

PALLID STURGEON PROPAGATION
2018
Garrison Dam NFH

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Background/Introduction

The Pallid Sturgeon Recovery Plan (1993) established guidance for collection of wild brood fish, propagation, research needs, and reintroduction of progeny to accomplish recovery goals. This hatchery's role in the recovery effort focuses on the development of techniques for spawning and rearing of pallids and propagation for augmentation. Pallid Sturgeon propagation at Garrison Dam NFH began in 1997. Successful spawning has occurred annually since 1998. Stockings from Garrison Dam NFH have occurred annually since 2002 in the Missouri and Yellowstone Rivers from Missouri to Montana. As of the spring stocking in 2018, a total of 285,379 fish and 1,500,924 fry had been directly stocked from Garrison Dam NFH to supplement recovery. Additional eggs, fry and fish from Garrison Dam NFH have been shipped to other participating recovery hatcheries and research facilities for further growth prior to stocking. Cryopreservation of milt also is a priority recovery action with Garrison Dam NFH being one of three hatcheries maintaining the pallid sturgeon milt repository. As of the fall 2018, 100 unique wild males have been cryopreserved for the Upper Basin Recovery. Four have no progeny stocked in any RPA and an additional 16 are not represented in all three RPAs.

Objectives

Garrison Dam NFH will be the spawning site for all wild brood collected that have not contributed progeny into the three upper RPA's. Pairing for family lots will be based on the results from the Lamar FTC for broodstock selection. Milt will be shipped overnight to be cryopreserved at Warm Springs FTC. We will use a 1X3 mating strategy making use of wild collected brood fish that have not contributed progeny to the recovery effort. The cryo repository will serve as a backup in the event we are short 'new' males.

The stocking request for 2018 will depend upon the number of adults captured that have not contributed progeny. Our stocking target will approximate the mean number of offspring released for the male families in each RPA to increase the effective population.

RPA1 - 270 spring yearlings/family
RPA2 - 400 spring yearlings/family
RPA3 - 30 spring yearlings/family up to a maximum of 180 fish

Approximately five thousand eggs per family (100 mls) will be sent to Gavins Point NFH for broodstock development. Gavins Point NFH will be spawning wild (RPA 4) and captive broodstock again this year. Progeny from the captive brood program will be used for research.

Spring Capture 2018

May 6 - Male PIT tag 1F4A13592B captured and released.

May 7 - Male PIT tag 1F521B1E56 (AKA 116175735A & 1F54696C38) captured at Fairview and taken to GDNFH. Two other males also captured and released; 7F7D291A07 and 7F7D37642C.

May 8 - Male PIT tag 6C00112905 captured at Fairview and taken to GDNFH. Five other males also captured and released; 115712453A, 1F482F3F2B, 220E5E551E, 220F107A6F, and 4704550E5B.

May 9 - Six pallid brooders captured, four males and two females. All released at capture as all previously used in the propagation program. Female 470A675627 is black egged. Female 4A49070E13 was not assessed. Males captured included 115669294A, 1F4A0B1A72, 1F4A363031, and 7F7D2D723D.

May 10 - Male PIT tag 7F7F05635A captured at Intake by the USGS crews shuttling fish around the diversion dam and taken to GDNFH. Three other males collected at the confluence; 132313521A, 465B6F1939, and 486838404F.

End of broodstock collections (total of 5 days). Water flows on the Yellowstone are dangerously high this Spring and unsafe for further broodstock collections. To date there have been 66 individual females, 114 males and 75 unknowns captured in RPA2.

Table 1. RPA 2 Pallid Broodstock Captures

Year	Pallids Collected	Females Collected	Males Collected	Unknowns
1988	3	1	1	1
1989	5	1	0	4
1990	5	1	1	3
1991	11	1	4	6
1992	38	4	16	18
1993	27	4	5	18
1994	66	6	23	37
1995	22	5	12	5
1996	20	5	12	3
1997	24	6	14	4
1998	14	3	9	2
1999	17	5	9	3
2000	26	4	17	5
2001	22	5	16	1
2002	30	8	21	1
2003	53	7	39	7
2004	65	16	48	1
2005	44	11	28	5
2006	66	14	49	3
2007	44	12	32	0
2008	62	15	47	0
2009	51	8	43	0
2010	40	5	35	0
2011	10	3	6	1
2012	43	9	34	0
2013	31	7	23	1
2014	25	5	20	0
2015	27	3	24	0
2016	17	8	25	1
2017	37	8	28	1
2018	3	5	23	0
Total	951	190	644	131
% of individuals captured this year		8%	20%	0%

Table 2. Adults Captured in 2018

2018 Pallid Broodstock Captures												
PIT Tag	PIT Tag 2	Code	Capture Date	Weight lbs	Sex	Spawn Year	Cryo Year	To Hatchery	Stocked Progeny			Comments
									RPA1	RPA2	RPA3	
116175735A	1F521B1E56		5/7/18	32	M	2017	2017	X	297	440	60	1F54696C38 - 3 PIT tags
6C00112905			5/8/18	32	M			X	0	0	0	New fish
7F7F05635A			5/10/18	25	M			X	0	0	0	Last captured in June 1994
1F4A13592B	220D4E6A57		5/6/18		M							
7F7D291A07			5/7/18		M							
7F7D37642C			5/7/18		M							
115712453A			5/8/18		M							
1F482F3F2B			5/8/18		M							
220E5E551E	220D0E1F0B		5/8/18		M							
220F107A6F			5/8/18		M							
4704550E5B	7F7B082208		5/8/18		M							
470A675627			5/9/18		F							Black eggs
4A49070E13			5/9/18		F							
115669294A			5/9/18		M							
1F4A0B1A72			5/9/18		M							
1F4A363031			5/9/18		M							
7F7D2D723D			5/9/18		M							
132313521A			5/10/18		M							
465B6F1939			5/10/18		M							
486838404F	4310624556		5/10/18		M							
115557165A			5/16/18		F							Black eggs
470378405D			5/29/18		F							Black eggs
7F7FD66963	220E5B3803		6/13/18		F							Atretic
115553761A			6/15/18		M							
115669540A			6/15/18		M							
1F4A435004			6/15/18		M							
115675486A			6/18/18		M							
4441774C6E			7/25/18		M							

Spawning and Propagation

June 24 - Pallids given injections of LH-RHa at the standard dosages starting at 10:00 pm.

June 26 - The 3 males were checked for spermiation and milt extracted at 10:00 am in two fish. Later that day at 1:20 pm the fish were handled again and milt collected. Still no response from male 7F7F05635A.

June 27 - milt from the two males is shipped to Warm Springs FTC for cryopreservation in a solution of Akos and glutamine.

June 28 - Milt from the two males successfully frozen - 100 0.5- ml straws and 20 5-ml straws per male. Motilty is 80% and 95%.

July 17 - The NDGF caught a HRPS in their standard sampling nets near Bear Den Bay on Lake Sakakawea. The 3rd left scute was missing. No PIT tag reader was available. The fish was caught in 25 foot of water. Total length was 590mm, fork length 490 mm and weight 990 grams.

August 6 - Milt from Warm Springs is received and placed in storage dewars. 40 0.5-ml straws and 8 5-ml straws.

