

Rainbow Trout Stocking Evaluations



INCREASING POST-STOCKING SURVIVAL OF WHIRLING DISEASE RESISTANT RAINBOW TROUT

Whirling Disease Resistant Rainbow Trout

Whirling disease resistant Rainbow Trout have been stocked by CPW hatcheries over the past decade to reestablish Rainbow Trout populations in waters where populations experienced significant declines due to the establishment of whirling disease in the early 1990s. The German Rainbow (GR), or Hofer, a resistant but domesticated Rainbow Trout strain, has been crossed with other Rainbow Trout strains to maintain both whirling disease resistance and wild survival characteristics. Crosses of the GR with other wild strains, such as the Colorado River Rainbow and Harrison Lake Rainbow Trout, are used for stocking various locations, for instance in rivers versus lakes, dependent upon life history characteristics of the wild strain and the management objectives for each body of water. Since these crosses are a relatively new addition to Colorado’s stocking program, the effects of fish size at stocking and variety were evaluated to determine which stocking methods result in increased post-stocking survival and recruitment in newly-established whirling disease resistant Rainbow Trout populations.

Rainbow Trout Stocking Evaluations in the upper Colorado River

Subcatchable Stocking Evaluations

A stocking strategy that was adopted in the years after whirling disease became established in Colorado, prior to the advent of resistant strains, was the use of large (> 6 inches) subcatchable fish. This was done because larger fish were less susceptible to whirling disease infection and predation. Whirling disease resistant Rainbow Trout, a cross between the GR and the Colorado River Rainbow Trout strains (H×C), were first stocked into the upper Colorado River below Windy Gap Reservoir in 2006, with additional stocking events in 2009 and 2010. These resistant-strain stocking events were also conducted with large subcatchable fish, similar to previous stocking events with susceptible strains. Prior to being stocked, all fish were individually tagged using external Floy tags to identify individuals upon recapture during annual population estimates. Although some natural reproduction took place in the upper Colorado River during this time, wild fry numbers remained low and little recruitment to the adult population occurred. As a result of both the low post-stocking survival of the stocked subcatchable fish and the low numbers of fry produced by these fish, the adult Rainbow Trout population continued to decline from 91 fish per mile in 2008 to 6 fish per mile in 2011 (Figure A; Fetherman et al. 2014).



Stocking Floy-tagged H×C in Colorado River

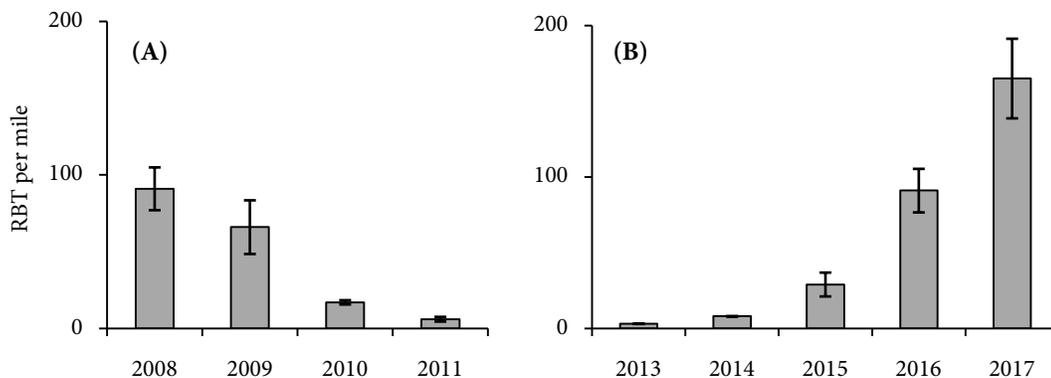


Figure (A) Decline in the adult rainbow trout population following subcatchable stocking and **(B)** increase in the adult rainbow trout population following fry stocking in the upper Colorado River.



