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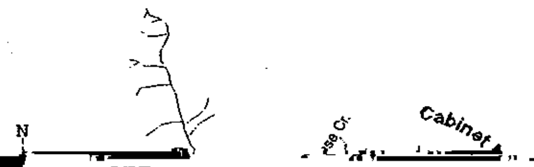
Habitat Use by Juvenile Bull Trout in Belt-Series Geology Watersheds of Northern Idaho

Abstract

Bull trout (*Salvelinus confluentus*), a native char of the Pacific Northwest, has declined in abundance and distribution in recent years. Little is known about the habitat use by salmonids in streams with substrate characterized by Belt-Series geology. Such [illegible] managers to evaluate potential effects of land use practices on the species, or to enhance or protect



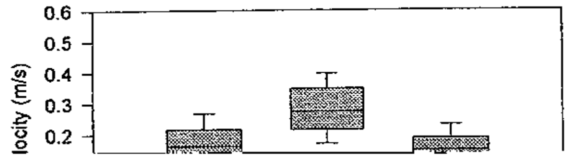
Oreille (Figure 1; Table 1). Details of the study streams are presented in Saffel (1994). Eighteen stream reaches to be sampled were systematically placed within the stream distance available to adfluvial bull trout. Length of study reaches was

TABLE 1. Key physical, chemical, and biological attributes of the six study streams. Geologic types are, UGB, unglaciated belt; GB, glaciated belt; and GM, granitic mix. Other trout species are: ctt, cutthroat trout; rbt, rainbow trout; brt, brook [illegible] measured on 27 and 28 August

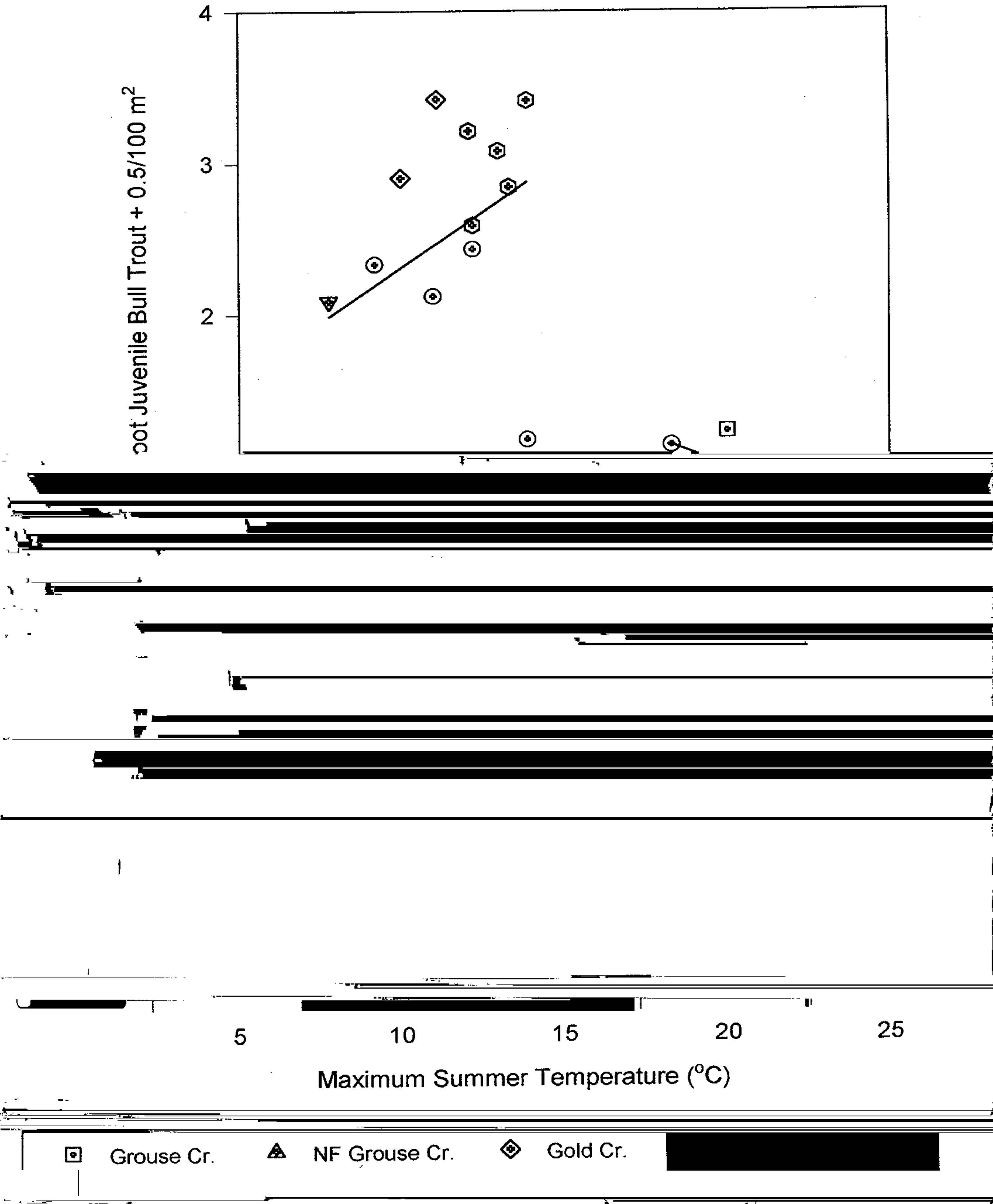
velocity and substrate diversity were calculated of a habitat type. The null hypothesis was that

