



**MILL MEADOW RESERVOIR
2022 TREND NET SURVEY**

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BACKGROUND: Mill Meadow Reservoir is located north of Loa, Utah, in Wayne County. Although the fishery in Mill Meadow Reservoir has experienced wide variation in species composition, the stocking of rainbow trout (RBT) has been consistent for decades. The current annual quota is set at 5,000 ten-inch (“catchable”) triploid RBT (Table 1). Triploids are requested in order to protect the Colorado River cutthroat trout population in UM Creek upstream of Forsyth Reservoir. Tiger and splake trout were stocked regularly after a study conducted in the mid to late 1990’s to evaluate performance and resistance to whirling disease by various trout hybrids. Utah chubs (UTC), Utah suckers (UTS), and yellow perch (YLP) have maintained self-sustaining populations in Mill Meadow and often negatively impact trout survival and growth when reaching high densities. Efforts to remove these species from the reservoir prove only temporary, as they also occur upstream in Johnson Reservoir and Fish Lake. Tiger and splake trout stocking was terminated after 2010 due to poor performance in the face of this competition. Mill Meadow Reservoir is unique in that abundant wild brown trout (BRN) resulting from recruitment upstream in the Fremont River and UM Creek often dominate the trout population in the reservoir. While many anglers target RBT, self-sustaining populations of BRN and YLP often have dominated the sport fishery.

Mill Meadow Reservoir was nearly drained in late 2012 to facilitate work on the dam outlet structure. The remaining pool was treated with rotenone to reduce the UTS population, which had come to dominate the fishery (82% of biomass sampled in spring 2012). The regular RBT quota was resumed in 2013, while BRN repopulated on their own from the tributaries. In response to angler requests, YLP were reintroduced by transfer from Fish Lake in 2015. After a brief reduction following the 2012 treatment, UTS again came to dominate the fishery, achieving 70% of fish biomass by 2018 and yielding poor growth and condition of trout species.

The post-treatment annual RBT quota at Mill Meadow Reservoir was kept at 5,000 – and hybrid trout quotas remained canceled – due to an anticipated addition of hybrid saugeye (walleye x sauger), which were expected to more readily utilize YLP and UTS fry as forage. Local anglers were also highly interested in the potential new species. The state has been unable to secure saugeye for stocking, however, and development of a saugeye program in Utah’s hatcheries is not currently being pursued. Accordingly, a quota of wipers was requested for Mill Meadow Reservoir after the trend net survey in 2018. Wipers have shown to be very effective at controlling small and medium sized cyprinids at other mid-elevation reservoirs in southern Utah. Mill Meadow Reservoir may provide a prime opportunity to evaluate wiper predation on both large-bodied suckers and YLP. The first group of 7,000 two-inch wipers was stocked in 2019 (Table 2). Wipers have not been found in the trend net survey since they were introduced to the reservoir, but reports from anglers indicate that there is a wiper population establishing in Mill Meadow.

The fishery at Mill Meadow Reservoir is monitored through trend net surveys, conducted on even years. Since 2012 a new gill net design recommended by the American Fisheries Society (AFS) has been utilized in these surveys. The random placement of differing mesh sizes is intended to avoid “leading” fish into the net and, thus, reduce bias in the net catch – as opposed to nets previously used for decades (“DWR” nets), which were comprised of graduating mesh sizes. In most waters, catch rate trends indicate that the AFS nets catch approximately 50% fewer trout than did the DWR nets, though the reduced catches are still sufficient to provide measures of population dynamics. At Mill Meadow Reservoir, mean catch rate for AFS nets has been about 33% of the old style nets, though use of the new nets also coincides with a time period of reduced trout stocking.

METHODS: Four experimental gill nets (two floating and two diving) were set in Mill Meadow Reservoir on April 26, 2022, and were allowed to fish overnight. Nets measured 6 ft. x 80 ft., with eight panels of randomly-arranged mesh size (1.5", 2.25", 1", 0.75", 2.5", 1.25", 2"). Most net locations have been consistent for 20+ years of sampling. The southwest shore is very steep and this net consistently caught fish only in the panels closest to shore. Because of this, the floating net that was previously set on the southwest shore was moved in 2020 to a point on the east shore, just north of the dam (SEF; "southeast floater") (Figure 1). Fish caught were removed from nets on the morning of April 27, 2022. All trout were measured to the nearest mm (total length) and weighed to the nearest gram. Trout body condition was measured by the calculation of Fulton's K_{TL} (generated from total length [TL]):

$$K_{TL} = (Weight/Length^3) \times 100,000$$

All UTS, UTC and YLP were measured and weighed. Results of the 2022 survey were compared with those from historic trend net surveys.

