Electrofishing Survey for Dunkel Ranch, North Fork Smith River

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Introduction

Gillilan and Associates, Inc. contracted fish sampling services of Confluence Consulting, Inc. to evaluate the biological integrity and abundance of various fish species on the Dunkel Ranch portions of the North Fork Smith River. The objectives were to determine the status and trends of this cold-water fishery and identify potentially limiting factors. Fish population data collected by Montana Fish, Wildlife & Parks provided in 1973 provided a baseline to compare current conditions.

Study Area

The North Fork of the Smith River is a spring fed stream, flowing approximately 10 miles before entering Lake Sutherlin. The portion of the river on the Dunkel Ranch is a moderately entrenched, sinuous channel consistent with Rosgen's C channel classification (Rosgen 1996). The stream flows through a dense willow complex and several beaver dams. To evaluate distribution of fish throughout the portion of the North Fork Smith River on the Dunkel Ranch, we established three sample reaches. Reach #1 originates approximately 0.3 miles upstream of the road crossing at the western end of the Dunkel Ranch. Reach #2 lies approximately 0.3 miles upstream of reach #1. Reach #3 is the uppermost reach, lying above a large beaver dam complex approximately 1 mile upstream of reach #2 (Figure 1).

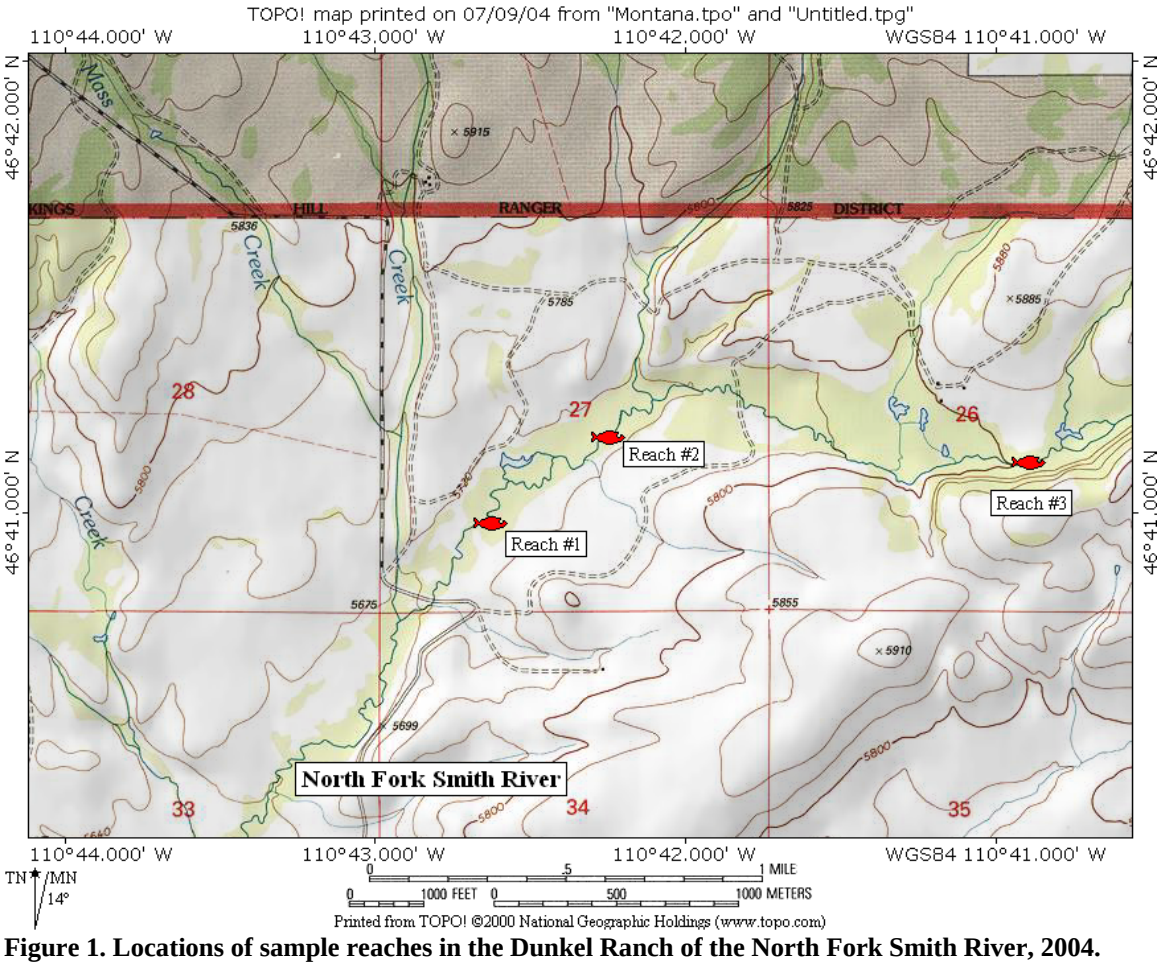

Figure 1. Locations of sample reaches in the Dunkel Ranch of the North Fork Smith River, 2004.

Methods

