

Trojan Male (YY) Brook Trout



YY Brood Stock Development and Implementation

YY Brook Trout Brood Stocks



Photo credit: Kevin Rogers

Brook Trout are native to cold water streams in eastern North America, but not to Colorado. These fish are able to outcompete native trout species in many places where they have been stocked in the western United States. While Brook Trout are an excellent sport fish in some scenarios, they can be a hindrance to native trout conservation. Removing Brook Trout is a common technique to restore Cutthroat Trout populations, typically accomplished by depopulating stream reaches with chemical treatments or by physical removal. These approaches are not always perfectly successful, and are not always suitable in locations where Cutthroat Trout are also present. A new technology, referred to as “Trojan Male” or “YY” Brook Trout, can

potentially eliminate unwanted wild Brook Trout populations by incrementally eliminating female Brook Trout, while leaving the existing Cutthroat Trout unharmed.

Like mammals, most fish species have two sex chromosomes: X and Y. A natural genetic female will have two X chromosomes (XX), and a natural genetic male will have one X and one Y chromosome (XY). In the development of YY Brook Trout brood stocks, very young Brook Trout are exposed to the female hormone estradiol in their feed at a specific level and for a specific length of time. The treatment makes the male fish become egg-producers, but they are still genetically male. These egg-producing males are then bred with normal XY males, which means 25% of the offspring will have two Y chromosomes, hence referred to as YY males. Some YY males produced in that generation are exposed to estradiol, which then converts them into egg-producing YY males. This process allows the hatchery to have a group of egg-producing YY males and a group of sperm-producing YY males, which are kept for brood stock. After that, hormone treatment is unnecessary because only Y chromosomes are present in the eggs and sperm of the brood stock, and all of the offspring will be YY males. Colorado Parks and Wildlife has developed a brood stock of YY Brook Trout, the second such in the nation, following the lead of Idaho Fish and Game. Colorado Parks and Wildlife has also developed the treatment recipe for creating YY Brown Trout.

YY FISH OFFSPRING

YY brood stock offspring are fertile, sperm producing, genetically YY male fish.

Stocking these fish ultimately results in a target population that is comprised of all normal XY males, but no females .

The eradication process is accelerated by simultaneous stocking of YY males while annually removing wild fish.

YY Male Implementation

Eradication of Brook Trout is accomplished by stocking large numbers of YY male Brook Trout into a lake or stream, to swamp out production of normal males. First, removing as many of the wild-type Brook Trout as possible is necessary. Once the population has been reduced, YY male Brook Trout are stocked to replace the fish removed. When these YY male Brook Trout are stocked into the wild and cross with wild (XX) females, all of their offspring will be normal male (XY) Brook Trout. The YY males cannot produce female offspring since they do not carry an X chromosome. Eventually the wild females in the population will die off, leaving only males. Stocking the YY Brook Trout can then be stopped and the all-male brook trout population will eventually die out on its own. This technique does not release chemicals or hormones into the water and is less labor intensive than eradication by mechanical removal alone. CPW is currently evaluating the technique as part of a research project, and are optimistic that it will work for Cutthroat Trout conservation efforts in the future.



Associated Literature

Kennedy, P., Schill, D. J., Meyer, K. A., Campbell, M. R., Vu, N., and M. J. Hansen. 2017. Production and evaluation of YY-Male brook trout to eradicate Nonnative wild brook trout populations. *In* Proceedings of the Wild Trout Symposium XII—Science, Politics, and Wild Trout Management: Who’s Driving and Where Are We Going (pp. 251-260).



Photo credit: Charlie Summers