RESULTS: A total of 48 trout were collected in four AFS gillnets at Mill Meadow Reservoir on April 27, 2022, for a catch rate of 12 trout per net-night (Table 3). This is the lowest trout catch rate observed since 2014 (Table 4, Figure 2). Trout made up 42% of the total catch and 40% of the biomass total (Table 3, Figure 3). Tiger Trout were the most abundant trout species collected in the netting survey (Table 3, Figures 6), spanning at least three size classes (Figure 5). Tiger trout measured 294-569 mm in total length (TL), with an average total length of 423 mm (16.6 in.), and weighed an average of 628 g (1.38 lbs.), with a mean condition (K_{TL}) of 0.75 (Table 3). A total of 14 brown trout were collected. The two larger BRN individuals measured 691 (27.20 in.) mm and 653 mm (25.70 in.) and weighed 3900 g (8.59 lbs.) and 3520 g (7.76 lbs.) (Figure 5). The brown trout collected had a mean condition of 0.84 (K_{TL}). The remainder of the trout catch was comprised of 10 RBT and 3 splake trout. RBT collected in the survey measured 307-355 mm, with an average total length of 330 mm (12.9 in.) (Table 3). All trout species collected in the trend net survey had a mean K_{TL} of less than 0.88, indicating poor body condition (Table 3).

Utah suckers dominated the non-game catch total, with 57 fish collected, spanning at least three age classes (Figure 6). Seven yellow perch and one Utah chub were also collected in the netting survey. UTS had catch rate of 14.25 per net-night, a decrease since the 2020 netting of 36 per net-night (Table 3, Figure 9). UTS ranged in sizes from 300-564 mm (11.8-22.2 in.), with a max weight of 1917 g (4.2 lbs.) (Table 3, Figure 7). Seven YLP were collected ranging in sizes of 150-197 mm (5.9-7.7 in), with a catch per net-night rate of 1.75 (Table 3, Figure 8). No wipers were collected in the trend survey netting.

DISCUSSION: Relative biomass of trout increased from 30% in 2020 to 40% in 2022 (Table 3, Figure 3). The increase is likely because of the larger brown trout and the many tiger trout that were flushed downstream when Forsyth Reservoir was drained and treated with rotenone in the fall of 2021. The larger brown trout demonstrated that the fish that are able to convert to piscivory can perform well with UTS competition.

Fertile RBT pose a threat to the population of native Colorado River cutthroat trout in UM Creek upstream of Forsyth Reservoir (which is upstream of Mill Meadow Reservoir). It is imperative that only sterile (triploid) RBT be stocked in Mill Meadow Reservoir to eliminate the

threat of hybridization in upper UM Creek. In addition to sterile stocking, a fish passage barrier in UM Creek -upstream of Mill Meadow Reservoir- was completed in 2021 to prevent fish movement upstream.

While YLP were not observed in the first three sampling surveys since they were reintroduced to Mill Meadow, seven YLP were collected in 2022 (Table 3). Anglers have also reported catching limited numbers. The increase in numbers is possibly from the draining of Forsyth Reservoir upstream. It is probable that competition with UTS could be affecting YLP population, so introducing more would not benefit the population at this time.

Until effective predators can be established, a limited trout fishery -characterized by poor growth- should be expected to continue at Mill Meadow Reservoir in the foreseeable future. The lack of wipers in the 2022 net catch was not concerning. Experience at other reservoirs has shown that wipers are not very susceptible to littoral zone gill nets until their second or third season in the reservoir. Several anglers have also reported catching few wipers by hook and line methods throughout the spring and summer months.

Inconsistencies in hatchery production led to stocking adjustments in 2020 with two wiper groups being stocked: 3,000 nine-inch fish and 1,500 four-inch fish. Due to challenges in the state's wiper program, the stocking quotas have changed. The current 2022 wiper stocking quota for Mill Meadow is 7,000 two-inch wipers (Table 2). Biennial trend net surveys will continue in order to evaluate wiper performance and UTS population dynamics. If wipers are unsuccessful, then other coolwater predators (saugeye, tiger muskies) should be considered for addition to the reservoir in the future.

