

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-45

Survey Location: Spearfish Creek

Survey Dates: July 30 – August 2, 2012

County: Lawrence

Introduction

The Spearfish Creek fishery was surveyed in late July and early August of 2012. A total of 8 historical sites were chosen for annual monitoring of Spearfish Creek (Figure 1). Annual monitoring of specific sites will aid in evaluating changes environmental conditions may have on the Spearfish Creek fish populations. For example, Spearfish Creek periodically experiences unusually high and low flows and such events have been found to be destructive to the development of brown trout embryos and yolk sac fry (Raleigh et al. 1986) in other streams. However, stream site conditions can vary temporally and, subsequently, site location could vary slightly from year to year. A recent example is Spearfish Creek discharge has varied over the last 6 years due to changing water yield as the result of regional drought (Figure 1).

Intensive surveys are also conducted on Spearfish Creek but are completed every 3 to 5 years, or as needed (determined by angler concerns or monitoring results) to better determine structure of fish populations. An intensive survey of Spearfish Creek (which involves random site selection) was last completed in 2011.

Spearfish Creek has been divided into six segments based on morphologic and hydrologic stream characteristics (SDGF&P 2008). During the 2012 survey two sites were surveyed in segment 1 (SFC189 and SFC220), no sites were surveyed in segment 2 (limited water in this segment), two sites were surveyed in segment 3 (SFC354 and SFC406), two sites were surveyed in segment 4 (SFC490 and 522), one site in segment 5 (SFC585), and one site in segment 6 (SFC636) (Figure 1). The sites surveyed varied slightly in chemical and physical characteristics (Appendix A).

Survey Methods

The 2012 survey of Spearfish Creek was conducted using three pass depletion electrofishing. Efforts were made to ensure the assumptions 1) the population is static, 2) capture probability remains constant across sampling periods, 3) all fish in the population are equally vulnerable to capture (Van Den Avyle and Hayward 1999; Hayes et al. 2007). Each site was enclosed with a top and bottom block net in an attempt to eliminate fish from emigrating out of or immigrating into the site. Three electrofishing passes were completed covering the entire 100 meter section (including all available habitats), and collected fish were kept in holding cages situated outside the site. Numbers of fish ≥ 200 mm should decrease with each electrofishing pass. If a subsequent pass has less fish than any of the previous passes a fourth pass is completed. Collected fish are anesthetized then identified by species and weighed (g)

and measured (mm). The fish are then placed back into holding cages to recover. Once the fish have fully recovered they are released back into the stream.

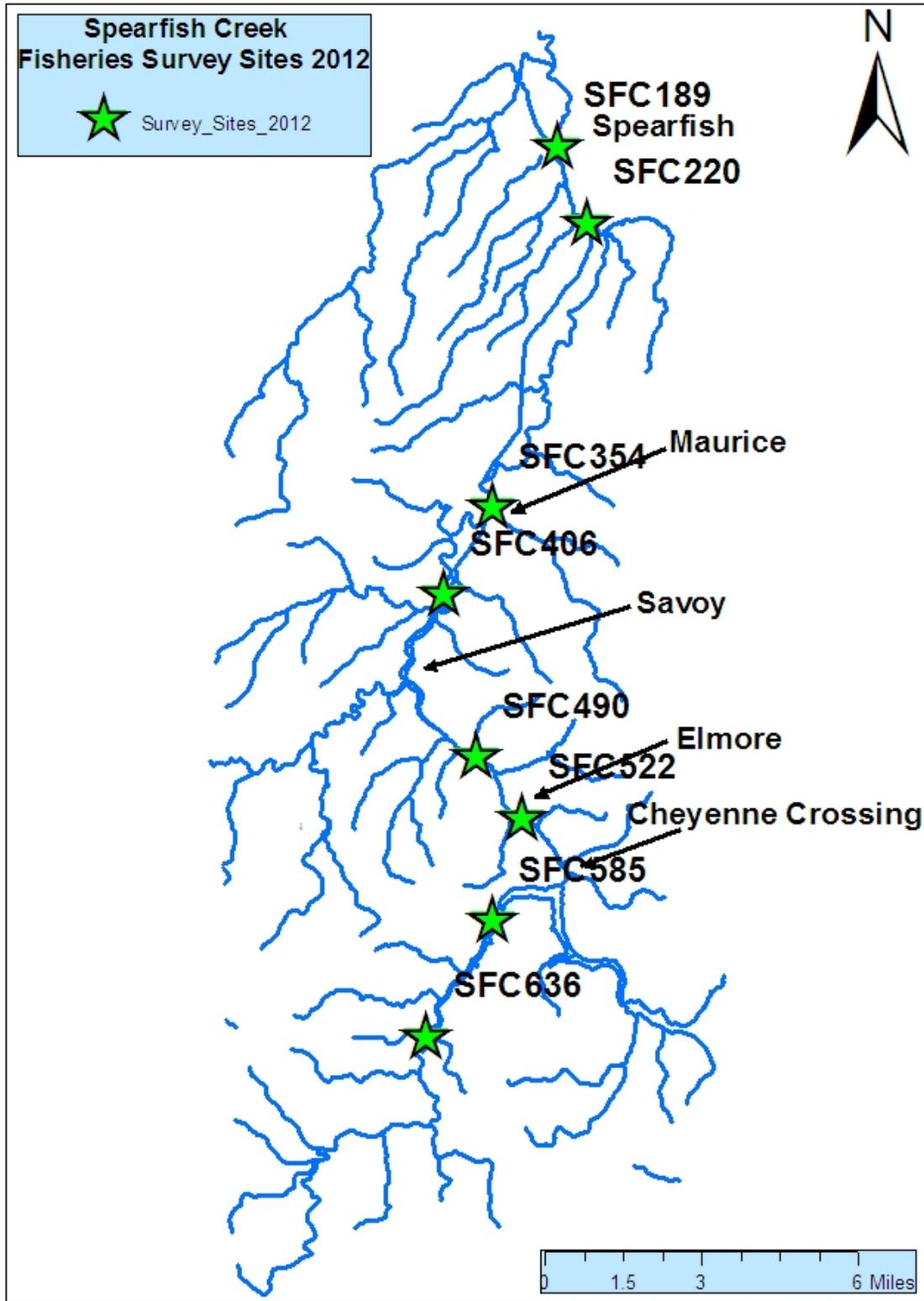


Figure 1. Spearfish Creek fisheries survey site locations 2012.