Sept 10 - broodstock are released in the river

No progeny produced this year

Table 3. Broodstock Data

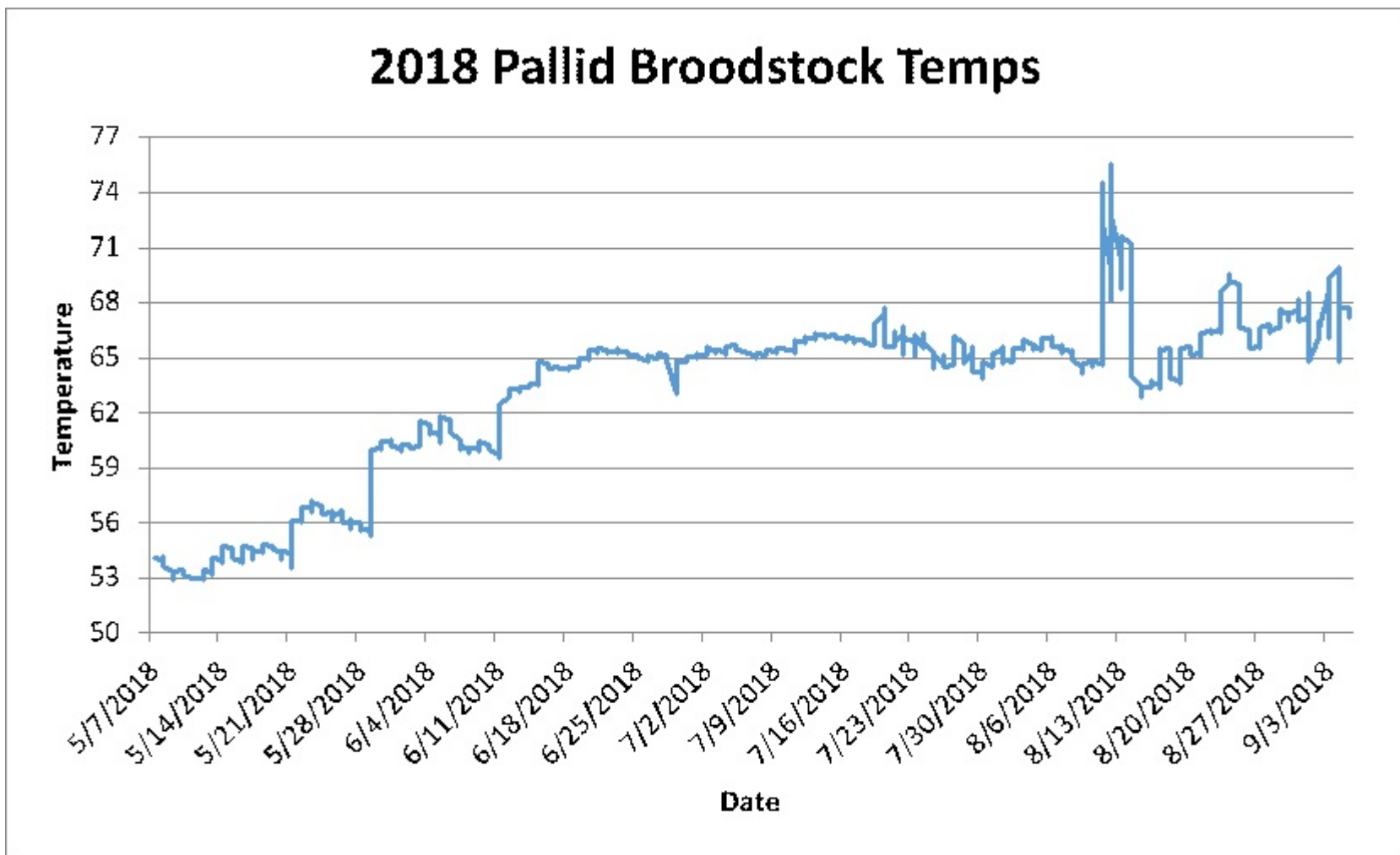
2017 PALLID STURGEON BROODSTOCK DATA														
Tag Number	Date Collected	Sex	Wt (Kg)	5 mgLH-RH/10 ml saline			PI	Tank	2018 Spawning Result	Previous Spawn Results				
				(mls)	(mg)	Dose (mg/kg) 0.05 or 0.02				Cry Year	Progeny (RPA)			
											1	2	3	
116175735A	1F521B1E56	M	14.5	0.58	0.29	0.02	-	N	Successful	2017	227	440	60	
6C00112905		M	14.5	0.58	0.29	0.02		N	Successful		0	0	0	
7F7F05635A		M	11.3	0.45	0.23	0.02		S	Unsuccessful		0	0	0	
TOTAL				1.6	0.81									

Table 4. Milt Collections

Pit Tag #	Inj Date	Inject Time	Take Date	Time	Amount (mls)	Motility (fresh)	Characteristics	Last cryo year	Milt Cryo 2018	Motility (at freeze)	5 ml straws	0.5 ml straws
1F521B1E56	6/24	10:00 pm	6/26	10:00 am	120	0		2017	N			
6C00112905	6/24	10:00 pm	6/26	10:00 am	190	5		-	N			
7F7F05635A	6/24	10:00 pm	6/26	10:00 am	0			-	N			
1F521B1E56	6/24	10:00 pm	6/26	1:20 pm	115	90		2017	Y	95	20	100
6C00112905	6/24	10:00 pm	6/26	1:20 pm	130	95		-	Y	80	20	100
7F7F05635A	6/24	10:00 pm	6/26	1:20 pm	0			-	N			

100 wild males now represented in the repository.

Chart 1. Broodstock Tank Temperatures



Appendix 1. Milt Repository at Garrison Dam NFH

#	Pit Tag	2nd Pit Tag	3rd Pit Tag	1 Cryo Year	2 Cryo Year	3 Cryo Year	4 Cryo Year	RPA1	RPA2	RPA3
1	0A180E0E7E			2016				329	399	30
2	114473737A			2004				0	0	6
3	115525534A			2006				3245	6816	167
4	115529097A			2004	2006	2007		567	1565	20
5	115544332A			2002				0	0	0
6	115552116A			2004				5285	1242	65
7	115553761A			2005				2157	5196	73
8	115556461A			2002	2015			733	2136	130
9	115626162A			2006	2008			6311	11969	522
10	115631222A	43154A1133		2001				1565	3514	91
11	115633183A			2017				286	1787	54
12	115669294A			2007				4564	3292	19
13	115669540A			2003	2017			1135	1181	59
14	115675486A			2003				1003	705	30
15	115679374A			2004				0	1493	24
16	115679523A			2009				1744	2643	29
17	115712453A			2000	2006	2008		3237	10369	935
18	116167123A			2002	2008			4	661	144
19	132114552A			2003	2007			57	798	128
20	132157621A			2003	2006	2007		557	2387	74
21	132313521A			2003	2010	2016		469	743	136
22	17509415139			2001				735	422	70
23	1F47606357	1F4A1E4336		2004				125	1777	17
24	1F47652015			2007				108	454	55
25	1F4772396F			2002	2016			30	103	15
26	1F47760123			2003	2007			5713	908	141
27	1F477B3A65			2000	2002			568	2298	188
28	1F477B4E51			2004	2006			378	3704	19
29	1F482F3F2B			2005				946	599	19
30	1F4838134E			2008				0	0	0
31	1F48472D25			2007	2008			84	128	3
32	1F4849755B			2008				2153	6781	680
33	1F4A0C2E5D			2008				0	0	0
34	1F4A111C6A			2001				0	368	70
35	1F4A13453F			2017				346	421	25
36	1F4A13592B	220D4E6A57		2003				1299	4289	382
37	1F4A143350			2000	2010			469	1003	77
38	1F4A206A0D			2007				276	2216	19
39	1F4A27214F			2001				3	378	195
40	1F4A312640			2004				25	1886	67
41	1F4A33194B			2000	2010			469	1043	75
42	1F4A34194A			2007				101	936	20
43	1F4A363031			2003	2007			730	713	68
44	1F4A3E1445	1F4A2F3A2E		2002	2004	2007		964	2706	394
45	1F4A435004			2013	2017			656	403	60
46	1F4A4B5973			2001	2004			510	1091	95
47	1F4B225A1A			2012				926	444	88
48	1F4B26036D			2007				300	2542	81
49	1F5001721E			2007	2008			231	1846	69

