Nonnative Fish Removal from Aravaipa and Bonita Creeks 2020 Annual Report

Interagency Agreement (R17PG00018 and R18PG00115) Between Bureau of Reclamation
And
Bureau of Land Management, Safford Field Office

Heidi Blasius
Bureau of Land Management, Safford Field Office
711 South 14th Avenue
Safford, Arizona 85546

March 15, 2021

Project Title: Nonnative fish removal from Bonita and Aravaipa Creeks (Task ID: AZ-2009-1).

Strategic Plan Goals for Bonita and Aravaipa Creeks:

Preventing Extinction and Managing Toward Recovery

Goal 4. Remove nonnative aquatic species threats.
Goal 9. Monitor to quantitatively measure and evaluate project success in improving the status of target species and their habitats.

BONITA CREEK ANNUAL REPORT

Recovery Goals/Objectives for Bonita Creek Fish:

Nonnative fish removal from Bonita Creek will help secure populations of Gila Chub (*Gila intermedia*) and Gila Topminnow (P*oeciliopsis o. occidentalis*) and address the following recovery goals identified for each species in their respective recovery plans.

Recovery Objectives for Gila Chub:

Gila Chub draft recovery plan (2015)

Task 1. Protect and manage remnant populations and their habitats.

Gila Chub draft 2015 recovery plan objective 1.3.1 - Eliminate or control problematic nonnative aquatic organisms.

Task 7. Use adaptive management practices to guide future recovery actions where uncertainty exists.

Gila Chub draft 2015 recovery plan objective 7 - Monitor remnant, repatriated, and refuge populations to inform adaptive management strategies.

Recovery Objectives for Gila Topminnow:

Gila Topminnow draft recovery plan (1999)

Task 1. Prevent extinction by protecting remaining natural and long-lived reestablished populations.

Gila Topminnow 1999 draft revised recovery plan objective 1.5 - Protect remaining natural and long-lived reestablished populations from invasion by detrimental nonnative aquatic species.

Task 2. Reestablish and protect populations throughout historic range.

Gila Topminnow 1999 draft revised recovery plan objective 2.4 - Protect habitats of reestablished or potential populations from detrimental nonnative aquatic species.

Task 3. Monitor natural and reestablished populations and their habitats.
Gila Topminnow 1999 draft revised recovery plan objective 3 - Monitor natural and reestablished populations and their habitats.

Geographical Area: Bonita Creek originates in the Gila Mountains on the San Carlos Apache Indian Reservation and flows southeasterly from its headwaters approximately 46 miles to its confluence with the Gila River. The Bonita Creek watershed drains approximately 370 square miles and is a mixture of federal, city, tribal, and private lands. From the reservation boundary downstream, BLM, SFO manages approximately 92% of the lands and the remaining 8% are City of Safford and private holdings. The two managers/landowners, Bureau of Land Management (BLM), Safford Field Office (SFO) and City of Safford are supportive of the project.

Background for Bonita Creek: In 2008, Bureau of Reclamation (BOR) through the Gila River Basin Native Fishes Conservation Program, constructed a fish barrier across lower Bonita Creek to prevent upstream incursion of nonnative aquatic species from the Gila River into lower and upper segments of Bonita Creek as part of a multi-agency native fish restoration project to protect the extant fish fauna including endangered Gila Chub, Longfin Dace (*Agosia chrysogaster*), Speckled Dace (*Rhinichthys osculus*), Sonora Sucker (*Catostomus insignis*), and Desert Sucker (*Pantosteus clarkii*) and to secure habitat for the repatriation of other imperiled Gila basin fish (Figure 1). Additionally, the reach of Bonita Creek between the City of Safford infiltration gallery dike and the fish exclusion barrier was chemically renovated with the piscicide rotenone to eliminate nonnative fishes. Shortly after the chemical treatment, nonnative fishes, including Western Mosquitofish (*Gambusia affinis*) and Green Sunfish (*Lepomis cyanellus*) in 2009, Fathead Minnow (*Pimephales promelas*) in 2010, and Yellow Bullhead (*Ameiurus natalis*) in 2011 were discovered in the renovated portion of Bonita Creek. With the discovery of Green Sunfish in 2009, Bureau of Land Management (BLM), Safford Field Office (SFO) initiated mechanical removal since retreatment of the stream with piscicides was deemed not feasible due to habitat complexity (which is likely the reason the first treatment failed), public perception, and permitting requirements.

Removal of Green Sunfish began August of 2009 with their discovery and ended September 4, 2018 as they are no longer detectable. A total of 23,282 Green Sunfish were removed from a 1.9-mile reach of lower Bonita Creek (Table 1).

Effort varied over the years and was largely dependent on funding and personnel availability. In 2016, increased funding from the BLM Washington Office and the Bureau of Reclamation's Gila River Basin Native Fishes Conservation Program allowed for the hiring of a dedicated removal crew that was able to more than double our overall effort in 2016 from 2015. This increased effort reduced Green Sunfish numbers to a point that recruitment was effectively eliminated.

The results for Bonita Creek suggest that in systems that are isolated either naturally or with a barrier, nonnative mechanical removal can be effective in either eliminating or reducing the numbers of nonnative fish species. The importance of timing the removal effort to reduce the number of spawning adults is equally as important as the amount of effort expended. Underestimating the effort needed, funding constraints, and lack of personnel are the primary reasons it took nine years to eliminate Green Sunfish from Bonita Creek.

Methods for Bonita Creek: Approximately 1.9 miles of lower Bonita Creek were divided into 15 segments based on low-water road crossings from the constructed fish barrier upstream to the City

of Safford's infiltration gallery (Figure 1). These segments were used to separate effort for data recording and analysis.

