Trout Populations in the Clark fork River, Warm Springs to superior, Montana

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Introduction

"In no part of the world is the water more limpid or pure, for whatever may be the depth of the river the bottom is seen as if there were nothing to intercept the view." These words were written by Father deSmet describing the upper Clark Fork River he observed on a trip through the upper basin in 1841. Obviously, the days of such purity are sadly gone for the Clark Fork. But by the same token, gone hopefully forever are the days when the Clark Fork was "Western Montana's sewer to the ocean." This was the headline of an article in the Daily Missoulian, July 10, 1960, in which the reporter described vividly the disgusting mess, which flowed through the area carrying a heavy load of toxic metals, trash of all descriptions, and sewage from nearly every town and industry in the valley. In those days fish kills were documented from the headwaters down the river as far as Superior, and clean-water aquatic insect life was at a nadir. Tremendous improvements in the fishery have occurred since 1960, but there is still a long way to go to restore the full potential of the sport fishery and the amenities it provides.

The sport fishery of the Clark Fork upstream from Milltown Dam consists predominantly of brown trout (Salmo trutta) with small numbers of rainbow trout (Salmo gairdneri), cutthroat trout (Salmo alarki lewisi), bull trout (Salvelinus aonfluentus), and brook trout (Salvelinus fontinalis). Downstream from Milltown Dam rainbow trout dominate the species composition with smaller numbers of the other species. In our present-day management of these species we strive to provide fishermen a good opportunity to catch a trout 14 inches or larger and we work to improve the environment for self-sustaining wild trout populations.

Methods

Quantitative fish population data have been collected on the Clark Fork using electrofishing to sample trout populations and statistical estimators to derive population statistics. Electrofishing is conducted using a boat equipped with stationary negative and either mobile or stationary positive electrodes. Alternating current produced by a gasoline-powered alternator passes through a rectifier changing it to direct current and then into the water via the electrode system. Fish in the electrical field generated around the boat are compelled to swim to the positive electrode and are immobilized to the extent they can be dip-netted and placed in a live box on the boat. Fish are weighed, measured, and marked, a scale sample is taken for aging, and the fish are released into the river near where they were captured. Marks placed on the fish are either a small notch cut in the edge of a fin (which will grow back) or a numbered plastic tag inserted behind the dorsal fin. These marks allow identification of individual fish, which have been captured previously. By sampling the population and marking fish in this way we can see the Chapman modification of the Peterson mark-recapture estimator to determine total numbers of fish in a section of river (7,8).

Our fish sampling equipment has improved over the years. In the beginning we were limited to sampling sections of river, which we could wade. Our present-day equipment gives us the capability to sample fish in the river regardless of its size. As equipment has evolved allowing us to sample bigger waters we

have worked our way down the river making population estimates and generating population statistics at nine different locations as far downstream as Superior (fig.1).

Trout Populations

The highest trout population numbers estimated in the river to date have been found in the pH Shack section immediately downstream from the Anaconda Minerals Company (AMC) settling ponds near Warm Springs (fig. 1). Fishery biologists began studying that population in 1969 (5). In that year, no trout were found there, and only one brown trout was captured in the Williams- Tavenner (W-T) section immediately downstream from Deer Lodge. In the early 1970's, AMC began treating their wastewater at Butte. and in 1975 they began liming Silver Bow Creek water as it entered the settling pond system, to maintain pH levels high enough to keep toxic metals out of solution (4). Brown trout responded and populations increased steadily until 1979 when the spring population estimate in the pH Shack section peaked at approximately 1,500 brown trout/mile (table 1). A steep decline in numbers followed the peak (fig.2). The 41-percent decline in brown trout numbers between 1979 and 1982 was believed to be related to excessive fisherman harvest. For this reason, the Fish and Game Commission implemented more restrictive fishing regulations in 1982. Creel limits were changed from 10 trout any size to a "slot limit" of five trout under 14 inches or four under 14 inches with one over 18 inches.

The brown trout population responded favorably to this regulation change. Between spring 1982 and spring 1984 total brown trout numbers increased 116%, and brown trout 14 inches and larger increased 213% (fig. 2 and table 1). In 1984 the large-trout population was at an all-time high for a 16-year period of record. The Williams-Tavenner section, 30 river miles downstream, was also studied during the same 16-year period. Populations in this section responded to MIC wastewater treatment, but numbers leveled off at a much lower point than in the pH Shack section, and the area did not attract nearly as many fishermen as the pH Shack section (table 1). A statistically significant trend in numbers was not present in the W-T section after 1979.

