SILVER and STALKER CREEKS

Introduction

Silver Creek is a tributary to the Little Wood River in Blaine County, Idaho. Silver Creek originates at the confluence of two main spring creek tributaries, Stalker Creek and Grove Creek on the Nature Conservancy's Silver Creek Preserve. Silver Creek and its tributaries provide a popular destination fishery for rainbow and brown trout. Several regulation scenarios exist throughout the Silver Creek drainage allowing multiple angling opportunities including fly fishing only, catch and release; no bait, barbless hook, catch and release; bait allowed, none between 12 inches and 16 inches; and general rules. The Silver Creek fishery, including it's tributaries, has been the focus of several studies over the past 10 years including; monitoring brown trout and rainbow trout movements (Young et al. 1997), describing the fish community structure (Wilkison 1996), analyzing genetic population structure (Williams et al. 2000), and evaluating whirling disease presence (Spall et al. 1996). Standard IDFG population monitoring transects and survey protocols were defined in 2004.

In 2007 a standard population monitoring survey was completed to evaluate long-term trends in population abundance and structure.

Methods

The Silver Creek system was sampled in 2007 at three locations encompassing Silver Creek and Stalker Creek to evaluate trends in population abundance and structure. Sampled segments included: lower Stalker Creek; Silver Creek, cabin site; and Silver Creek, Martin Bridge (Appendix C). Sample efforts were conducted using a drift boat electrofishing setup (Appendix A). Fish were sampled on two passes separated by seven days. Sampling was conducted during daylight hours on the lower Stalker Creek reach and during dark hours on the remaining two reaches.

Fish were identified, measured (TL), weighed (g), marked, and released during the first sampling pass - marking run. Weights were taken only during the marking run. Caudal fin clips were used to mark rainbow and brown trout equal or greater than 100 mm for identification in the recapture run. Other collected species were not marked. Rainbow and brown trout were counted, measured, and observed for marks in the second (recapture run) electrofishing pass.

Estimates of rainbow trout and brown trout abundance were made using a modified-Peterson mark-recapture estimator (Ricker 1975). Calculations were completed in FA+ (Fisheries Analysis Software, Version 1.0.8). Estimates were calculated in 100 mm increments for fish equal or greater than 100 mm total length. A minimum of five recaptures was required to complete estimates. Length groups were pooled when less than five recaptures were made within an individual length group. Estimates of rainbow and brown trout equal or greater than 100 mm were reported for evaluation of long term trends.

Marking run data were used to describe the sampled fish community and estimate population parameters. Estimated population parameters included relative stock density and relative weight. Relative stock densities (RSD – 400) were determined for rainbow trout and brown trout collected in each transect to describe the available preferred component of the fishery. RSD-400 was calculated as the number of fish ≥ 400 mm divided by the number of fish ≥ 200 mm (Ney 1993). Relative weight was calculated for rainbow trout and brown trout as a measure of fish condition and reported as mean relative weight by 100 mm length groups (Anderson and Neumann 1996, Simpkins and Hubert 1996).

Population estimates and relative stock densities (RSD-400) from 2007 were compared to population estimates and RSD-400 values generated from 2001 and 2004 data (Warren et al. 2001, Ryan and Megargle 2004). Standard locations were sampled among all years. Comparisons of population estimates by species were for all fish equal or greater than 100 mm.

Mean length at age and annual mortality of rainbow and brown trout were estimated from collected otoliths. Otoliths were collected from representative groups of rainbow trout and brown trout. One sample group for each species was collected from a combination of all sampled transects. Age was estimated from otoliths by cleaning and reading in whole view using a dissecting microscope at 30X-40X magnification. Otoliths were cut using a rotary cutting tool or broken and read in cross-section if the whole view was not considered to be clear. Estimated ages were applied to an age-length key, extrapolated to all sampled fish in the marking pass, and used to determine mean length at age (Devries and Frie 1996). Mean length at age was determined for all age classes sampled. Mean length at age four was reported as a benchmark of growth over time. Catch curves were used to estimate mortality and survival. (Van Den Avyle 1993).

Catch Curves were generated in FAST (Fisheries Analysis and Simulation Tools, Version 2.1).

Habitat data was collected on a separate date following electrofishing efforts. Transect lengths and widths were measured with an electronic rangefinder (Leica, LRF 900 Rangemaster) and or measuring tape at set intervals. Interval distance was chosen randomly prior to conducting measurements. Transects waypoints were marked for future replication using a Magellan Sporttrack Topo Global Positioning System (GPS) (Appendix C).

Results

Silver Creek mark and recapture electrofishing samples were completed from 19 to 21 June, 2007 and 26 to 28 June, 2007, respectively. Habitat data was collected on 7 July, 2007. Transect length at the lower Stalker Creek; Silver Creek, Cabin site; and Silver Creek, Martin Bridge locations were 795 m, 1190 m, and 840 m, respectively. Mean transect widths at the lower Stalker Creek, Silver Creek - cabin site, and Silver Creek - Martin Bridge locations were 9.00 m, 29.74 m, and 18.12 m, respectively.

Lower Stalker Creek

Fish sampled in the Stalker Creek transect included wild rainbow trout (39%), brown trout (43%), bridgelip sucker (13%), longnose dace (3%), and speckled dace (3%) (Table SILVERSTALKER 07 CATCH SUMMARY).

Table. SILVERSTALKER 07 CATCH SUMMARY – Silver Creek and Stalker Creek 2007 catch summary by location and species. Includes only marking run data. Summary includes total caught (N), relative abundance in catch (% CATCH), mean total length (mm), standard deviation of total length (SD), mean weight (g), and standard deviation of weight (SD).