Fish were collected with two-pass removal sample strategy on June 23 and July 7, 2004 under a scientific collectors permit issued by Montana Fish, Wildlife & Parks (Permit Number SCP-36-04). We utilized a crawdad electroshocker with a 5hp gas-powered generator for reach #1. For reaches #2 and #3, a 24-volt battery powered electroshocking backpack unit was used. A block net was placed at the upper end of the reach to prevent fish from escaping upstream. Species and length were recorded for each fish sampled. Fish population estimates were generated using techniques described in Lockwood and Schneider (2000) and Zippin (1958). These techniques estimate fish populations and confidence intervals based on numbers of fish collected in each of two passes.

Results

Reach #1 – Population Estimate

Sampling yielded 112 trout, including 85 brook trout (*Salvelinus fontinalis*) and 27 rainbow trout (*Oncorhynchus mykiss*) from the 930-foot long sampling reach. Mottled sculpin (*Cottus bairdi*) were relatively abundant with 94 individuals collected. Population estimates calculated for rainbow trout, brook trout, and total trout per 1,000 feet suggest densities range as high as 168 trout per 1000 feet with brook trout substantially outnumbering rainbow trout (Table 1).

Table 1. Population estimates for rainbow trout, brook trout and total trout at sample reach #1, North Fork Smith River on the Dunkel Ranch, 2004.

Sample	Population Estimate (per 1000 ft)	Upper 95% Confidence Limit
Rainbow trout	31	37
Brook trout	113	140
Total trout	143	168

Reach #1 – Size Distribution

Most brook trout in reach #1 were within the 101 to 150 mm (4 to 6 inch) size range. There were relatively few brook trout large enough to be deemed “catchable” a condition that limits the recreational value of the brook trout fishery in this stream. Conversely, the relative abundance of smaller fish suggests that reproduction is not the limiting factor in this stream.