RECOMMENDATIONS:

1. Maintain annual stocking quotas of 5,000 catchable triploid RBT and 7,000 two-inch wipers at Mill Meadow Reservoir.
2. Conduct trend net surveys on even years to continue monitoring.
3. Continue to monitor wipers and explore options for creating a saugeye program in Utah.

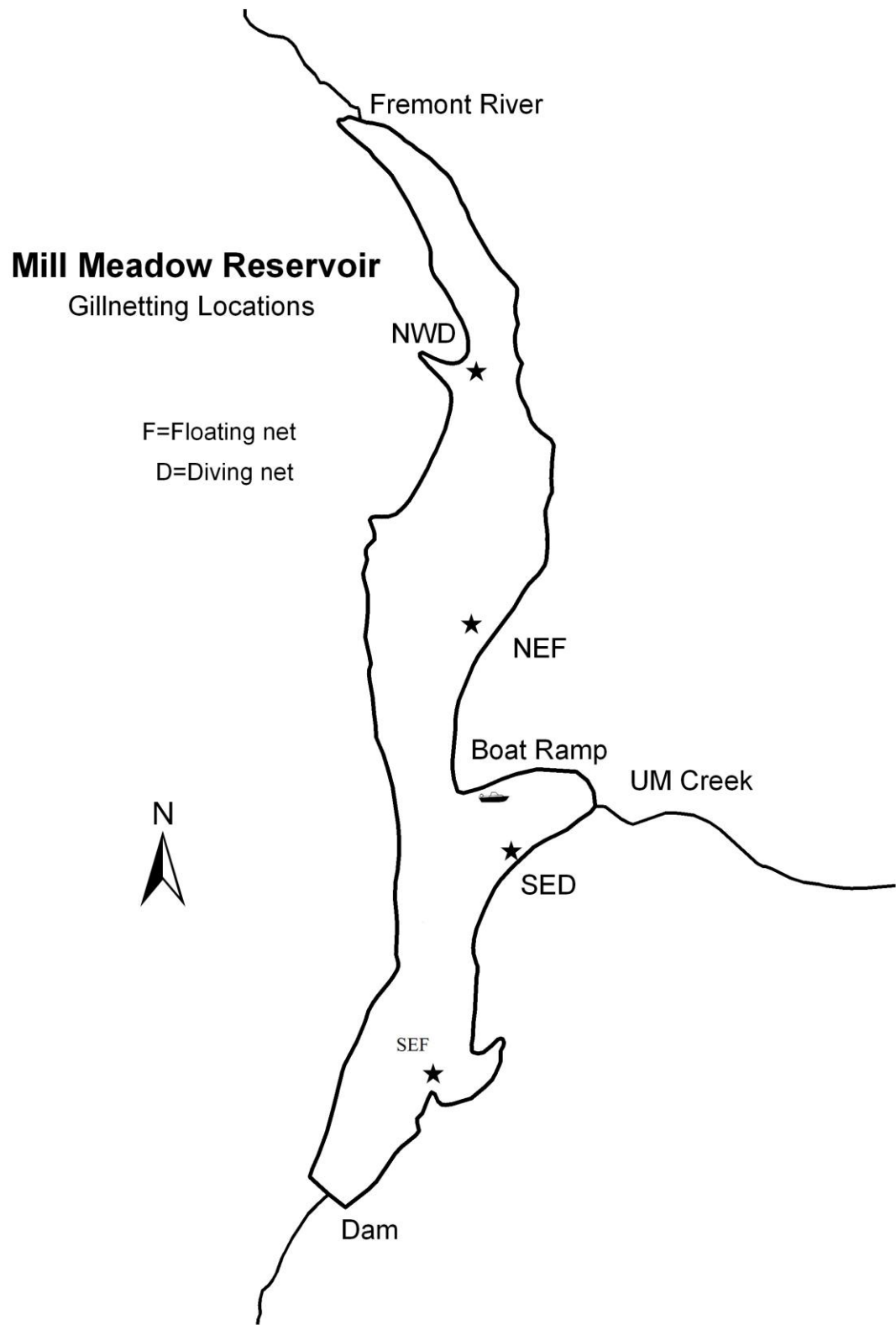


Figure 1. Locations of gill nets set at Mill Meadow Reservoir during the 2022 trend net survey.

