South Fork Clearwater Summer Steelhead
Population Viability Assessment

The South Fork Clearwater steelhead population (Figure 1) is part of the Snake River Steelhead ESU which has six major population groupings, including: Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River. The ESU contains both A and B run steelhead. The South Fork Clearwater population is a "B" run and resides in the Clearwater River MPG.

The ICTRT classified the South Fork Clearwater population as an "intermediate" population (Table 1) based on historical habitat potential (ICTRT 2005). A steelhead population classified as intermediate has a mean minimum abundance threshold of 1000 naturally produced spawners with sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe.

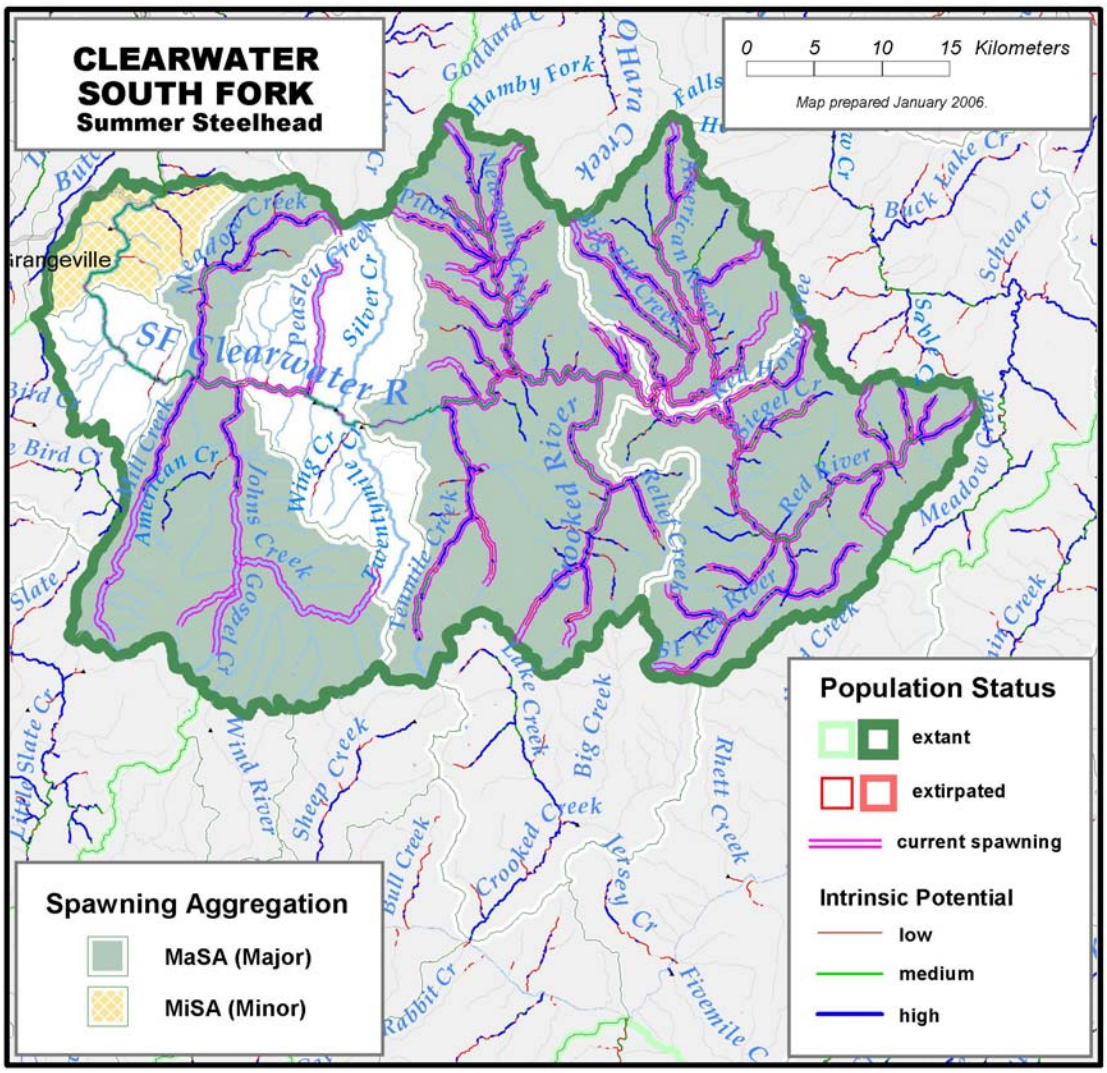

Figure 1. South Fork Clearwater steelhead major and minor spawning areas.