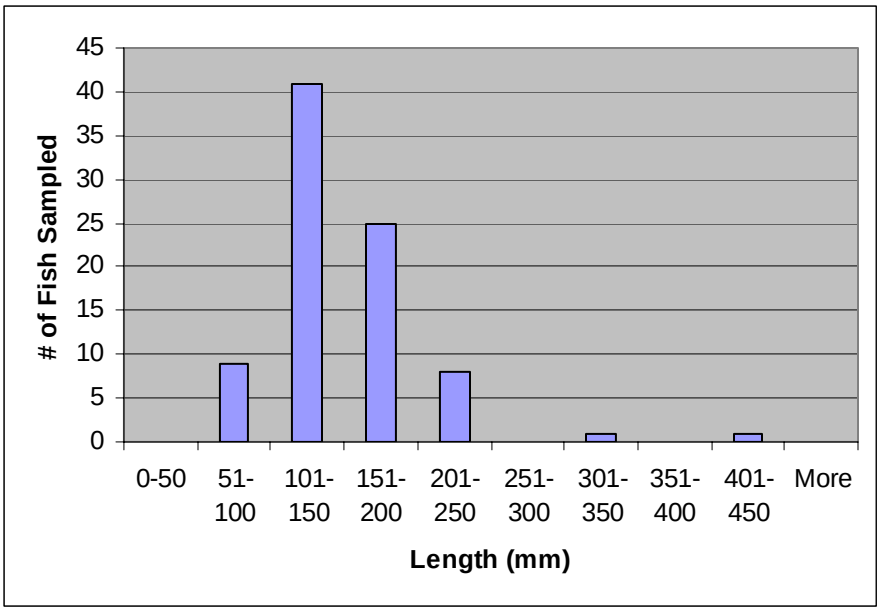

Figure 2. Size distribution of brook trout in sample reach #1.

Rainbow trout had a similar size class distribution to brook trout in this reach (Figure 3). Most fish were in the smaller size classes with very few catchable fish present. Another concerning factor is the apparent absence of a size or year class in the 8 to 12 inch range. Missing size classes are often the result of an event or stressor that substantially reduces reproductive output in a given year.

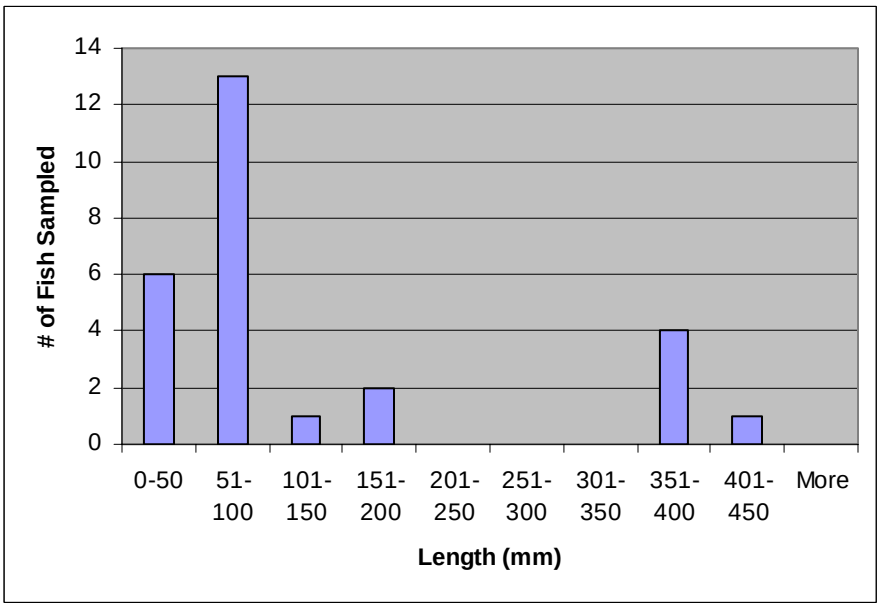

Figure 3. Size distribution of rainbow trout sampled in reach #1.

Reach #2 – Population Estimate

Electrofishing in reach #2 yielded 45 trout, including 35 brook trout and 10 rainbow trout from the 340 foot long sampling reach. Due to difficult sampling conditions, mottled

sculpin were not collected in this reach; however, observations indicate sculpin were relatively abundant. Population estimates indicated higher densities of trout than reach #1 with numbers ranging between 191 and 300 fish per 1000 feet. Once again, brook trout outnumbered rainbow trout, by a sizeable margin (Table 2).

Table 2. Population estimates for rainbow trout, brook trout and total trout at sample reach #2, North Fork Smith River on the Dunkel Ranch, 2004.

Sample	Population Estimate (per 1000 ft)	Upper 95% Confidence Limit
Rainbow trout	53	165
Brook trout	141	220
Total trout	191	300

Reach #2 Size Distribution

Size class distribution for brook trout mirrored reach #1. Most fish were less than 6 inches in length and only 5 of the 35 brook trout captured exceeded 8 inches. This size class distribution suggests that a lack of catchable fish limits the value of the recreational fishery.

