



Colorado River near Parshall

FISH SURVEY AND MANAGEMENT INFORMATION

Jon Ewert - Aquatic Biologist (Hot Sulphur Springs)

General Information: The Colorado River offers approximately 4 miles of public access on the Kemp-Breeze, Lone Buck, and Paul Gilbert State Wildlife Areas and BLM Sunset property unit.

Location: Approximately 10 miles east of Kremmling, CO on US highway 40.

Recreational Management: Colorado Parks and Wildlife, Bureau of Land Management

Fishery Management: Gold medal river trout fishery

Amenities and General Info.

- 4 miles of public river access for wade or bank angling at multiple access points
- Picnic Areas
- Kids fishing pond
- Primitive restrooms
- Guide services available through several area businesses

Regulations

- All fishing is by flies and lures only, and all trout must be returned to the water immediately.

Previous Stocking

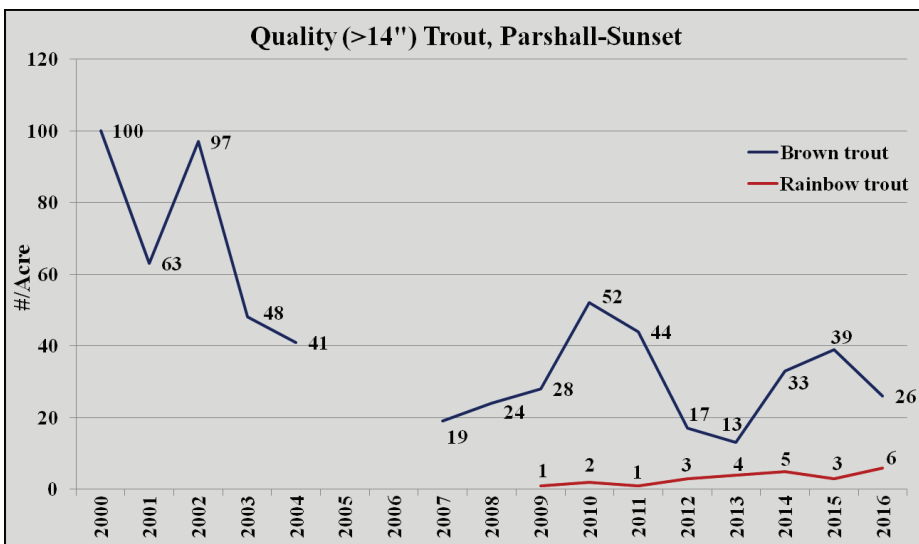
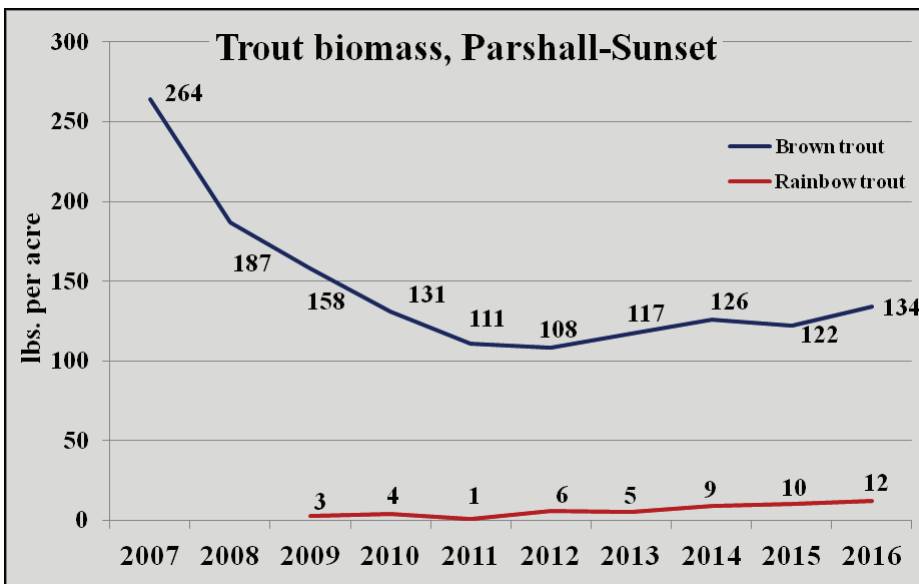
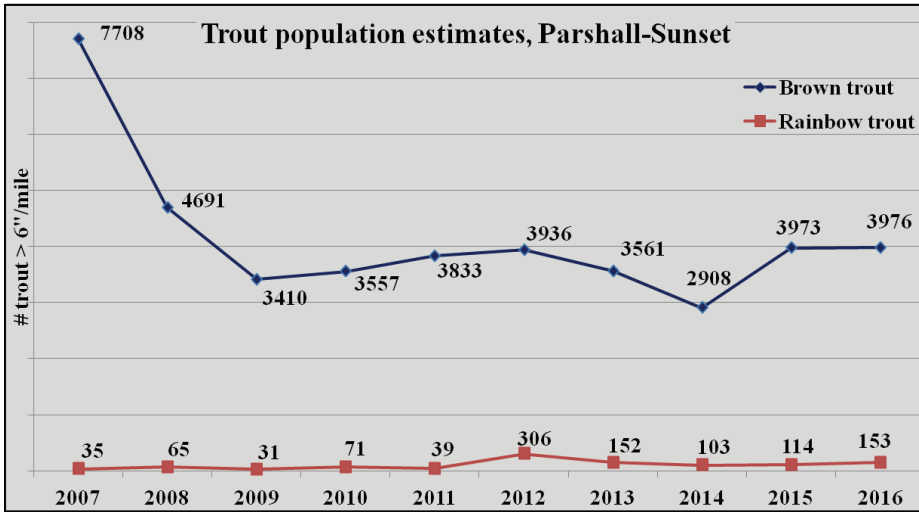
Rainbow trout of various sizes have been stocked every year over the past decade (see report), with the goal of reestablishing a wild, self-sustaining rainbow population.