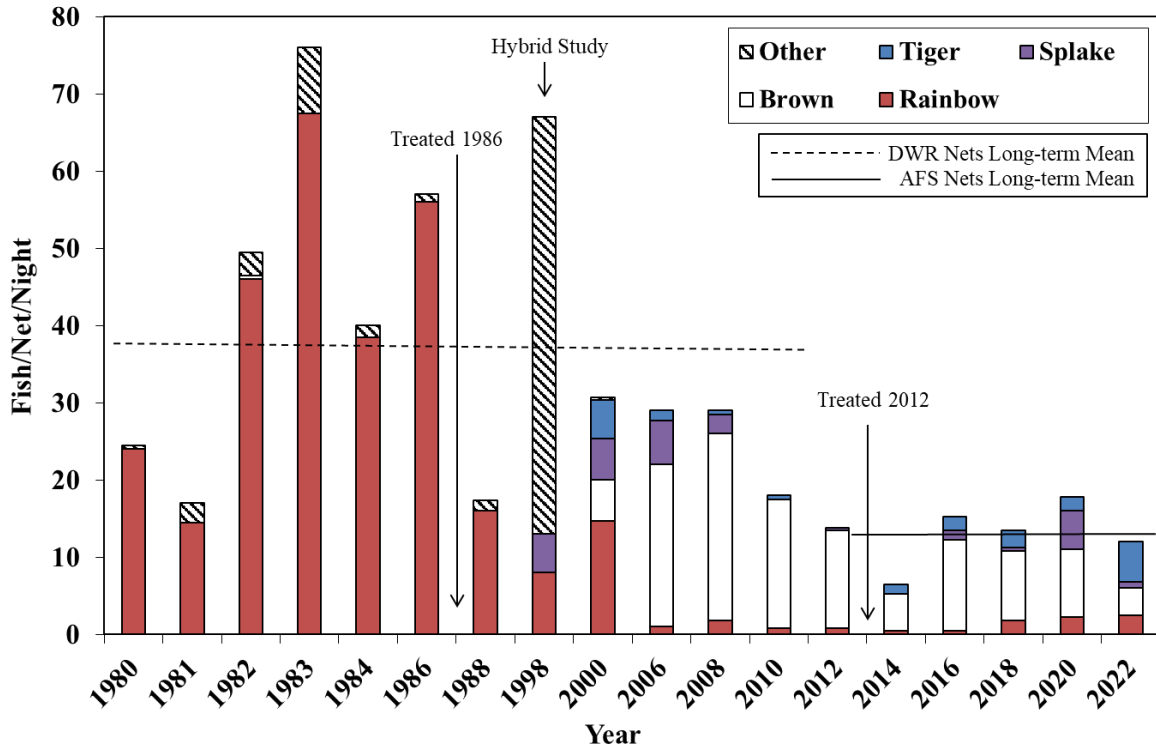


Figure 2. Trout catch rate during trend netting surveys at Mill Meadow Reservoir from 1980-2022.