A variety of gear types, including collapsible Promar nets (0.3 m diameter, 0.6 and 0.9 m long, double throat, 1.2 cm mesh), Gee metal minnow traps (25 cm diameter, 47 cm long, double throat, 0.6 or 0.3 cm mesh), and hoop nets (0.7 m diameter, 1.2 m long, two-hoop, single throat, 0.6 cm mesh) were used to optimize removal efforts. Promar nets and metal minnow traps were set in pairs with enough space between them to not interfere with their ability to catch fish. All traps and nets were baited with wet or dry dog food to attract fish and increase catch. Nets and minnow traps were set in daytime and fished overnight. Time of deployment and retrieval of nets and minnow traps were recorded, but effort was summarized as net sets regardless of the actual time fished. Traps were set with air-pockets to prevent non-targeted animals from drowning.

All species captured were identified, classified as either juvenile or adult, and enumerated. Native species captured included Gila Chub, Longfin Dace, Speckled Dace, Gila Topminnow, Sonora Sucker, Desert Sucker, and Sonora mud turtle (*Kinosternon sonoriense*). Nonnative species encountered included fathead minnow (*Pimephales promelas*), Western Mosquitofish (*Gambusia affinis*), and Yellow Bullhead (*Ameiurus natalis*). American Bullfrog (*Rana catesbeianus*) was recorded as present or absent. Total length (TL) measurements in millimeters (mm) were recorded for Yellow Bullhead. Yellow Bullhead ≥140 mm TL was classified as adult or if <140 TL was classified as juvenile.

All nonnative fish species were placed in a bucket and euthanized with an overdose of tricane methanesulfonate (MS-222) and discreetly placed away from the creek and visitors in a debris pile or buried. Non-targeted native species were returned to the water immediately at or near the point of capture to minimize impacts to them.

Results for Bonita Creek: Seven removal trips were conducted from January through September 2020 and 622 Yellow Bullhead were removed (Table 2). An additional 15 Yellow Bullhead were removed during annual fish monitoring in March. A length-frequency histogram of all the fish removed, except one not measured, from Bonita Creek in 2020 depict several age classes of Yellow Bullhead including young-of-year fish less than 50 mm TL, juveniles less than 140 mm TL, and adults 140 mm TL or greater (Figure 2).

No Green Sunfish have been collected or observed since 2018 in Horse Camp Canyon, which suggests their eradication.

Recommendations for Bonita Creek: Removal trips will focus on the upper reaches, which support fewer Yellow Bullhead than lower reaches, and will continue downstream as CPUE approaches zero. areas are cleared. Movement of Yellow Bullhead from downstream into upstream removal reaches is difficult, if not impossible, due to beaver dams that act as barriers to upstream fish movement. Elimination of Yellow Bullhead from Bonita Creek will likely require an effort comparable to what was done for Green Sunfish and would entail a minimum of three interns working weekly, four days per week, for up to one-year. Budget costs to hire three interns full-time for one year are estimated at $113,695 (Table 3). Current resources available for removal effort are not enough for eradication, but does maintain a level of suppression, which is beneficial for

reproduction and recruitment of native fish in reaches with Yellow Bullhead. Suppression efforts will continue until additional resources are available to eradicate Yellow Bullhead from the system.

ARAVAIPA CREEK ANNUAL REPORT

Recovery Goals/Objectives for Aravaipa Creek Fish: Nonnative fish removal of piscivorous Yellow Bullhead from Aravaipa Creek will help protect and secure genetic lineages of two of the rarest endemic fishes of the Gila River basin, Loach Minnow (*Tiaroga cobitis*) and Spikedace (*Meda fulgida*) and address the following recovery goals identified for each species in their respective recovery plans.

Recovery Objectives for Loach Minnow:

Loach Minnow and Spikedace recovery plans (1991)

Task 5. Enhance or restore habitats occupied by depleted populations.

Loach Minnow recovery objective 5.1 Identify target areas amenable to management.

Loach Minnow recovery objective 5.2 Determine necessary habitat and landscape improvements. This includes removal or other control of nonnative fishes, where they are problematic.

Loach Minnow recovery objective 5.3 Implement habitat improvement. This includes repeated management to remove nonnatives.

Task 6. Reintroduce populations to selected streams within historic range.

Loach Minnow recovery objective 6.2.2 Enhance habitat, as necessary.

Loach Minnow recovery objective 6.2.3 Assess status of nonnative fishes in watershed.

Loach Minnow recovery objective 6.2.5 Reclaim as necessary to remove non-native fishes.

Recovery Objectives for Spikedace:

Loach Minnow and Spikedace recovery plans (1991)

Task 5. Enhance or restore habitats occupied by depleted populations.

Spikedace recovery objective 5.1 - Identify target areas amenable to management.

Spikedace recovery objective 5.2 - Determine necessary habitat and landscape improvements. This includes depletion or removal of nonnative fishes, if identified as significant deterrents to survival or enhancement of Spikedace.

Spikedace recovery objective 5.3 - Implement habitat improvement. This includes repeated management to remove nonnatives.

Task 6. Reintroduce populations to selected streams within historic range.

Spikedace recovery objective 6.2.3 - Assess status of non-native fishes in the watershed.

Spikedace recovery objective 6.2.5 - Reclaim as necessary to remove non-native fishes.

Geographical Area: Aravaipa Creek is a tributary to the San Pero River and is in southeastern Arizona about 50 miles west of Safford, Arizona, along the border of Graham and Pinal counties (Figure 3). The creek becomes perennial at Aravaipa Spring near Stowe Gulch on lands owned and managed by The Nature Conservancy and flows west to the San Pedro River approximately 22-miles. The watershed covers 558 square miles and includes multiple tributaries, some which contribute flow to the mainstem. Landownership is comingled with private, federal, and tribal inholdings. The two primary managers/landowners, BLM and The Nature Conservancy are supportive of the project. Permission to remove Yellow Bullhead from private lands on the west end is in progress with permission granted so far from 18 of the 19 landowners contacted.