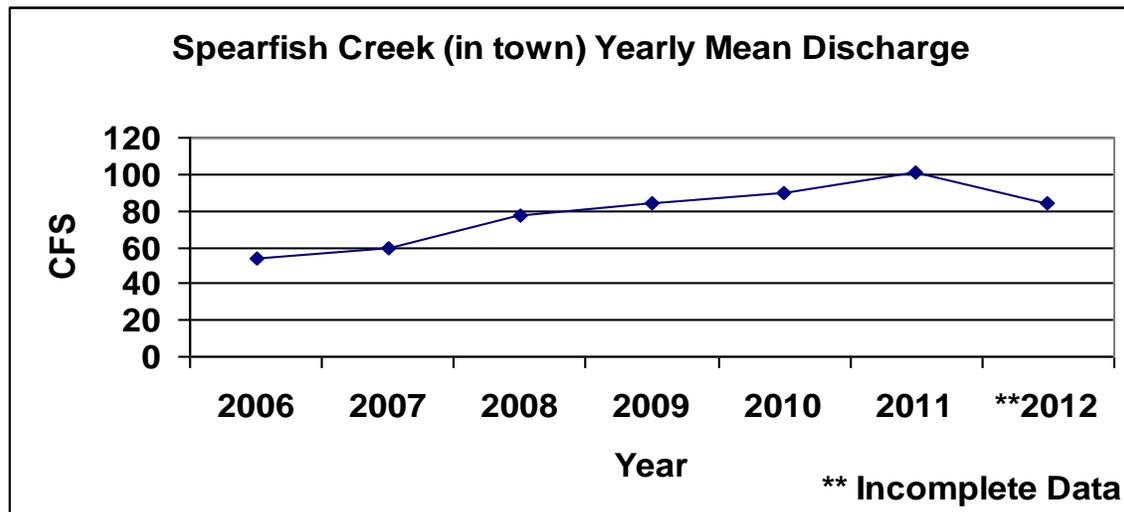


Figure 2. Spearfish Creek yearly mean discharge. Data was collected from the United States Geological Survey (USGS) website. <http://waterdata.usgs.gov/>

Data are entered into Coldstream database. The Coldstream database was used to calculate parameters such as population estimates of fish per 100 meters and estimated numbers of fish per acre. Calculations are based on depletion of fish numbers in each pass, and the catchability of fish within each site. Microsoft Excel was utilized for other fisheries parameters such as length frequency histograms. During intensive surveys such as the 2011 survey, including random site selection, data was presented as fish population estimates per stream segment. However, the 2012 survey was merely a monitoring survey of historical sites, and therefore, the data is presented as populations in specific sites. Length frequency histograms were also representative of specific sites, and age-0 fish (identified as the first mode break in the histogram) were not included in the histogram as some fish were measured and some were bulk counted.

Results and Discussion

Spearfish Creek has self-sustaining populations of brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), and rainbow trout (*Oncorhynchus mykiss*). During the 2012 survey of 8 historical sites on Spearfish Creek only 3 fish species were encountered and collected: brook trout, brown trout and rainbow trout. Spearfish Creek was last stocked by South Dakota Game, Fish and Parks (SDGF&P) in 2007. In recent surveys, no other fish species (native, rough or game) have been found within Spearfish Creek.

For all trout species, age data (physiological structures from the fish) was not collected. However, younger ages (0-3) may be apparent as modes in the length frequency histograms in the Summary by site section. Some of the modes are clear and others are not; therefore ages were not assumed in the report, but rather that multiple age classes are present and recruitment is occurring.

Summaries by species

Spearfish Creek has a considerable brown trout population with all 8 sample sites in 2012 containing a Class 1 brown trout fishery (≥ 150 fish per acre) (Figure 3). The population of brown trout ≥ 200 mm (8in) per 100m has increased from 2011 to 2012 in 6 of the 8 individual sites (Figure 4). Population estimates for brown trout < 200 mm have stayed around the same numbers for the past few surveys for most sites (Figure 5).

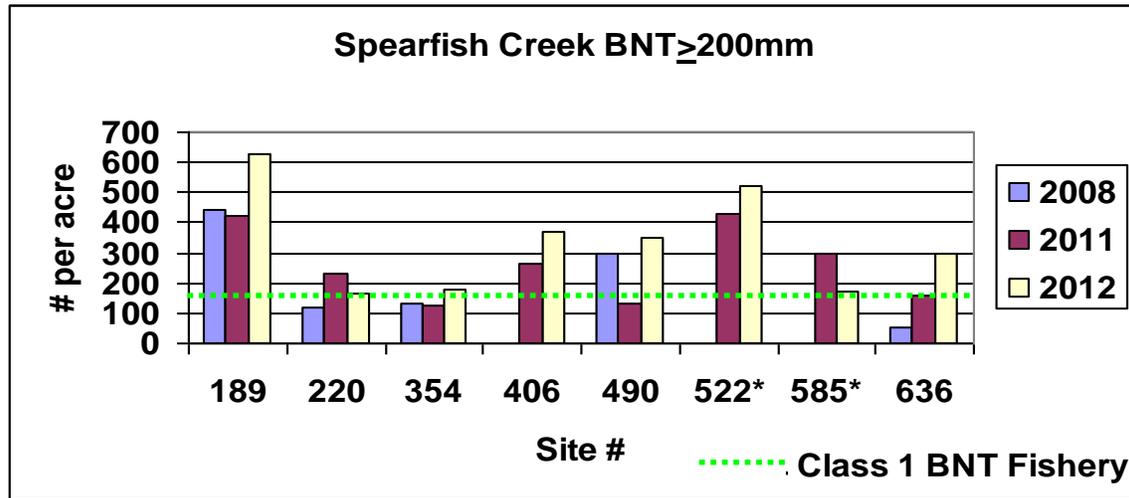


Figure 3. Spearfish Creek survey sites brown trout ≥ 200 mm number per acre 2008, 2011, and 2012. Sites marked with asterisks were not surveyed in 2008. Site 406 was surveyed in 2008 however the fish were bulk counted so number per acre estimate could not be calculated.