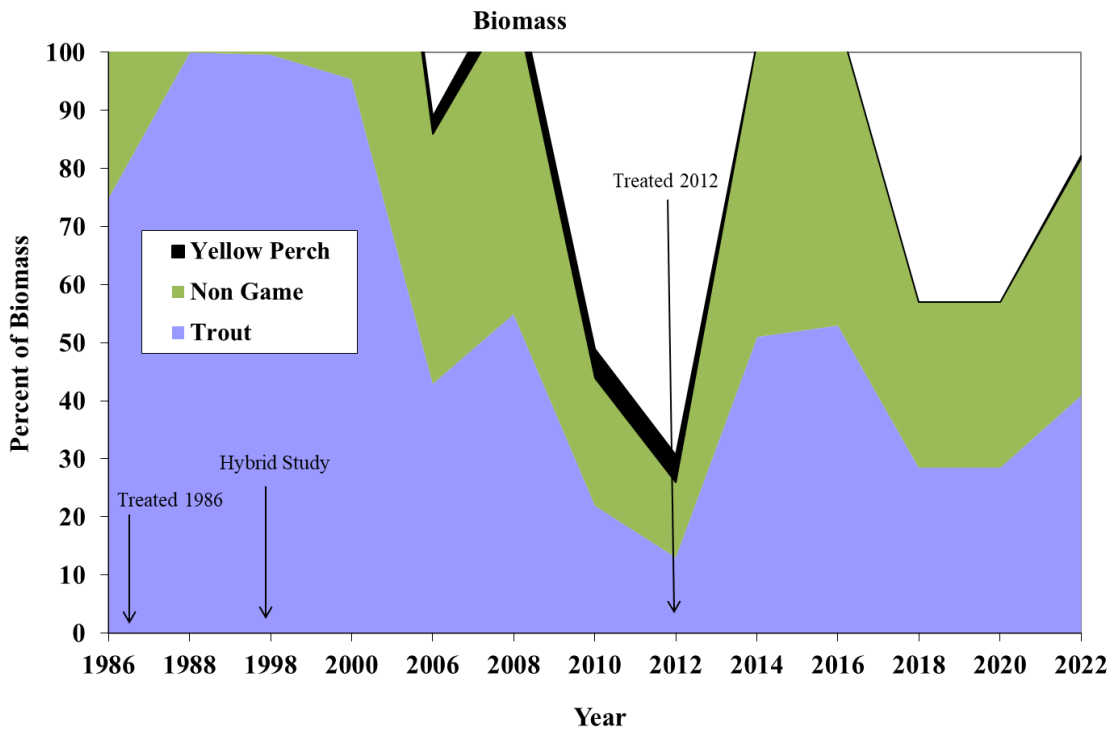


Figure 3. Relative biomass of fish collected during trend net surveys at Mill Meadow Reservoir from 1986-2022. "Non Game" references Utah suckers and Utah chubs. During surveys prior to 2006, perch were not observed and sampling was often designed to avoid catching non-game fish.



Figure 4. Brown Trout collected in trend netting survey at Mill Meadow Reservoir April 27, 2022.

Trout Length Distribution

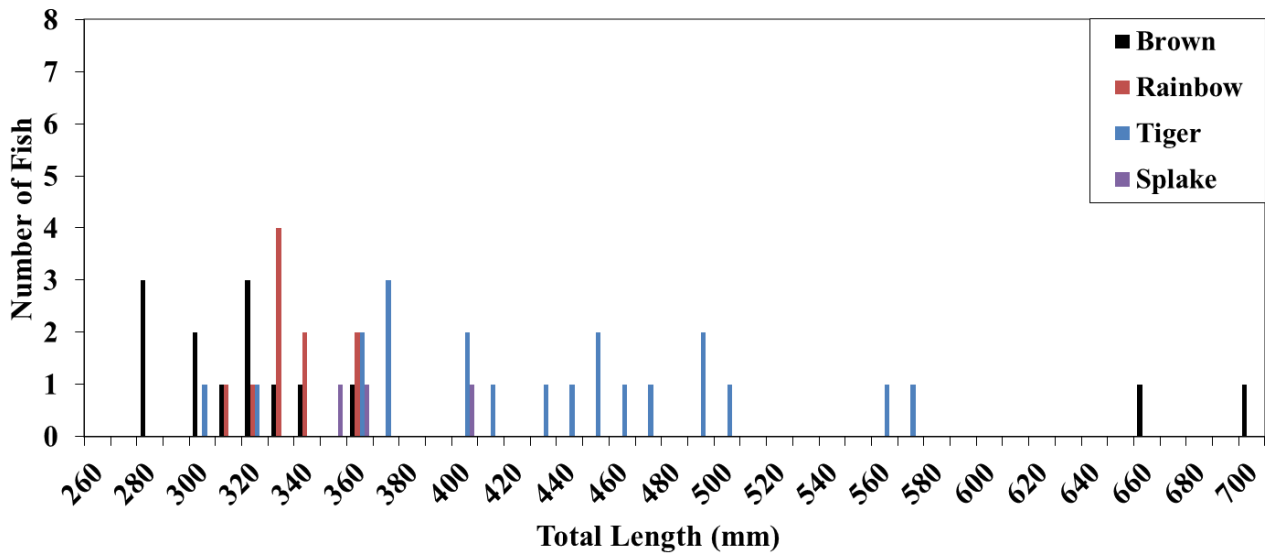


Figure 5. Length distribution of all trout (rainbow, splake, brown, and tiger trout) collected in a trend net survey at Mill Meadow Reservoir on April 27, 2022.