Background for Aravaipa Creek: Considered one of the premiere native fish assemblages in the state, Aravaipa Creek (Figure 3) supports **seven** populations of native fish species, including Loach Minnow, Spikedace, Roundtail Chub (*Gila robusta*), Speckled Dace, Longfin Dace, Sonora Sucker, and Desert Sucker. Additionally, nonnative predatory and competitive fishes, including Yellow Bullhead and Red Shiner (*Cyprinella lutrensis*) inhabit the mainstem of Aravaipa Creek and threaten the native fishes. A third nonnative fish species, Green Sunfish, was successfully removed from Horse Camp Canyon, a tributary to Aravaipa Creek, by BLM, SFO and partners using a variety of gear types, including Promar nets, Gee metal minnow traps, dipnets, seines, and backpack electrofishers from 2010 to 2015. With the elimination of Green Sunfish, the BLM, SFO and partners-initiated removal of Yellow Bullhead from Aravaipa Creek in 2017 as nonnative fish are the greatest threat to the native fish community in this system. Future invasions of nonnative fishes from the San Pedro River are unlikely due to paired fish barriers that were constructed in 2001 by BOR.

The purpose of this task is to remove nonnative fishes, Yellow Bullhead and Red Shiner from Aravaipa Creek to protect the extant native fish community. Although both species prey upon and compete with the native species, removal efforts will focus primarily on habitats occupied by Yellow Bullhead, which includes pools, backwaters, and streambank margins. By focusing on these habitats, impacts to federally endangered Loach Minnow and Spikedace will be minimal. Red Shiner will not be targeted directly since their habitat preferences tend to overlap with both Loach Minnow and Spikedace.

Methods for Aravaipa Creek: Aravaipa Creek was divided into 79, 500-meter (m) segments starting from the lower constructed fish barrier (S001, UTM 534676E, 3634081N) upstream to Stowe Gulch (S079, UTM 559509E, 3636784N). These segments were used to separate effort for data recording and analysis. One or two teams consisting of a backpack electrofisher (Smith-Root model LR-24 or 20B) and one or two dip netters collected fishes by shocking along both banks for the days sampled. Electrofishing effort (seconds [s]) was recorded for each segment sampled and UTM coordinates were recorded where sampling began, ended, and at each location Yellow Bullhead was captured. All likely Yellow Bullhead habitat was sampled and included slow-moving pools, woody debris, vegetation, and undercut banks. When a Yellow Bullhead was encountered, the location was repeatedly sampled with the electrofisher until no additional individuals were captured. Pool and backwater habitats were sampled with a backpack electrofisher, seine, or both and occasionally with traps and nets. When traps and nets were used, their location was marked with a UTM coordinate or conspicuously identified if no GPS signal was available. They were

baited with wet or dry dog food and set for a maximum of two hours. The locality of capture for each yellow bullhead was recorded with a handheld GPS (Garmin GPSMAP 64st). Nonnative fish were placed in a bucket, euthanized with MS-222, enumerated, and measured (TL in mm). Non-targeted native species, including Lowland Leopard Frog were returned to the water immediately at or near the point of capture to minimize impacts to them.

Results Aravaipa Creek: The BLM, SFO and partners conducted eleven removal trips in 2020. Six of the removal trips were for Interagency Agreement (R17PG00018) and five were for (R18PG00115). One-hundred and sixty-three stream segments, totaling approximately 82.5 river kilometers were sampled in 2020. A total of 2,785 Yellow Bullhead were removed by electrofishing (Table 4) and 111 by seining (Table 5). Juveniles comprised 74% (n=2,153) of total catch and adults comprised 26% (n=742). One Yellow Bullhead was not measured. An additional 127 juvenile Yellow Bullhead were removed during the fall 2020 bi-annual fish monitoring (Table 6) for a total of 3,023 Yellow Bullhead. A length-frequency histogram of all the fish removed (excluding those collected during fish monitoring) from Aravaipa Creek in 2020 depict several age classes of Yellow Bullhead including young-of-year fish less than 50 mm TL, juveniles less than 140 mm TL, and adults 140 mm TL or greater (Figure 4).

Recommendations Aravaipa Creek: It was anticipated in 2019 that we would be able to estimate population size of Yellow Bullhead in 2020, however, catch-per-unit-effort (CPUE) did not decline, but increased. The increase in CPUE was seen primarily in juvenile Yellow Bullhead. Plausible explanations for this increase include reduced predation from adult Yellow Bullhead as the population of adult Yellow Bullhead has declined with removal, low flows, and perhaps lack of floods, which would normally displace nonnative fish. Current discharge at Aravaipa Creek based on the Mammoth, Arizona stream gauge is 11 cubic feet per second (cfs), which is 15% below average for this time of year. Daily maximum mean discharge from 2015 through 2020 is shown in figure five.

We anticipate being able to discuss the efficacy of Yellow Bullhead mechanical removal by the end of 2021 if we see a decline in CPUE.

Acknowledgement: The work described in this report was partially funded through Interagency Agreements (Nos. R17PG00018 and R18PG00115) with U.S. Bureau of Reclamation as part of the Central Arizona Project (CAP) Gila River Basin Native Fishes Conservation Program.

Literature Cited

U.S. Fish and Wildlife Service. 1991a. Spikedace Recovery Plan. Albuquerque, New Mexico. 38 pp.

U.S. Fish and Wildlife Service. 1991b. Loach Minnow Recovery Plan. Albuquerque, New Mexico. 38 pp.