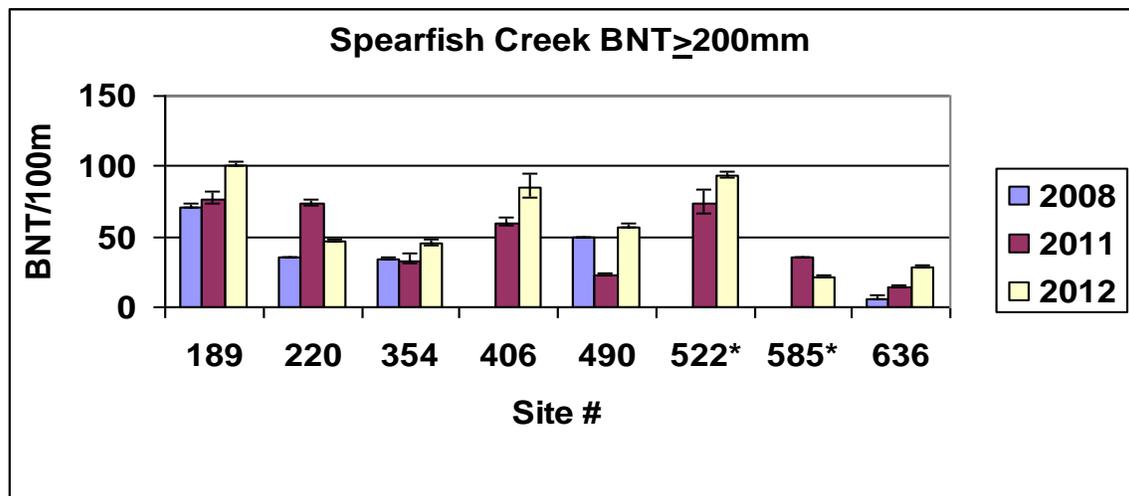


Figure 4. Spearfish Creek brown trout ≥ 200 mm population estimate per 100 m in 2008, 2011, and 2012.

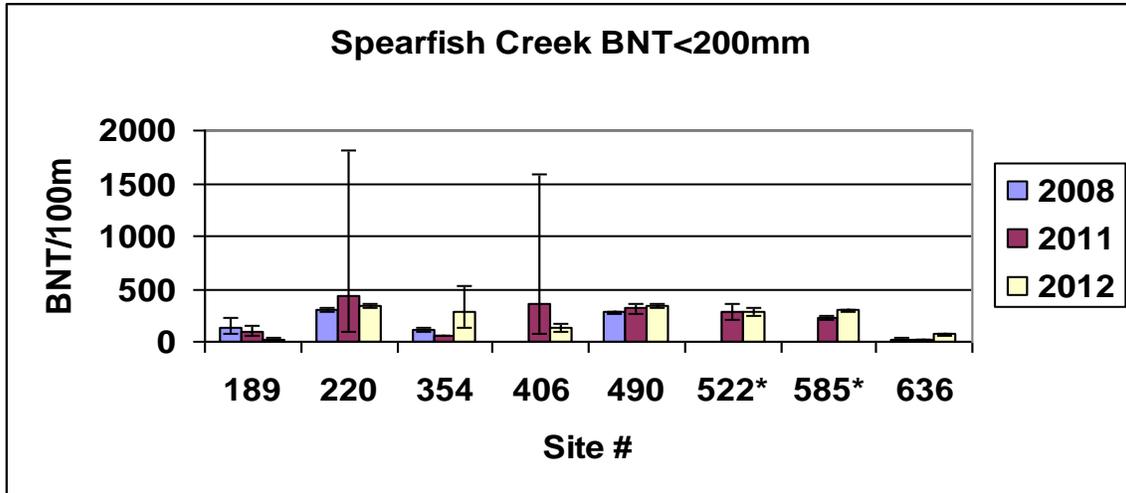


Figure 5. Spearfish Creek brown trout <200 mm population estimate per 100 m in 2008, 2011, 2012.

Brook trout were found in 4 sample sites in 2012 with the greatest numbers found in section 6 (site 636) near the headwaters (Figures 6, 7 and 8). The number of large (>200 mm) brook trout at site 636 meets criteria for listing as a Class 1 brook trout fishery (Figure 6). Since 2008, the brook trout numbers per acre have shown an increase during the 2011 and 2012 surveys. Brook trout ≥ 200 mm were found in three sites in 2012 (Figure 7). Site 636 (near the headwaters) has continued to increase in numbers of larger brook trout over the past three surveys. Also noticeable is the increase in brook trout <200 mm from 2011 to 2012 at sites 585 and 636 (Figure 8).

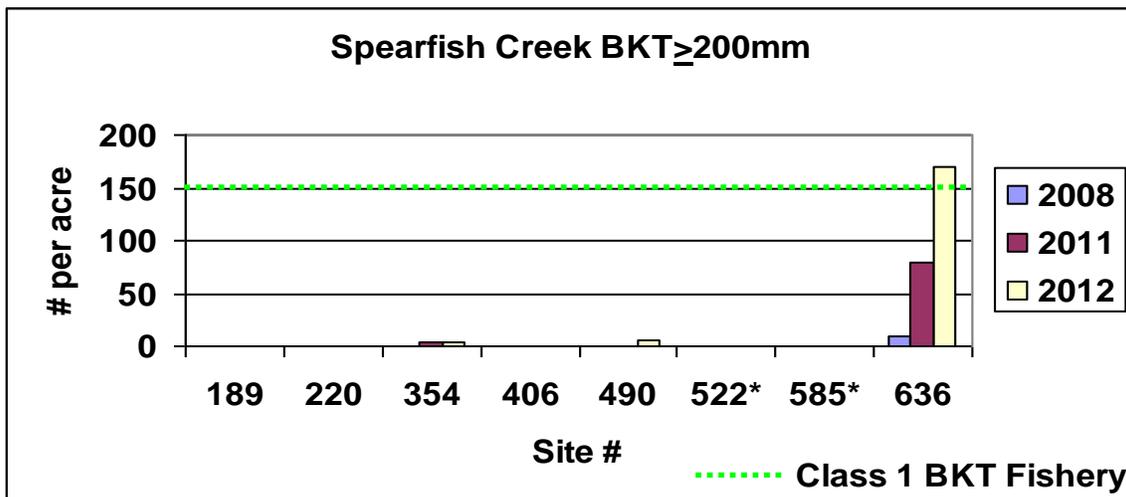


Figure 6. Spearfish Creek survey sites brook trout ≥ 200 mm number per acre 2008, 2011, and 2012. Sites marked with asterisks were not surveyed in 2008. Site 406 was surveyed in 2008 however the fish were bulk counted so number per acre estimate could not be calculated 2012.

