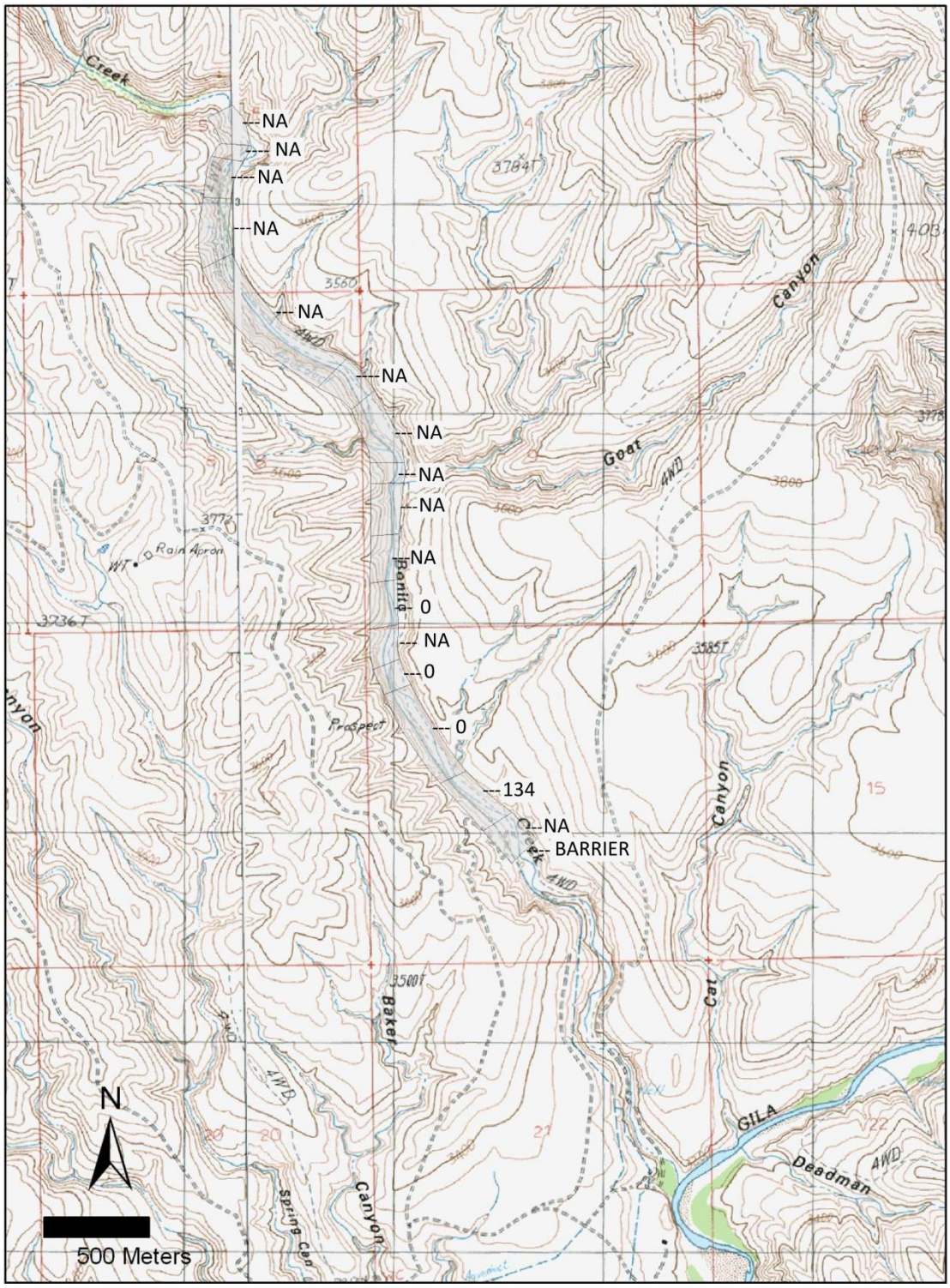

Figure 2. Yellow bullhead captures for Bonita Creek, Graham Co., Arizona, sampling February 17-20, 2015. Totals were divided among stream reaches bounded by road crossings between the fish barrier (BARRIER) and the known upper extent of yellow bullhead occupancy. Reaches without effort during this sample period are labeled 'NA.'