				TOTAL LENGTH		WEIGHT	
SITE	SPECIES	N	% CATCH	MEAN	SD	MEAN	SD
Stalker	Bridgelip sucker	39	12.79%	153	60	59	66
Stalker	Brown trout	131	42.95%	226	145	238	324
Stalker	Longnose dace	8	2.62%	71	19	4	3
Stalker	Rainbow trout	119	39.02%	178	76	84	125
Stalker	Specked dace	8	2.62%	74	7	4	1
Cabin	Brown trout	158	39.30%	254	145	286	360
Cabin	Longnose dace	4	1.00%	82	17	7	3
Cabin	Rainbow trout	236	58.71%	178	82	90	137
Cabin	Redside shiner	1	0.25%	80	--	5	--
Cabin	Paiute sculpin	2	0.50%	75	7	6	3
Cabin	Speckled dace	1	0.25%	76	--	4	--
Martin	Bridgelip sucker	163	34.98%	187	60	100	74
Martin	Brown trout	179	38.41%	301	120	363	316
Martin	Longnose dace	11	2.36%	72	14	4	2
Martin	Rainbow trout	41	8.80%	210	87	132	127
Martin	Redside shiner	61	13.09%	79	14	6	3
Martin	Speckled dace	11	2.36%	67	8	4	1

Mean total length of sampled rainbow trout was 178 mm and ranged from 105 mm to 395 mm (Figure-SILVERSTALKER 07 STALKER RBT LF). Relative stock density (RSD – 400) was zero (Figure SILVERSTALKER 07 RSD BY YEAR). Relative weight of rainbow trout ranged from 0.93 to 0.79 for fish greater than or equal to100 mm and decreased with total length. Rainbow trout annual mortality was estimated at 55% for ages one to six (Figure-SILVERSTALKER 07 STALKER RBT CATCH CURVE). Mean length of rainbow trout at age four for all transects was estimated at 345mm (Figure-SILVERSTALKER 07 LENGTH AT AGE).

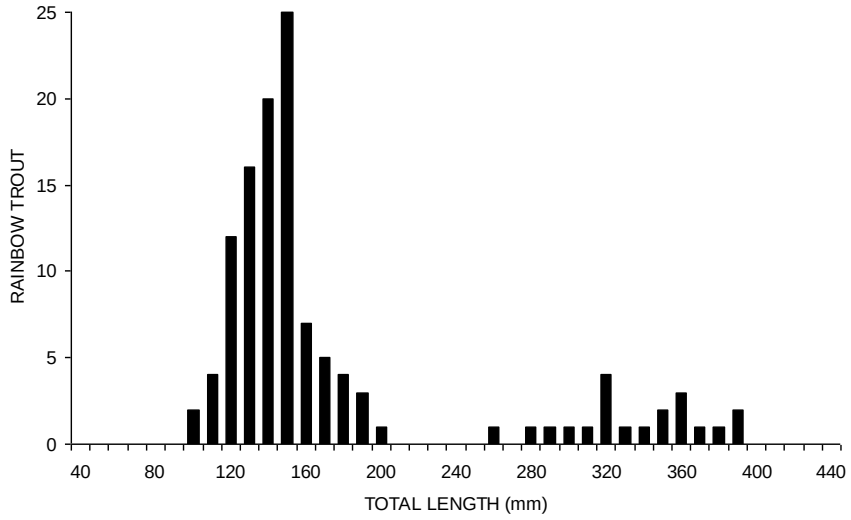

Figure-SILVERSTALKER 07 STALKER RBT LF. Length frequency histogram of rainbow trout collected in the Stalker Creek, Idaho 2007

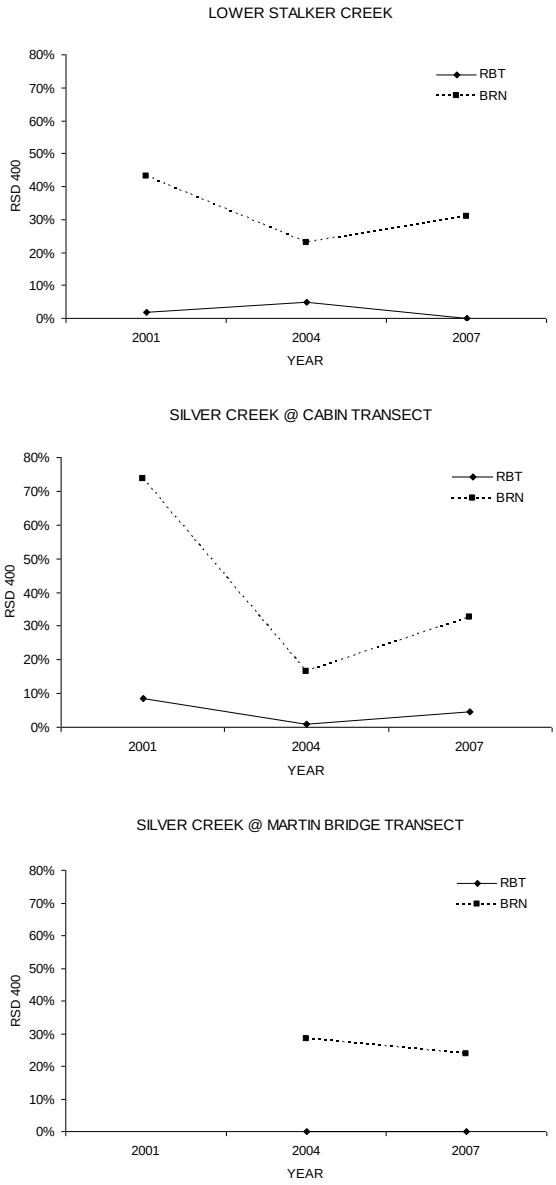

Figure SILVER STALKER 07 RSD BY YEAR. Relative stock density (RSD 400) of rainbow and brown trout by survey transect and year in Stalker Creek and Silver Creek, Idaho.