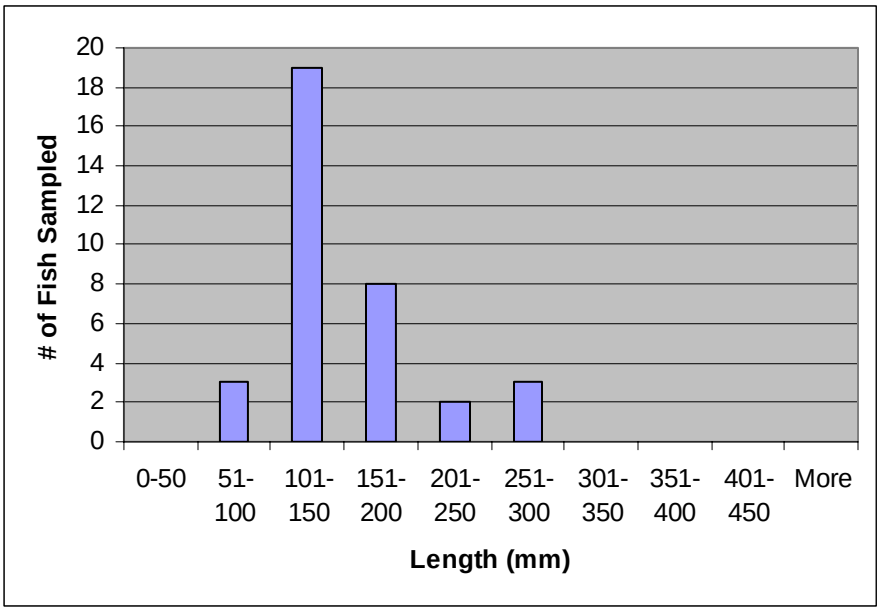

Figure 4. Size distribution of brook trout sampled in reach #2.

Size class distribution of rainbow trout in reach #2 was also similar to reach #1 (Figure 5). Most rainbow trout in this reach (70%) were juveniles and age 1 fish under 100 mm (4 in). Catchable fish were rare with only one rainbow trout greater than 8 inches captured in this reach.

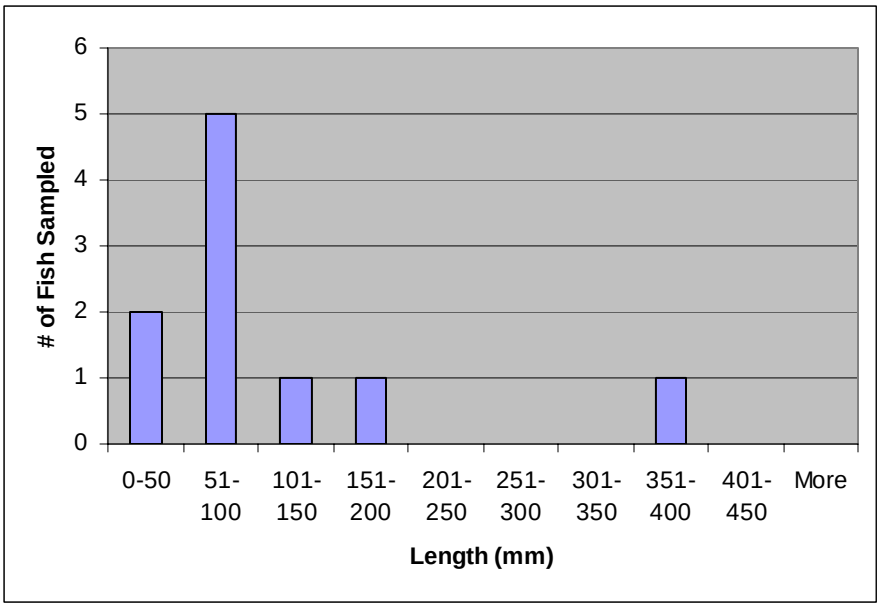

Figure 5. Size distribution of rainbow trout sampled in reach #2.