U.S. Fish and Wildlife Service. 2015. Gila chub (Gila intermedia) Draft Recovery Plan. U.S. Fish and Wildlife Service, Southwest Region, Albuquerque, New Mexico. 118 pp. + Appendices A-C.

Weedman, D. A. 1999. Gila topminnow, *Poeciliopsis occidentalis occidentalis*, revised recovery plan. Draft. August 1999. U.S. Fish and Wildlife Service, Phoenix, AZ.

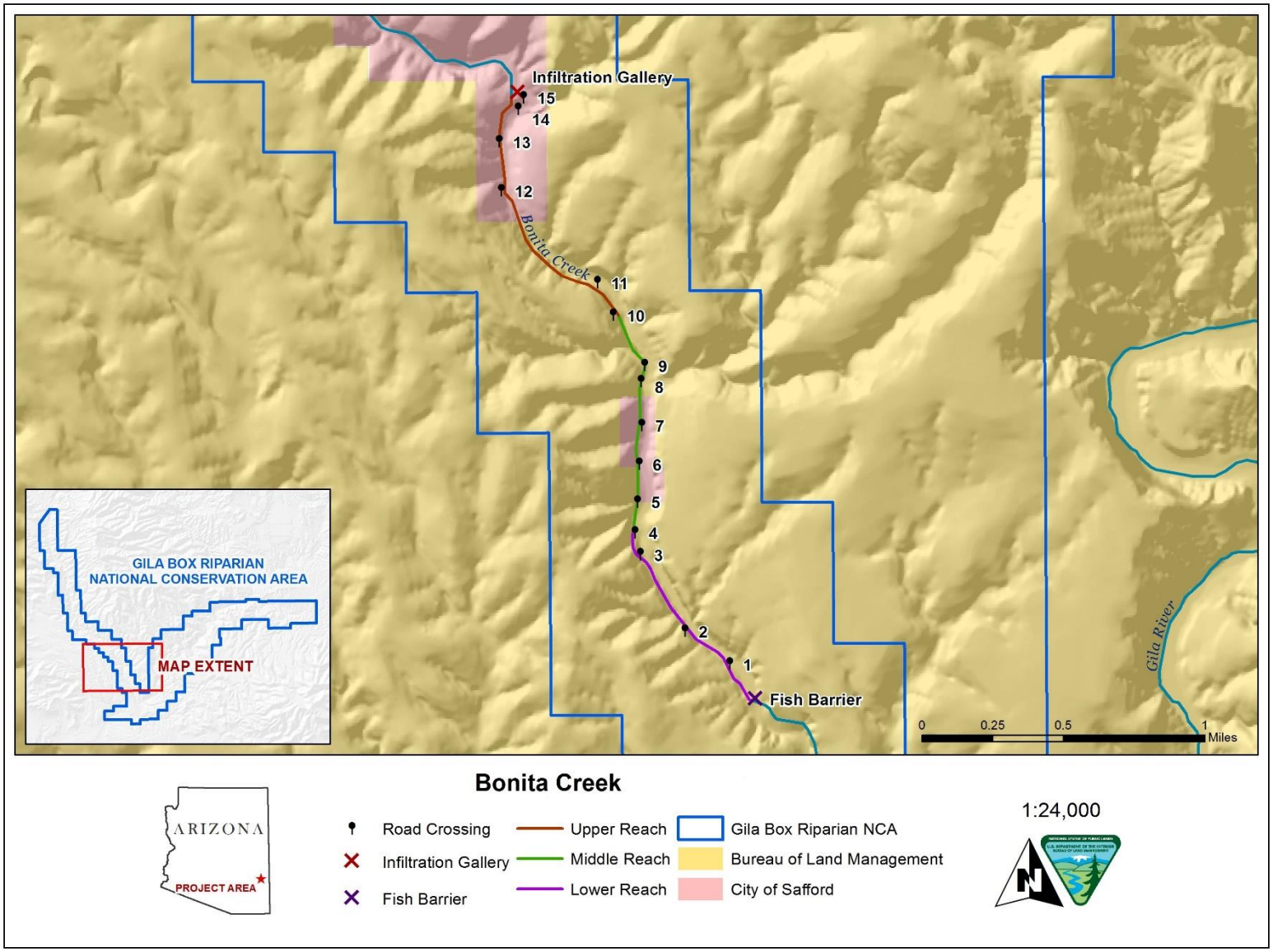

Figure 1. Project area showing low water road crossings, City of Safford infiltration gallery, fish barrier, and stream reaches of Bonita Creek.