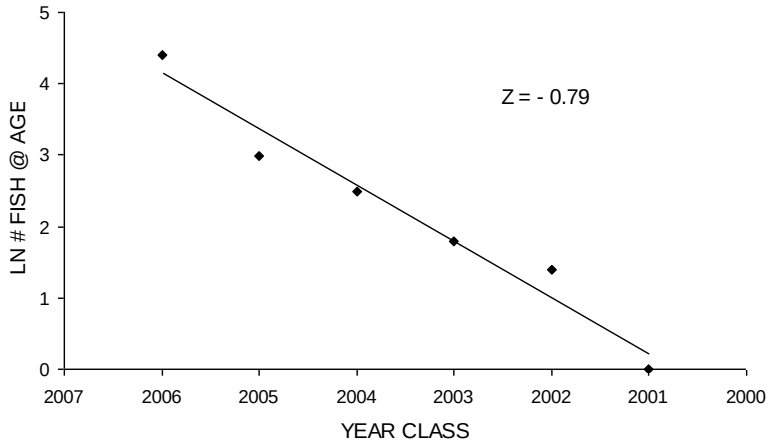

Figure – SILVERSTALKER 07 STALKER RBT CATCH CURVE. Catch curve representing rainbow trout collected in Stalker Creek, Idaho 2007.

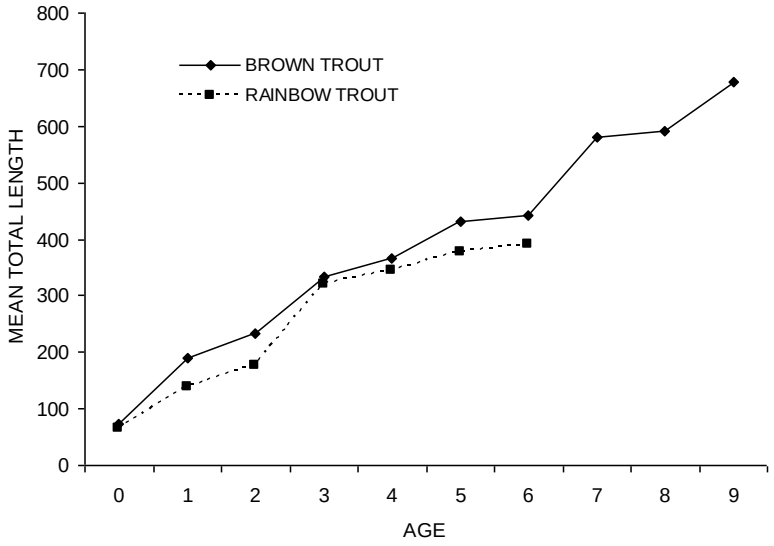

Figure SILVERSTALKER 07 MEAN TL @ AGE. Estimated mean total length at age of rainbow and brown trout collected in Stalker Creek and Silver Creek, Idaho in 2007.

Mean total length of sampled brown trout was 254 mm and ranged from 64 mm to 610 mm (Figure-SILVERSTALKER 07 STALKER BRN LF). Relative stock density (RSD – 400) was 31(Figure SILVERSTALKER 07 RSD BY YEAR). Relative weight of brown trout ranged from 0.90 to 0.82 for fish greater than or equal to100 mm and demonstrated no specific trend with size. Brown trout annual mortality was estimated at 37% for ages zero to nine (Figure-SILVERSTALKER 07 STALKER BRN CATCH CURVE). Mean length of brown trout at age four for all transects was estimated at 367 mm (Figure-SILVERSTALKER 07 LENGTH AT AGE).

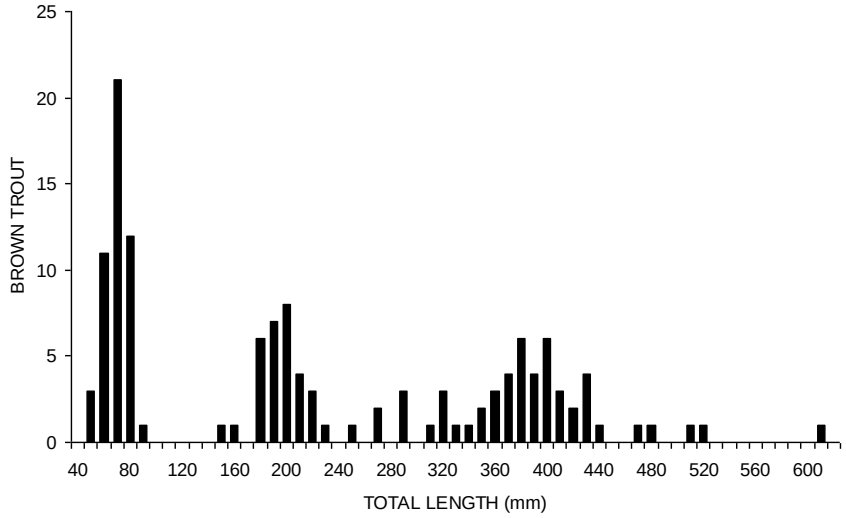

Figure-SILVERSTALKER 07 STALKER BRN LF. Length frequency histogram of rainbow trout collected in the Stalker Creek, Idaho 2007

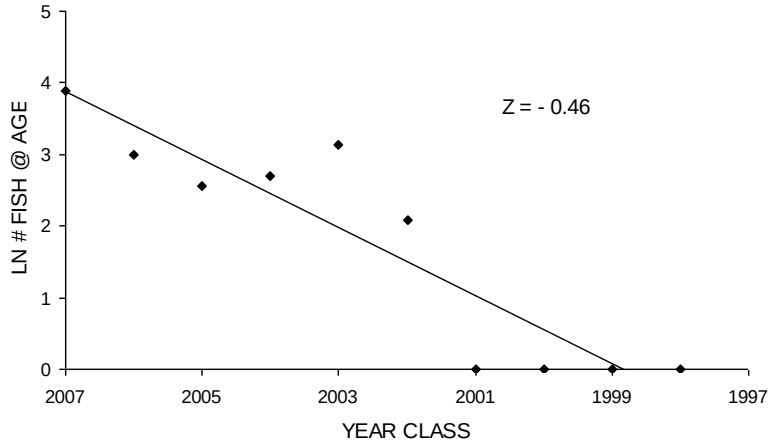

Figure – SILVERSTALKER 07 STALKER BRN CATCH CURVE. Catch curve representing brown trout collected in Stalker Creek, Idaho 2007.