Table 1. South Fork Clearwater steelhead basin statistics

Drainage Area (km2)	2,252
Stream lengths km* (total)	1,056
Stream lengths km* (below natural barriers)	726
Branched stream area weighted by intrinsic potential (km2)	0.665
Branched stream area km2 (weighted and temp. limited)	0.665
Total stream area weighted by intrinsic potential (km2)	2.445
Total stream area weighted by intrinsic potential (km2) temp limited	2.445
Size / Complexity category	Intermediate / "B" (dendritic structure)
Number of MaSAs	4
Number of MiSAs	1

*All stream segments greater than or equal to 3.8m bankfull width were included
**Temperature limited areas were assessed by subtracting area where the mean weekly modeled water temperature was greater than 22ºC.

Current Abundance and Productivity

Current abundance (number of adults spawning in natural production areas) is unknown for this population. However, the ICTRT has developed a generic dataset for extant "B" run steelhead populations above Lower Granite Dam to be applied as a surrogate for these populations. The dataset was generated using the time series of "B" run natural fish at Lower Granite Dam (TAC report 2002) and dividing by nine (the number of extant "B" run populations above the dam). An average age structure (Yuen and Sharma 2005) was used to calculate returns, and the dataset was delimited at 750 spawners. The average size category across all nine populations is intermediate; therefore the generic abundance and productivity estimates are based on a threshold of 1000 spawners.

Recent year natural spawners include returns originating from naturally spawning parents. Some strays may also be spawning naturally, as well as hatchery-origin adults returning to the watershed. The proportion of spawners originating from naturally spawning parents is unknown (Table 2).

Abundance in recent years has been moderately variable, the most recent 10-year geometric mean number of natural spawners was 272 (Table 2). During the period 1986-1998, returns per spawner for the generic "B" run steelhead dataset ranged from 0.24 (1990) to 6.63 (1998). The most recent 13-year SAR adjusted and delimited (at 750 spawners) geometric mean of returns per spawner was 0.85 (Table 2).

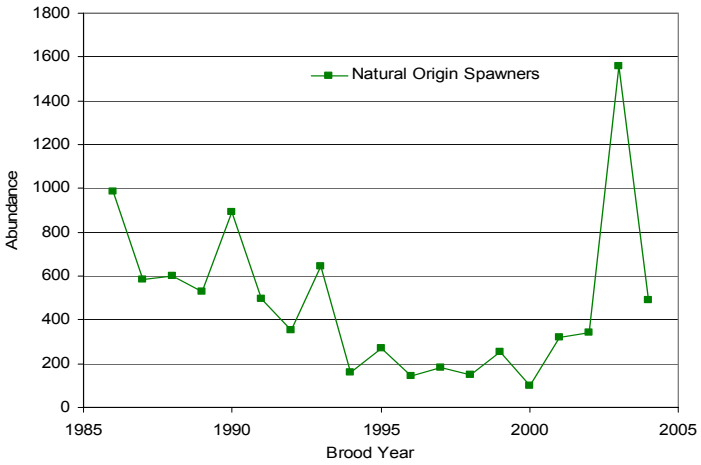

Figure 2. Generic "B" run steelhead abundance (1986-2004). Estimates based on dam counts.

Table 2. Generic "B" run steelhead abundance and productivity measures. These data are used as a surrogate for "B" run steelhead where no population-specific dataset exists. FOR GENERAL EVALUATION ONLY.

10-year geomean natural abundance	272
13-year return/spawner productivity	0.82
13-year return/spawner productivity, SAR adj. and delimited*	0.85
13-year Bev-Holt fit productivity, SAR adjusted	1.30
13-year Lambda productivity estimate	1.00
Average proportion natural origin spawners (recent 10 years)	1.0
Reproductive success adj. for hatchery origin spawners	n/a

*Delimited productivity excludes any spawner/return pair where the spawner number exceeds 750. This approach attempts to remove density dependence effects that may influence the productivity estimate.