50	1F521B1E56	1F54696C38	116175735A	2003	2017	2018		297	440	60
51	1F53312736			2015				600	493	60
52	2202236E31			2000				0	0	0
53	220E3F2578			2010				334	400	30
54	220E4E4E5D			2003	2009	2017		278	378	31
55	220E5E551E	220D0E1F0B		2008				1772	2524	25
56	220E5F4928			2004				228	1560	19
57	220F0E6207			2004				484	428	15
58	220F0F7677			2004				13	1277	0
59	220F107A6F			2002	2016	2017		573	2038	144
60	2224076523			2006	2012			174	277	24
61	411D0B4E09	17509312265		2001				776	411	120
62	411D0E2C5F			2001	2003	2017		472	392	70
63	41476A0462			2001				553	424	70
64	424E36510D			2007				67	274	79
65	424E3E6127			2008				0	0	0
66	424E5A5314			2008				0	0	0
67	425028583F			2008				0	0	0
68	4255534C5D			2008				0	0	0
69	430E452777			2004	2008	2010		0	4873	20
70	43105C602B			2009				4024	5520	43
71	431565767B			2007				6253	969	65
72	435F71414F	220E5F6E26	7F7F054773	2000	2009			619	886	27
73	435F7C1210			2006				387	352	0
74	4441774C6E			2006				229	1895	86
75	444334021A			2008				893	3505	63
76	44436E2975			2010				469	731	75
77	44440A7B73			2007	2009			3573	886	76
78	452738076E			2003				88	99	31
79	452A4E1F15	7F7D461025		2003				0	653	145
80	454B30016B			2007	2016			3166	443	20
81	465B6F1939			2009				1441	2133	37
82	465D43745B			2006				413	790	138
83	466C473C59			2006				830	1614	0
84	4704550E5B	7F7B082208		2009	2010			2829	7048	103
85	470A754E14			2009				1868	3100	14
86	4714560E0E			2007				110	402	20
87	4718447879			2009				283	436	24
88	486838404F	4310624556		2011	2014			665	385	60
89	6C00112905			2018				0	0	0
90	7F7B023253			2005				1610	2414	165
91	7F7B024F2D			2012	2017			283	411	61
92	7F7B025248			2012				165	266	28
93	7F7B031F17			2005				1002	4075	257
94	7F7B082C10			2009				545	733	25
95	7F7D24754C	220E465E74		2010				469	1032	76
96	7F7D23292E	34354025646		2016				326	400	30
97	7F7D291A07			2003	2006	2007		5951	1057	266
98	7F7D2D723D			2007	2008			3107	7611	663
99	7F7D365422	41475D3C5D		2009				2175	3637	159
100	7F7D372A6B			2003	2006			3269	2359	64
101	7F7D37642C			2009				4415	9263	185
102	7F7D376F73	1F54714656		2004	2015			611	594	80
103	7F7D3C5708			2001				0	247	67
104	7F7D41431D			2007	2008			120	866	19
105	7F7D434B54	4443422E34		2002	2006			311	1532	19
106	7F7D437250	7F7D3C555D	435F557624	2004	2008			804	1626	64
107	7F7D487531	132235554A	3435464185	2004				43	914	83
108	7F7D4A7758	4310556551		2006				2048	3427	184

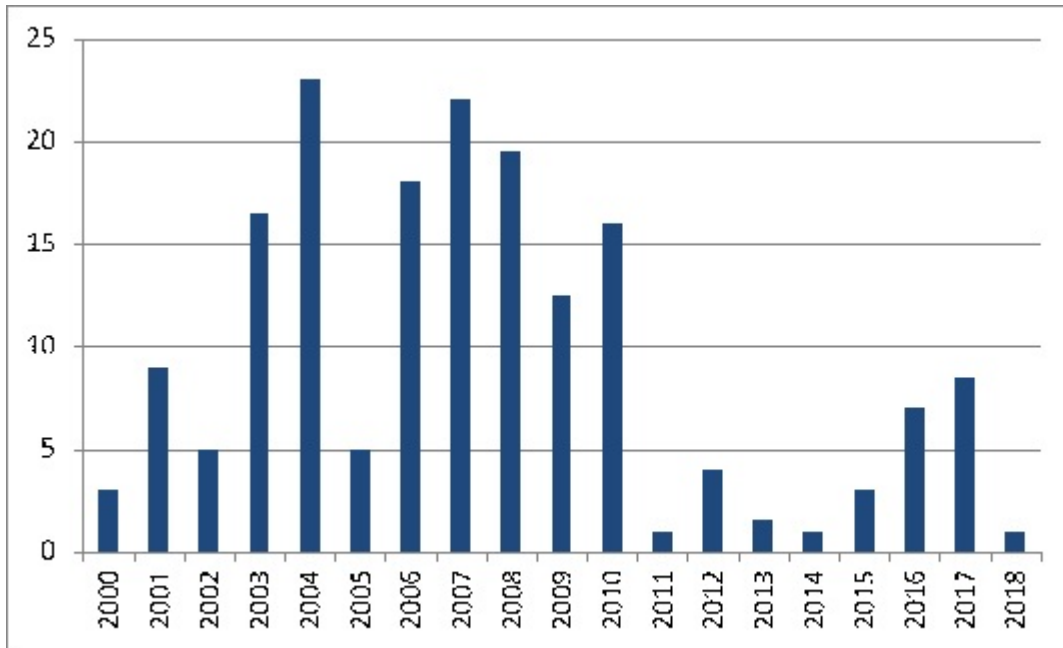
109	7F7E42795C			2004				0	0	0
110	7F7E55466D	1F557B2071		2004	2008			3638	14269	412
111	7F7F065834			2002	2004	2016		453	1246	186
112	7F7F066471	115667264A		2006	2008			4648	10927	595
113	7F7F06697C			2009				1846	2750	62
114	7F7F066A40	2204583665		2004	2006			726	5605	19

Cryopreserved sperm from future broodstock males at Gavins Point NFH - 14 males

PIT Tag # on cane

Stockings for need validating. Stocking #'s do not include fry. 100 wild males to date cryopreserved

Appendix 2. Cryopreserved Milt Repository - Upper Basin Wild



114 males are represented in the repository, 100 from the wild and 14 from the broodstock program. 45 males have been cryopreserved on more than one occasion (repeats). Four wild males are not yet represented as progeny in the river and 16 are needed on one of the three RPA's. Milt prior to 2008 is of poorer quality due to cryoprotectant used (HBSS pre-2008, AKOS from 2008 to present) and 0.5 ml straws are generally higher quality.