A total of 119 and 174 rainbow trout were collected in the Lower Stalker Creek transect during the marking and recapture runs, respectively. The capture efficiency rate (R/M ratio unadjusted for size selectivity) was 22% for fish equal or greater than 100 mm. The estimated number of rainbow trout in the sample reach (≥ 100 mm) was 768 ± 235 (95% CI), which equated to 1,073 rainbow trout/ha (Table – SILVERSTALKER 07 POP EST).

Table SILVERSTALKER 07 POP EST. Population and density estimates of rainbow and brown trout by survey transect and size class from Stalker Creek and Silver Creek, ID 2007. Mark and recapture data values were summarize by marked fish (M), captured fish in the second sampling pass (C), recaptured fish in the second sampling pass (R), estimated population size in the sampled reach (EST), and the 95 % confidence interval of the population estimate (± 95% CI). Linear and area density estimates were standardized by kilometer (#/km) and hectare (#/ha).

TRANSECT	SPECIES	SIZE CLASS	M	C	R	EST	SD EST	± 95% CI	LENGTH	MEAN WIDTH	#/km	#/ha
STALKER	Rainbow trout	100 - 199 mm	98	136	16	797	160	320	795	9.0	1003	1114
STALKER	Rainbow trout	200 - 399 mm	21	33	8	82	17	35	795	9.0	103	115
STALKER	Rainbow trout	100 - 499 mm	119	172	26	768	118	235	795	9.0	966	1073
STALKER	Brown Trout	100 - 199 mm	15	33	5	90	25	49	795	9.0	113	126
STALKER	Brown Trout	200 - 299 mm	22	47	8	122	27	55	795	9.0	153	171
STALKER	Brown Trout	300 - 399 mm	25	25	9	67	13	25	795	9.0	84	94
STALKER	Brown Trout	400 - 599 mm	20	18	9	39	6	12	795	9.0	49	55
STALKER	Brown Trout	100 - 699 mm	83	123	31	324	38	77	795	9.0	408	453
CABIN	Rainbow trout	100 - 199 mm	184	258	27	1710	277	553	1190	29.7	1437	483
CABIN	Rainbow trout	200 - 299 mm	15	25	5	66	17	35	1190	29.7	55	19
CABIN	Rainbow trout	100 - 499 mm	231	309	34	2054	297	594	1190	29.7	1726	580
CABIN	Brown Trout	100 - 199 mm	19	20	3[A]	104	38	76	1190	29.7	87	29
CABIN	Brown Trout	100 - 299 mm	55	53	14	201	37	73	1190	29.7	169	57
CABIN	Brown Trout	200 - 299 mm	36	33	11	104	19	38	1190	29.7	87	29
CABIN	Brown Trout	300 - 399 mm	30	33	10	95	18	37	1190	29.7	80	27
CABIN	Brown Trout	400 - 699 mm	32	28	12	73	11	23	1190	29.7	61	21
CABIN	Brown Trout	100 - 699 mm	117	114	36	366	41	81	1190	29.7	308	103

Table SILVERSTALKER 07 POP EST. Continued…

TRANSECT	SPECIES	SIZE CLASS	M	C	R	EST	SD EST	± 95% CI	LENGTH	MEAN WIDTH	#/km	#/ha
MARTIN	Rainbow trout	100 - 499 mm	40	43	3	**80*	NA	NA	840	18.1	**95*	**53*
MARTIN	Brown trout	100 - 199 mm	10	14	1[A]	82	40	80	840	18.1	98	54
MARTIN	Brown trout	100 - 299 mm	50	71	13	261	52	104	840	18.1	311	171
MARTIN	Brown trout	200 - 299 mm	40	57	12	182	36	71	840	18.1	217	120
MARTIN	Brown trout	300 - 399 mm	72	61	24	180	22	44	840	18.1	214	118
MARTIN	Brown trout	400 - 699 mm	35	41	13	107	18	36	840	18.1	127	70
MARTIN	Brown trout	100 - 699 mm	157	173	50	538	52	103	840	18.1	640	353

**Values represent minimum estimates bases on total fish sampled*
[A] Values represent insufficient recaptures

A total of 131 and 374 brown trout were collected in the Lower Stalker Creek transect during the marking and recapture runs, respectively. The capture efficiency rate (R/M ratio unadjusted for size selectivity) was 36% for fish equal or greater than 100 mm. The estimated number of brown trout in the sample reach (≥ 100 mm) was 324 ± 77 (95% CI), which equated to 453 brown trout/ha (Table – SILVERSTALKER 07 POP EST).

Silver Creek – Cabin Transect

Fish sampled in the Silver Creek Cabin transect included wild rainbow trout (59%), brown trout (39%), longnose dace(1%), Paiute sculpin (< 1%), redside shiner (< 1%), and speckled dace (< 1%). (Table SILVERSTALKER 07 CATCH SUMMARY). Mean total length of sampled rainbow trout was 178 mm and ranged from 75 mm to 433 mm (Figure-SILVERSTALKER 07 CABIN RBT LF). Relative stock density (RSD – 400) was 4 (Figure SILVERSTALKER 07 RSD BY YEAR). Relative weight of rainbow trout ranged from 0.93 to 0.73 for fish greater than or equal to 100 mm and decreased with total length. Rainbow trout annual mortality was estimated at 53% for ages one to six (Figure-SILVERSTALKER 07 CABIN RBT CATCH CURVE).