Comparison to the Viability Curve

- Abundance: 10-year geometric mean natural spawners
- Productivity: 13-year return/spawner adjusted for marine survival and delimited at 750 spawners
- Curve: Hockey-Stick curve
- Conclusion: Generic "B" run steelhead populations are at **HIGH RISK** with respect to abundance and productivity.

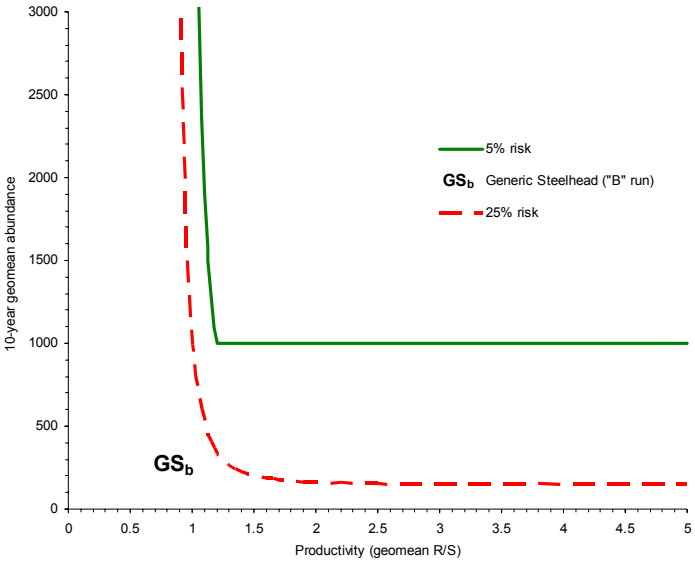

Figure 3. Generic "B" run steelhead abundance and productivity metrics against the viability curve for this ESU. This is not a population specific estimate—INTENTED FOR GENERAL EVALUATION ONLY.

Spatial Structure and Diversity

The ICTRT has identified four major spawning areas (MaSAs) and one minor spawning area (MiSA) within the South Fork Clearwater steelhead population. There are no modeled temperature limitations for the MaSA in this population. Spawning is widely distributed throughout the population. Spawning has been documented in all of the larger tributaries to the South Fork Clearwater River.

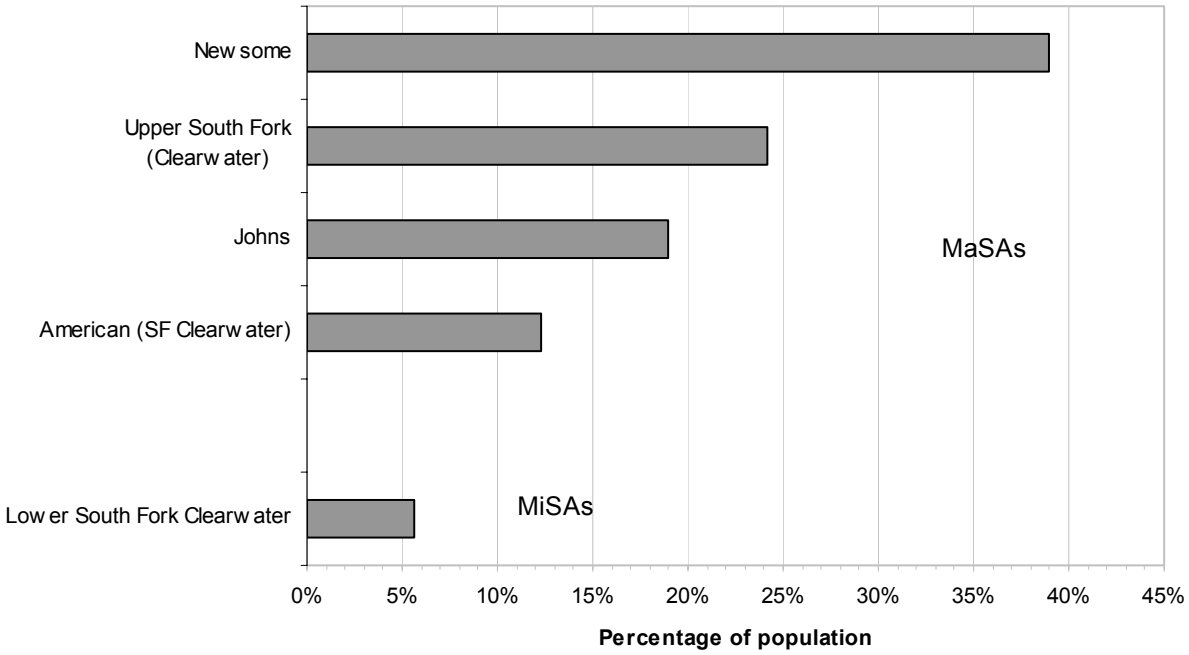

Figure 4. Proportion of major and minor spawning areas that make up the South Fork Clearwater River steelhead population. There are no modeled temperature limitations for the MiSAs/MaSAs in this population.