Appendix 3. Females Used in Upper Basin Recovery Effort

PIT Tag	PIT Tag 2	RPA1	RPA2	RPA3	RECAP	Last Capture Date	Weight (lbs)	Latest Fate Status	Radio
113953385A						4/25/2006	51	SPAWNED @ GDNFH; NO OVULATION	
114476216A	43104B266F	0	11685	170	59	11/13/2006	39	RELEASED	CODE 114
115551683A	4063767709	185	415	44	30	10/24/2005	47	SPAWNED @ GPNFH IN 2006; DIED	
115553544A		302	2355	142	48	4/30/2013	34	RELEASED	CODE 13
115555495A				26	6	4/22/2004	66	SPAWNED @ GDNFH; DIED	
115557165A		1073	2136	60	622	4/20/2016	45	SPAWNED @ GDNFH; 271,566 FRY STOCKED	CODE 116
115557463A		4639	6065	75	196	4/22/2008	33	SPAWNED @ MCSFH; RELEASED	
115676635A			241	2755	122	6/23/2017	55	RELEASED	CODE 95
115676694A						5/5/2003	37	SPAWNED @ GDNFH; FRY DIED	
115679394A						5/5/2003	28	SPAWNED @ MCSFH; EGGS DIED	
115713555A						4/13/2000	57	SPAWNED @ GDNFH; FRY DIED	CODE 62
115716093A						5/16/2014		FOUND DEAD ON SHORE	CODE 31
116224546A			3986	601	462	4/29/2002	60	SPAWNED @ GDNFH; RELEASED	
132253516A						4/21/2004	62	SPAWNED @ GDNFH; DIED	
132256586A		536	581	202	70	4/30/2003		SPAWNED @ MCSFH; DIED	
1F47715752						4/11/2000	55	SPAWNED @ GDNFH; ATRITIC	CODE 25
1F477B7E21						5/6/2008	59	SPAWNED @ GDNFH; FRY DIED	
1F48421542		2722	1488	180	98	5/11/2017	50	RELEASE	CODE 87
1F497F1801		11441	28997	2337	1126	4/19/2016	42	SPAWNED @ GDNFH; 61,549 FRY STOCKED	CODE 9
1F4A301354		290	103	199	359	4/26/2010	46	RADIO IMPLANTED; RELEASED	CODE 38
1F4A436E66		6828	4848	60	36	7/6/2011		FOUND DEAD	
1F4B237A79	1F497F6534	0	0	0		4/24/1997	66	SPAWNED @ GDNFH; DIED	
1F4B246E04		443	677	239	397	9/26/2005	53	RADIO IMPLANTED; RELEASED	CODE 121
1F5330401E	1F521F363A	4	5	18	6	4/29/2004	31	SPAWNED @ MCSFH; PROGENY IN RPA4	
1F54756038	1F5420727B	0	0	0		4/30/2002	68	SPAWNED @ GDNFH; DIED	
1F5569653E	1F557B761B	1125	1500	76	131	5/3/2016	32	TAKEN TO GDNFH; DIDN'T OVULATE	CODE 30
220E345E09		0	734	140	124	4/24/2001	62	SPAWNED @ MCSFH; RADIO	CODE 10
220E7E3A38		0	0	0		4/18/2007	33	RADIO IMPLANTED; RELEASED	CODE 155
220F01755C	2204657963	12099	20408	264	456	5/3/2017	61	RADIO IMPLANTED RELEASED	CODE 43
220F0F6213		0	0	0		4/18/2000	45	SPAWNED @ GDNFH; DIED	
40636B2945		3967	4647	88	53	4/23/2007	48	SPAWNED @ GDNFH; 44;131 FRY STOCKED	
4064021213		0	0	191	11	10/31/2006	50	PCR & HISTOLOGY TAKEN, RELEASED	
40640E415B	40640E4158?	0	0	0		10/24/2005	30	RELEASED	
4310187B69		0	0	0		4/24/2002	37	SPAWNED @ GDNFH; DIED	

PIT Tag	PIT Tag 2	RPA1	RPA2	RPA3	RECAP	Last Capture Date	Weight (lbs)	Latest Fate Status	Radio
43105F0C7E		1125	1500	219	198	5/24/2010	46	SPAWNED @ GDNFH	CODE 85
431532681F		0	0	0		4/25/2006	48	RADIO IMPLANTED; RELEASED	CODE 95
4315327C7B		827	1170	70	107	5/8/2009	30	SPAWNED @ GDNFH	CODE 66
4443240458		668	3817	20	240	5/9/2007	51	SPAWNED @ GDNFH; 101777 FRY STOCKED	
4443250A24		1176	1532	138	164	5/2/2017	55	RADIO IMPLANTED; RELEASED	CODE 127
44635F477B		1002	1592	80	107	5/6/2013	44	RELEASED	
454910202B		147	4524	41	20	3/28/2014		FOUND DEAD BY ANGLER	
454B380D60		1005	7107	127	67	5/20/2015	33	RELEASED	CODE 37
454B490528		1603	3285	194	206	4/22/2009	46	SPAWNED @ MCSFH; 7611 FRY STOCKED	
470378405D		477	4188	151	70	4/19/2016	40	SPAWNED @ GDNFH; 138,833 FRY STOCKED	CODE 36
47037F460C		3945	3780	102	64	4/24/2007	57	SPAWNED @ GDNFH; 143,497 FRY STOCKED	
470468383C		2612	3718	73	143	10/15/2008	54	SPAWNED @ GPNFH	
470A675627		14194	30919	1421	346	5/18/2016	64	SPAWNED @ GDNFH; 159,995 FRY STOCKED	CODE 35
47151A3D3A		8023	6264	102	97	4/25/2007	66	SPAWNED @ GDNFH; 43,533 FRY STOCKED	
486A080614		465	747	0	105	4/24/2012	54	SPAWNED @ GDNFH; RADIO IMPLANTED	CODE 44
4A46717168		464	400	45	12	4/20/2016	56	SPAWNED @ GDNFH; 7,133 FRY STOCKED	CODE 122
4A49070E13		604	700	48		5/2/2017	33	SPAWNED @ GDNFH	CODE 124
7F7B016070	44426F185B	556	0	224	56	5/14/2003	51	SPAWNED @ GDNFH; DIED	
7F7B021573		0	478	181	68	10/6/1998	65	SPAWNED @ GPNFH; RELEASED	
7F7B025D51		471	3636	107	34	10/31/2006	65	SPAWNED @ GPNFH; 71,328 FRY STOCKED	
7F7B026102		2157	5946	155	193	4/27/2005		SPAWNED @ GDNFH; RELEASED	
7F7B081169	220D0A6D37	0	0	0		9/25/1997	51	SPAWNED @ GPNFH; FRY DIED	
7F7D373C61		0	0	0		10/7/1992	31	TAKEN TO GPNFH; DIED 7/3/94	
7F7D43086C		0	0	0		9/11/1993	66	TAKEN TO GPNFH; DIED 6/5/94	
7F7D517479		1494	1417	155	80	4/19/2016	34	SPAWNED @ GDNFH; 13,080 FRY STOCKED	CODE 34
7F7D7C2E4B		612	440	22		5/23/2017	39	SPAWNED @ GDNFH	CODE 39
7F7F054855		1841	1886	89	106	4/24/2003		SPAWNED @ MCSFH, DIED	
7F7F056171		0	200	98	54	4/22/1998	65	SPAWNED @ GDNFH; DIED	
7F7F065E12		0	0	0		9/30/1998	65	SPAWNED @ GPNFH; DIED	
7F7F066452	115559532A	2109	5026	334	131	4/22/2008	26	SPAWNED @ MCSFH	
7F7F06672B		0	545	138	69	4/24/2001	48	SPAWNED @ MCSFH; DIED	
7F7FD66963	220E5B3803	5609	16787	257	283	4/18/2016	36	SPAWNED @ GDNFH; 47,593 FRY STOCKED	CODE 40