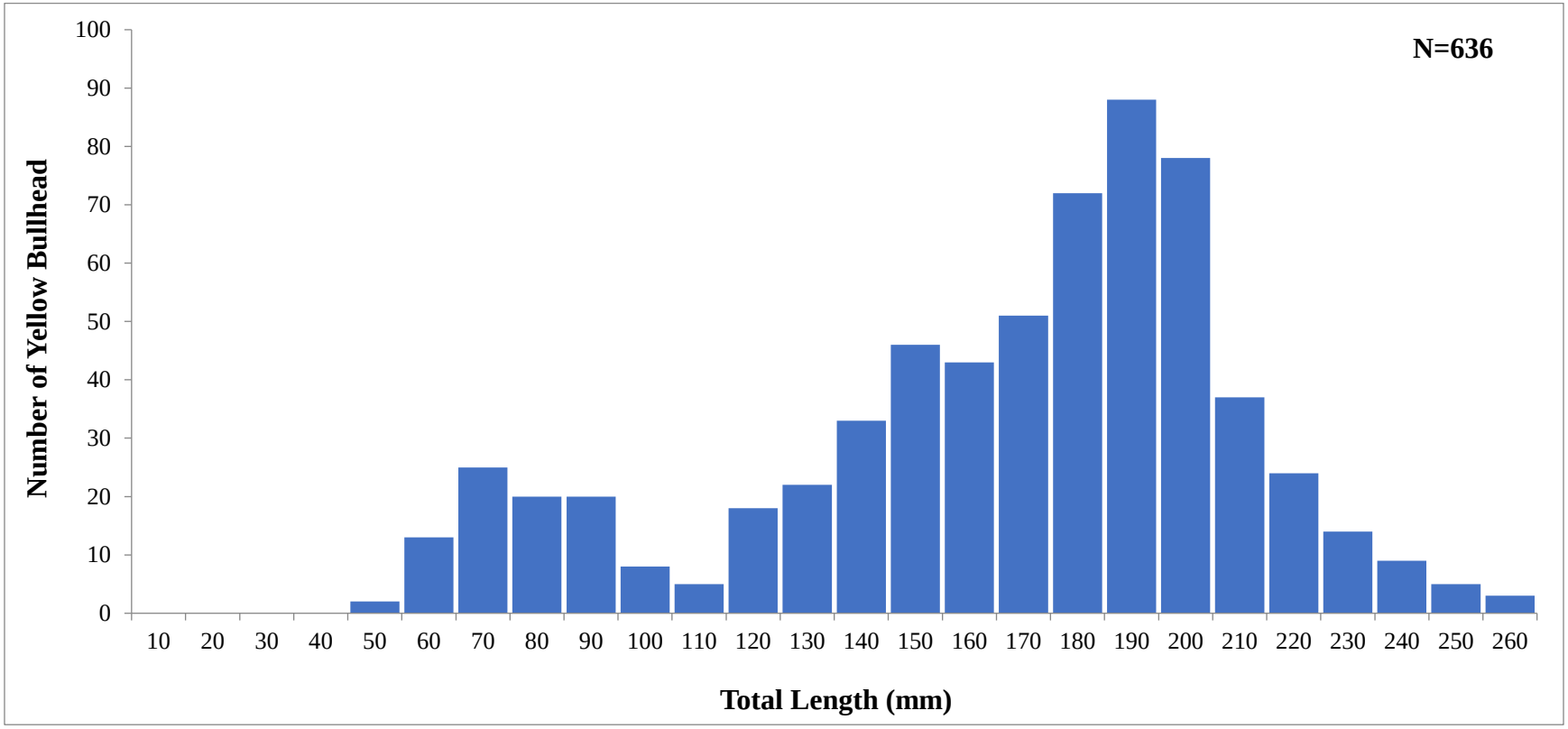

Figure 2. Length frequency histogram of Yellow Bullhead catch in Bonita Creek, January-September 2020.