Curious about the dramatic decline in trout numbers between the pH Shack and W-T sections, biologists conducted studies to determine if the difference was related strictly to habitat or if water quality deteriorated progressively with increasing distance downstream from the treatment system at Warm Springs. The Sager Lane section lies about midway between pH Shack and Williams- Tavenner (fig.1). Figure 2 indicates populations in 1981 and 1982 at Sager Lane were intermediate between the pH Shack and W-T sections (6). The theory of decreasing water quality was strengthened by these results since habitat differences between Sager Lane and pH Shack appeared to be insignificant.

A review of trout population estimates on the Clark Fork suggests that clean-water tributaries are a major influence on water quality and trout populations in the main river. The Little Blackfoot River increases the average flow of the Clark Fork by 50% at Garrison. At Phosphate, a short distance downstream, brown trout are generally in greater abundance than above the Little Blackfoot at W-T (fig.2). After the clean-water influence of the Little Blackfoot dissipates, trout populations in the Bearmouth and Bonita sections reach the lowest number found anywhere in the river. There are no significant sources of clean water to the Clark Fork in the 64 miles of river between the Little Blackfoot and Rock Creek near Clinton (fig.1). Trout numbers drop to fewer than 50 per mile in the Bearmouth and Bonita sections just upstream from Rock Creek (2). Sampling in these sections in 1984 indicated numbers may presently be-too low to estimate (W. Hadley, Fishery Biologist, Montana Department of Fish, Wildlife and Parks, Deer Lodge, 1984, personal communication).

Rock Creek nearly doubles the flow of the Clark Fork with clean water. and trout populations in the Clark Fork downstream from Rock Creek improve significantly. In 1980, brown trout numbers in the Turah section, down stream from Rock Creek were approximately 350 per mile of river compared to 47 brown trout per mile in the Bonita section just upstream from Rock Creek. Although the number of trout in the Turah section is lower than the number expected from a large river like the Clark Fork, the beneficial clean-water influence of Rock Creek on the trout population in the Turah section is significant.

Seventeen miles downstream from Rock Creek the Blackfoot enters the Clark Fork River through Milltown Reservoir. The clean-water influence of the Blackfoot is dampened by toxic metals and accumulation of fine sediment in the reservoir. In the fall of 1980, when population estimates were initiated below Milltown Dam, the trout population in the Milltown section below the dam was estimated at approximately one-half the population at Turah just upstream from the dam (fig.1). Interestingly, species composition also changed at Milltown from 70% brown trout above the reservoir to 84% rainbow trout below (1).

Based on these tests it was suspected the sediment and toxic metals released downstream during annual drawdowns and occasional deep drawdowns was suppressing trout populations in the river downstream from the dam. The influence of fine sediment and toxic metals began to be documented in 1970 with live-caged fish tests during a major reservoir drawdown by Montana Power Company (1). Mortality rates of 100% of 2- to 4-inch rainbow trout and up to 80% of 7--to 9-inch trout at stations below the dam while only one trout died at the control station indicated clearly adverse effects to trout from the release of reservoir sediments into the river below.

In 1982 a new plan of operation was implemented by Montana Power Company, which resulted in reducing the amount of material flushed from the reservoir. Since then trout populations have apparently increased; however, because of a change in the time of year the population was sampled and a change in fishing regulations, further study is needed to evaluate the 400 trout per mile increase in numbers observed between 1980 and 1984 below the reservoir (1).

Downstream from Missoula the Clark Fork nearly doubles in size again when the Bitterroot River enters (fig. 1). Our only trout population work on the river downstream from Missoula has been at Superior. There, a 13-mile-long section was sampled in 1983 and 1984 indicating an average population over the 2 years of 515 rainbows per mile (3). Annual population statistics will be gathered from this section for the next several years to determine trout response to the lower Clark Fork River environment.

Discussion

Toxic metals in the upper Clark Fork River flood plain present difficult cleanup problems. In addition, AMC's treatment system of settling ponds and liming is not as effective during the winter in removing toxic metals from solution as during summer. There is also the problem of bypass flows around the settling ponds during spring runoff and possibly during heavy summer storms. How effectively we deal with these and other as yet unknown problems will determine the future of the Clark Fork River water quality and sport fishery.