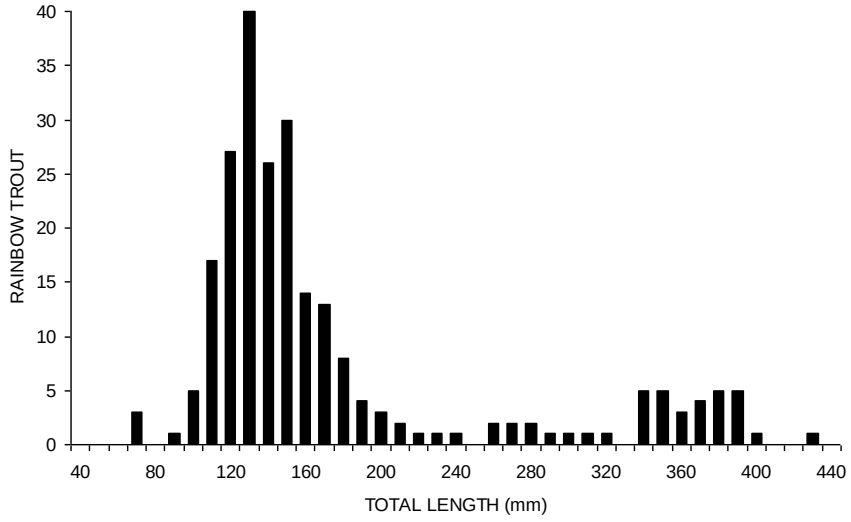

Figure-SILVERSTALKER 07 CABIN RBT LF. Length frequency histogram of rainbow trout collected in the Cabin transect Silver Creek, Idaho 2007

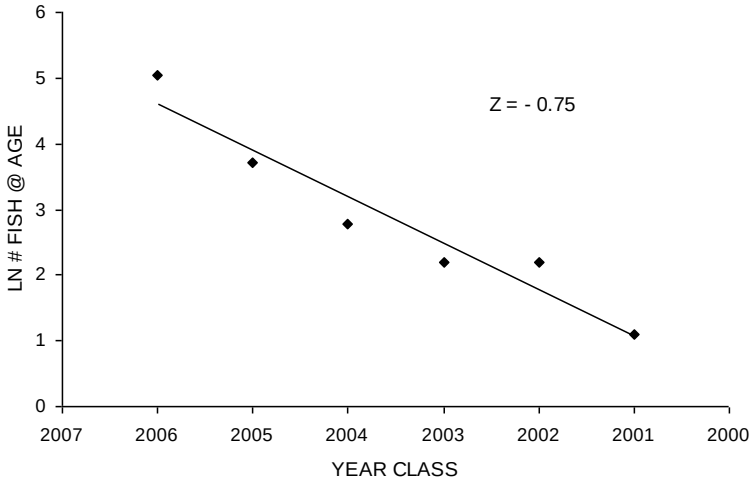

Figure – SILVERSTALKER 07 CABIN RBT CATCH CURVE. Catch curve representing rainbow trout collected at the Cabin site in Silver Creek, Idaho 2007.

Mean total length of sampled brown trout was 255 mm and ranged from 64 mm to 610 mm (Figure-SILVERSTALKER 07 CABIN BRN LF). Relative stock density (RSD – 400) was 33 (Figure SILVERSTALKER 07 RSD BY YEAR). Relative weight of brown trout ranged from 0.91 to 0.78 for fish greater than or equal to 100 mm and decreased with total length (Figure-SILVERSTALKER 07 BRN RELATIVE WEIGHT). Brown trout annual mortality was estimated at 30% for ages zero to nine (Figure-SILVERSTALKER 07 CABIN BRN CATCH CURVE).

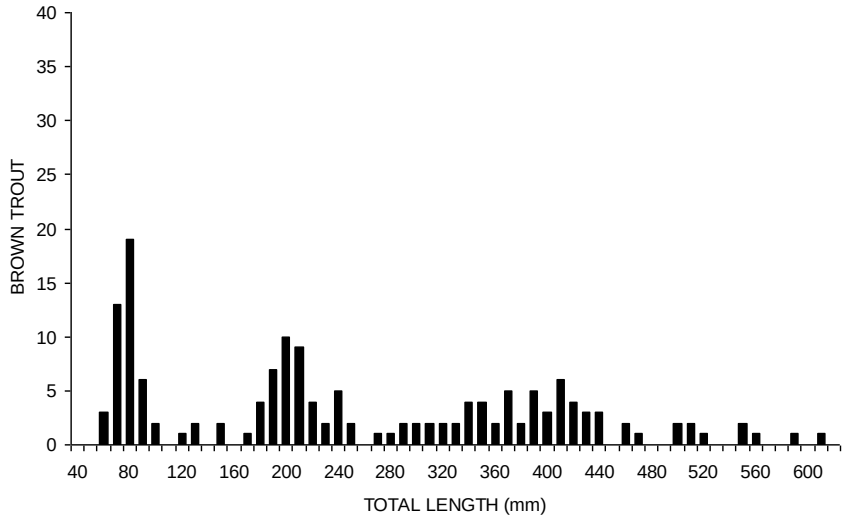

Figure-SILVERSTALKER 07 CABIN BRN LF. Length frequency histogram of brown trout collected in the Cabin transect Silver Creek, Idaho 2007

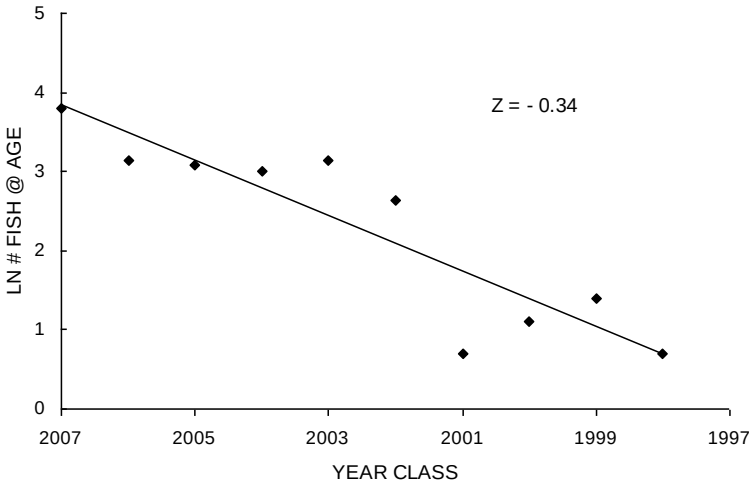

Figure – SILVERSTALKER 07 CABIN BRN CATCH CURVE. Catch curve representing brown trout collected at the Cabin site in Silver Creek, Idaho 2007.