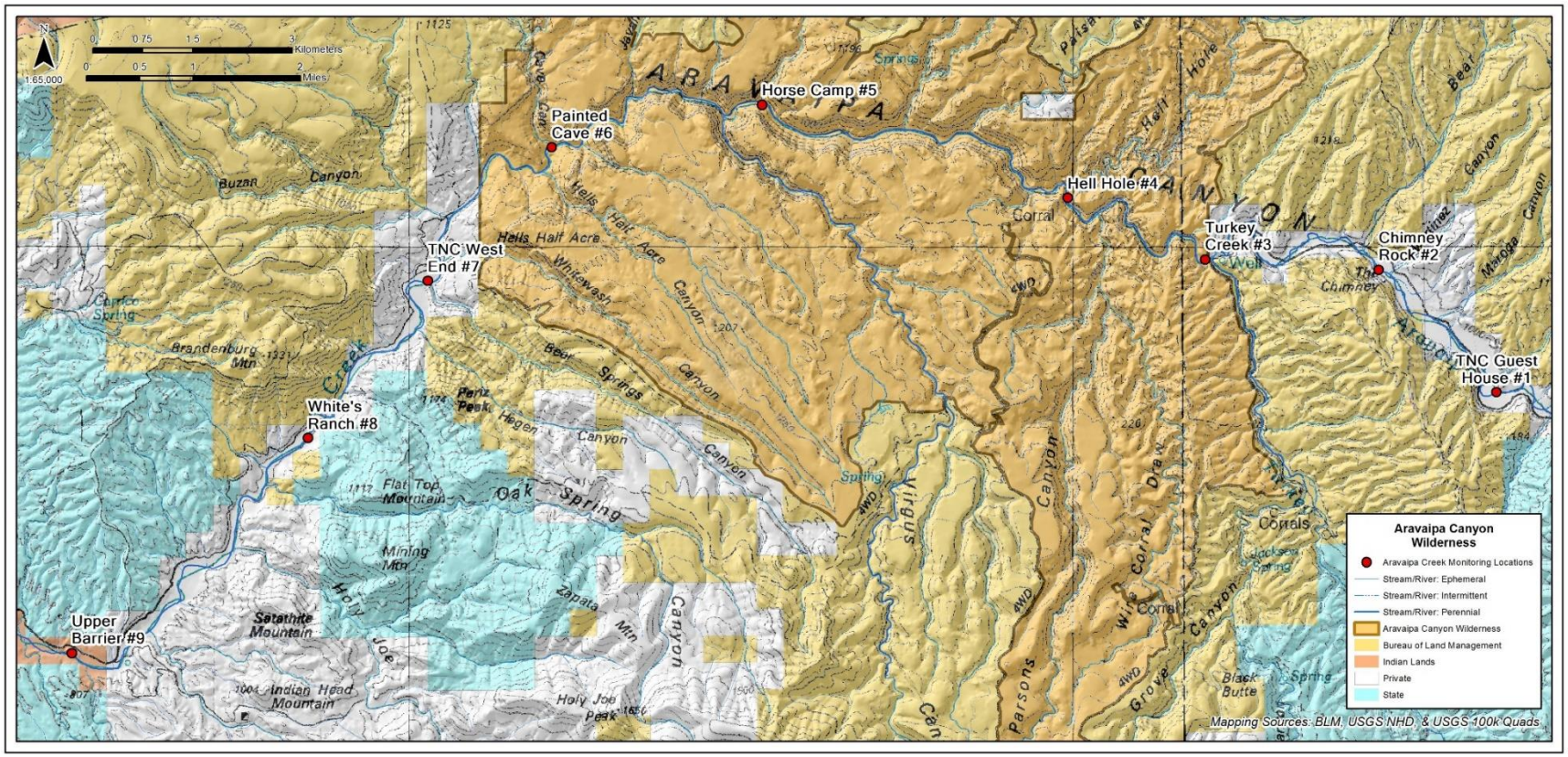

Figure 3. Project area showing landownership, ephemeral, intermittent, and perennial reaches, and permanent fish monitoring sites of Aravaipa Creek.

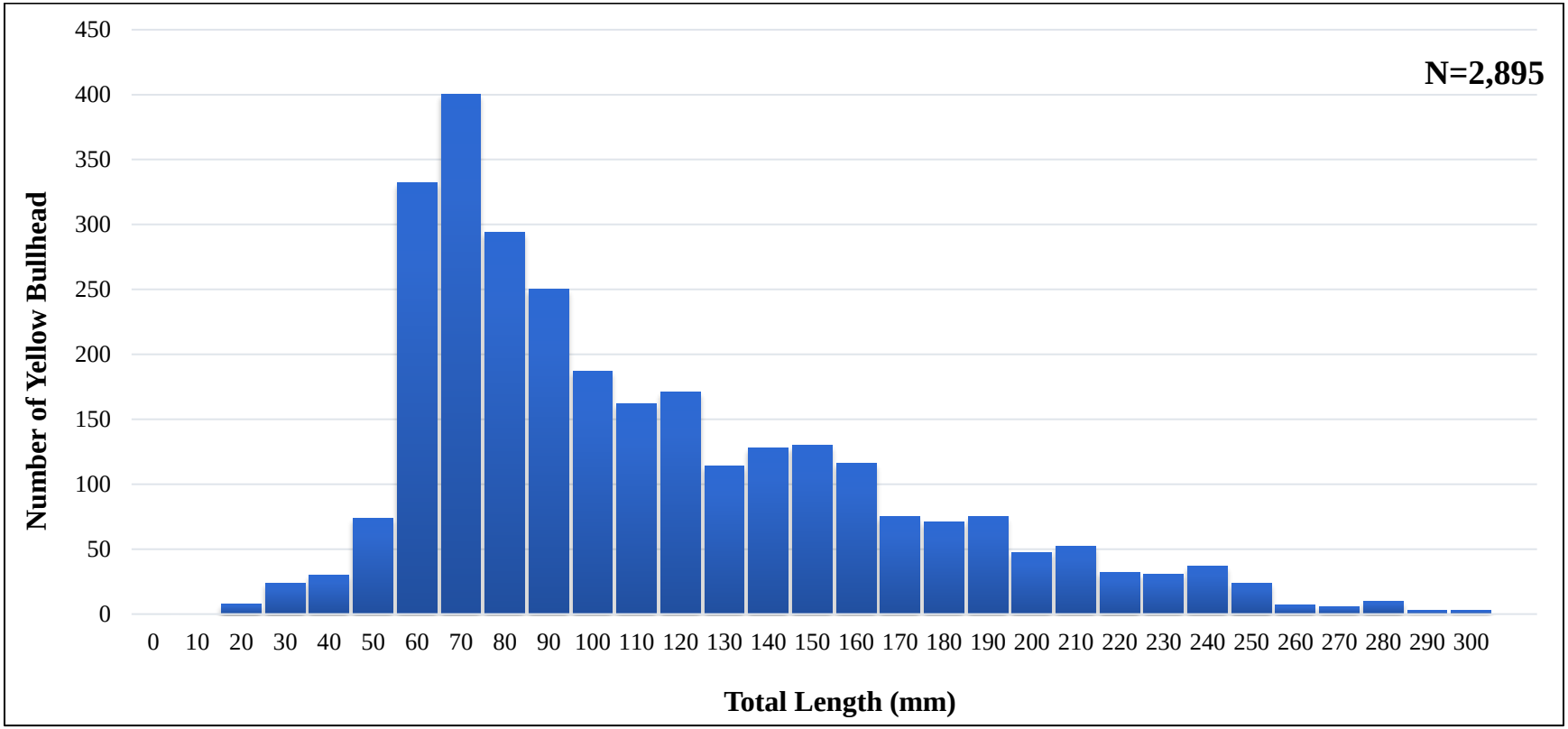

Figure 4. Length frequency histogram of Yellow Bullhead catch in Aravaipa Creek, January-November 2020.