Acknowledgements

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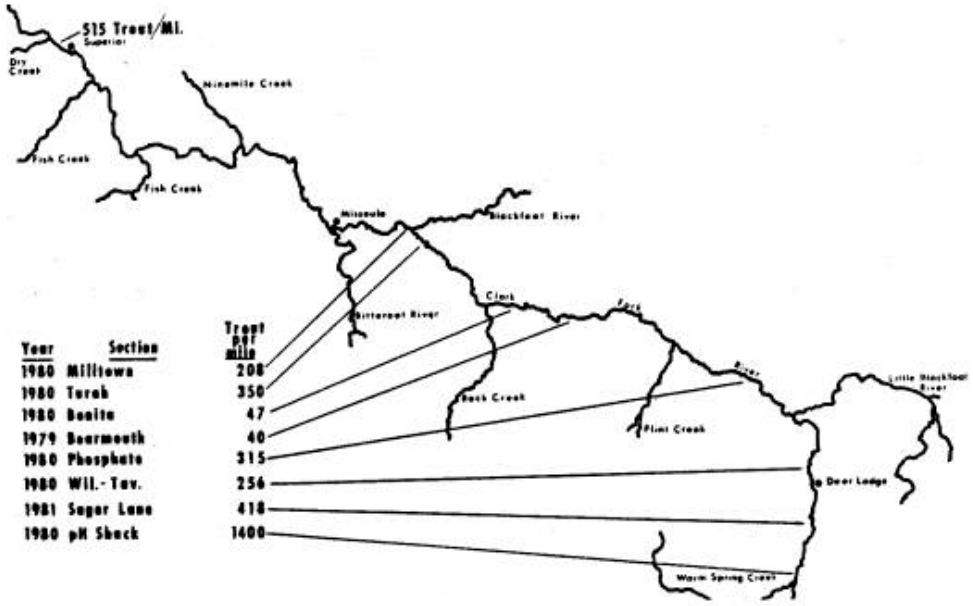

Figure 1. Clark Fork River trout populations at nine locations.

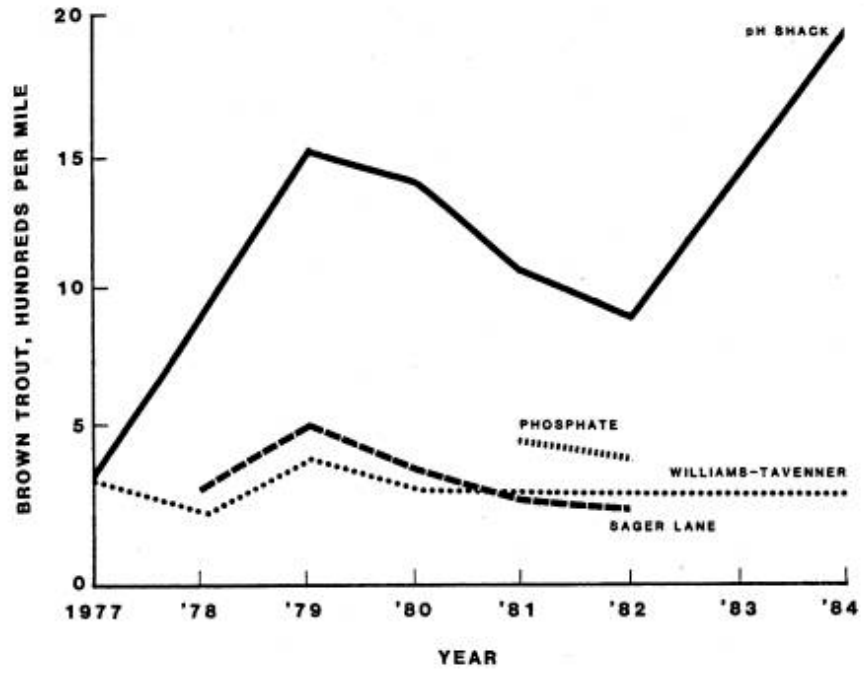

Figure 2. Brown trout in four sections of the upper Clark Fork River.

Table 1.--Brown trout population estimates, in numbers per mile of river, for the spring of each year

Year	Fish per mile	80 percent C.I.	Fish ≥14 inches per mile
		pH Shack Section	
1974	361	231- 479	58
1977	347	276- 418	143
1978	890	785- 995	164
1979	1,509	1,223-1,795	217
1980	1,400	1,186-1,614	106
1981	1,054	909-1,199	73
1982	892	779-1,005	103
1983	no data		
1984	1,930	1,697-2,163	322
		Williams-Tavenner Section	
1977	272	201-343	no data
1978	168	128-208	44
1979	355	240-470	90
1980	256	196-316	43
1981	245	175-315	19
1982	217	168-266	34
1983	no data		
1984	224	156-292	28