Sportfishing Notes

- This section of The Colorado River is one of the most well-known and heavily fished sections of river in the state.
- Despite heavy fishing pressure, trout populations are consistently excellent
- Fly fishing is the most common method of choice. There is a wide spectrum of aquatic insect varieties to imitate, from midges in the winter to various mayflies in the spring, stoneflies in early summer, caddis, terrestrials, and more mayflies later in the summer. Usually the biggest challenge for catching fish is figuring out what the trout happen to be focused on that particular day.
- These fish are well-educated and demand an accurate presentation.

Colorado River at Parshall

Fish sampling information
Jon Ewert—aquatic biologist



This and all the following information reflects trout population data collected on the two-mile reach of river beginning just upstream of the “Parshall Hole” and extending downstream to the large irrigation diversion on the BLM Sunset property. This survey is conducted in the third or fourth week of September annually. Population estimates are obtained by raft electrofishing and using standard mark-recapture methodology .

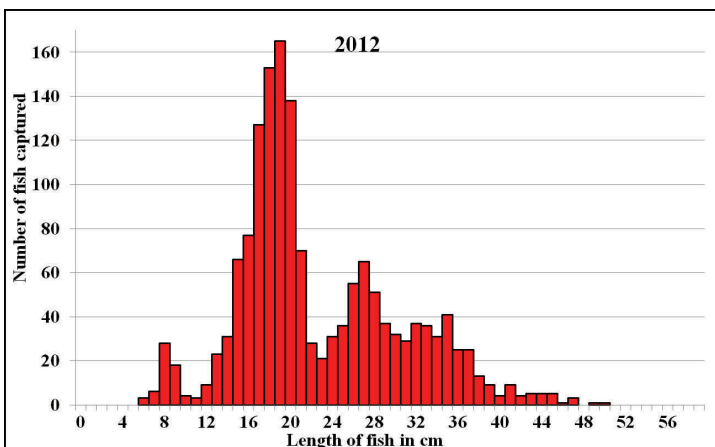
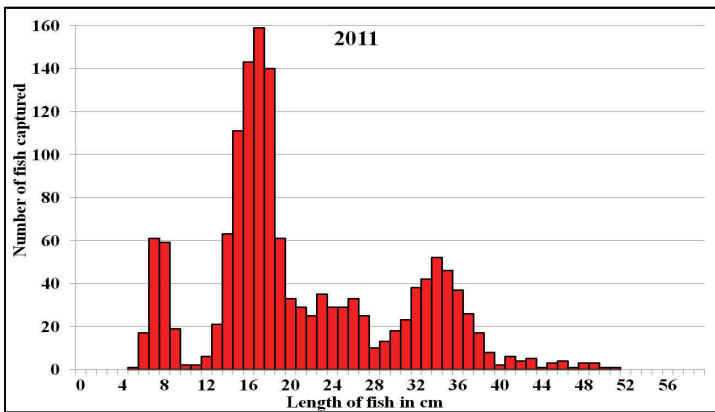
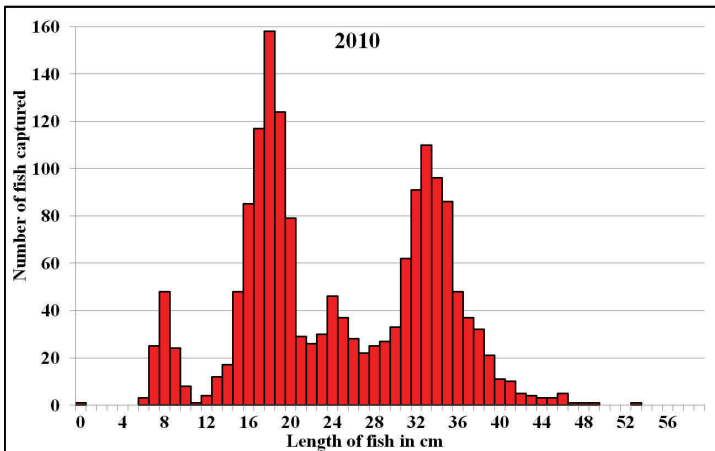
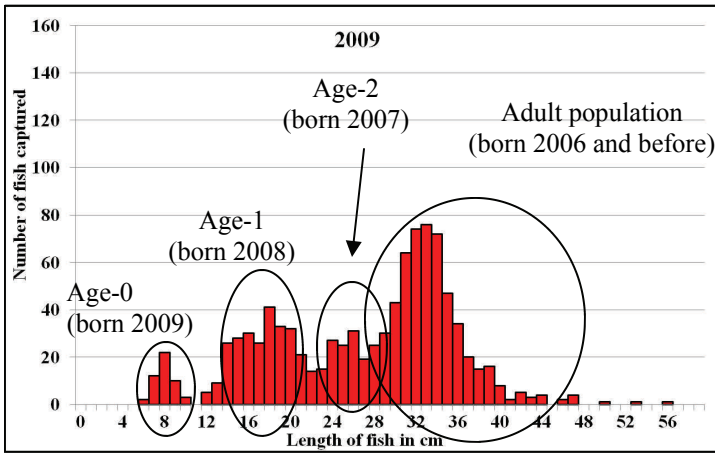
The figure at top left displays trout population estimates in fish per mile 6” or larger. The high brown trout estimate in 2007 is the result of multiple large year classes of young brown trout recruiting during the relatively low-water years leading up to that year. It is common to see high recruitment of juvenile brown trout during drought periods, simultaneous with declining numbers of large fish. The increase in rainbow trout estimates beginning in 2012 reflects the introduction of Whirling Disease resistant rainbows to this section of river.