Factors and Metrics

A.1.a. Number and spatial arrangement of spawning areas.
The South Fork Clearwater River steelhead population contains four major spawning areas and one minor spawning area (Figs. 1 and 5). There is extensive and complex branching of the spawning areas within the population. The metric is rated *Very Low* risk.
The ICTRT has identified four major spawning areas (MaSAs) and one minor spawning area (MiSAs) within the River steelhead population. A limited number of spawner surveys have been conducted across the population.

A.l.b. Spatial extent or range of population.
Habitat use by steelhead was determined from steelhead redd counts and juvenile surveys conducted by IDFG. Redd count data for the population is very limited, especially with respect to the number and frequency of surveys. Those surveys indicate spawning is occurring in a large portion of the mainstem South Fork Clearwater River and in numerous tributaries (Figs. 1 and 5). Although a Very Low Risk rating for this metric could be inferred from the data, the metric is rated as *Low Risk*. The redd distribution data is not current and may not reflect the true current status of the population. Because of this uncertainty in the data the higher risk rating was applied.

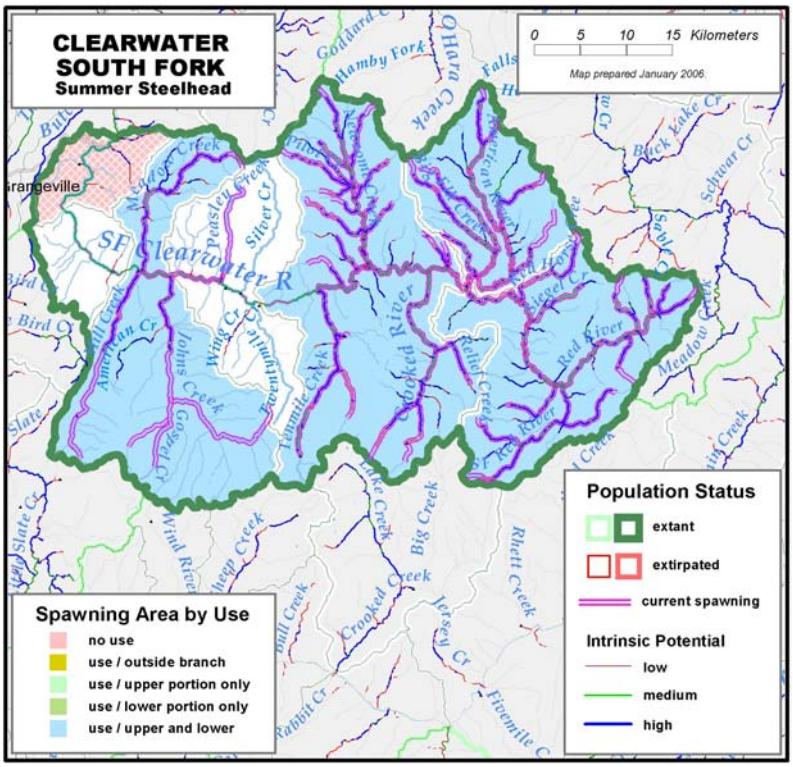

Figure 5. South Fork Clearwater River steelhead distribution.

A.1.c. Increase or decrease in gaps or continuities between spawning areas.
There has been no or very little change in gaps between spawning aggregates when comparing current and historic distributions. However, the population is rated at *Moderate* risk because the single MiSA, at the downstream-most extent of the population currently is not occupied. Loss of occupancy in that MiSA results in a gap between this and adjacent populations greater than the threshold established for this metric.

B.1.a. Major life history strategies.