Appendix 4. Males Used in Upper Basin Recovery Effort

PIT Tag	PIT Tag 2	RPA1	RPA2	RPA3	RECAP	Last Capture Date	Weight (lbs)	Latest Fate Status	Radio
113719262A			160	65	30	9/22/1998	27	SPAWNED @ GPNFH; RELEASED	
114473737A				6	1	4/22/2004	41	SPAWNED @ GDNFH; RADIO IMPLANTED	CODE 29
115525534A		2801	6816	167	143	8/26/2014	34	RELEASED	CODE 5
115529097A		567	1565	20	67	5/21/2014	29	RADIO IMPLANTED; RELEASED	CODE 79
115544332A						4/23/2002	55	SPAWNED @ GDNFH; DIED	
115552116A		5285	1242	65	31	4/21/2009	31	RELEASED	CODE 24
115553761A		2157	5196	143	180	6/1/2015	44	RADIO IMPLANTED; RELEASED	CODE 21
115556461A		1073	2136	60	43	5/25/2017	43	RELEASED	CODE 12
115626162A		6311	11518	522	192	6/18/2016	31	RADIO IMPLANTED; RELEASED	CODE 18
115631222A	43154A1133	6311	11518	522	62	8/28/2013	28	SPAWNED @ MCSFH; 1378 FRY STOCKED	CODE 14
115633183A		0	0	0	85	5/25/2017	29	SPAWNED @ GDNFH	CODE 51
115669294A		0	0	0	46	4/18/2016	36	RELEASED	CODE 89
115669540A		1135	1181	59	53	5/25/2017	29	SPAWNED @ GDNFH	
115675486A		1003	705	30	53	5/6/2014	30	RADIO IMPLANTED; RELEASED	CODE 38
115679374A		0	1493	24	7	5/11/2006	37	RELEASED	
115712453A		3237	9973	935	128	5/16/2017	33	RELEASED	CODE 10
116165646A		96	267	78	59	9/20/2016	28	RELEASED	
116167123A		0	645	144	44	6/3/2009	44	RELEASED	
132114552A		0	798	128	41	5/7/2014	22	RELEASED	CODE 76
132157621A		479	2387	74	66	4/24/2007	46	SPAWNED @ GDNFH; 101,777 FRY STOCKED	
132313521A		375	500	0	48	5/1/2017	37	RELEASED	CODE 193
1F47606357	1F4A1E4336	125	1777	17	14	4/20/2016	33	TAKEN TO GDNFH; DIDN'T SPERMATE	CODE 187
1F4772396F						4/24/2002	53	SPAWNED @ GDNFH; DIED	
1F47760123		5713	908	141	67	5/19/2015	34	RELEASED	CODE 82
1F477B3A65		565	2298	188	137	4/23/2015	31	RELEASED	CODE 62
1F477B4E51		378	3704	19	21	5/18/2011	40	RELEASED	CODE 106
1F482F3F2B		946	599	19	83	9/11/2017	32	RELEASED	CODE 74
1F4849755B		2153	6341	680	92	5/25/2010	25	RELEASED	CODE 118
1F49517057						9/23/1997	53	SPAWNED @ GPNFH; FERT EGGS DIED	
1F4A0B1A72		11441	28997	2337	204	5/22/2017	33	IMPLANTED RADIO; RELEASED	CODE 71
1F4A111C6A		0	0	0	66	4/22/2008	35	RADIO IMPLANTED; RELEASED	CODE 53
1F4A13453F		0	0	0	29	5/12/2017	37	SPAWNED @ GDNFH	CODE 20
1F4A13592B	220D4E6A57	1299	3851	382	42	5/19/2016	31	RELEASED	CODE 32
1F4A143350		375	500	96	63	6/22/2017	25	RELEASED	CODE 196
1F4A206A0D		276	2216	19	6	5/7/2012	23	RELEASED	CODE 22
1F4A24076C	1F4A4E5772	375	500	0	18	4/18/2016	20	TAKEN TO GDNFH; DIDN'T SPERMATE	CODE 49
1F4A27214F		0	366	195	100	4/22/2004		RELEASED	CODE 2

PIT Tag	PIT Tag 2	RPA1	RPA2	RPA3	RECAP	Last Capture Date	Weight (lbs)	Latest Fate Status	Radio
1F4A3E1445	1F4A2F3A2E	970	2696	394	198	5/16/2017	34	RELEASED	CODE 23
1F4A312640		21	1884	67	17	4/18/2007	52	RELEASED; RADIO IMPLANTED	CODE 145
1F4A33194B		375	500	75	77	4/19/2016	31	RADIO IMPLANTED; RELEASED	CODE 130
1F4A363031		730	813	68	45	4/25/2012	39	RADIO IMPLANTED; RELEASED	CODE 55
1F4A435004		57	553	60	22	5/22/2017	33	SPAWNED @ GDNFH	CODE 68
1F4A4A1439	1F47671023	295	314	156	276	?/?/1997		SPAWNED @ GPNFH; RELEASED	
1F4A5A5A63		615	2207	0	29	4/29/2008	29	RADIO IMPLANTED; RELEASED	CODE 12
1F4B225A1A		926	444	88	57	4/25/2012	34	TO GDNFH; CRYO PRODUCED HRPS IN 2013	
1F50072169		593	1832	271	125	5/3/2017	28	RELEASED	CODE 67
1F521B1E56	1F54696C38	297	440	60	7	4/21/2004		RELEASED - cryo in 2017, progeny stocked	
1F53312736	1F52167900	900	493	60	30	4/19/2016	40	RADIO IMPLANTED; RELEASED	CODE 132
2202236E31		0	0	0		4/21/2004		RELEASED	CODE 44
2204583665	7F7F066A40	726	5605	19	31	4/18/2006		RELEASED; CRYO PROGENY STOCKED	
220E3F2578	220E3F7096	334	400	30	6	6/22/2016		SPAWNED @ GPNFH WITH CRYO MILT	
220E4E4E5D		401	566	46	17	5/22/2017	36	SPAWNED @ GDNFH	CODE 52
220E5E551E	220D0E1F0B	1772	3770	0	66	4/21/2016	28	RELEASED	CODE 72
220E5F4928		228	1560	0	21	5/8/2007	35	SPAWNED @ GDNFH; RELEASED	CODE 129
220F0E6207		336	428	15	9	5/19/2016	37	SPAWNED @ GDNFH; CRYOED MILT	CODE 63
220F0F7677		13	1277	0	3	4/26/2017	28	RADIO IMPLANTED; RELEASED	CODE 15
220F107A6F		292	2173	144	260	5/2/2017	33	SPAWNED @ GDNFH	CODE 19
2224076523		174	277	0	32	5/8/2012	36	SPAWNED @ GDNFH	CODE 65
40637D481B		0	0	0		4/22/2008	64	SPAWNED @ MCSFH; DID NOT SPERMATE	
430E452777		0	4873	20	14	4/29/2013	38	GENETICS TAKEN; RELEASED	CODE 15
4310556551	7F7D4A7758	2048	3125	26	77	5/28/2014	34	RELEASED	CODE 73
43105C602B		2582	3461	43	90	5/8/2012	26	RADIO IMPLANTED; RELEASED	CODE 75
431565767B		6244	1007	65	44	4/23/2008	48	RADIO IMPLANTED; RELEASED	CODE 128
435F71414F	220E5F6E26	619	886	27	40	5/25/2010	52	RELEASED	CODE 154
435F7C1210		387	352	0	39	5/30/2007	33	RELEASED	
444171072D		824	1546	0	215	5/27/2010	29	RELEASED	CODE 10
4441774C6E		229	1895	86	36	5/23/2017	31	RELEASED	CODE 81
444334021A		1311	3027	46	128	5/25/2017	37	RADIO IMPLANTED RELEASED	CODE 93
4443422E34	7F7D434B54	311	1532	19	17	6/26/2007		CRYO @ GDNFH; 6140 FRY STOCKED	
4443610736		0	0	0		5/10/2006	41	SPAWNED @ GDNFH; NO SPERM	
44436E2975		375	500	75	45	9/30/2014	37	RADIO IMPLANTED; RELEASE	CODE 91
44440A7B73	4443332814	3576	906	26	72	5/16/2017	32	RELEASED	CODE 59
454B30016B		3166	443	20	3	4/19/2016	33	SPAWNED @ GDNFH; MILT CRYOED	CODE 42
454B385D67		0	0	0		4/26/2007	33	TAKEN TO GDNFH W/ LESIONS; DIED	
465B6F1939		1441	2133	37	83	5/14/2014	48	RELEASED	CODE 195
465D43745B		413	790	138	66	4/18/2006		SPAWNED @ MCSFH	