The middle figure at left displays the estimates for trout biomass in pounds per surface acre over the 2-mile reach. The lower figure at left displays density estimates of trout greater than 14” per surface acre.

Biomass and density of quality trout are important parameters because these are the estimates used to confirm a river’s status as a Gold Medal fishery. In order to maintain Gold Medal status, a fishery must produce at least 60 pounds per acre of total trout biomass AND at least 12 trout per acre greater than 14” in length. In recent years such as 2012 and 2013, this reach of the Colorado River has come uncomfortably close to failing to meet those standards.

Each of these three graphs show a point in recent history when the particular parameter being measured has reached a historic low point. Taken together, this information makes a strong case that this is a declining fishery. All the reasons for this are not known, but some of the most likely culprits are a long-term degradation in the quality of the invertebrate forage base, long-term degradation in the quality of physical habitat (particularly overwinter habitat), resulting in more frequent weak juvenile year classes and poor recruitment into the adult population. These declines are probably attributable to a combination of these factors, which are interrelated.

Brown trout population size structure

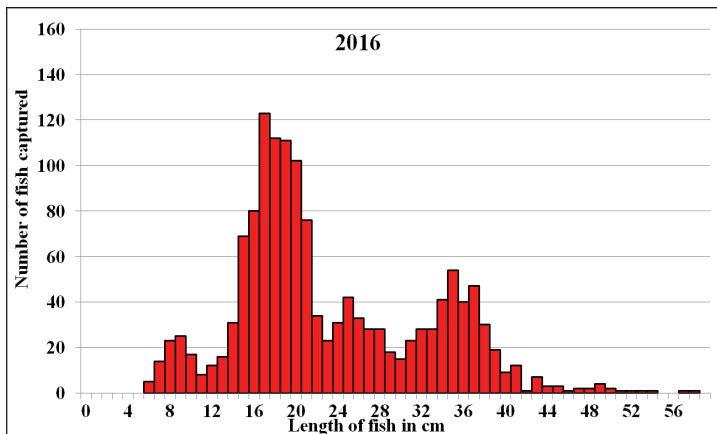
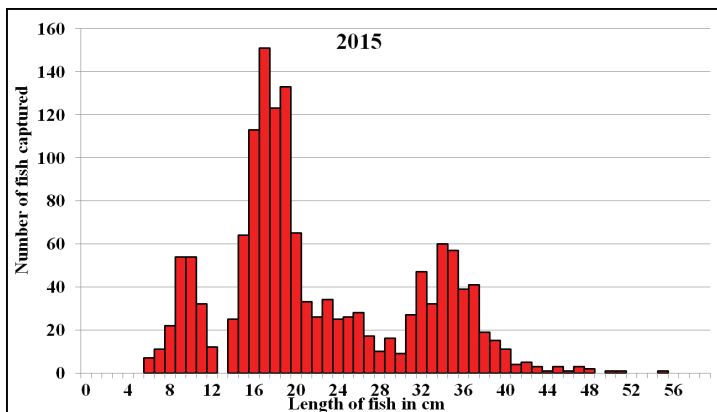
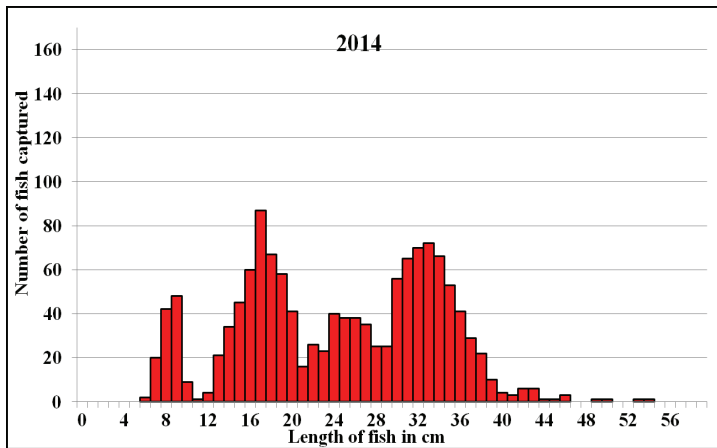
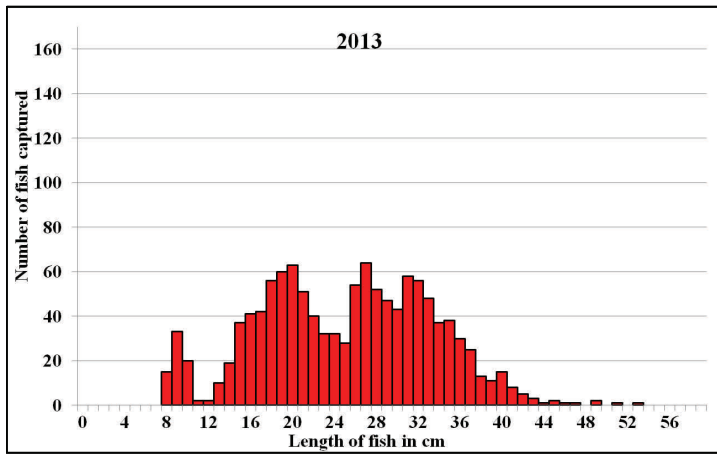