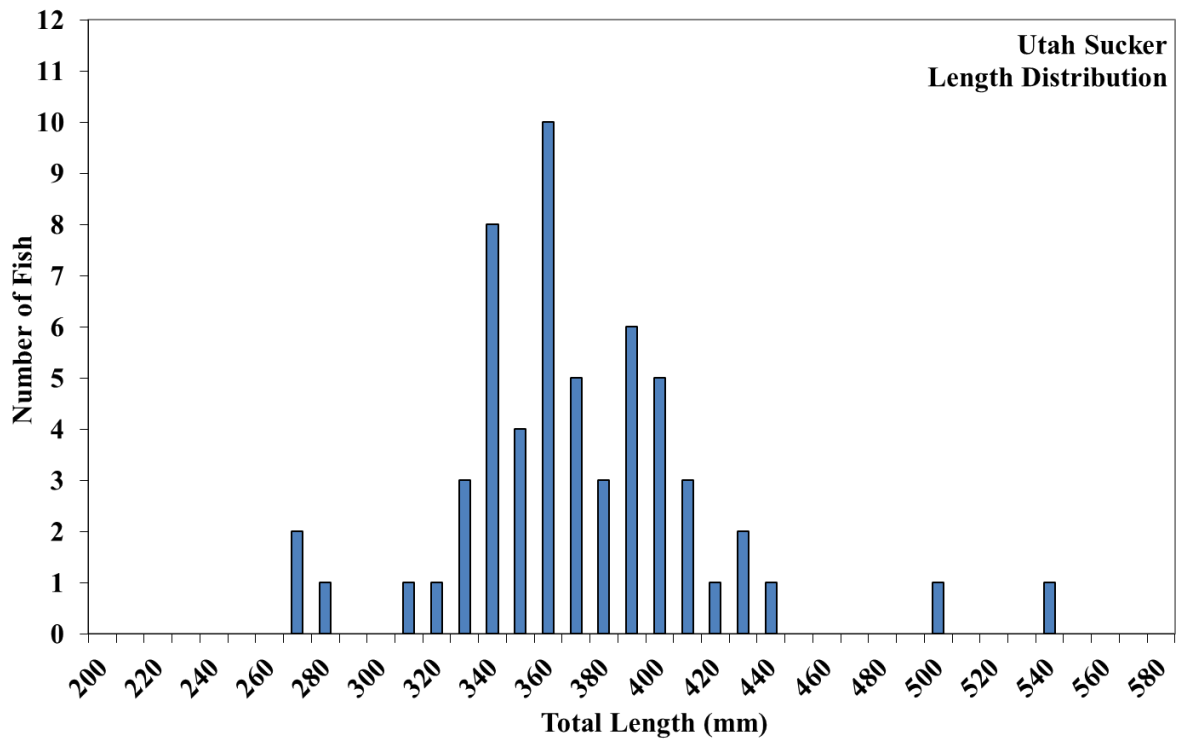


Figure 6. Length distribution of Utah suckers collected in trend netting survey at Mill Meadow Reservoir on April 27, 2022.

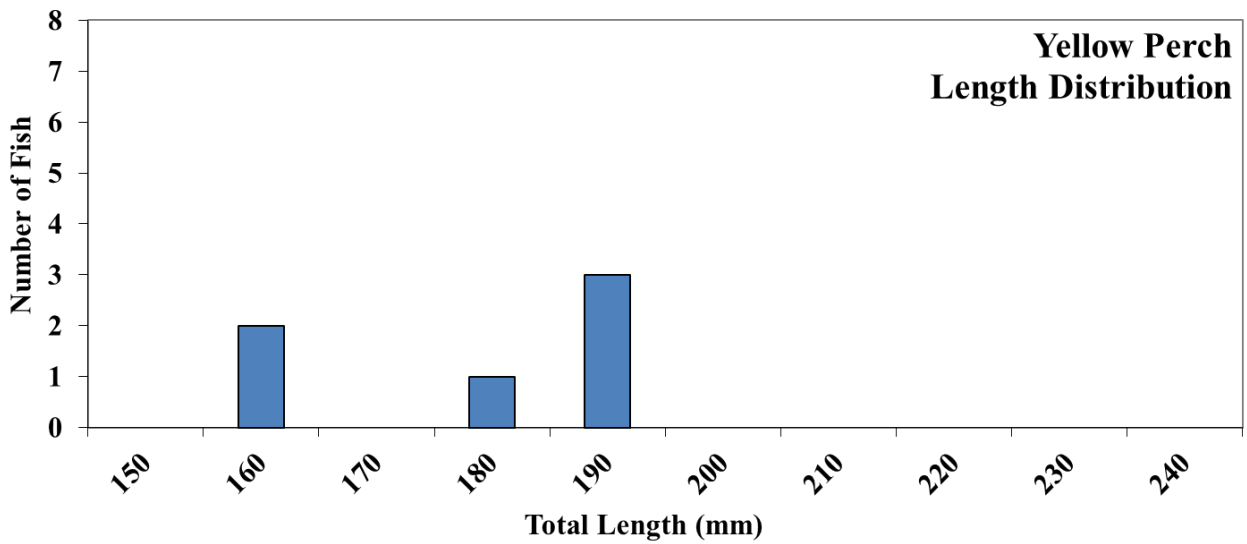


Figure 7. The length distribution of the seven yellow perch collected at Mill Meadow Reservoir on April 27, 2022.