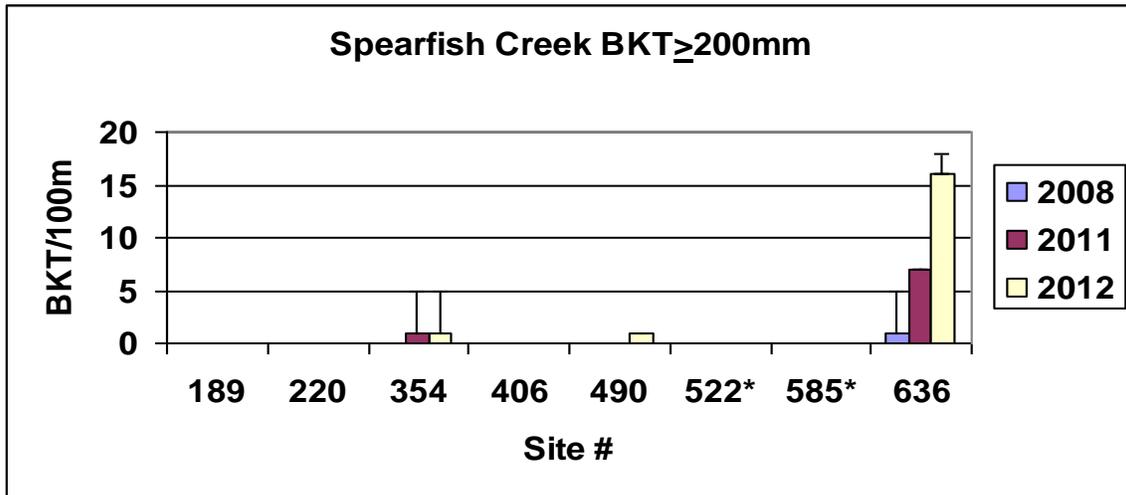


Figure 7. Spearfish Creek brook trout \geq 200 mm population estimate per 100m in 2008, 2011, 2012.

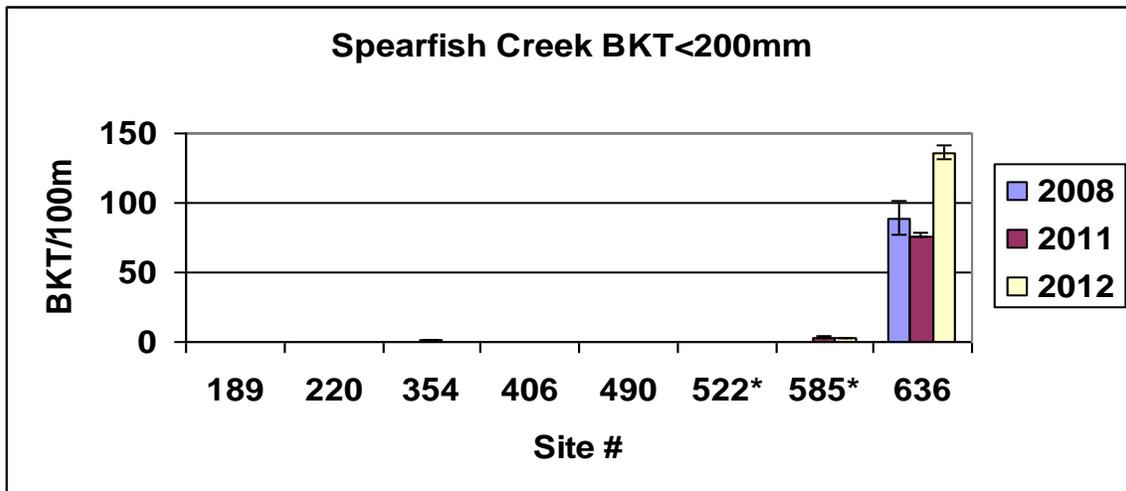


Figure 8. Spearfish Creek brook trout <200 mm population estimate per 100m in 2008, 2011, 2012.

Rainbow trout were found in site 354 in all of the last 3 surveys (Figures 9 and 10). There were high numbers of rainbow trout <200 mm in site 354 in 2012 (Figure 10). Rainbow trout were only found in site 354 during the 2012 survey. It appears that the number of rainbow trout \geq 200 mm has increased from 2011 to 2012 in site 354. However the highest population estimate for rainbow trout in site 354 was in 2008, but the estimate is confounded by large confidence intervals (Figure 7). In addition, rainbow trout <200 mm per 100 m increased by nearly 10 times from 2011 to 2012 (Figure 10).

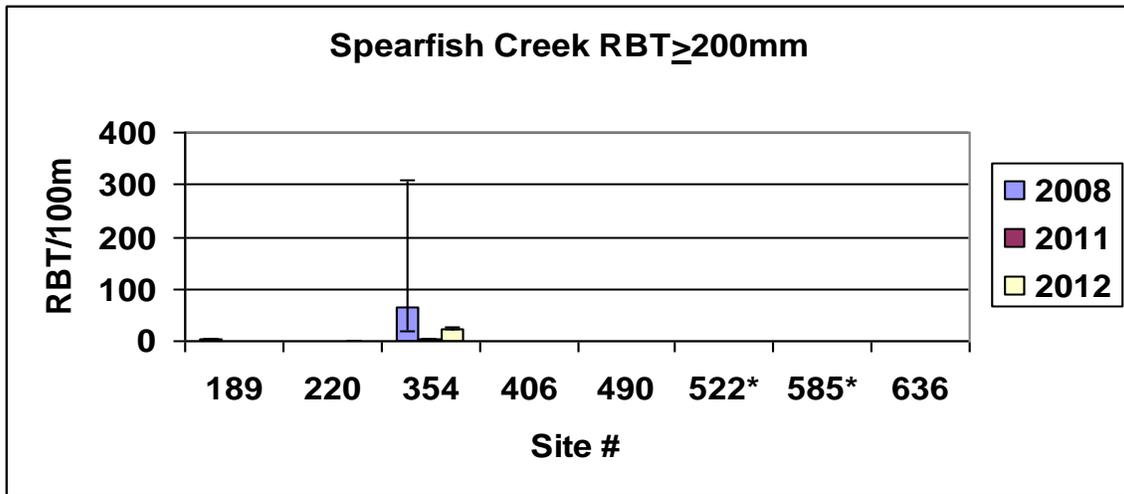


Figure 9. Spearfish Creek rainbow trout ≥ 200 mm population estimate per 100m in 2008, 2011, 2012.