The figures on this and the following page display the length-frequency histograms for all the brown trout captured in the Parshall-Sunset reach from 2009-2016. The vertical axis on all graphs is the same, so comparisons among years can be easily made. The vertical bars represent the number of fish that were captured in each size class by centimeter (15 cm = 6"). Viewing the data in this way reveals a wealth of useful information including rough estimates of annual growth and survival rates from one year to the next. Fish less than 15 cm long are not effectively captured during these surveys, so it is difficult to confidently assess the abundance of the age-0 year class (the fish that were born the year the survey is conducted) from this data. However, the age-1 year class (born the year prior to the sample), in the 12-20 cm range, is represented more accurately.

When studying this survey data, a question sometimes arises regarding movement of trout. The question is whether or not the data represents the "true" resident population of fish, or whether the fish move so much that it is more of a single snapshot in time of the trout that happen to be occupying the reach on that day. There are a few aspects of this data which at least partially answer that question. First, the survey is conducted as close to the same date as possible every year. If the results are heavily influenced by fish movements, those movements should at least be similar from year to year as long as the dates of the survey are consistent. Anecdotally, many fish are collected each year that have small scars in the tail where they were marked in previous years' surveys, proving that those fish occupy the same reach across multiple years. Also, the analysis below demonstrates that year class strength is a strong predictor of the future adult population. If the population was heavily influenced by emigration or immigration, this would not necessarily be the case. There are examples of other reaches of the Colorado (such as the Radium survey reach) where the number of juvenile fish that we collect has never explained the high density of adult fish present, meaning that the reach "gains" fish from elsewhere.

The strength of the age-1 year class in any given year is of great interest because of its ability to predict trends in the adult population of fish in future years. Because of high mortality rates in small fish, strong age-1 year classes are necessary in order to maintain the adult population. Strong age-1 classes were found in 2007, 2010, 2011, and 2012, 2015, and 2016. Weak age-1 classes were observed in 2008, 2009, 2013 and 2014.

The result of weak age-1 recruitment in 2008 and 2009 can be seen in the weakening of the adult population in 2011 and 2012. That weakening of the adult population is evident on page 2 in the biomass and quality trout estimates for those years.



In 2012 the age-2 fish were poised to bolster the adult population, which indeed took place in 2013 and 2014. This also appears on page 2 in the improving biomass estimates in those years and the increase in quality trout in 2014.

2013 revealed another strong age-2 year class; however the age-1 group was weak in both 2013 and 2014. The adult population in 2014 reflects the benefit of the strong age-1 groups of 2011 and 2012. This is also evident in the increased number of quality trout that we observed in 2014. However, the weak recruitment years of 2013 and 2014 resulted in moderate decreases in the adult population in 2015 and 2016, which was ultimately manifested in the lower quality fish estimate in 2016. Age-1 recruitment in 2015 and 2016 returned to strong levels, which should again bolster the adult population in 2017 and 2018. Age-0 capture in 2016 was low, resembling that of 2012 and 2013. This suggests that 2017 will reveal another weak Age-1 year class.