A total of 236 and 323 rainbow trout were collected in the Silver Creek Cabin transect during the marking and recapture runs, respectively. The capture efficiency rate (R/M ratio unadjusted for size selectivity) was 17% for fish equal or greater than 100 mm. The estimated number of rainbow trout in the sample reach (≥ 100 mm) was 2054 ± 594 (95% CI), which equated to 580 rainbow trout/ha (Table – SILVERSTALKER 07 POP EST).

A total of 158 and 186 brown trout were collected in the Silver Creek Cabin transect during the marking and recapture runs, respectively. Our capture efficiency rate (R/M ratio unadjusted for size selectivity) was 31% for fish equal or greater than 100 mm. The estimated number of brown trout in the sample reach (≥ 100 mm) was 366 ± 81 (95% CI), which equated to 103 brown trout/ha (Table – SILVERSTALKER 07 POP EST).

Silver Creek – Martin Bridge Transect

Fish sampled in the Silver Creek Martin Bridge transect included wild rainbow trout (9%), brown trout (38%), bridge~~bridge~~ lip sucker (35%), long~~long~~ nose dace (2%), red~~red~~ side shiner (13%) and speckled dace (2%) (Table SILVERSTALKER 07 CATCH SUMMARY).

Mean total length of sampled rainbow trout was 210 mm and ranged from 45 mm to 385 mm (Figure-SILVERSTALKER 07 MARTIN RBT LF). Relative stock density (RSD – 400) was zero (Figure SILVERSTALKER 07 RSD BY YEAR). Relative weight of rainbow trout ranged from 1.06 to 0.73 and decreased with total length (Figure-SILVERSTALKER 07 RBT RELATIVE WEIGHT). Rainbow trout annual mortality was estimated at 42% for ages one to six (Figure-SILVERSTALKER 07 MARTIN RBT CATCH CURVE).

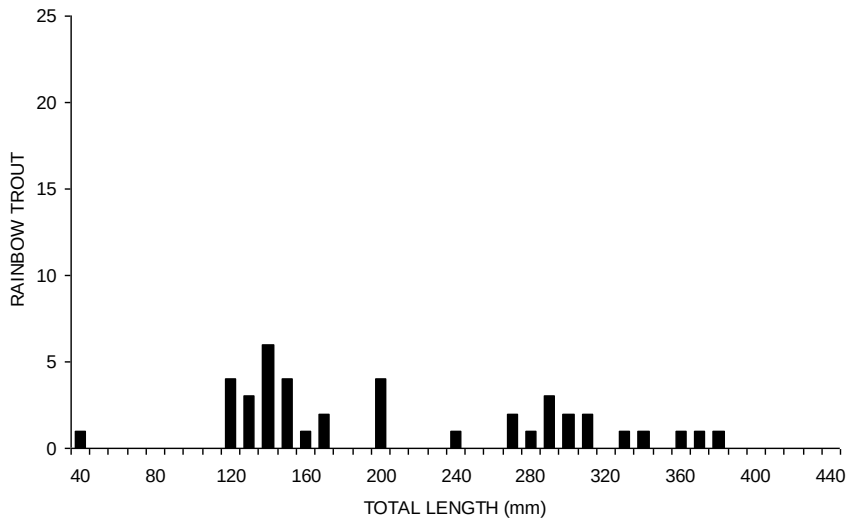

Figure-SILVERSTALKER 07 MARTIN RBT LF. Length frequency histogram of rainbow trout collected in the Martin transect Silver Creek, Idaho 2007

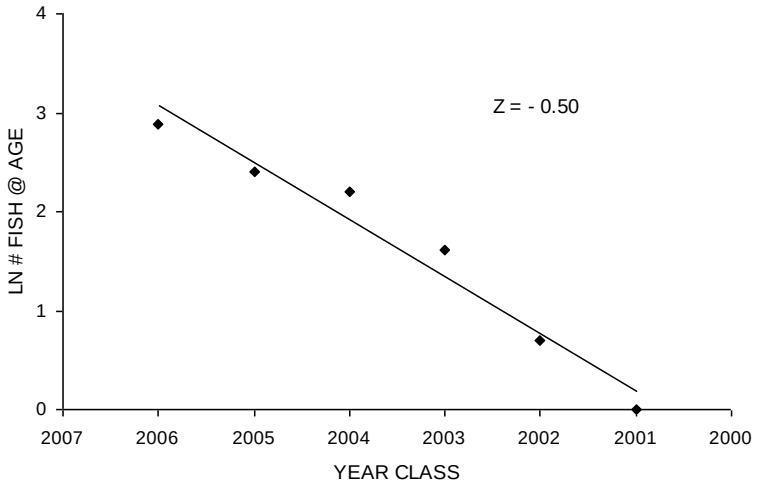

Figure – SILVERSTALKER 07 MARTIN RBT CATCH CURVE. Catch curve representing rainbow trout collected at the Martin site in Silver Creek, Idaho 2007.

Mean total length of sampled brown trout was 301 mm and ranged from 55 mm to 600 mm (Figure-SILVERSTALKER 07 MARTIN BRN LF). Relative stock density (RSD – 400) was 24 (Figure SILVERSTALKER 07 RSD BY YEAR). Relative weight of brown trout ranged from 1.07 to 0.76 for fish greater than or equal to 100 mm and generally decreased with total length (Figure-SILVERSTALKER 07 BRN RELATIVE WEIGHT). Brown trout annual mortality was estimated at 28% for ages zero to nine (Figure-SILVERSTALKER 07 MARTIN BRN CATCH CURVE).