There are limited data to allow any direct comparisons between historic life history strategies and current strategies. Anthropogenic impacts have resulted in habitat changes from historic conditions. Fish movement pathways and continuity of habitat for juvenile steelhead have likely been influenced by flow and temperature changes. Although flow and temperature changes may have influenced life history strategies, it is not likely they have influenced major life history strategies or pathways. Anadromous *O. mykiss* persists in the population, only the adult summer run timing was present historically and it is presumed that both A-run and B-run type fish historically occupied the population. It appears all historic major life history pathways are present, although the mean and variability may have shifted slightly. The population was rated at *Low Risk* for this metric.

B.1.b. Phenotypic variation.

There is no direct evidence for loss or substantial change in phenotypic traits from historic conditions. The changes in flow patterns and temperature profiles discussed above (metric B.1.a) likely have reduced the variation in both juvenile migration and adult spawn timing. Reduced flows and elevated water temperatures result in a narrower window for successful smolt outmigration as well as truncation of adult spawn timing. Adult entry into freshwater and arrival on the spawning grounds likely has not changed however, adult entry into the Snake River and migration through the lower Snake River in late summer and early fall is delayed because of elevated mainstem temperatures. It is hypothesized that adult upstream migration has changed from historic conditions due to temperature effects; magnitude of the change is unknown. The population is rated at *Low Risk* for this metric because of the substantial change in adult run timing and likely changes in the mean and variability of juvenile migration and movement patterns.

B.1.c. Genetic variation.

Genetic ratings for populations were based on IC-TRT analysis of allozyme data presented in Winans et al. (2001) and Waples et al. (1993) and microsatellite data presented in Moran (2003). This metric has tentatively been rated as *Low* risk. This population was clearly differentiated from other populations and demonstrated no similarity to the single hatchery sample. Further analysis is necessary because of the extensive releases of hatchery fish, and the release of out-of-population hatchery fish into the population.

B.2.a. Spawner composition.

No surveys are conducted to determine the proportion of naturally spawning fish that are hatchery origin. Significant to the assessment of spawner composition for this population is the long history of outplanting hatchery steelhead. Steelhead fry, fingerlings, smolts and adults have been released into the population at least since 1969. The majority of fish released, and possibly all, were Dworshak hatchery B-run stock. Some of the hatchery fish releases are for harvest augmentation, and there is substantial of harvest of these fish within and outside of the population. All fish released for harvest augmentation are marked with an adipose fin clip. In recent years unclipped hatchery steelhead smolts were released for supplementation purposes, and these releases are expected to continue into the near-term. The contribution of supplementation releases and un-harvested marked hatchery fish to natural production is unknown.

(1) *Out-of-ESU strays*. This sub-metric was not rated because there is no data. The number of out-of-DPS strays in the population likely is zero or negligible, based on observations in the downstream Clearwater Lower Mainstem steelhead population.

(2) *Out-of-MPG strays from within the ESU*. This sub-metric was not rated because there is no data.

(3) *Out of population within MPG strays*. Neither the occurrence nor the number of out-of-population-within-MPG strays is known. However, out-of-MPG hatchery steelhead are deliberately released into the population under current management programs to supplement the natural population. This sub-metric is rated as High Risk because of the duration (multiple generations) of supplementation releases and the potential for the natural spawning population to consist of a high proportion of hatchery-origin fish.

(4) *Within-population hatchery spawners.* This sub-metric was not rated. The overall metric is rated High risk as a result of the rating for sub-metric (3).

B.3.a. Distribution of population across habitat types.

The South Fork Clearwater River steelhead population intrinsic potential habitat historically was distributed across three EPA level IV ecoregions (Table 3 and Fig. 6). Only one ecoregion contained more than 10% of the total population historical branched spawning area and was considered in the rating of this metric. The metric was rated *Low Risk* as there was no substantial change in ecoregion occupancy. This is the lowest risk rating the population could achieve for this metric.