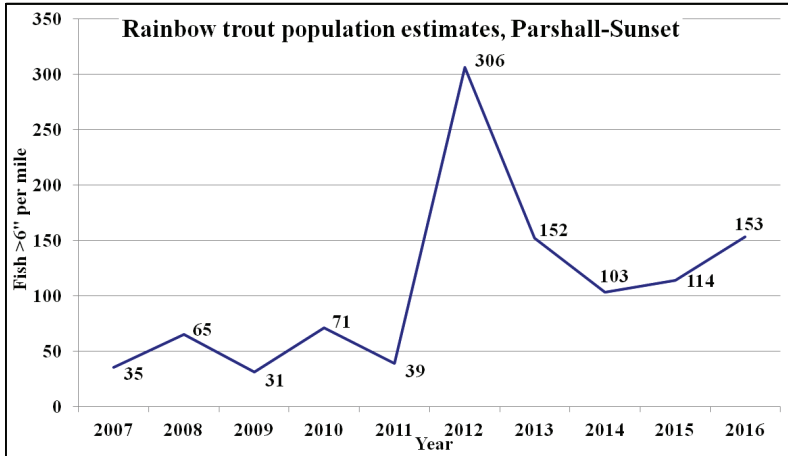
We do not have a strong understanding of factors that produce strong or weak year classes in any given year on this reach of the Colorado. In some rivers, above-average runoff results in high mortality of brown trout, thus forming poor year classes, while drought years see high survival of age-0 fish due to the lack of intense flows. However, we have seen counterexamples of that dynamic in the Colorado River in recent years. 2011 produced a peak runoff period that was far above average, yet a strong year class survived. Conversely, 2012 was a drought year that produced a weak age-1 group. Intensity of runoff probably plays a role in some years, but does not appear to be the chief factor determining year class strength on this reach.

Spawning habitat quality could act as a limiting factor in the formation of year classes. However, if there was a general lack of spawning habitat, there would be no reason for the variability in year class strength that we have observed. All year classes would be equally poor.

In some winters, anchor ice, frazil ice, and various formations of ice damming can be observed on this reach of the Colorado. It is possible that harsh winter conditions lead to high mortality rates of brown trout eggs that are incubating in the gravel, which would result in poor year class formation. We do not currently have a way to quantify those conditions, and the degree to which they vary among winters. However, in-channel habitat improvements would address this issue by enhancing the quality of spawning riffles as well as overwintering habitat, making these areas less vulnerable to the harsh winter conditions that can take place during periods of cold weather and low flows.

Status of wild rainbow trout in the Parshall-Sunset reach

The Colorado River in Grand County historically supported one of the most productive wild rainbow trout fisheries in the world. In 1981, there were estimated to be 75 rainbow trout per acre over 14". These fish were all the product of wild reproduction and unsupported by stocking of fish. Brown trout comprised 25% of the trout population in the river in that year. Whirling disease appeared in the river in 1987. The proliferation of this parasite ended virtually all successful reproduction of rainbow trout. In the following years, the brown trout population exploded to fill the habitat that was being vacated due to lack of successful reproduction in the rainbow population. It has always been the goal of CPW to restore some level of a wild rainbow trout fishery to this reach of the Colorado. Beginning in 1994, CPW began stocking fingerling rainbow trout to attempt to compensate for the lost natural reproduction. Research has shown that rainbow trout mortality from whirling disease drops dramatically when the fish have reached a length of 5". Based on this information, that is the size of fish that was stocked throughout the 2000's. Due to the timing of rainbow trout spawning, fish of that size were generally not available until the fall, usually October. 40,000 5" fish per year were stocked annually in October in this reach of river.