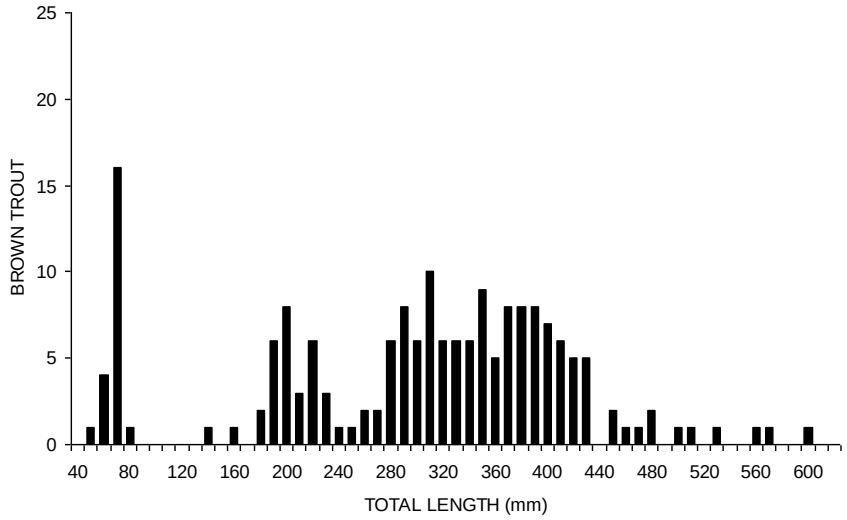

Figure-SILVERSTALKER 07 CABIN BRN LF. Length frequency histogram of brown trout collected in the Martin transect Silver Creek, Idaho 2007

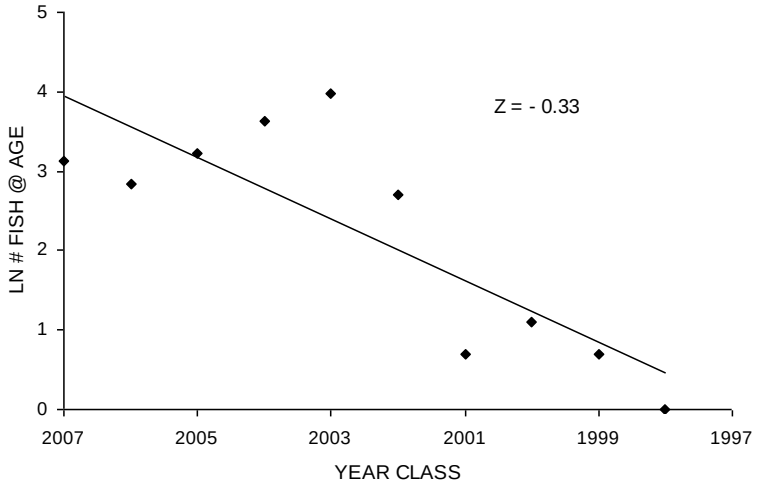

Figure – SILVERSTALKER 07 MARTIN BRN CATCH CURVE. Catch curve representing brown trout collected at the Martin site in Silver Creek, Idaho 2007.

A total of 41 and 43 rainbow trout were collected in the Silver Creek Martin Bridge transect during the marking and recapture runs, respectively. Our capture efficiency rate (R/M ratio unadjusted for size selectivity) was 7.5% for fish equal or greater than 100 mm. Fewer than five total recaptures precluded a rainbow trout population estimate in the sample transect (Table – SILVERSTALKER 07 POP EST). A total of 80 individual fish (≥ 100 mm) were sampled equating to a minimal estimate of 53 rainbow trout/ha~~hectare~~ (Table – SILVERSTALKER 07 POP EST).

A total of 119 and 174 brown trout were collected in the Silver Creek Martin Bridge transect during the marking and recapture runs, respectively. Our capture efficiency rate (R/M ratio unadjusted for size selectivity) was 32% for fish equal or greater than 100 mm. Estimated number of brown trout in the sample reach (≥ 100 mm) was 538 ± 103 (95% CI), which equated to 353 brown trout/hectare (Table – SILVERSTALKER 07 POP EST).

Silver Creek/Stalker Creek Trends

Relative abundances of species sampled within survey transects represented only minor transect specific changes from 2004 IDFG survey results (Ryan and Megargle in review). Notable observed shifts in relative abundance within the Stalker Creek transect included increases of 9% and 18% in rainbow and brown trout, respectively and a reduction of 9% abundance in red~~red~~ side shiner. Red~~Red~~ side shiner observed in the sample catch also declined in the Silver Creek Martin Bridge sample transect by approximately 16%. Notable observed shifts in relative abundance

within the Silver Creek Cabin transect included an increase of approximately 15% in rainbow trout and the absence of bridge~~bridge~~ lip sucker in the sample representing an approximate decline of 9%. In contrast the relative abundance of bridgelip suckers~~bridge lip sucker~~ observed the sample catch within the Silver Creek Martin Bridge sample transect increased by approximately 16%. The relative proportions of rainbow trout and brown trout in the catch from combined sample transects were 46% and 54%, respectively. Observed proportions represent little to no change from 2007, but represented a potential stabilizing shift in the trend observed since 1977 (Figure SILVERSTALKER 07 % COMP BY YEAR) (Wilkison 1996, Ryan and Megargle 2004).

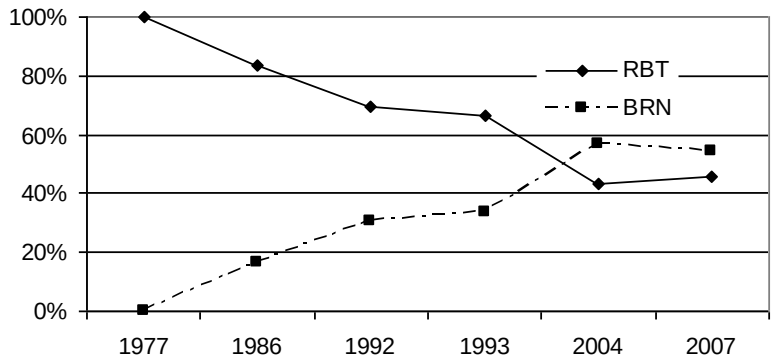

Figure SILVERSTALKER 07 % COMP BY YEAR. Relative proportions of rainbow and brown trout by year from combined sample sites on Silver Creek and Stalker Creek, Idaho upstream and including the Martin Bridge transect. Surveys represent a variety of sample techniques over time.