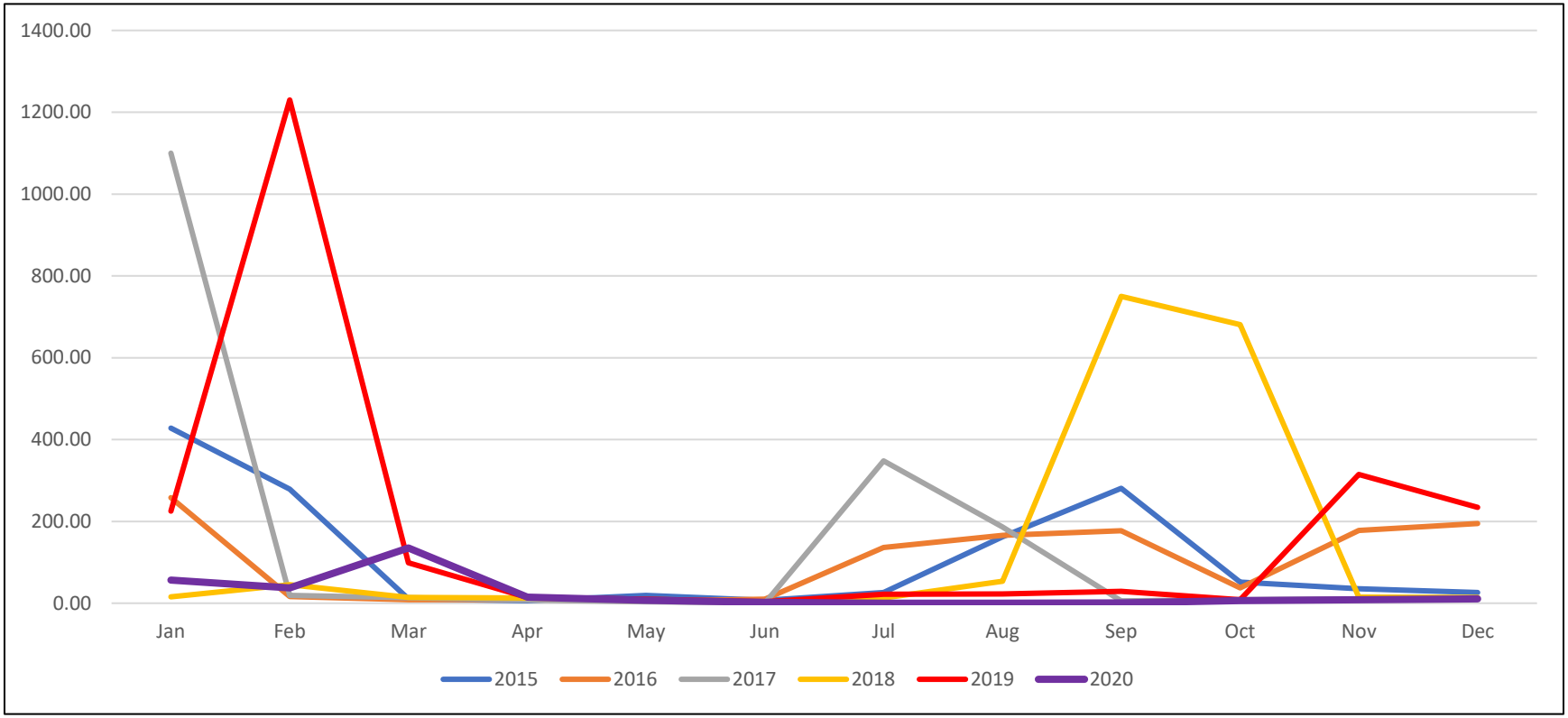

Figure 5. Daily maximum mean discharge, cubic feet per second from 2015 through 2020.

Table 1. Gear type and total number of Green Sunfish removed from Bonita Creek, 2009-2020.

Gear Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Gee Minnow Trap	137	1,647	2,323	3,701	1,152	2,278	1,329	2,815	2				15,384
Promar Net	155	471	820	1,623	857	521	574	576	5				5,602
Hoop Net			76	224	148	198	204	126					976
Gee and Promar - Combined			756										756
Seine	173				186			12					371
Dip Net					93								93
Red Promar	7				4			42					53
Backpack Electrofisher	10	8	10			2							30
Tote Barge Shocker						7							7
Custom Trap						8	1						9
Crab Trap					1								1
Total	482	2,126	3,985	5,548	2,441	3,014	2,108	3,571	7	0	0	0	23,282

Table 2. Summary of Yellow Bullhead removal from Bonita Creek in 2020.

Removal Date	Location – Road Crossings	Gee Metal Minnow Trap Effort (net night)	Promar® Net Effort (net night)	Number of Yellow Bullhead Captured by net and CPUE			
				Gee	CPUE	Promar®	CPUE
1/27-28/2020	6-7	50	50	0	0	33	0.66
3/15-16/2020	13-14	40	40	0	0	15	0.38
6/09/10/2020	7-8 & 10-11	25	25	0	0	16	0.64
8/30-31/2020	11-12	50	50	6	0.12	111	2.22
8/31-9/1/2020	11-12	142	142	3	0.02	173	1.22
9/1-2/2020	11-12	142	142	2	0.01	98	0.69
9/2-3/2020	11-12, 12-13, & 13-14	142	142	1	0.01	104	0.73
9/3-4/2020	10-11, 14-15, & 15-gallery	125	125	26	0.21	49	0.39
Total		716	716	38	0.05	599	0.84

Table 3. Total cost to hire three interns for one year to mechanically remove Yellow Bullhead from Bonita Creek.

Budget Categories:	Rate or Cost Explanation	Total Cost per Category
Partner Expenses (Federal Financial Assistance Agreement)		
Personnel (Labor)	3*$13.00*2080 hrs.	$81,120
Fringe Benefits (ERE)	3*$4,056	$12,168
Other	Vehicle Mileage (10,400 miles *$0.575/mile)	$5,980
Total Direct Charges		$99,268
Indirect Charges	10% of total costs	$9,927
BLM		
Supplies (AOO)	Nets, MS222, field supplies	$4,500
Total Cost per Year		**$113,695**

Table 4. Yellow Bullhead effort and catch per segment by electrofishing in Aravaipa Creek, 2020.