Reach #3 – Population Estimate

Sampling efforts in reach #3 resulted in the capture of 439 trout, including 36 brook trout and 3 rainbow trout in this 322 foot long sampling reach. Due to difficult sampling conditions, sculpin were not collected in this reach; however observations indicated sculpin were relatively abundant. Population estimates suggest trout number about 136 fish per 1000 feet. Brook trout comprised over 90% of the total catch in this reach (Table 3).

Table 3. Population estimates for rainbow trout, brook trout and total trout at sample reach #3, North Fork Smith River on the Dunkel Ranch, 2004.

Sample	Population Estimate (per 1000 ft)	Upper 95% Confidence Limit
Rainbow trout	9	10
Brook trout	130	167
Total trout	136	167

Reach #3 - Size Distribution

Reach # 3 had the highest proportion of catchable brook trout among the sampling reaches (Figure 6). Size classes were evenly distributed for fish larger than 100 mm. This distribution of size classes suggests conditions in this reach are suitable for all life history stages of brook trout (reproduction, rearing, and growth).

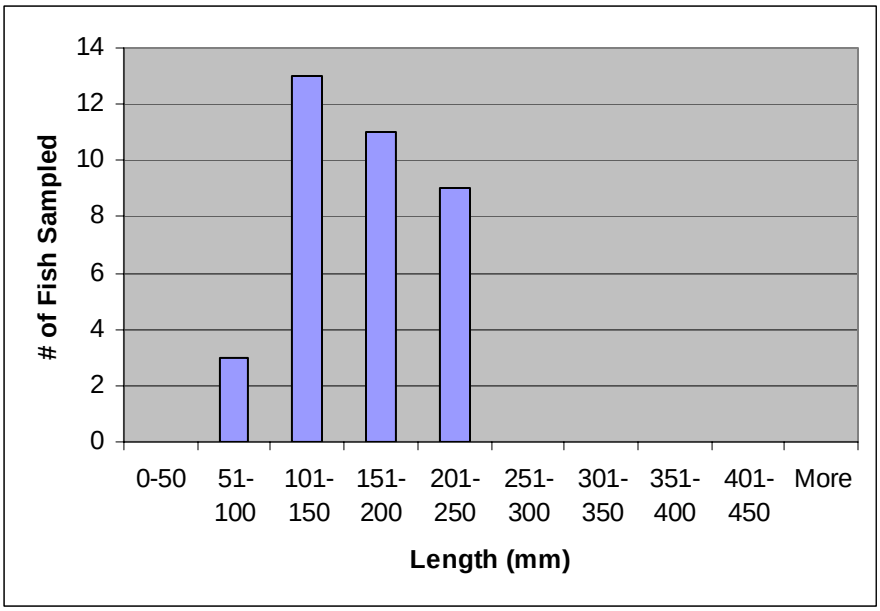

Figure 6. Size distribution of brook trout sampled in reach #3.

Rainbow trout in reach #3 consisted entire of fish less than 4 inches (Figure 7). The three rainbow trout captured were either young of the year or one-year-old fish. An apparent lack of catchable fish is a limitation in the recreational value of this fishery.