Trends in density estimates of rainbow and brown trout equal or greater than 100 mm including survey years 2001, 2004, and 2007 indicated sampled populations are stable in both the Stalker Creek and Silver Creek Martin Bridge sample transects (Figure

SILVERSTALKER 07 DENSITY EST BY YEAR). Density estimates in both transects varied by survey year, but overlapping confidence intervals suggest differences were not significant. Shifts in brown trout abundance from 2001 to 2004 in the Stalker Creek transect did not follow the observed trend and declined considerably. Brown trout relative stock densities (RSD - 400) within the Stalker Creek transect also declined in this period (Figure SILVERSTALKER 07 RSD BY YEAR). A similar trend was observed from 2001 to 2007 in the Silver Creek Cabin transect.

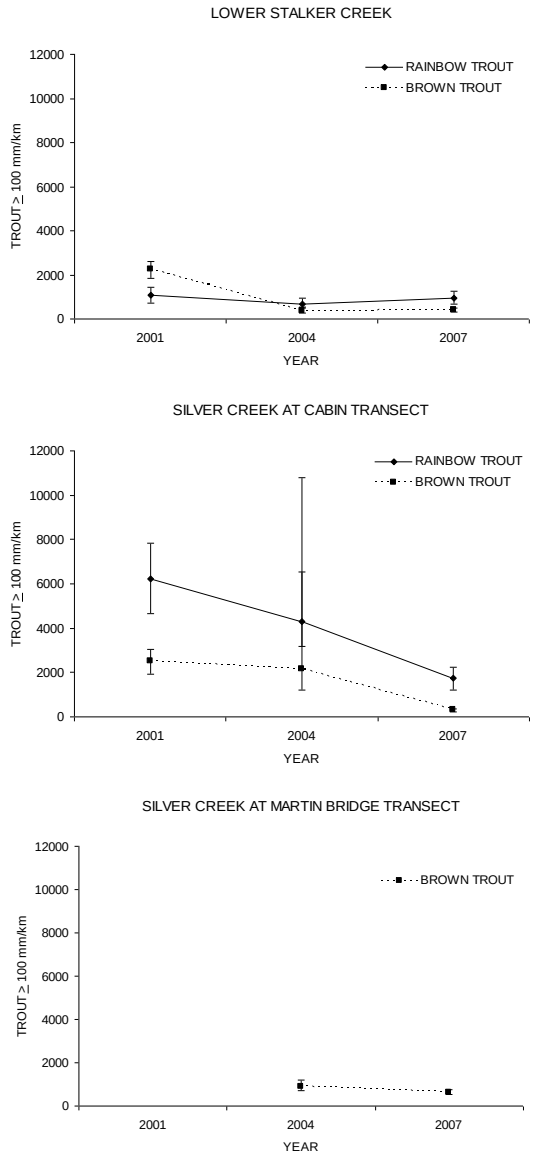

Figure SILVERSTALKER 07 DENSITY EST BY YEAR. Density estimates and 95% confidence intervals of rainbow and brown trout equal or greater than 100 mm, per kilometer, by year from Stalker Creek and Silver Creek, Idaho~~ID~~.

Observed trends in density estimates from the Silver Creek Cabin transect indicated densities of both rainbow and brown trout have declined from previous survey levels (Figure SILVERSTALKER 07 DENSITY EST BY YEAR). Density declines in rainbow and brown trout were significant from 2001 to 2007 and from 2004 to 2007. A considerable decline in brown trout relative stock density (RSD 400) values from 2001 to 2004 in the same transect was also observed (Figure SILVERSTALKER 07 RSD BY YEAR).

Discussion

Trends in rainbow trout density and associated population structure suggested that rainbow and brown trout populations have been stable with the exception of declines in both rainbow trout and brown trout abundance observed in the Silver Creek Cabin transect and the observed decline in brown trout density between 2001 and 2004 in Stalker Creek. Declines in brown trout density from the 2001 survey year likely do not reflect comparable shifts in density in either sample transect. Surveys in 2001 were completed in mid to late September. Seasonal upstream migration of both rainbow and brown trout in the Silver Creek system has been observed by Young et al. 1997 and may have inflated 2001 estimates in both locations. Observed RSD values support the suggestion that a greater proportion of large spawning size fish was present during this survey. It is recommended that survey sampling continue to be conducted in early to mid June and that trends in sample transects be maintained from 2004 for consistent comparisons among years.

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Observed changes in rainbow and brown trout densities in the Silver Creek Cabin transect from 2004 to 2007 likely do reflect representative declines in density. Population declines in rainbow and brown trout appeared to parallel each other indicating consistent changes among species. Non overlapping confidence bounds provided an indication the declining trends were significant. The cause of the measured decline in abundance in both rainbow and brown trout was not specifically defined.

Changes in habitat within the Silver Creek, Cabin transect potentially relate to observed population declines. A noticeable decline in aquatic vegetation within the Silver Creek Cabin reach was observed during the 2007 sampling period; although, no measure of aquatic vegetation presence was made. Vegetation loss was not observed in Lower Stalker Creek, but was observed to a lesser degree in the Silver Creek, Martin Bridge transect. Habitat changes appeared to continue up Grove Creek. Aquatic vegetation loss had the potential to reduce available cover providing a causal agent of density declines. Aquatic vegetation loss also had the potential to reduce capture efficiencies by increasing the opportunity for fish to flee. However, estimated capture efficiencies remained comparable among all sample transects.

The cause of aquatic vegetation loss was unclear. A high water event occurred in 2006 and noticeably changed substrate composition. The observed change in substrate may have influenced vegetation growth. It is recommended that substrate composition be monitored to follow trends that may be associated with vegetation growth.

Annual mortality and conditional indices represented initial values for use in future trend monitoring. Values were not estimated in previous sample years.

Estimated annual mortality and relative weight values in 2007 were considered reasonable in all transects. Estimated values were also comparable among transects with the exception of rainbow trout annual mortality in the Silver Creek, Martin Bridge transect. Rainbow trout annual mortality in the Martin Bridge transect was approximately ten percent less than that described in other transects.

Recommendations

- Maintain survey sample timing in early to mid June for consistency
- Maintain trends in sample transects from 2004 in combination with consistent survey timing and methods for comparisons among years
- Monitor habitat variables including substrate composition in association with trout densities

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