PIT Tag	PIT Tag 2	RPA1	RPA2	RPA3	RECAP	Last Capture Date	Weight (lbs)	Latest Fate Status	Radio
466C473C59		722	1614	0	230	5/7/2012	42	GENETICS TAKEN; RELEASED	
47037F3026		1480	2178	26	67	6/29/2012	35	RADIO IMPLANTED; RELEASED	CODE 50
4704550E5B	7F7B082208	2829	7048	103	175	5/1/2017	31	RELEASED	CODE 27
470A754E14		1868	3100	14	49	5/4/2017	12	RELEASED	CODE 69
4718447879		283	436	24	34	4/29/2013	32	RADIO IMPLANTED; RELEASED	CODE 179
486838404F	4310624556	665	415	60	35	5/6/2014	25	SPAWNED @GDNFH	CODE 200
7F7B023253		1610	2414	165	109	5/10/2006	43	RELEASED	
7F7B023408		787	1120	22	47	5/16/2017	33	RELEASED	CODE 90
7F7B024F2D		283	408	32	32	5/16/2017	32	SPAWNED @ GDNFH	CODE 54
7F7B025248		165	266	0	41	5/29/2013	22	STOMACH PUMPED; RELEASED	CODE 61
7F7B031F17		1002	4075	257	176	5/16/2017	44	RELEASED	CODE 77
7F7B081579		0	0	0		4/12/2000	32	SPAWNED @ GDNFH; IRIDOVIRUS	CODE 26
7F7B082C10		545	733	25	46	4/22/2010	67	RELEASED	CODE 80
7F7D24754C	220E465E74	375	500	76	100	5/22/2017	44	RELEASED	CODE 48
7F7D291A07		5951	1057	266	377	5/4/2017	40		CODE 45
7F7D2D723D		3107	7463	663	193	5/4/2017	37	RELEASED	CODE 8
7F7D365422	41475D3C5D	2175	3637	159	131	5/23/2017	35	RELEASED	CODE 78
7F7D372A6B		3269	2359	64	31	6/3/2009	39	RADIO IMPLANTED; RELEASED	CODE 17
7F7D37642C		4415	9263	185	260	4/20/2016	39	RADIO IMPLANTED; RELEASED	CODE 13
7F7D376F73	1F54714656	919	594	80	39	5/19/2015	35	SPAWNED @ GDNFH	
7F7D3C5708		0	247	67	17	5/13/2003	34	RELEASED	CODE 116
7F7D433241		223	245	45	31	5/6/2014	29	SPAWNED @ GDNFH	
7F7D437250	7F7D3C555D	804	1240	63	74	5/19/2016	31	435F557624 , RELEASED	CODE 46
7F7D441774	7F7D400B19	0	159	66	17	10/15/1997	52	SPAWNED @ GPNFH; RELEASED	
7F7D7C2447		0	0	0	14	5/3/2017	20	RELEASED	CODE 11
7F7E55466D	1F557B2071	3635	13646	38	78	8/21/2017	35	RELEASED	CODE 86
7F7F054773		0	0	0		4/11/2000	50	SPAWNED @ GDNFH; IRIDOVIRUS	
7F7F054D0D		0	0	0		4/27/1997	41	SPAWNED @ GDNFH; EGGS DIED	
7F7F05635A		0	0	0		8/21/2017	23	RELEASED	CODE 131
7F7F056372		0	0	0		5/13/2003	28	RELEASED	
7F7F05660D		0	0	0		6/5/1991	42	RELEASED	
7F7F065834		327	931	48	26	4/19/2016	33	SPAWNED @ GDNFH; 159.995 FRY STOCKED	CODE 83
7F7F06583D		151	315	129	143	9/14/1993	27	SPAWNED @ GPNFH IN 1997; RELEASED	
7F7F065A4D		0	0	0		4/18/2000	22	RELEASED	
7F7F065A4E		0	0	0		4/22/2003		TAKEN TO MCSFH, DIED	
7F7F066471	115667264A	4648	10472	596	110	5/6/2017	33	RADIO IMPLANTED; RELEASED	CODE 57
7F7F06697C		1846	2750	62	136	6/1/2017	39	RELEASED	CODE 60

Appendix 5. RPA2 Unknown Sex Wild Broodstock

PIT Tag	PIT Tag 2	RPA1	RPA2	RPA3	Last Capture Date	Weight (lbs)	RECAP	Latest Fate Status	Radio
115529091A		0	0	0	11/1/2006	33		RELEASED	
115554596A		0	0	0	7/12/2005	58		RELEASED	
115555446A		0	0	0	7/14/2005	25		RELEASED	
115676690A		0	0	0	4/13/2000	12		RELEASED; POSSIBLE HYBRID	
116175735A		0	0	0	5/7/2018			TAKEN TO GDNFH	
116216195A		0	0	0	5/13/2003			RELEASED	
1F47671023		0	0	0	10/21/1997	29		RELEASED	
1F49516C5B		0	0	0	4/20/2016	26		TAKEN TO GDNFH; NO RESULTS	CODE 150
1F4A504C7B		0	0	0	9/27/1994	22		RELEASED	
1F55776D28	1F520F7C04	0	0	0	8/24/1995	37		RELEASED	
22045E534D		0	0	0	5/8/2003	0		RELEASED	
220C7D0429	2204523542	0	0	0	4/28/2004	31		RELEASED	
220E587576		0	0	0	4/25/2001	12		RELEASED	
220E681454		0	0	0	4/28/1998	48		RELEASED	
220E770F3F		0	0	0	5/13/2003	24		RELEASED	
4443706E51		0	0	0	10/6/2005	40		RELEASED	
444374235B		0	0	0	9/13/2006	33		RELEASED	
44440F4A35		0	0	0	9/20/2005	18		RELEASED	
487D471D18		0	0	0	8/21/2017	16		1997 YEAR CLASS	CODE 117
6C00112905		0	0	0	5/25/2017	32		RADIO IMPLANTED; RELEASED	CODE 94
7F7B015B78		0	0	0	11/15/1994	28		RELEASED	
7F7B020D71	1F541E4A25	0	0	0	8/25/1995	44		RELEASED	
7F7B024922		0	0	0	5/31/1995	36		RELEASED	
7F7B035C47		0	0	0	4/22/1993	33		RELEASED	
7F7B035D1B		0	0	0	9/28/1993	45		RELEASED	
7F7B08162E	1F54715E3E	0	0	0	9/29/1995	32		RELEASED	
7F7B082C14		0	0	0	9/7/1994	28		RELEASED	
7F7D26595E		0	0	0	9/21/1994	76		RELEASED	
7F7D266242		0	0	0	4/18/2000	29		RELEASED	
7F7D27307F		0	0	0	4/25/1993	9		RELEASED	
7F7D292179		0	0	0	9/27/1994	26		RELEASED	
7F7D337721		0	0	0	4/27/1993	28		RELEASED	
7F7D352A52		0	0	0	4/26/1997	39		RELEASED	
7F7D35317F		0	0	0	11/15/1994			RELEASED	

PIT Tag	PIT Tag 2	RPA1	RPA2	RPA3	Last Capture Date	Weight (lbs)	RECAP	Latest Fate Status	Radio
7F7D364B62		0	0	0	9/25/2002	27		RELEASED	
7F7D365140		0	0	0	9/25/1994	40		RELEASED	
7F7D37765C		0	0	0	9/24/1994	46		RELEASED	
7F7D380720		0	0	0	9/25/1994	49		RELEASED	
7F7D381776		0	0	0	9/11/1993	52		RELEASED	
7F7D3E6D23		0	0	0	10/22/1992	27		RELEASED	
7F7D433F0C		0	0	0	4/13/2000	39		RELEASED	
7F7D43515A		0	0	0	9/10/1993	25		RELEASED	
7F7D435261		0	0	0	9/25/1994	50		RELEASED	
7F7D441A7C		0	0	0	10/27/1992	30		RELEASED	
7F7D44647E		0	0	0	9/29/1993	26		RELEASED	
7F7D4B0A42		0	0	0	9/9/2013	10		RADIO IMPLANTED; RELEASED	
7F7D7B1607		0	0	0	5/30/1997			RELEASED	
7F7E427F69	1F555C367A	0	0	0	10/12/1995	60		RELEASED	
7F7E690405		0	0	0	5/21/1993			RELEASED	
7F7E6B3364		0	0	0	10/6/1992	32		RELEASED	
7F7E6B3711		0	0	0	9/9/1993	28		TAKEN TO GPNFH; DIED 7/12/94	
7F7F054864		0	0	0	9/16/1993	24		RELEASED	
7F7F054B4E		0	0	0	9/27/1994	28		RELEASED	
7F7F055428	1F545E002F	0	0	0	3/19/1996	51		RELEASED	
7F7F055B56		0	0	0	9/22/1994	44		RELEASED	
7F7F055C21		0	0	0	9/30/1992	43		RELEASED	
7F7F056360		0	0	0	9/30/1992	43		RELEASED	
7F7F056A0A		0	0	0	9/22/1994	32		RELEASED	
7F7F064F27		0	0	0	6/8/1994	18		RELEASED	
7F7F065014		0	0	0	10/19/1992	35		RELEASED	
7F7F06511C		0	0	0	10/5/1998	31		RELEASED	
7F7F065841		0	0	0	3/21/1989	29		RELEASED	
7F7F065A3D		0	0	0	4/11/2000	55		RELEASED	
7F7F065C30		0	0	0	3/10/1989	33		RELEASED	
7F7F065F14		0	0	0	9/24/1994	32		RELEASED	
7F7F066128		0	0	0	9/26/1994	47		RELEASED	
7F7F06617F		0	0	0	5/15/1994			RELEASED	
7F7F06627E		0	0	0	6/17/1992	28		RELEASED	
7F7F066502		0	0	0	9/28/1994	28		RELEASED	
7F7F066613		0	0	0	9/14/1990	39		RELEASED	
7F7F06685C		0	0	0	8/4/1999	40		RELEASED	
7F7F06685E		0	0	0	9/23/1991	50		RELEASED	