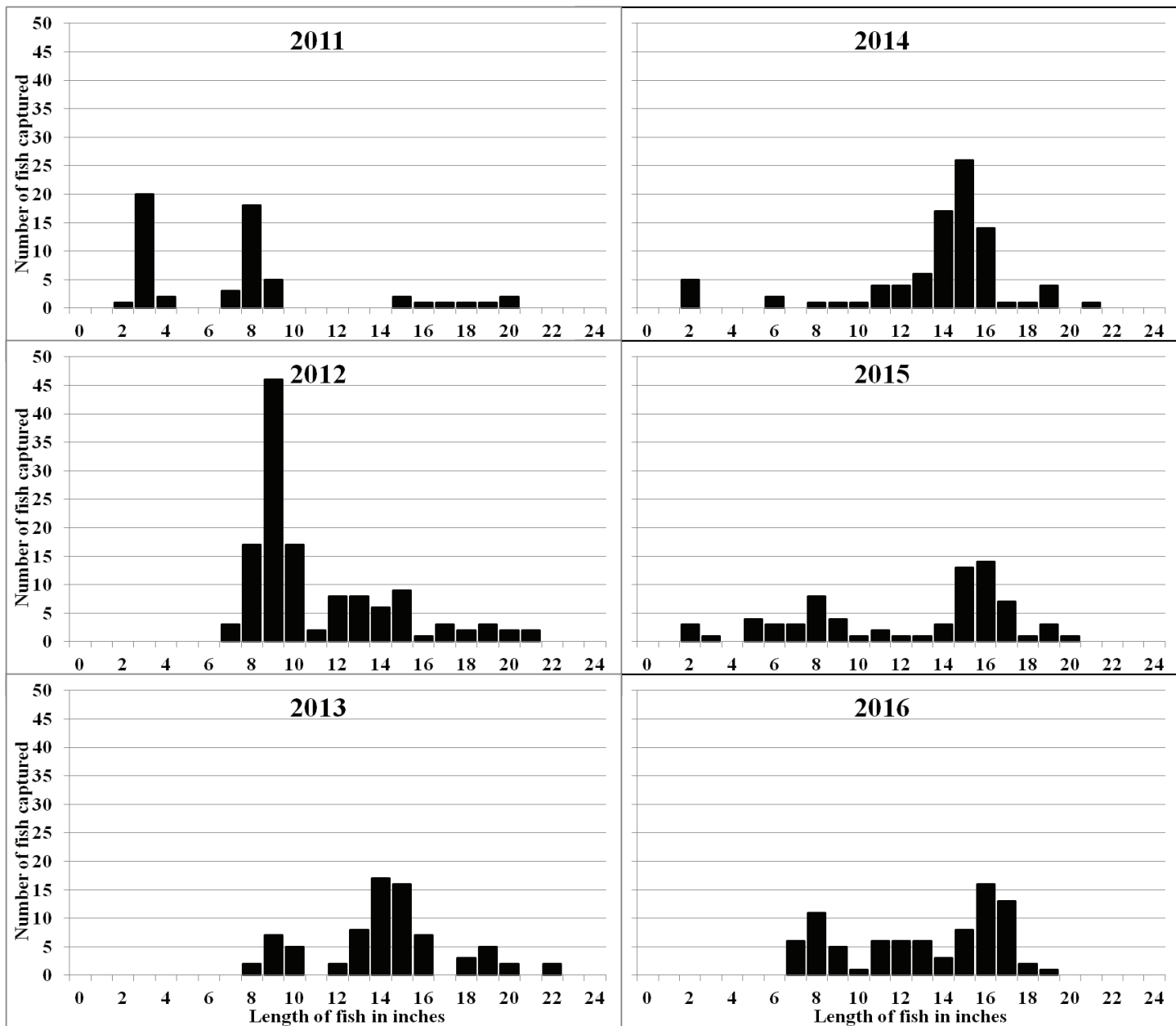
The figure to the left demonstrates the failure of the stocking strategy described above. Even though 5" fish should be able to survive in the presence of whirling disease, recruitment rates from stocking these fingerlings was abysmal, and rainbow trout continued to constitute a tiny fraction of the total trout population of this reach.

In 2008 and 2009, the fingerlings stocked were a hybrid strain of Colorado River rainbow trout (the historic strain that had been developed in the river over the previous 100+ years), crossed with German rainbow trout which have been found to be highly resistant to whirling disease. The fish were still 5" long, and stocked in October. We did not observe any evidence that this strain was any more successful at recruiting into the population when stocked at that size.

In 2010, we adopted a different stocking strategy based on the hypothesis that the limitation on recruitment in these 5" plants is timing rather than whirling disease infection (if this was not the case we should have seen a positive response with the introduction of the WD-resistant strain in 2008). We stocked a larger number (60,000) of smaller (1.6 inches average) fish during the third week of July. We stocked these small fish out of a raft, only in the most ideal fry habitat. At this small size the fish are not heavily habituated to being fed yet, and will hopefully quickly develop wild behaviors that are likely already lost in fish that have been raised to 5" in a hatchery environment. After encouraging results in 2010, in 2011 and 2012 we continued this stocking strategy and increased the number of fry stocked to 100,000. Pictures of the stocking operation are shown below.

Our 2012 electrofishing survey detected the recruitment of these fish into the adult rainbow trout population for the first time, as displayed in the graph above. Subsequent surveys have not yielded population estimates as high as 2012; however we remain optimistic that this method of stocking will enable WD-resistant rainbow trout to proliferate and successfully spawn in the coming years.





The figures above display the size distribution of all the rainbow trout captured over the past six years during sampling of this reach. In 2010 we captured rainbow trout smaller than 6” for the first time. These were the 2” fry that had been stocked two months previously. In 2011, we found that the fry stocked in 2010 had grown to an average of 8 inches in length, which was an excellent growth rate. In addition, the fish stocked in 2011 were present in good numbers, as can be seen in the large group averaging 3” in length.

2012 saw the largest age-1 year class to date, and the 2010 year class was now in the 12-15” range. We did not capture age-0 fish in 2012 during the raft survey, but fish that size are difficult to capture while raft electrofishing. We also conduct fry surveys during the summer, and from those surveys we know that those fish are present as well.

2013 revealed the continued development of a more robust adult population in the 12-16” range, and another age-1 year class, although much weaker than 2012’s age-1 group.