Date	Segments	Total Effort (s)	Number of Yellow Bullhead Removed
1/9/2020	S021	467	1
	S022	415	1
1/14/2020	S023	1133	6
	S024	736	2
	S025	784	4
	S026	816	9
2/24/20	S026	25	1
	S027	1341	6
	S028	1168	8
2/25/20	S029	1313	4
	S030	1328	10
	S031	1713	25
	S032	1789	22
	S033	1422	18
2/26/20	S033		2 – Caught in Promat net.
	S038	1586	8
	S039	1475	15
2/27/20	S040	1546	14
	S034	1849	9
	S035	1925	8
	S036	2145	10
	S037	1621	24
4/16/2020	S050		1– Caught in Promat net.
4/27/2020	S057	1904	1
	S058	542	1
	S059	795	2
	S060	608	1
4/28/2020	S041	1269	11
	S042	586	5
	S043	1520	21
	S044	1572	24
	S045	1541	9
	S046	1515	19
4/29/2020	S047	1519	9
	S048	1544	12
	S049	1449	14
	S050	1614	19
	S051	939	6
	S052	945	2
	S053	732	3
	S054	980	2
	S055	728	0
	S056	769	0

4/30/2020	S061	1119	1
	S062	962	0
	S063	878	0
	S064	481	1
5/11/2020	S054	1202	6
	S055	624	0
	S056	736	4
	S057	527	0
5/12/2020	S041	1041	5
	S042	349	0
	S043	688	5
	S044	592	7
	S045	587	3
	S046	523	1
	S047	485	3
	S048	670	4
5/13/2020	S043	1072	11
	S044	470	3
	S045	560	5
	S046	465	0
	S047	667	2
	S048	762	4
	S049	520	4
	S050	573	8
	S051	528	0
	S052	259	1
5/14/2020	S050	1109	19
	S053	598	0
	S054	622	0
5/25/2020	S022	1617	9
	S023	1849	6
5/26/2020	S038	1869	11
	S039	2080	27
	S040	2064	20
5/27/2020	S031	2358	11
	S032	2061	12
	S033	2054	16
	S034	2871	35
	S035	1176	11
5/28/2020	S024	714	7
	S025	847	16
	S026	1011	11
	S027	938	20
	S028	1083	23
	S029	815	15

6/22/2020	S001	1263	3
	S002	1042	1
	S003	1271	19
	S004	859	4
	S005	276	11
	S006	0	0
	S007	72	0
	S008	1022	6
	S009	1705	32
6/23/2020	S011 (in part)	1204	9
	S012	2194	14
	S013	2082	18
	S014	1989	14
	S015	1697	11
6/24/2020	S016	1927	11
	S017	2916	18
	S018	2051	16
	S019	2840	28
	S020	1962	12
6/25/2020	S021	2108	11
	S022	1741	10
	S023	1556	12
	S024	1591	19
	S025	2695	45
	S026	1799	14
	S027	1236	29
7/11/2020	S001	972	2
	S002	755	6
	S003	879	12
	S004	999	31
	S005	0	Dry
	S006	0	Dry
	S007	0	475 meters Dry; 25 meters wet.
	S008	189	0
	S009	1846	26
	S010	713	17
7/28/2020	S058	2918	112
7/29/2020	S040	791	22
	S041	742	23
	S042	779	33
	S043	823	20
	S044	581	30
	S045	712	20
	S046	599	7
	S047	657	26

	S048	753	15
7/30/2020	S049	1066	20
	S050	1275	34
	S051	880	8
	S052	620	22
	S053	533	7
	S054	491	13
	S055	543	7
	S056	626	10
	S057	556	17
7/31/2020	S059	418	6
	S060	743	0
	S061	659	0
	S062	888	1
	S063	764	0
11/9/2020	S057	3705	100
11/10/2020	S038	1907	38
	S039	636	21
	S040	421	33
	S041	605	65
	S050	3679	238
	S051	1367	36
11/11/2020	S042	1782	33
	S043	1878	58
	S044	2225	75
	S045	2105	56
11/12/2020	S046	3415	111
	S047	2916	105
	S048	3063	104
	S049	2132	82
Totals	**163**	**193,448**	**2,785**

Table 5. Yellow Bullhead effort and catch per segment seine effort in Aravaipa Creek, 2020.

Date	Segment	Total Effort (hauls)	Number Removed
11/09/2020	S058	3	3
11/10/2020	S038	7	8
11/11/2020	S043	26	91
11/12/2020	S049	7	9
Totals	**4**	**43**	**111**

Table 6. Summary of Yellow Bullhead removal from Aravaipa Creek from January 9, 2020 through November 12, 2020.

Removal Date	Location	Distance Covered	Effort (Seconds)	Number of Yellow Bullhead Removed	Comments
1/9/2020	West End	1.0 rkm	882	2	
1/14/2020	West End	4.0 rkm	3,469	21	
2/24-27/2020	West End	7.0 rkm	22,246	182	
2/24-27/2020	West End	-----	-----	2	Caught in Promar® Net.
4/16/2020	East End	-----	-----	1	Caught in Promar® Net.
4/27-30/2020	East End	12.0 rkm	26,511	163	
5/11-14/2020	East End	12.5 rkm	16,229	95	
5/25-28/2020	West End	8.0 rkm	25,407	250	
6/22-25/2020	West End	13.0 rkm	41,098	367	
7/11/2020	West End	5.0 rkm	6,353	94	
7/27-31/2020	East End	12.0 rkm	19,417	453	
10/16-17/2020	East & West Ends			127	Collected during bi-annual fish monitoring.
11/9-12/2020	East End	8.0 rkm	31,836	1,155	
11/9-12/2020	East End	-----	-----	111	43 seine hauls.
Total		82.5 rkm	193,448	3,023	