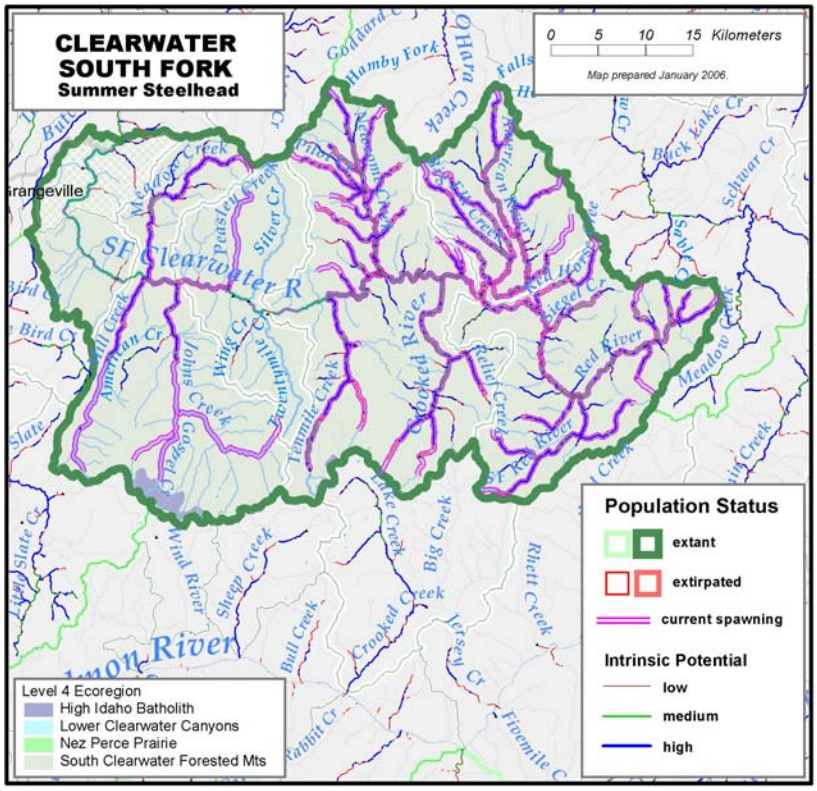

Figure 6. South Fork Clearwater steelhead population distribution across various ecoregions.

Table 3. South Fork Clearwater steelhead—proportion of spawning areas across various ecoregions.

Ecoregion	% of historical branch spawning area in this ecoregion (non-temperature limited)	% of currently occupied spawning area in this ecoregion (non-temperature limited)
Lower Clearwater Canyons	6.8	0.0
Nez Perce Prairie	8.2	0.0
South Clearwater Forested Mountains	84.9	100.0

B.4.a. Selective change in natural processes or selective impacts.

Hydropower system: The hydrosystem and associated reservoirs impose some selective mortality on smolt outmigrants and adult migrants; the selective mortality is not likely to remove more than 25% of the affected individuals. The likely impacts are rated as *Low Risk* for this action.

Harvest: Overall harvest impacts on steelhead populations are unknown. There are no freshwater recreational fisheries directly targeting naturally produced steelhead; indirect mortalities are expected to occur in some fisheries selective for hatchery fish. It is unlikely that the incidental mortalities from recreational fisheries are selective. Harvest of steelhead in mainstem Columbia River gillnet fisheries may be selective, related to the mesh size of gillnets used. Further assessment is necessary to determine the extent of selective mortality occurring related to harvest. This action was rated as *Moderate Risk* because the population has been affected over many generations; the action is expected to continue into the future and because of the high degree of uncertainty in overall effect.

Hatcheries: Hatchery programs within this population and hatchery programs in proximate populations are not suspected to have a selective impact on this population. The selective impact of hatchery actions was rated as *Low* risk.

Habitat: Habitat changes resulting from land use activities in the basin may impose some selective mortality, but the extent is unknown. It is likely that any selective mortality impacts would affect a non-negligible portion of the population. This selective impact was rated *Low Risk*.

Spatial Structure and Diversity Summary

Overall spatial structure and diversity has been rated *Moderate Risk* for the South Fork Clearwater River steelhead population (Table 4). This risk rating is driven by the large numbers and potentially high proportions of hatchery steelhead in the population.

Table 4. Spatial structure and diversity scoring table. "NR" scores indicate the metric was not rated.

Metric	Risk Assessment Scores				
	Metric	Factor	Mechanism	Goal	Population
A.1.a	VL (2)	VL (2)	Low Risk (Mean=1.00)	Low Risk	**Moderate**
A.1.b	L (1)	L (1)			
A.1.c	M (0)	M (0)			
B.1.a	L (1)	L (1)	Low Risk (1)	Moderate Risk	
B.1.b	L (1)	L (1)			
B.1.c	L (1)	L (1)			
B.2.a(1)	NR	H (-1)	High Risk (-1)		
B.2.a(2)	NR				
B.2.a(3)	H (-1)				
B.2.a(4)	NR				
B.3.a	L (1)	L (1)	Low Risk (1)		
B.4.a	L (1)	L (1)	Low Risk (1)		