In 2014, we found the most fully developed adult rainbow population to date. The density estimate for rainbows larger than 14” was 5 fish per acre, which was the highest estimate in the post-WD era, until 2016 yielded an estimate of 6 per acre. We also did not detect an age-1 year class in 2014 for the first time since fry stocking began. Reasons for this are not known. However, we did collect some age-0 (fry stocked in 2014) fish. 2015 and 2016 saw the return of moderate age-1 groups.

Due to a disease issue in our hatchery system, rainbow trout fry were not stocked in 2016 for the first time since 2009. The 8” age-1 year class seen in 2016 represents the last rainbow fry that were stocked. This strain of rainbows will not be available until approximately 2019, and thus we are entering a new management period of no rainbow stocking and observation to determine whether or not there are enough adult rainbows in the river now to sustain themselves and increase their numbers through natural reproduction. Through fry monitoring, we have observed some successful natural reproduction, and we are hopeful that this trend will continue.

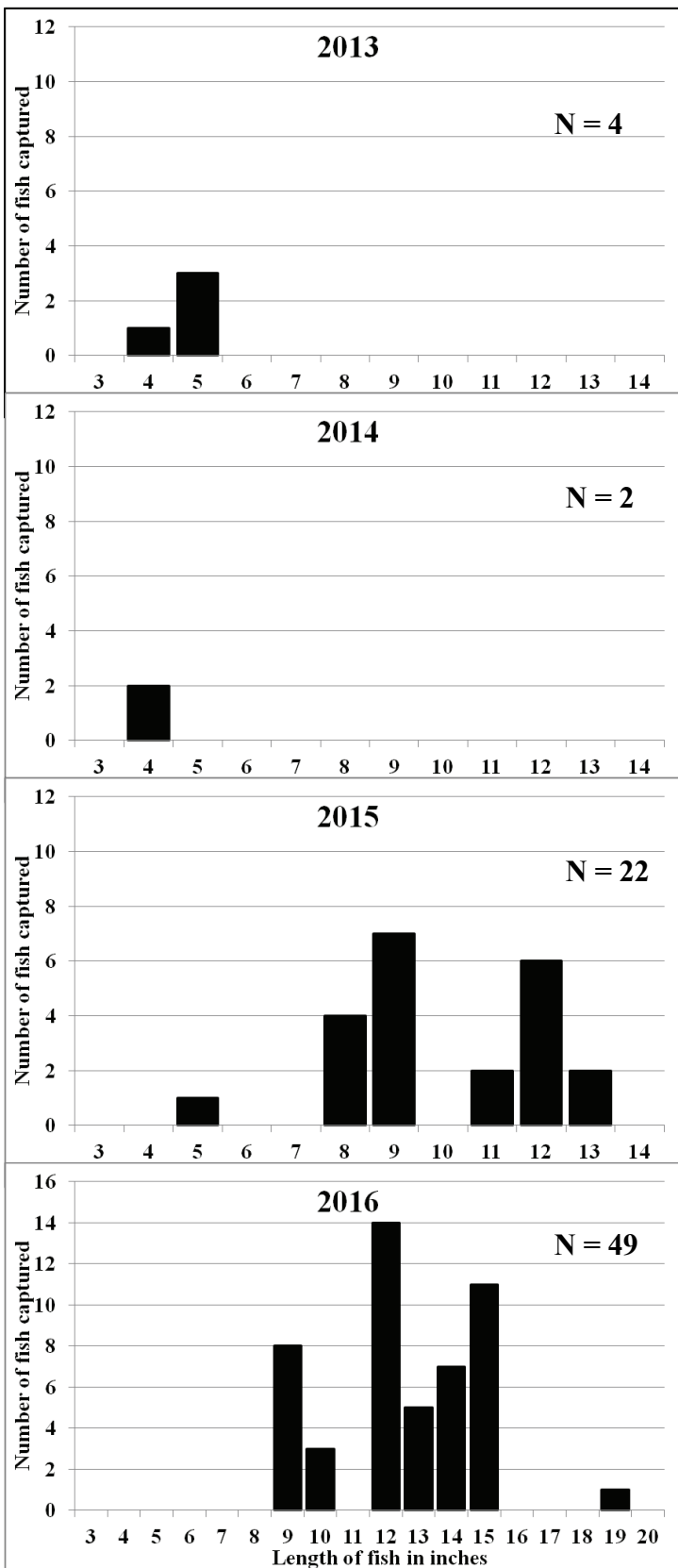
Mountain Whitefish Invasion

In 2013, we collected four juvenile mountain whitefish on this reach of the river for the first time. This species has never been captured on this reach of river in a history of biological survey work that extends back to 1981. There are no historical records of mountain whitefish occurring anywhere in Middle Park upstream of Gore Canyon. This species is native to the White and Yampa river drainages but not to the Colorado River drainage.

The graphs at left display the size distribution of the whitefish that we have captured to date. In 2014, we captured two juvenile whitefish again. By 2015, we captured 22 mountain whitefish representing three age-classes, which corresponded to the juveniles we had caught the two previous years. In 2016 our catch more than doubled again, to 49 mountain whitefish representing four year-classes and ranging up to 19” in length.

