

negatively associated with stream elevation, which the authors believed resulted from the interaction of low water temperatures or other characteristics of the high-elevation hydrologic regimes and either the physiological or habitat requirements of rainbow trout and their hybrids with WCT. In a study conducted in the Kootenay (= Kootenai) River, British Columbia, Rubidge *et al.* (2001) found that WCT introgressive hybridization with rainbow trout had become more widespread in the drainage since the mid-1980s, which the authors attributed to the ongoing stocking of rainbow trout into Koocanusa Reservoir in British Columbia.

In addition, many extant WCT populations occur upstream from barriers that entirely prevent the upstream movements of nonnative fishes, including those that may potentially hybridize with WCT. We examined the database of Shepard *et al.* (2003) to determine the extent that extant, nonintrogressed or suspected nonintrogressed WCT populations occur upstream from such "complete" barriers. Results indicated that 48 percent of the 1,944 stream miles inhabited by WCT in isolets are protected by such barriers, whereas about 6 percent of the 9,999 stream miles inhabited by nonintrogressed WCT in metapopulations are similarly protected. Thus, nonintrogressed or suspected nonintrogressed WCT populations inhabiting 2,454 km (1,525 mi) of stream are protected from introgressive hybridization by barriers to the upstream movement of nonnative fishes.

The available empirical evidence and speculations by many fishery scientists indicate that rainbow trout genes are expected to continue moving upstream into many stream reaches presently inhabited by nonintrogressed WCT, although, as we have discussed, there may be limits to that upstream dispersal set by low stream temperatures or other factors. However, the observation that numerous nonintrogressed WCT populations persist today despite both the longstanding occurrence (*i.e.*, more than 100 years) of potentially hybridizing fishes in regions downstream and the absence of obvious intervening barriers to the upstream movement of those fish suggests that not all nonintrogressed WCT populations have been and are equally vulnerable to introgression. Behnke (1992, 2002) provides evidence that phenotypically true, native cutthroat trout of several subspecies persist in many essentially undisturbed, natural habitats because they have fitness superior to that of

nonnative fishes, including potentially hybridizing species and their hybrid descendants. Thus, the eventual extent that rainbow trout, or YCT, genes move upstream may be stream-specific and unpredictable. Nonetheless, as noted previously (see previous section, "The Value of Hybrid Westslope Cutthroat Trout in Listing Determinations"), small amounts of genetic introgression do not disqualify individual WCT or their populations from species membership under the Act. Finally, nonintrogressed or suspected nonintrogressed populations of WCT inhabiting 2,454 km (1,525 mi) of stream are considered secure from genetic introgression because those populations occur upstream from barriers to the upstream movement of nonnative fishes or their hybrid descendants. Therefore, the best scientific and commercial information available to us indicates that the WCT subspecies is not threatened by introgressive hybridization.

#### Evaluation of Ongoing Conservation Efforts

In the initial status review (U.S. Fish and Wildlife Service 1999), we identified numerous, ongoing conservation efforts that benefitted WCT and their habitats. For example, the U.S. Forest Service, State fish and wildlife agencies, and National Park Service reported more than 700 ongoing projects directed toward the protection and restoration of WCT and their habitats.

Recent information indicates that these important conservation efforts are ongoing and increasing in number. At the time of the initial status review, the four State fish and wildlife agencies, the U.S. Forest Service, and other entities were implementing WCT conservation actions in a minimally coordinated manner. The State of Montana had developed a formalized conservation program for WCT that included a State-wide conservation agreement, a conservation strategy with specific goals and objectives, a steering committee consisting of representatives from various key agencies and other concerned entities, and a technical oversight group. At that time, Idaho, Oregon, and Washington also were implementing WCT conservation actions as an integral part of their fisheries management programs. The U.S. Forest Service also was protecting WCT habitat as specified under INFISH and PACFISH, and had established a new professional position whose incumbent focused entirely on inland cutthroat trout conservation in the western United States.

More recently, the conservation efforts for WCT have been enhanced by

formalized coordination among the four State fish and wildlife agencies, the U.S. Forest Service, and the Service. Beginning in June 2001, formal coordination meetings have been held under the leadership of a representative of the Idaho Department of Fish and Game. A formal coordination agreement is now being developed, consistent conservation goals and objectives for WCT have been identified, and an emphasis on consistency and continuity in WCT conservation among the agencies has emerged. An indication of the important level of coordination that has been achieved is provided by the recent WCT status update report (Shepard *et al.* 2003), which was completed through a concerted effort among the parties to the coordination agreement. To complete that report, 112 biologists—working with 19 geographic information systems and data-entry specialists—completed the task of updating the current information on WCT in a timely and comprehensive manner.

In Idaho, hundreds of conservation efforts have been undertaken in recent years to protect WCT and their habitats (Moore 2003). Those efforts include initiation of a study to determine movement patterns of WCT in the Middle Fork of the Salmon River basin (this study will be expanded into the upper Salmon River basin), accelerated genetic sampling of fishes in central and northern Idaho streams, addition of a qualified geneticist to Department of Fish and Game staff, and implementation of joint efforts with the U.S. Forest Service focused on protection and enhancement of WCT habitat and populations. Montana Fish, Wildlife and Parks continues to implement its conservation agreement and plan. In Montana, more than 200 projects that directly benefit WCT have now been completed, many of which were accomplished as part of a Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout in Montana, and numerous, additional projects are ongoing (Hagener 2002). Included in the Montana Fish, Wildlife and Parks efforts are removal of nonnative trout through both physical and chemical means, installation of fish-passage barriers, and coordinated efforts with U.S. Forest Service and other management authorities focused on WCT habitat protection and enhancement.

Oregon and Washington fishery agencies are likewise planning and implementing WCT conservation actions. In Oregon (Unterwagner 2002), the Department of Fish and Wildlife is developing a Native Fish Conservation