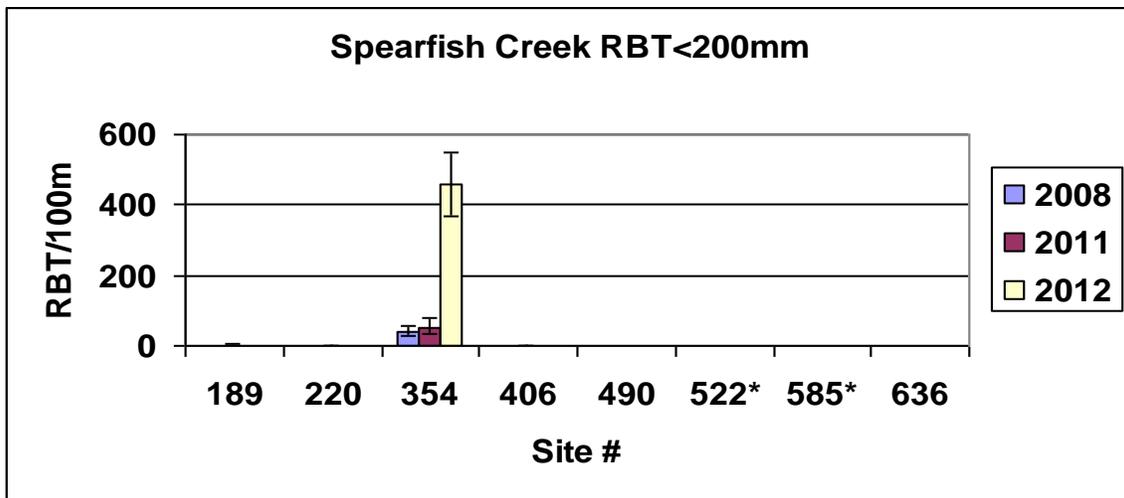


Figure 10. Spearfish Creek rainbow trout < 200 mm population estimate per 100m in 2008, 2011, 2012.

Summaries by site

Site 189 (West of Spearfish high school)

Site 189 is a historical survey site on Spearfish Creek located in the town of Spearfish, west of the high school (Figure 11). Site 189 was surveyed on July 31, 2012. The site is characterized by abundant larger brown trout (≥ 200 mm), and lower numbers of small brown trout (Figures 4 and 5). This may be due to the higher flows and deeper water at this site which is not suitable habitat for juvenile brown trout (Raleigh et al. 1986). The majority of the fish collected at Site 189 during the past three surveys have been brown trout. However, rainbow trout were collected in 2008 and 2011 (Figures 9 and 10).

Recruitment appears to be consistent with the exception of a gap in the length frequency around stock length in 2011 (Figures 12, 13 and 14). There appears to be several year classes of brown trout present in all of the past three surveys. Many of the brown trout are over quality length with a large portion exceeding preferred length as well (Figures 12, 13 and 14).

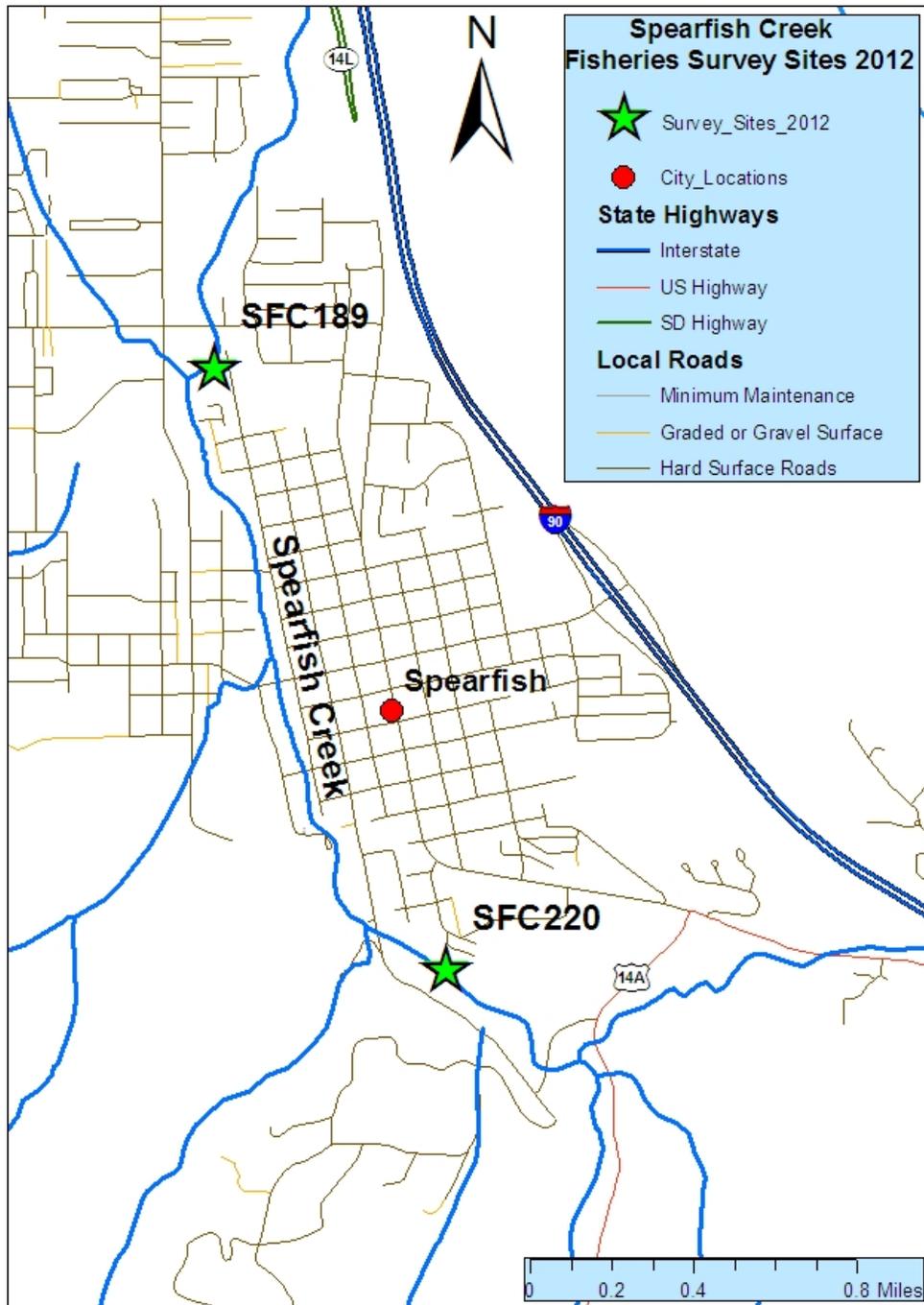


Figure 11. Spearfish Creek fisheries survey sites 189 & 220, 2012.