Stocking HxC fry in the Colorado River

Fry Stocking Evaluations

Because of the continued decline in the adult Rainbow Trout population following stocking of subcatchables, fry stocking was proposed as a possible alternative to increase recruitment to the adult population. Subcatchables are often held in the hatchery for six months or more to get the fish to larger sizes for stocking, whereas fry are stocked 1.5 months after hatching, reducing the amount of time spent in the hatchery and the potential influence of the hatchery environment on post-stocking survival. Use of larger subcatchables was no longer necessary due to the inherent resistance of the new strains. HxC were first stocked as fry in the upper Colorado River in 2013, with HxC fry

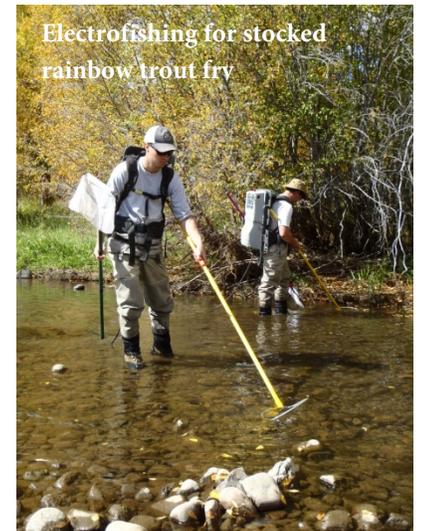
continuing to be stocked annually through 2016. Fry were distributed by raft in appropriate fry habitat throughout the upper Colorado River. Electrofishing estimates conducted throughout the study section showed that the HxC fry persisted as well as naturally-produced brown trout fry in the same reaches. Additionally, the number of adult Rainbow Trout per mile increased each year following the commencement of fry stocking (Figure B), suggesting that the HxC fry were recruiting to the adult population. As such, stocking HxC fry versus subcatchables appeared to be the best stocking strategy for the Colorado River, and similar rivers across the state.

German Rainbow (GR) versus HxC Fry Stocking

The observed survival of the HxC fry was promising. However, studies had shown that eventual dilution of resistance of these stocks could be a concern (Fetherman et al. 2012). Reduced resistance in future generations would be much less likely when stocking pure GR fish. Therefore, stocking pure GR as fry could be an option for establishing whirling disease resistant Rainbow Trout populations in certain situations.

Comparative Survival of GR and HxC Fry

In a recent collaborative study with Colorado State University, a laboratory and field experiment were undertaken to compare the post-stocking survival of GR and HxC fry. The field experiment was conducted in one mile reaches of nine Colorado streams, selected for consistency in size and physical habitat characteristics. Each stream was stocked with 5,000 GR and 5,000 HxC fry, and survival was assessed at two months, six months, and one year post stocking. After one year in the streams, the strains survived equally well. In the laboratory experiment, equal numbers of GR and HxC were stocked into tanks with brown trout as predators and held for 24 hours. Again, survival did not differ between the strains. The results of this study indicated that stocking the GR as fry may be a viable option in some streams where whirling disease is enzootic (Avila et al. *In review*). To test this in a larger river system, GR fry were stocked in place of HxC fry in the Colorado River in 2016, and continue to be evaluated annually for survival and recruitment to the adult population. Fry stocking and recruitment evaluations will continue in the upper Colorado River through 2022.



Electrofishing for stocked rainbow trout fry



References

- Avila, B. A., D. L. Winkelman, and E. R. Fetherman. *In review*. Survival of whirling disease resistant Rainbow Trout fry in the wild: a comparison of two strains. *Journal of Aquatic Animal Health*.
- Fetherman, E. R., D. L. Winkelman, G. J. Schisler, and M. F. Antolin. 2012 Genetic basis of differences in myxospore count between whirling disease-resistant and -susceptible strains of Rainbow Trout. *Diseases of Aquatic Organisms* 102:97-106.
- Fetherman, E. R., D. L. Winkelman, M. R. Baerwald, and G. J. Schisler. 2014. Survival and reproduction of *Myxobolus cerebralis* resistant Rainbow Trout in the Colorado River and increased survival of the age-0 progeny. *PLoS ONE* 9(5):e96954.