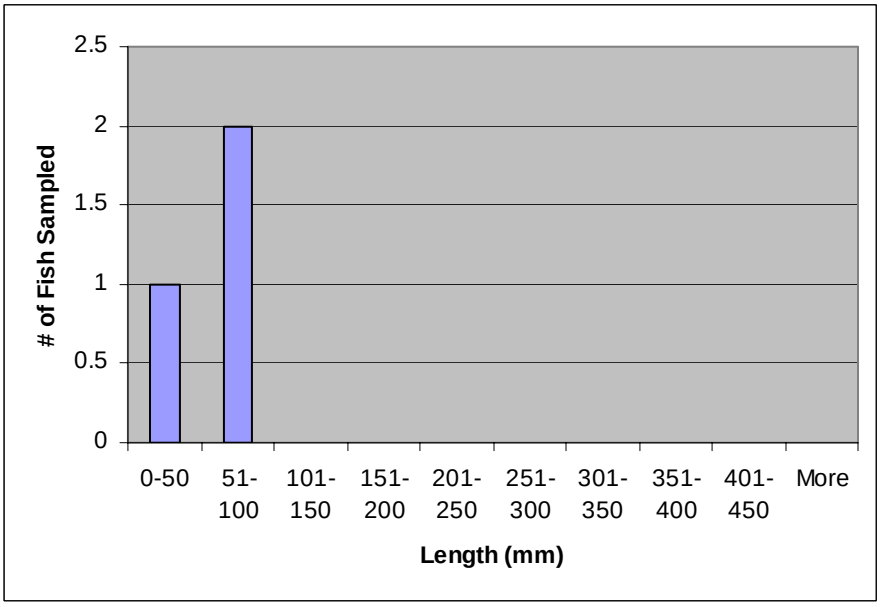

Figure 7. Size distribution of rainbow trout sampled in reach #2.

Historic Data

Fish abundance data obtained from the MFISH database provided a basis for evaluating the status and trends of this fishery. Montana Fish, Wildlife & Parks sampled in the Dunkel section of the North Fork Smith River in 1973 (Table 4). Similar to the present investigation, salmonids captured in 1973 included rainbow trout and brook trout.

However, rainbow trout comprised a higher proportion of fish in the 1970s at about 33%, compared to percentages ranging between 7 and 24% for reaches sampled in 2004.

Table 4. Population estimates for rainbow trout and brook trout in the North Fork Smith River, Dunkel section, 1973 (from MFISH database).

Sample	Population Estimate (per 1000 ft)
Rainbow trout	152
Brook trout	313

Conclusions

Comparison of 1973 and 2004 data from this reach of the North Fork Smith River indicates marked population declines for both rainbow and brook trout. Causal factors for this decline are difficult to determine given the available data, but habitat conditions did not appear to be responsible. Overall, in-stream habitat complexity appeared excellent throughout the sample reach. The channel included alternating pool/riffle sequences with abundant cover provided by a dense willow overstory. Pool formation included a combination of lateral scours, plunge pools underneath beaver dams, and backwatered pools above beaver dams. Undercut banks were abundant, providing excellent holding locations for fish. The bed substrate was primarily clean, spawning-sized gravels with some interspersed cobbles in riffle sections. Fine sediments accumulation appeared only in backwater areas above beaver dams and in small eddies, and did not appear to limit spawning habitat.

Investigations of Potential Factors Limiting Fish Populations on the Dunkel Ranch

Fish populations on the North Fork of the Smith River on the Dunkel Ranch consist primarily of non-native brook trout, low numbers of rainbow trout, whitefish and sculpin. Only one whitefish was sampled in 1,592 feet of sample reaches. Fish population estimates indicate decreasing densities of both brook and rainbow trout from 1973 estimates (MFISH database).

Water Quality

Historic mining operations may affect water quality in the North Fork Smith River, affecting fish abundance. Investigations of all mining claims within the drainage did not reveal any indications of contamination sources. These investigations did not indicate presence of tailings or acid mine leakage into the river or any tributaries of the river; therefore historic mining operations are not likely limiting the fishery.

Whirling Disease
Whirling disease has had a profound impact on fish populations in streams throughout Montana. This disease, caused by the myxosporean parasite *Myxobolus cerebralis*, has been associated with significant declines in some wild rainbow trout populations in the western United States (Anderson 2004, Vincent 1996). Moderate and consistent temperatures of spring creeks may promote severe *M. cerebralis* infections (Anderson 2004).

Observations of rainbow trout sampled in all three sample reaches did not reveal any symptoms typical of fish infected with whirling disease. No juvenile or adult rainbow trout showed blackened tails, malformation of the head or circular swimming motions. Although it cannot be fully determined if whirling disease is present in the North Fork of the Smith River without analyzing tissue samples, observations do not appear to indicate severe infection in any of the three reaches sampled. On the other hand, the relative rarity of rainbow trout in this stream presents a small sample size to observe malformations caused by infection. Therefore, a lack of observable symptoms cannot be a reliable source to exclude whirling disease as a limiting factor.