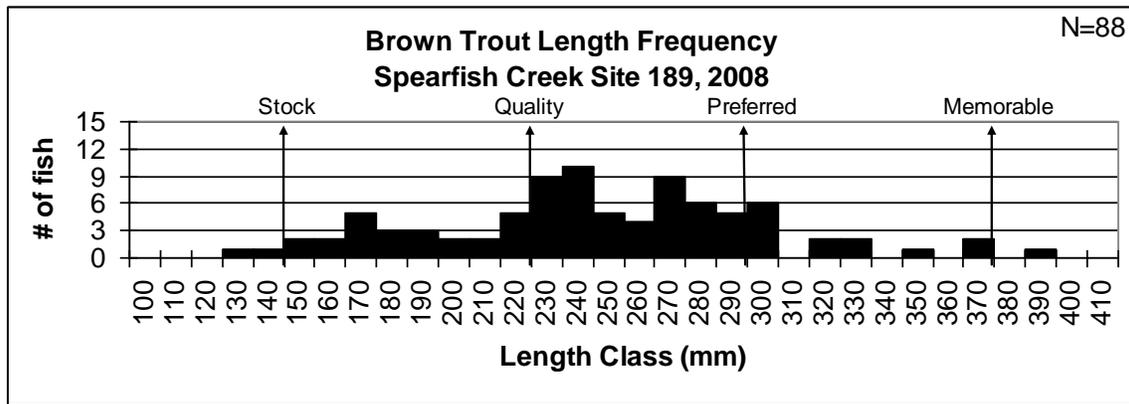


Figure 12. Brown trout length frequency histogram for Spearfish Creek Site 189, 2008. Age-0 fish were not included in the histogram.

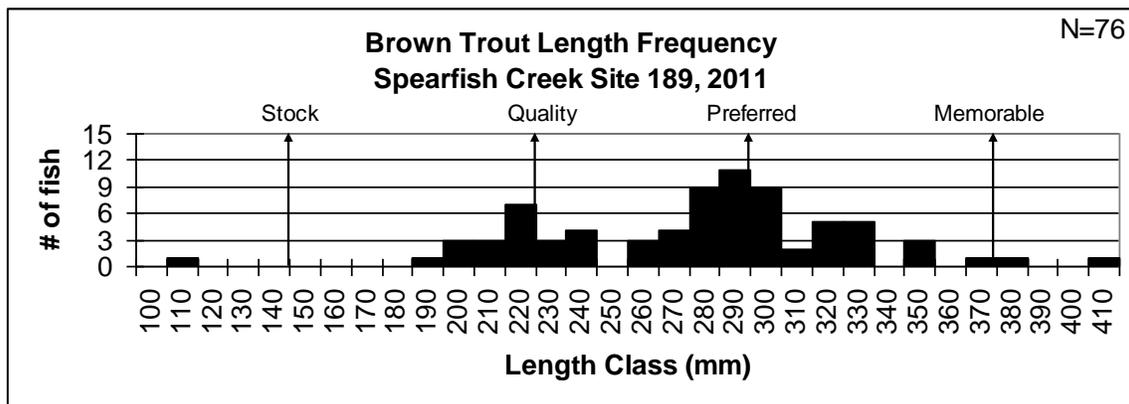


Figure 13. Brown trout length frequency histogram for Spearfish Creek Site 189, 2011. Age-0 fish were not included in the histogram.

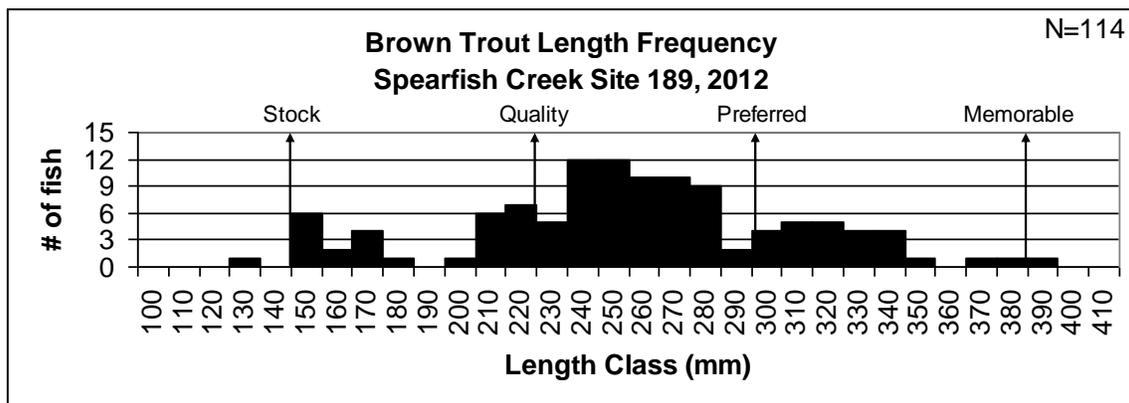


Figure 14. Brown trout length frequency histogram for Spearfish Creek Site 189, 2012. Age-0 fish were not included in the histogram.

Site 220 (Spearfish campground)

Site 220 is a historical site in the town of Spearfish along the border of the city campground (Figure 11). Site 220 was surveyed on July 31, 2012. During the past three fisheries surveys only brown trout have been collected at this site (Figures 5 – 10). Small brown trout (<200 mm) are abundant in this site (Figure 5). This may be due to the side channels present at the site that provide shallow, slower moving water habitat adequate for juvenile brown trout (Raleigh et al. 1986).

There appears to be consistent recruitment in this site as several year classes are visible on the length frequency histograms (Figures 15, 16, and 17). A large proportion of the brown trout are over quality length with a few fish exceeding preferred length (Figures 15, 16, and 17). This was one of the few sites in which abundance of brown trout ≥ 200 mm per 100 m decreased from the 2011 survey (Figure 5).

