

greater abundance of WCT across the subspecies' range than we had estimated during the initial status review. The available data do not suggest the future loss of any of the three life-history forms represented by WCT. Consequently, we conclude that the WCT subspecies is not threatened by the loss of one or more of its life-history forms throughout all or a significant portion of its historic range.

Hybridization With Nonnative Fishes—Hybridization with introduced, nonnative fishes, particularly rainbow trout and their hybrid descendants that have established self-sustaining populations, is recognized as an appreciable threat to the WCT subspecies. Hybridization requires that the nonnative species invade the WCT habitat, the two species interbreed, and the resulting hybrids themselves survive and reproduce. If the hybrids backcross with one or both of the parental species, genetic introgression can occur. Continual introgression can eventually lead to the loss of genetic identity of one or both parent species, thus resulting in a "hybrid swarm" consisting entirely of individual fish that each contain genetic material from both of the parental species.

The WCT is known to interbreed with rainbow trout and YCT, both of which were first stocked into many regions of the historic range of WCT more than 100 years ago. Nonetheless, the limited data available at the time of our initial status review revealed that numerous, nonintrogressed WCT populations inhabited more than 4,184 km (2,600 mi) of stream (U.S. Fish and Wildlife Service 1999). Moreover, in the present document, we have concluded that nonintrogressed WCT are known to inhabit 5,633 km (3,500 mi) of stream and probably inhabit as many as 20,278 km (12,600 mi) of stream in which no potentially hybridizing fishes occur. Clearly, not all nonintrogressed WCT populations have been equally vulnerable to introgressive hybridization. In Idaho, WCT in many populations are sympatric with potentially hybridizing, native redband trout but remain nonintrogressed (Moore 2002). Thus, the occurrence of potentially hybridizing fishes does not portend their imminent hybridization with WCT.

The WCT status update report (Shepard *et al.* 2003) concluded that the threats to extant WCT populations from introgressive hybridization were greater for the extensive WCT metapopulations than for the smaller WCT populations that occurred as isolets. As pointed out by Shepard *et al.* (2003), the vulnerability to hybridization of WCT in metapopulations stems from the key

characteristic of the metapopulation itself, *i.e.*, the ability of its member fish to move (and interbreed) among the various WCT populations that constitute the metapopulation. It is assumed that potentially hybridizing fishes are similarly unencumbered in their movements throughout the geographic area occupied by the metapopulation and, accordingly, WCT metapopulations can inevitably become completely introgressed as a hybrid swarm.

We examined the database of Shepard *et al.* (2003) to assess the introgressive hybridization risk to extant WCT that consist of: (1) Nonintrogressed or suspected nonintrogressed populations and (2) introgressed or suspected introgressed "conservation" populations. Results indicated that nonintrogressed and suspected nonintrogressed WCT populations occurring as isolets were at moderately high or high risk of introgression in about 16 percent of their 1,944 occupied stream miles, whereas nonintrogressed populations occurring in metapopulations were considered to be at similar risk in 89 percent of their 9,999 occupied stream miles. Similarly, WCT in introgressed or suspected introgressed conservation populations occurring as isolets were at moderately high or high risk of introgression in about 38 percent of their 751 occupied stream miles, whereas introgressed populations occurring in metapopulations were considered at similar risk in 99 percent of their 11,775 occupied stream miles. The WCT in introgressed or suspected introgressed populations inhabited a total 19,262 km (11,943 mi) of stream, 1,060 km (657 mi) less than reported by Shepard *et al.* (2003). However, those authors also reported the 563 WCT "conservation" populations collectively occupied 39,349 km (24,450 mi) of stream, nearly identical to the amount that we found (*i.e.*, 39,466 km or 24,469 mi) when the database was examined. The reason for the small discrepancy (5.2 percent) in the total amounts of habitat occupied by WCT in introgressed or suspected introgressed populations is unknown but may be due to differences in the specific database queries.

The hybridization risk to WCT is almost entirely from rainbow trout, YCT, and the hybrid offspring and descendants of those fishes that have established self-sustaining populations within the range of extant WCT populations. We examined the database of Shepard *et al.* (2003) to assess the extent that rainbow trout and "other cutthroat trout" (primarily YCT) co-occur (*i.e.*, are sympatric) with extant WCT in: (1) Nonintrogressed or

suspected nonintrogressed populations and (2) introgressed or suspected introgressed "conservation" populations. Rainbow trout or YCT occur in 47 to 91 percent of the stream miles occupied by WCT metapopulations but only 0 to 22 percent of the stream miles occupied by WCT isolets.

In most cases today, it is not technologically possible to eliminate the self-sustaining populations of potentially hybridizing, nonnative fishes from entire drainages or even individual streams. Consequently, perceived threats to extant WCT posed by nonnative fishes in streams are sometimes met by installing barriers to the upstream movement of the nonnative fishes into stream reaches occupied by WCT. In a few cases, usually involving small streams that provide the greatest opportunity for success, fish toxins may be used to completely remove all fishes upstream from such barriers, after which WCT may be stocked (*e.g.*, Hagener 2002). In either case, because of technological, budgetary, and other limitations, such actions are now being taken for only a small proportion of WCT populations across the subspecies' range.

Because self-sustaining populations of nonnative fishes pose the greatest hybridization threat to WCT and few of those populations can be eliminated or appreciably reduced, a key concern is for the extent that introgressive hybridization may eventually pervade extant, nonintrogressed or suspected nonintrogressed WCT populations, particularly those that inhabit headwater streams in high-elevation areas. Hitt (2002) reported that 55 percent of 40 WCT populations examined in the Flathead River drainage in Montana showed evidence of introgressive hybridization with rainbow trout, and that introgression had progressed upstream in several tributaries during the past 2 decades. Additional evidence suggested that the upstream introgression of rainbow trout genes would eventually be halted by diminished stream size, as evidenced by the observation that rainbow trout usually inhabit larger streams than cutthroat trout. However, Hitt (2002) further speculated that the stream reaches upstream from those potentially limiting locations would be too small to support viable WCT populations.

In the Clearwater River drainage in Idaho, Weigel *et al.* (2003) similarly found that WCT at 64 percent of the 80 sample sites showed evidence of introgression with rainbow trout or native redband trout. The incidence and intensity of that introgression was