In other surveys, in 2016 we also captured single adult whitefish as far upstream as Windy Gap dam. These findings suggest that we are witnessing the beginning of a significant invasion of the species into the upper Colorado, with what appears to be an exponentially increasing number. The reasons that this is occurring now are unknown. 2011 saw the highest flows on the Colorado River since the first half of the 1980’s, and our current theory is that the prolonged high flows during that summer allowed adult whitefish to find their way through Gore Canyon for the first time.

The impacts of mountain whitefish on the trout fishery are unknown at this time. There are ways in which they might benefit the fishery (for example, providing an additional prey source for large, predatory brown trout), but they may also present new competition with trout for food and physical habitat. Catch-and-release regulations on this reach of river apply to trout only, so these fish are available for angler harvest. We will closely monitor this invasion as it develops over the coming years and continually assess whether or not any management changes are warranted.



Mountain whitefish captured in the Parshall Hole.

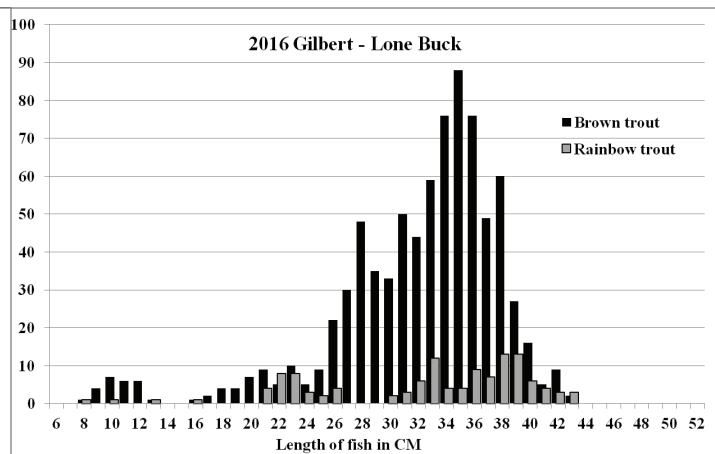
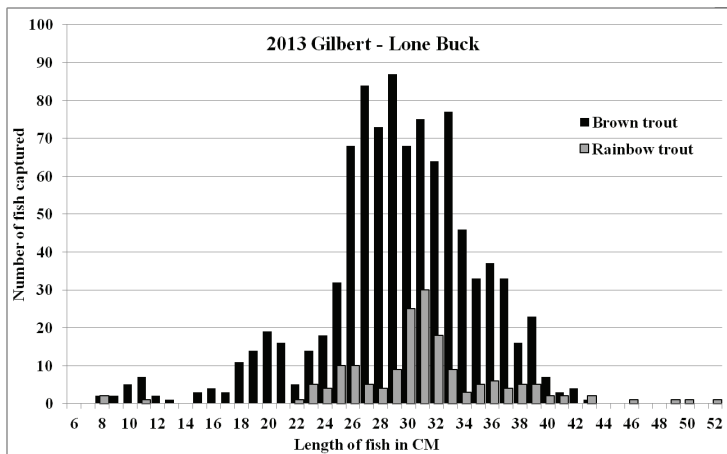
Spring 2016 survey of Paul Gilbert—Lone Buck reach

On April 19 & 21, 2016, we conducted a raft electrofishing survey of the Colorado River beginning just downstream of the Byers Canyon bridge and extending to the downstream border of the Lone Buck State Wildlife Area. This encompassed a river reach of approximately 7,000 feet in length. The main reason for this survey was to determine the number of spawning rainbow trout in this reach, which contains locations where rainbows regularly spawned historically. This was the first time since 2013 that we had surveyed this section. These are the only two occasions in recent history that the reach has been surveyed in the spring.

Results of the 2013 and 2016 surveys are contained in the table at right. Rainbow estimates remained essentially the same across the two occasions, while the number of large brown trout increased dramatically. This resulted in a greatly increased estimate of brown trout biomass as well. The size distribution of both species is shown in the graphs below.

In the 2016 survey, we also captured one mountain whitefish measuring 16". At that time this was the farthest-upstream location that we had ever captured a mountain whitefish; however, the following month we captured two more mountain whitefish upstream of the town of Hot Sulphur Springs, indicating that they are present in the river up to Windy Gap dam.

Colorado River, Paul Gilbert—Lone Buck Station		
	2013	2016
Date of survey	5/6 & 8	4/19 & 21
Rainbows: #> 6"/mile	214	182
#>14"/surface acre	5	6
Biomass (lbs./acre)	13	13
Browns: #> 6"/mile	1,537	1,178
#>14"/acre	11	28
Biomass (lbs./acre)	74	132



A Whirling Disease-resistant rainbow from the Lone Buck reach.



This handsome Parshall Hole rainbow in 2015 had recently enjoyed a meal of a 10" brown.



The largest brown captured in 2014. 21 inches, 4.6 pounds



This 15" brown had recently eaten some kind of rodent.