Overall Viability Rating

The South Fork Clearwater River steelhead population does not currently meet viability criteria because Abundance/Productivity risk tentatively has been rated as High Risk and does not meet the criteria for a viable population (Fig. 7). Improvement in abundance/productivity status (reduction of risk level) will need to occur before the population can be considered viable. Also, the population currently does meet the criteria for a "maintained" population and can not achieve Highly Viable status unless overall spatial structure/diversity rating risk is reduced. Spatial structure/diversity risk is most influenced by the presence of hatchery fish in the population.

		Spatial Structure/Diversity Risk			
		Very Low	**Low**	**Moderate**	**High**
Abundance/ Productivity Risk	**Very Low** (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M	
	High (>25%)			South Fork Clearwater	

Viability Key: HV – Highly Viable; V – Viable; M – Maintained; Shaded cells – does not meet viability criteria.

Figure 7. Viable Salmonid Population parameter risk ratings for the South Fork Clearwater River steelhead population. This population does not meet viability criteria.

Generic "B" Run Steelhead – Data Summary

Data type: Dam counts
SAR: ???

Table 5. Generic "B" run steelhead data (used for curve fits and R/S analysis). Data used in the productivity calculation are bolded.

Brood Year	Spawners	%Wild	Natural Run	Nat. Rtns	R/S	Rel. SAR	Adj. Rtns	adj R/S
1986	984	1	984	573	0.58	1.71	978	0.99
1987	**585**	**1**	**585**	**451**	**0.77**	**0.65**	**295**	**0.50**
1988	**597**	**1**	**597**	**453**	**0.76**	**1.52**	**688**	**1.15**
1989	**529**	**1**	**529**	**317**	**0.60**	**1.28**	**405**	**0.77**
1990	891	1	891	211	0.24	2.16	456	0.51
1991	**498**	**1**	**498**	**186**	**0.37**	**1.42**	**264**	**0.53**
1992	**353**	**1**	**353**	**162**	**0.46**	**1.27**	**206**	**0.58**
1993	**641**	**1**	**641**	**179**	**0.28**	**2.49**	**444**	**0.69**
1994	**160**	**1**	**160**	**190**	**1.19**	**0.67**	**127**	**0.80**
1995	**272**	**1**	**272**	**189**	**0.69**	**0.99**	**187**	**0.69**
1996	**143**	**1**	**143**	**258**	**1.80**	**0.52**	**134**	**0.94**
1997	**183**	**1**	**183**	**585**	**3.20**	**0.49**	**286**	**1.56**
1998	**147**	**1**	**147**	**977**	**6.63**	**0.35**	**341**	**2.31**
1999	256	1	256					
2000	101	1	101					
2001	317	1	317					
2002	339	1	339					
2003	1558	1	1558					
2004	490	1	490					

Table 6. Geomean abundance and productivity measures. Boxed values were used in evaluating the current status of the "B" run steelhead populations.

	R/S measures				Lambda measures	Abundance
	Not adjusted		SAR adjusted		Not adjusted	Nat. origin
delimited	median	75% threshold	median	75% threshold	1986-1997	geomean
Point Est.	1.56	0.94	1.01	0.85	1.00	272
Std. Err.	0.40	0.28	0.22	0.14	0.17	0.24
count	6	11	6	11	13	10

Table 7. Poptools stock-recruitment curve fit parameter estimates. Values potentially indicating a non-fit are highlighted in gray.

	Not adjusted for SAR							Adjusted for SAR						
SR Model	a	SE	b	SE	adj. var	auto	AICc	a	SE	b	SE	adj. var	auto	AICc
Rand-Walk	0.82	0.21	n/a	n/a	0.40	0.72	39.8	0.83	0.10	n/a	n/a	0.14	0.49	20.6
Const. Rec	308	48	n/a	n/a	n/a	n/a	26.9	313	50	n/a	n/a	n/a	n/a	27.6
Bev-Holt	50.00	138.74	314	52	0.12	0.79	30.5	1.30	0.41	994	564	0.15	0.14	21.1
Hock-Stk	2.54	0.11	121	0	0.12	0.78	30.3	0.83	0.09	1418	0	0.14	0.49	24.1
Ricker	2.48	0.88	0.00241	0.00066	0.21	0.71	34.1	1.13	0.25	0.00067	0.00041	0.15	0.19	21.6