Results

a)



volume of large woody debris).



4
3
2
Juvenile Bull Trout + 0.5/100 m2
5
10
15
20
25
Maximum Summer Temperature (°C)
Grouse Cr.
NF Grouse Cr.
Gold Cr.
[redacted]

reaches (df = 17) of six streams.

Independent Variable (X)	r^2	F	Probability	Equation
No. of pocket pools/100 m	0.33	7.87	0.01	Y = 1.26 + 0.06(X)
Mean bottom velocity	0.04	0.59	0.46	Y = 1.33 + 3.75(X)
Mean depth	0.06	1.01	0.33	Y = 0.84 + 0.09(X)
Substrate diversity	0.05	0.88	0.36	Y = 0.87 + 0.35(X)
Volume of large woody debris (log...)	0.09	1.6	0.22	Y = 1.63 + 1.65(X)

4). Density of juvenile bull trout in the four reaches within Grouse Creek and North Fork Grouse Creek was poorly described by the linear model and decreased the amount of variation explained (r^2). These four reaches differed from the others in that maximum summer temperatures were > 18°C whereas the other reaches had maximum summer temperatures of <14°C.

Using multiple best subsets linear regression, transformed juvenile bull trout density (Y) was best predicted by the model: $Y = 2.919 - 0.119(X_1) + 0.055(X_2)$ where X_1 = maximum summer temperature, and X_2 = number of pocket pools/100 m ($R^2 = 0.64$; df = 16; $P < 0.001$; Table 5; Figure 5). Number of pocket pools accounted for 33%

of the variation and maximum summer temperature accounted for 31%. Colinearity between number of pocket pools and maximum summer temperature was insignificant ($r = -0.02$; $P > 0.90$). Model numbers 2 through 5 (Table 5) were also significant, however, in each case either maximum summer temperature or number of pocket pools were included in the model and accounted for most of the variation.

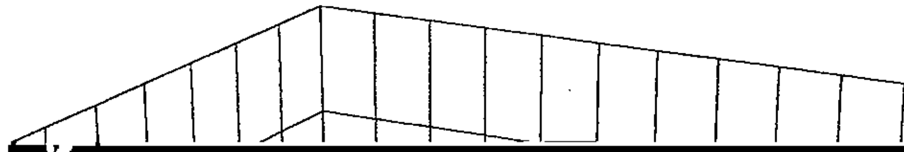
The interpretation of the temperature data in this study is limited because of the dependence

the upper reaches, warm stream temperatures (13.9 and 18.3°C) in the middle reaches, and low temperatures (12.2°C) at the lowermost reach, where the stream was influenced by a large, cold water spring. Densities of bull trout were highest in the upper and lowermost reaches where temperatures were coolest, and lowest in the middle two reaches.

Discussion

Age 0 bull trout used habitat differently than age ≥ 1 bull trout. Age 0 fish were found primarily in the channel margins of runs and riffles, whereas the older juveniles selected deeper, slower pool areas and exhibited an avoidance of riffles and cover. Segregation of habitat between larger, older

salmonids and younger, smaller salmonids has been reported for bull trout in the upper Arrow Lakes drainage, British Columbia (McPhail and Murray 1979), for age 0 and older char (bull trout and brook trout) in Sun Creek, Oregon (Dambacher et al. 1992) and for steelhead trout (*O. mykiss*) and chinook salmon (*O. tshawytscha*) in two Idaho streams (Everest and Chapman 1972). Use of higher velocity, main channel areas for food acquisition requires stronger swimming, which may also exclude smaller fish. Channel margins often provide the necessary habitat for salmonid fry to



because they may demonstrate a fixed-site territoriality (Pratt 1984). Pratt (1985) suggested that densities of bull trout may be controlled by the

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refuge from higher velocities. Unlike cutthroat

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1934; MacCrimmon and Campbell 1969; Meisner 1990). In this study, stream reaches with maximum summer temperatures below 13.9°C showed

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temperature. Little is known about how tempera-

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survival and growth was between 8 to 10°C

Creek is largely spring fed with low temperatures

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