

The indigenous fishery of Glacier National Park has been radically altered from its pristine condition during the past half-century through introductions of non-native fishes and the entry of non-native species from waters outside the park. These introductions have adversely affected the native westslope cutthroat trout (*Oncorhynchus clarki lewisi*; Fig. 1) throughout much of its park range.

The effects of non-native fishes on indigenous fisheries have been reviewed by Taylor et al. (1984), Marnell (1986), and Moyle et al. (1986). Effects of fish introductions in Glacier National Park include establishment of non-native trout populations in historically fishless waters, genetic contamination (i.e., hybridization) of some native westslope cutthroat trout stocks, and ecological interferences with various life-history stages of native trout.

Research conducted in the park during the 1980's addressed the genetic effects of fish introductions on native trout. Of 47 lakes known or suspected to contain cutthroat trout or trout hybrids, 32 lakes contained viable populations of cutthroat trout, rainbow trout (*O. mykiss*), or hybrids. Trout introduced in the other waters were evidently unable to sustain themselves through natural reproduction.

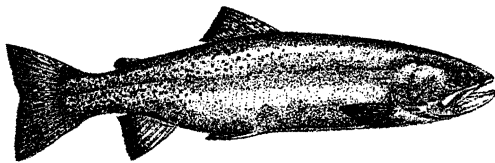


Fig. 1. Westslope cutthroat trout (*Oncorhynchus clarki lewisi*).

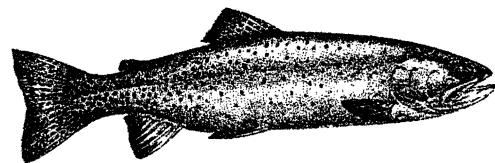


Fig. 2. Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*).

About 30 trout sampled from each lake underwent laboratory genetic analyses. Close agreement of the results from two analytical procedures yielded a high degree of confidence in the conclusions (Marnell et al. 1987). Genetic classifications in Tables 1 and 2 reflect the combined results of the analyses.

Fourteen pure strain populations of westslope cutthroat trout persist in 15 lakes (i.e., some interconnected lakes contain a single trout population) in the North and Middle Fork drainages of the Flathead River; the species was historically present in these waters (labeled as "stable" populations in Table 1).

Pure strain native trout also inhabit four

other Middle Fork lakes (i.e., Avalanche, Snyder, and Upper and Lower Howe lakes), but it is unclear whether they are indigenous or were transplanted from other park waters. Recent findings from sediment paleolimnology studies suggest that trout have been present in at least one of these lakes for more than 300 years (D. Verschuren, University of Minnesota, and author, unpublished data). Hence, trout populations in these four lakes are tentatively classified as indigenous (Table 1).

Introduced populations of Yellowstone cutthroat trout (*O. clarki bouvieri*; Fig. 2) and trout hybrids including cutthroat-rainbow trout (*O. clarki* spp. x *O. mykiss*) occur in 13 lakes distributed among the three continental drainages

Cutthroat Trout in Glacier National Park, Montana

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Lake	Area (ha)	Trout classification*	Population status**
North Fork, Flathead R.			
Akokala	9	WCT	Stable
Arrow	23	WCT x YCT	Hybrid
Bowman	691	WCT	Unstable
Camas	8	YCT	Non-native
Cerulean	20	WCT	Stable
Evangeline	28	YCT	Non-native
Grace	32	WCT x YCT	Hybrid
Kintla	688	WCT	Unstable
Logging	444	WCT	Unstable
Quartz	349	WCT	Stable
Lower Quartz	67	WCT	Stable
Middle Quartz	19	WCT	Stable
Trout	86	WCT	Stable
Middle Fork, Flathead R.			
Avalanche	23	WCT	Stable
Fish	3	WCT x YCT	Hybrid
Harrison	101	WCT	Unknown
Hidden	110	YCT	Non-native
Lincoln	14	WCT	Stable
Lower Howe	12	WCT	Stable
Lower Isabel	17	WCT	Stable
McDonald	2,760	WCT	Unstable
Ole	2	WCT	Stable
Snyder	2	WCT	Stable
Upper Howe	3	WCT	Stable
Upper Isabel	6	WCT	Stable

* WCT — pure strain westslope cutthroat trout.
YCT — the introduced Yellowstone cutthroat trout.
x — two or more species have hybridized.
** Stable — native population exists in a pristine environment.
Unstable — declining condition resulting from presence of competing non-native species.
Hybrid and non-native populations — classified without regard to population condition.

Lake	Area (ha)	Trout classification*	Population status**
South Saskatchewan River			
Lower Slide	15	YCT x RBT	Hybrid
Otokomi	9	YCT x RBT	Hybrid
Red Eagle	55	YCT x WCT x RBT	Hybrid
Upper Slide	5	YCT x RBT	Hybrid
Upper Missouri River Drainage			
Katoya	4	YCT	Non-native
Morning Star	4	YCT	Non-native
Old Man	17	YCT	Non-native

*YCT— introduced Yellowstone cutthroat trout.
x — two or more species have hybridized.
RBT— rainbow trout.
WCT — westslope cutthroat trout.
**Hybrid and non-native populations are classified without regard to population condition.

Table 1. Status and trends of cutthroat trout and their hybrids in the North and Middle Fork, Flathead River drainages of Glacier National Park, Montana.

Table 2. Status and trends of non-native and hybrid trout populations in the South Saskatchewan and Missouri river drainages of Glacier National Park, Montana.

that form their headwaters in Glacier National Park (Tables 1 and 2). Native cutthroat trout were not found east of the Continental Divide in the Missouri River or South Saskatchewan River drainages within the park.

In addition to genetic concerns, ecological disturbances associated with the presence of introduced fishes have compromised the native westslope cutthroat fishery. Fish are no longer stocked in park waters; however, several waters, including some that contain undisturbed native fisheries, remain vulnerable to invasion by non-native migratory species. Introduced kokanee salmon (*O. nerka*), a specialized planktivore, are believed to be competing with juvenile stages of native trout in some waters, especially during periods of winter ice cover when plankton may be limited. Predation by introduced lake trout (*Salvelinus namaycush*) has also been implicated in the decline of native cutthroat trout in several large glacial lakes in the North and Middle Fork drainages (Marnell 1988). Native cutthroat trout have been compromised by fish introductions and invasions throughout about 84% of their historic range in Glacier National Park (Marnell 1988).

Although native cutthroat trout have been adversely affected throughout a large portion of their park range, the species has not been lost

from any water where it was historically present. Glacier National Park remains one of the last strongholds of genetically pure strains of lacustrine (i.e., lake-adapted) westslope cutthroat trout. This fact could have important implications for reestablishment of this unique subspecies throughout the central Rocky Mountains, where this trout has disappeared from most of its original range.

References

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