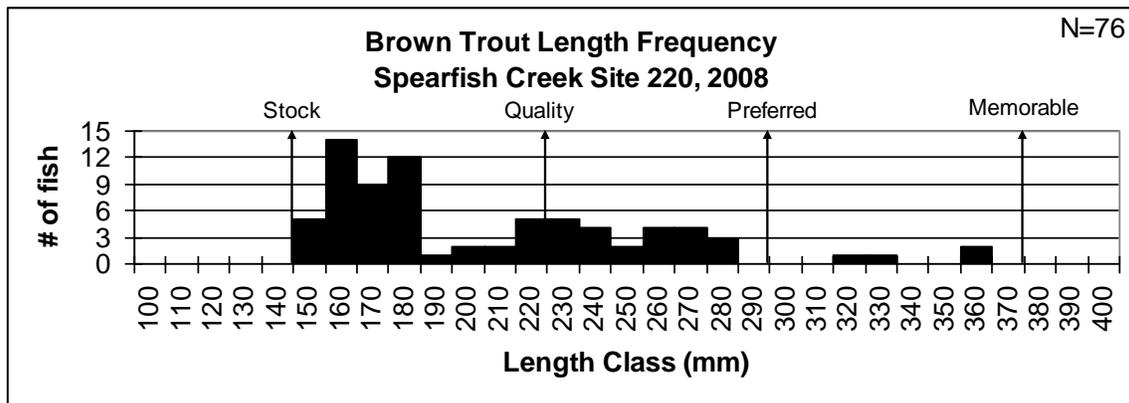


Figure 15. Brown trout length frequency histogram for Spearfish Creek Site 220, 2008. Age-0 fish were not included in the histogram.

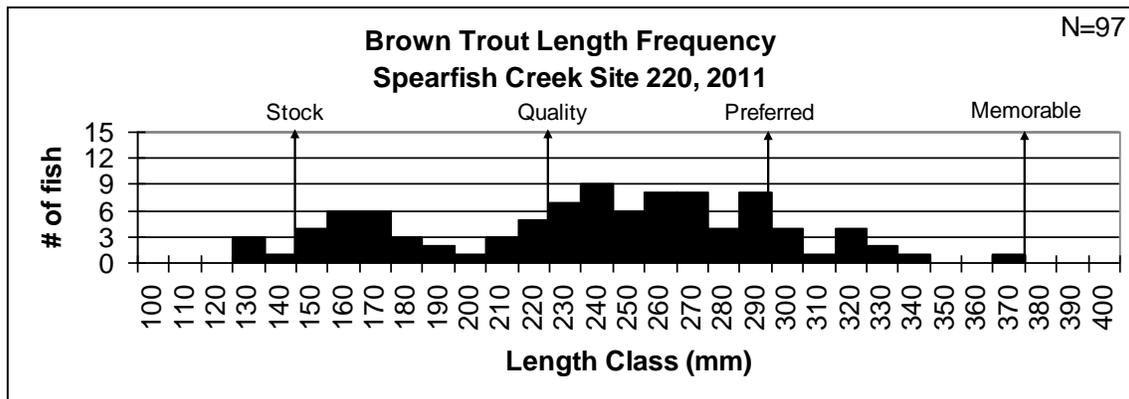


Figure 16. Brown trout length frequency histogram for Spearfish Creek Site 220, 2011. Age-0 fish were not included in the histogram.

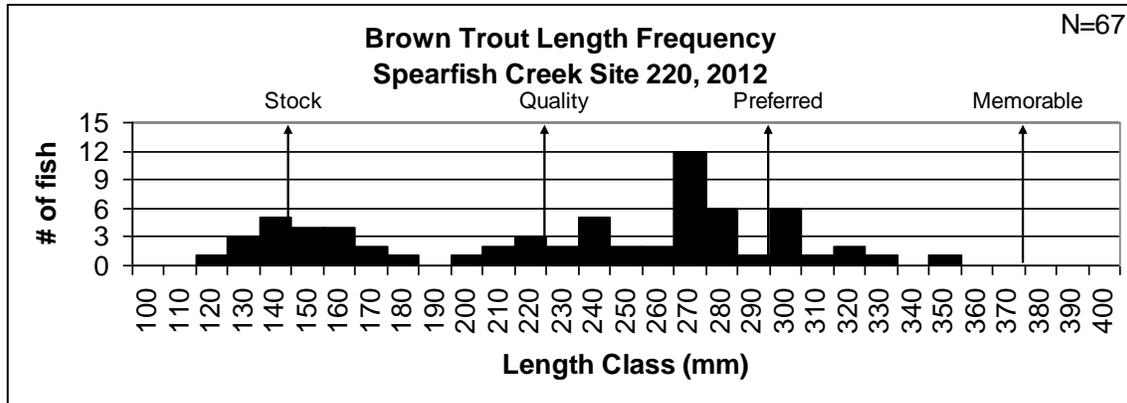


Figure 17. Brown trout length frequency histogram for Spearfish Creek Site 220, 2012. Age-0 fish were not included in the histogram.

Site 354 (Confluence of Cleopatra Creek)

Site 354 is a historical site located at the confluence of Spearfish Creek and Cleopatra Creek just north of Maurine (Figure 18). Site 354 was surveyed on July 30, 2012 using the three pass electrofishing. A portion of the brown trout population is over quality length; however, very few fish exceed preferred length at this site (Figures 19 – 21).

In addition to the brown trout there is also a reproducing population of rainbow trout in Site 354 (Segment 3) (Figures 9 and 10). However, in Site 354 in particular, there has not been many rainbow trout collected over quality length during the past three surveys (Figures 22, 23, & 24). This may simply be a product of habitat suitability for large rainbow trout at this particular site.

Recruitment appears to be consistent for both rainbow and brown trout with several year classes present in the length frequency histograms (Figures 18 - 23).