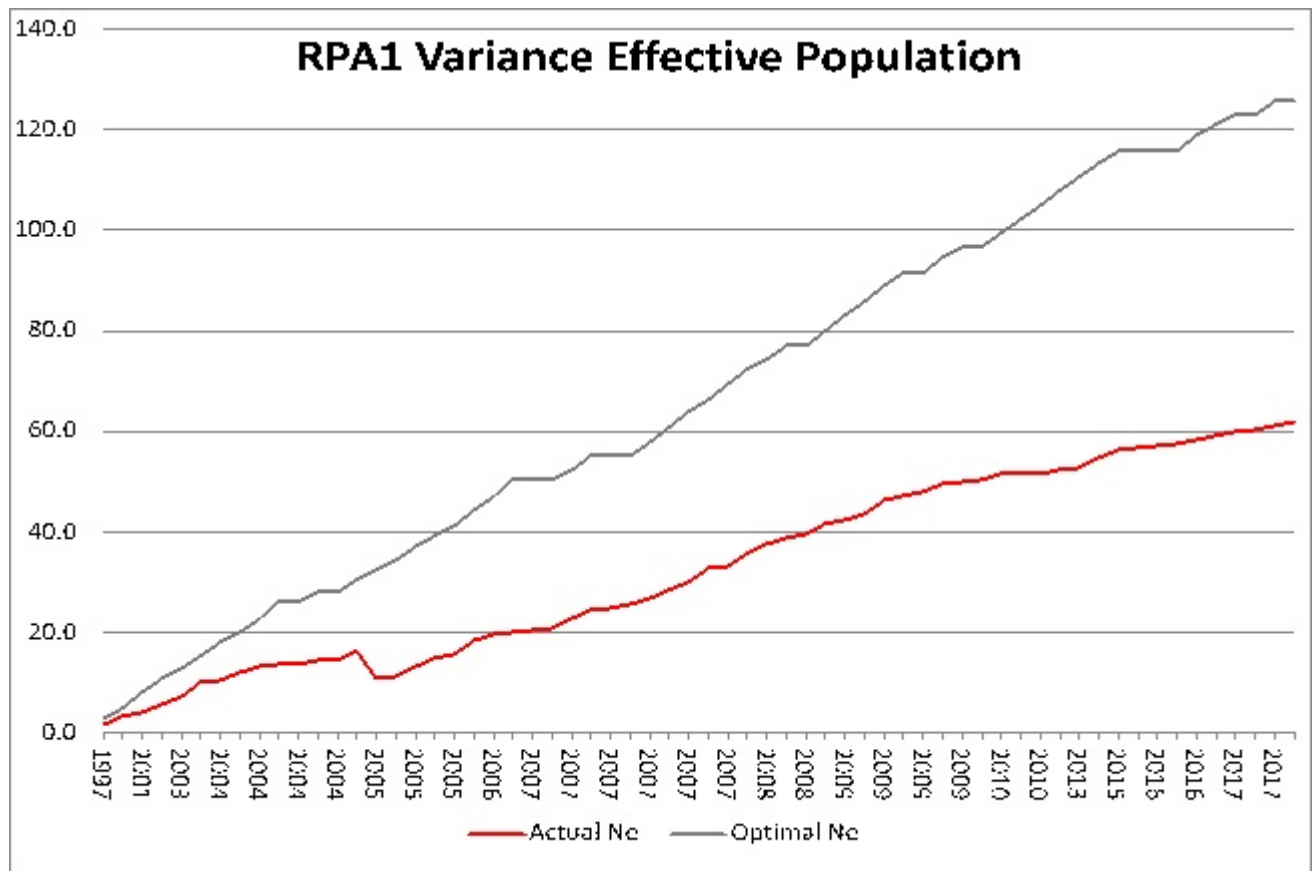
PIT Tag	PIT Tag 2	RPA1	RPA2	RPA3	Last Capture Date	Weight (lbs)	RECAP	Latest Fate Status	Radio
7F7F066A0E		0	0	0	9/13/1990	33		RELEASED	
7F7F066A45		0	0	0	9/26/1994	34		RELEASED	
7F7F066A66		0	0	0	5/31/1991	32		RELEASED	
LAMTAG 1111					7/18/1991	25		RELEASED	
YE DANGLER TAG					10/6/1992	28		RELEASED	
ORANGE #7-0049					5/21/1994			RELEASED	
AVID TAG *009*28					6/16/1994	25		RELEASED	
AVID TAG *010*11					6/16/1994	22		RELEASED	
DANGLER 10025 PINK					8/11/1994			RELEASED	
DANGLER 7-2008 RED					8/11/1994			RELEASED	
DANGLER 10025 PINK					8/11/1994			RELEASED	
RED DANGLER # 7-2					8/12/1994			RELEASED	
CINCH TAG# 7-01174					5/28/2000	29		RELEASED	

Appendix 6. Garrison Dam NFH Hatchery Capacity

Tank Capacity at a Density of 0.5 Pounds per Square Foot									
Tank Size(ft)	#	Square Ft (ea)	Total Sqft	Capacity of 2" fish/tank	Capacity of 4" fish/tank	Capacity of 6" fish/tank	Capacity of 8" fish/tank	Capacity of 9" fish/tank	Capacity of 10" fish/tank
				892.86	111.61	33.07	13.95	9.80	7.14
4 Circular	10	12.6	126	5625	703	208	88	62	45
5 Circular	38	19.6	744.8	8750	1094	324	137	96	70
6 Circular	0	28.2	0	12589	1574	466	197	138	101
8 Circular	7	50.2	351.4	22411	2801	830	350	246	179
20 Circular	2	314	628	140179	17522	5192	2190	1538	1121
3 X 29 Tanks	8	87	696	38839	4855	1438	607	426	311
Total	65		2546	1136696	142087	42100	17761	12474	9094
Normal Hatchery Capacity	55			545625	68203	20208	8525	5988	4365