Non Trout Catch Rate

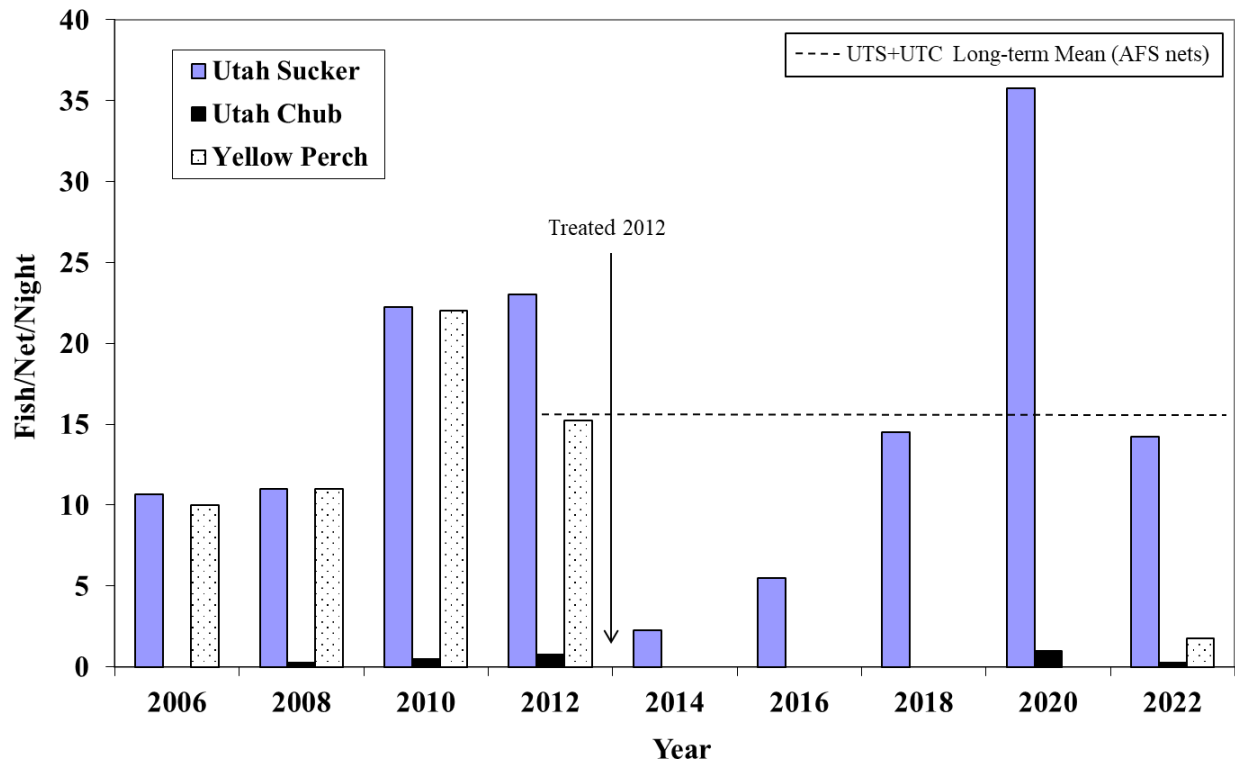


Figure 8. Catch rate of Utah suckers, Utah chubs, and yellow perch during trend net surveys at Mill Meadow Reservoir from 2006-2022. During surveys prior to 2006, perch were not observed and sampling was often designed to avoid catching non-game fish. Perch were reintroduced after the treatment in 2012.

Table 1. Record of rainbow trout stocking in Mill Meadow Reservoir from 2017-2022.

Rainbow Trout		
Year	Number	Size (in)
2017	5,001	9.6
2018	4,999	8.9
2019	5,053	10.2
2020	5031	9.86
2021	4142	10.07
2022		
<i>Quota</i>	5,000	10.0

Table 2. Record of wiper stocking in Mill Meadow Reservoir from 2019-2022.

Wiper		
Year	Number	Size (in)
2019	7,110	1.9
2020	4541	4.2 - 8.6
2021	1893	3.48
2022		
<i>Quota</i>	7,000	2.0

Table 3. Summary of the results from the 2022 trend net survey at Mill Meadow Reservoir.