Migration Barriers
Migration barriers often prevent fish from accessing spawning habitat upstream of artificial structures such as culverts, diversions and dams. These structures prevent movement by blocking upstream movement or creating flow velocities and gradients impossible for fish to swim through. Some barriers may be considered "partial barriers", where only very large, strong fish can pass upstream. Beaver complexes may make upstream migrations more difficult for fish, although they typically do not pose significant passage barriers. Both rainbow trout and brook trout have evolved with beavers and often thrive in their presence. Beaver complexes provide thermal and nutrient inputs to stream ecosystems and increase pool diversity. No known migratory barriers exist between Lake Sutherlin upstream to the Dunkel Ranch.

Food Availability
Aquatic insects likely are the main source of forage for trout in the North Fork of the Smith River. Macroinvertebrate sampling indicated high diversity, including five mayfly species. Additional forage for larger trout includes the presence of sculpins. Preliminary investigations indicate forage is not a limiting factor for fish populations in the North Fork of the Smith River.

Temperature
The North Fork Smith River is spring fed, flowing approximately 10 miles before entering Lake Sutherlin. The stream primarily flows through a dense overstory of willows, providing excellent shade and cover. Many of the outside banks are undercut, providing additional thermal cover. Temperature sampling indicates water flowing from the spring source is 40° F. Groundwater and tributary inputs may keep surface waters cool enough to limit fish abundance and growth in upper reaches of the North Fork of the Smith River. Conversely, the relatively warmer winter temperatures resulting from thermally buffered groundwater inputs may promote instream productivity and growth

throughout the year. Additional temperature sampling in the drainage is ongoing and will provide additional insight as to whether this may be a limiting factor for the fishery.

Fishing Pressure

The North Fork of the Smith River is not a popular area for anglers, as it is difficult to fish given the dense willow overstory and poor accessibility. The current landowners do not utilize the ranch for recreational fishing. Lake Sutherlin is a stocked reservoir, providing a recreational fishery. This resource likely draws additional people away from fishing on private lands upstream of the reservoir. Therefore, it is highly unlikely angler pressure limits the fishery on the Dunkel Ranch.

Other Factors

Preliminary investigations indicate good water quality, excellent habitat, adequate forage sources, no significant migration barriers, low fishing pressure and no indicators of aquatic infections. Cold temperatures may limit productivity in the upper portions of the creek and prevent higher densities of fish in upstream reaches. Rainbow trout may utilize portions downstream of the Dunkel Ranch for spawning if water temperatures are more suitable in these reaches. Lake Sutherlin is considered a put-and-take fishery; therefore most rainbow trout stocked are likely harvested by anglers. Those that survive and attempt to spawn in the North Fork of the Smith River may not acclimate to colder water temperatures found on the Dunkel Ranch, and may prefer to spawn in downstream reaches.

Brook trout, although also found in lower densities than in 1973, comprised 80% of the fish sampled in all three reaches combined. The 1973 survey indicated 67% of the population consisted of brook trout with the remaining 33% rainbow trout. These data indicate brook trout, although declining in density, are increasing in percent of total trout population. This is typical of many systems inhabited by brook trout which tend to aggressively compete with other trout species. Rainbow trout appeared to decrease in density in the upstream direction. Many headwater systems were historically stocked with brook trout to provide additional fishing opportunities for anglers. Brook trout populations in the North Fork Smith River may be slowly declining due to cold water conditions limiting their survival.

No cutthroat trout were found in any of the sample reaches. Westslope cutthroat trout may have historically been found in this drainage; however, it appears they are either in very low numbers of have been extirpated from this area. Westslope cutthroat typically thrive in cold water environments and could be the favorable species in this stream. The presence of brook trout may make westslope cutthroat trout reintroduction efforts difficult due to their highly competitive nature. Brook trout are known to out-compete native cutthroat trout, and have been a major factor in the demise of their current distribution.

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