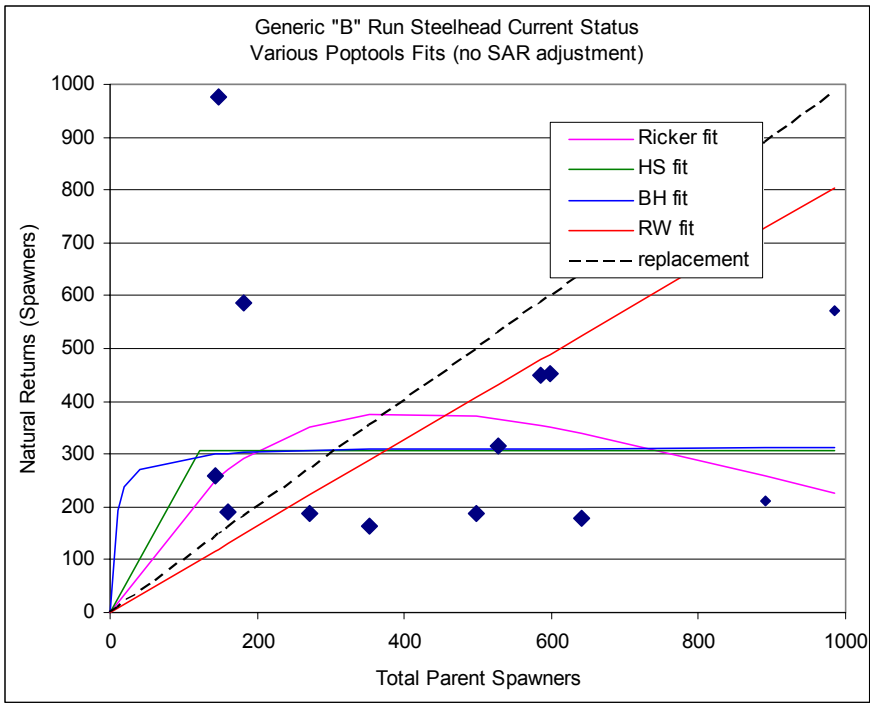

Figure 8. Stock recruitment curves for a generic "B" run steelhead population. Data not adjusted for marine survival.

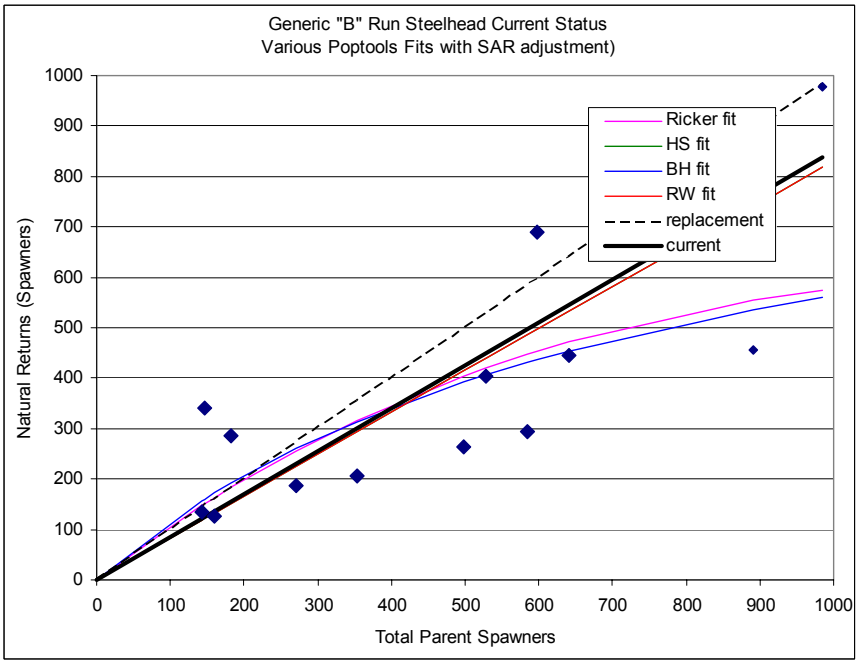

Figure 9. Stock-recruitment curves for a generic "B" run steelhead population. Data adjusted for marine survival.