Gill Net Survey																	
Water:	Mill Meadow Reservoir						Catalog #:	I 512									
Date Set:	4/26/2022			Time Set:	13:00		Weather:	Sunny, slight wind									
Date Pulled:	4/27/2022			Time Pulled:	9:30		Water Temp:	48 F									
# Nets:	2 floaters, 2 divers; AFS design						Collectors:	M. Hadley, M. Roundy, T. Whitesell									
Summary for Sport Fish																	
Species	N	Total Wt (kg)	fish per net/night	Total Length (mm)			Weight (g)			Condition (Ktl)			% total catch	% total biomass	% trout catch	% trout biomass	
				Mean	SE	Range	Mean	SE	Range	Mean	SE	Range					
Brown Trout	14	10.19	3.50	359	36.0	272-691	728	338.6	135-3900	0.84	0.0045	0.67-1.26	12.39	15.08	29.17	36.95	
Rainbow Trout	10	3.15	2.50	330	4.78	307-355	315	12.094	275-385	0.88	0.022	0.79-1.04	8.85	4.67	20.83	11.44	
Splake Trout	3	1.03	0.75	365	14.402	346-393	343	26.2	304-393	0.71	0.0306	0.67-0.74	2.65	1.52	6.25	3.74	
Tiger Trout	21	13.20	5.25	423	15.7	294-569	628	80.8	206-1704	0.75	0.016	0.56-0.92	18.58	19.53	43.75	47.87	
Trout	48	27.57	12.00	381	13.53	272-691	574	104.95	135-3900	0.80	0.017	0.56-1.26	42.48	40.80	---	---	
Summary for Non-Sport Fish																	
Species	N	Total Wt (kg)	fish per net/night	% total catch	% total biomass	TL range (mm)											
Utah Sucker	57	39.47	14.25	50.44	58.42	300-564											
Utah Chub	1	0.12	0.25	0.88	0.17	300											
Yellow Perch	7	0.42	1.75	6.19	0.62	150-197											

Table 4. Trend net survey results at Mill Meadow Reservoir from 1976-2022.

Date	Net Sets		Total Trout	All Trout Per Net-Night	Rainbow trout All Ages			Brown Trout All Ages			Yellow Perch Per Net-Night	Yellow Perch All Ages		Total Nongame Per Net-Night	Comments
	Flo	Div			Mean TL (mmm)	Mean W (g)	Mean Ktl	Mean TL (mm)	Mean W (g)	Mean Ktl		Mean TL (mm)	Mean W (g)		
	10-May-76	1			0	28	28	249	186	1.20		384	625		
22-May-80	1	1	49	25	294	277	1.06						0.5	Treated 1978	
1-May-81	0	2	34	17	303	303	1.02						0		
26-May-82	1	1	99	50	256	213	1.03						0	Forsyth drained	
10-May-83	2	0	152	76	274	205	0.95						1.5		
10-May-84	2	0	80	40	261	166	0.91						8		
13-May-86	2	0	114	57	301	270	0.99						7	Treated Fall 1986	
12-May-88	2	2	52	17	332	457	1.18						0		
11-May-98	2	2	268	67	354	560	1.14						1	Hybrid study	
16-May-00	2	1	92	31	330	431	1.16	339	426	1.01			0.33		
4-May-06	1	2	87	29	341	432	1.10	331	362	0.94	10	175	82	11	Sampled by FES
29-Apr-08	2	2	116	29	339	456	1.04	346	378	0.87	11	178	79	11	
5-May-10	2	2	72	18	331	397	1.06	356	418	0.82	22	194	75	23	
3-May-12	2	2	55	14	349	439	1.03	331	335	0.86	15	203	110	24	
30-Apr-14	2	2	26	7	351	466	1.08	344	422	0.99	0			2	Treated 2012
27-Apr-16	2	2	61	15	380	583	1.06	379	487	0.85	0			6	
25-Apr-18	2	2	54	14	322	303	0.91	362	397	0.81	0			15	
29-Apr-20	2	2	71	18	343	334	0.83	358	593	0.86	0			37	
27-Apr-22	2	2	48	12	330	315	0.87	359	758	0.84	1.75	178	59	16	Forsyth drained 2021
Long-term mean				30	292	281	1.02	350	424	0.87	7	185	84	10	
DWR Nets (1976-2010)				37							14			7	
AFS Nets (2012-present)				13							3			17	