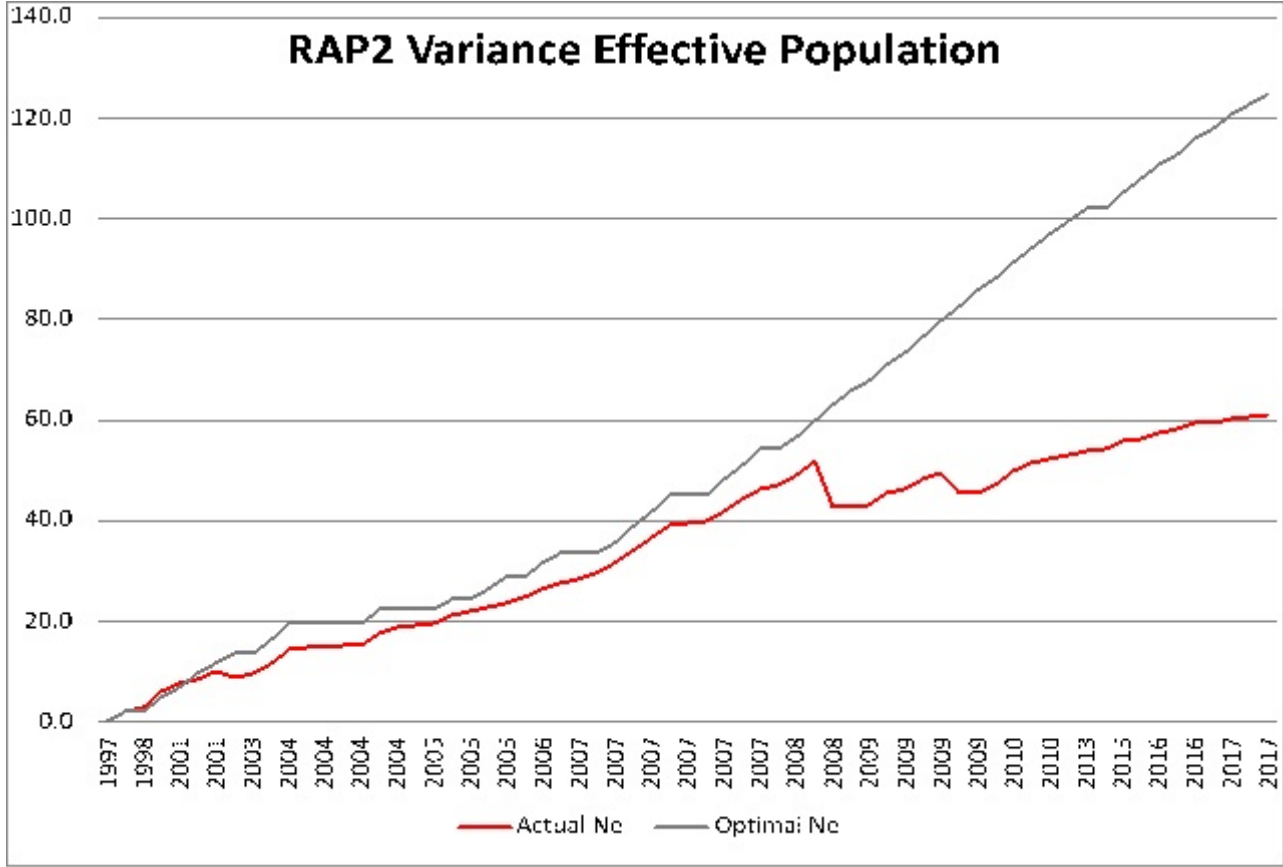
Overwinter Tank Capacity at a Density of 0.70 Pounds per Square Foot									
Tank Size(ft)	#	Square Ft (ea)	Total Sqft	Capacity of 10" fish/tank	Capacity of 11" fish/tank	Capacity of 12" fish/tank	Capacity of 13" fish/tank	Capacity of 14" fish/tank	Capacity of 15" fish/tank
				7.14	5.37	4.13	3.25	2.60	2.12
4 Circular	10	12.6	126	63	47	36	29	23	19
5 Circular	38	19.6	744.8	98	74	57	45	36	29
6 Circular	0	28.2	0	141	106	82	64	51	42
8 Circular	7	50.2	351.4	251	189	145	114	91	74
20 Circular	2	314	628	1570	1180	909	715	572	465
3 X 29 Tanks	8	87	696	435	327	252	198	159	129
Total	65		2546	12731	9565	7367	5795	4640	3772
Normal Hatchery Capacity	55			6111	4591	3536	2782	2227	1811

Appendix 7. RPA1 Variance Effective Population



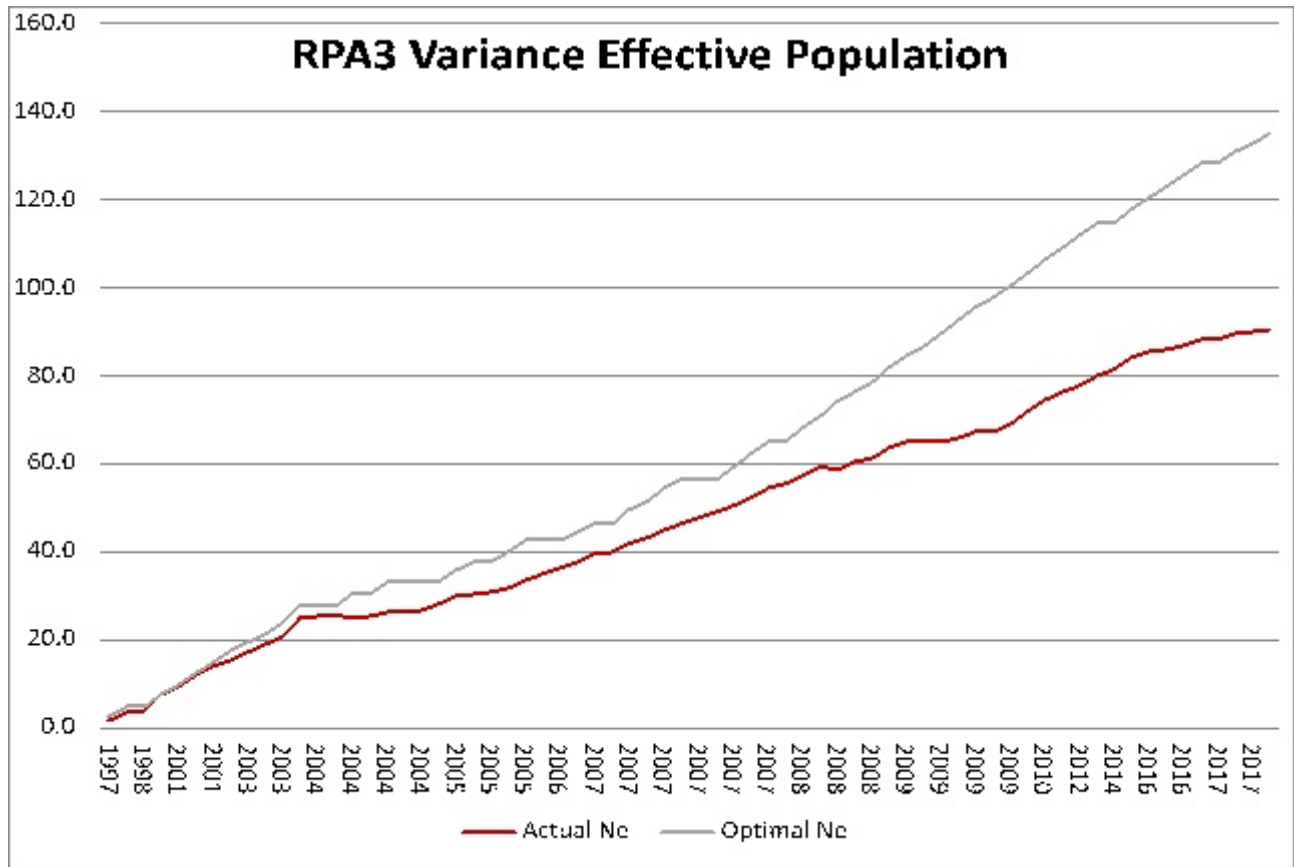
The median number for males in RPA1 is 352 and for females 560.

Appendix 8. RPA2 Variance Effective Population



Median number for males in RPA2 is 661 and for females 734.

Appendix 9. RPA3 Variance Effective Population



The median number for males in RPA3 is 63 and for females 102.

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