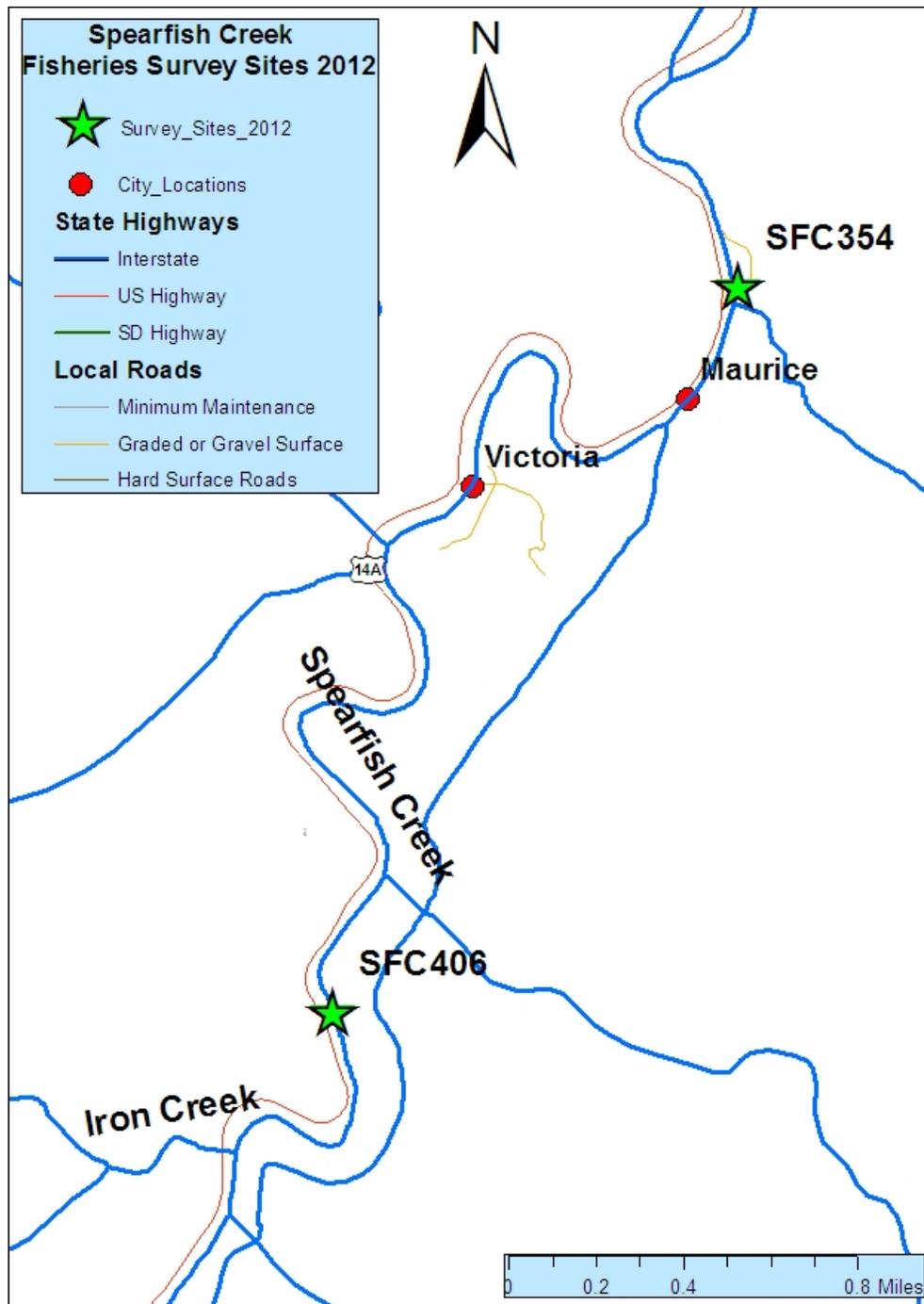


Figure 18. Spearfish Creek fisheries survey sites 354 & 406, 2012.

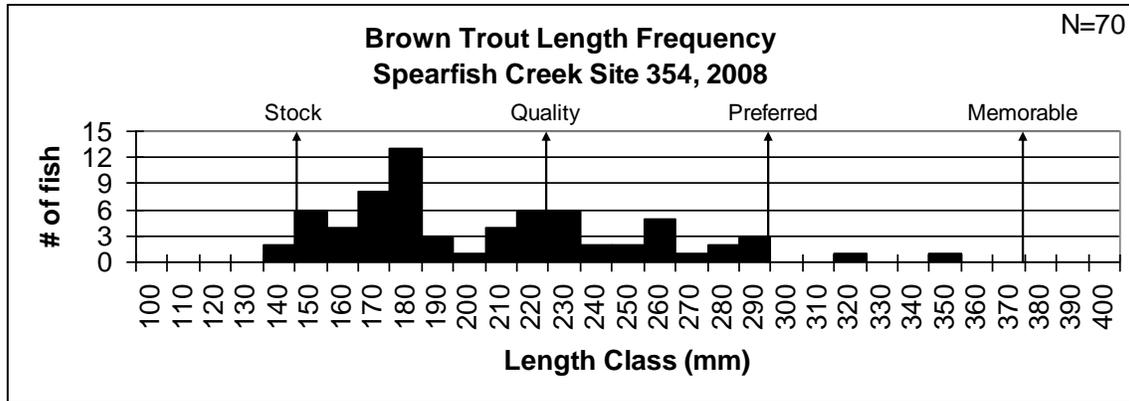


Figure 19. Brown trout length frequency histogram for Spearfish Creek Site 354, 2008. Age-0 fish were not included in the histogram.

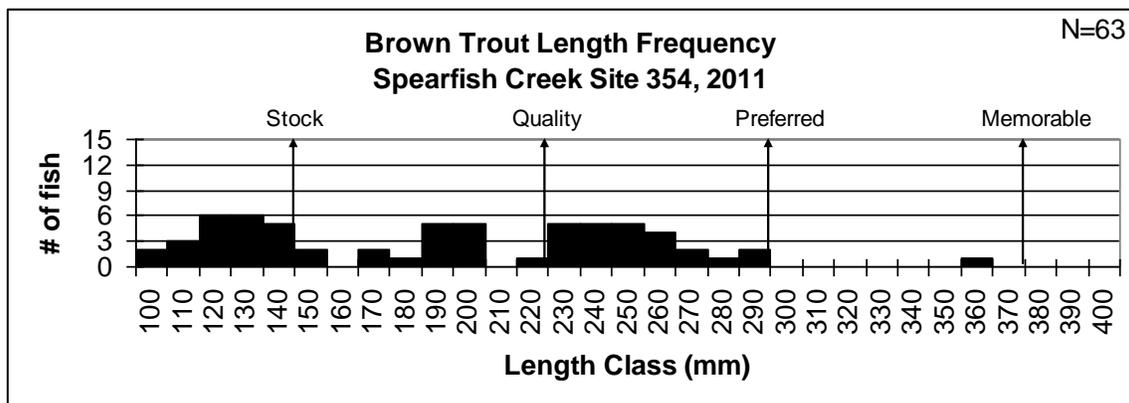


Figure 20. Brown trout length frequency histogram for Spearfish Creek Site 354, 2011. Age-0 fish were not included in the histogram.

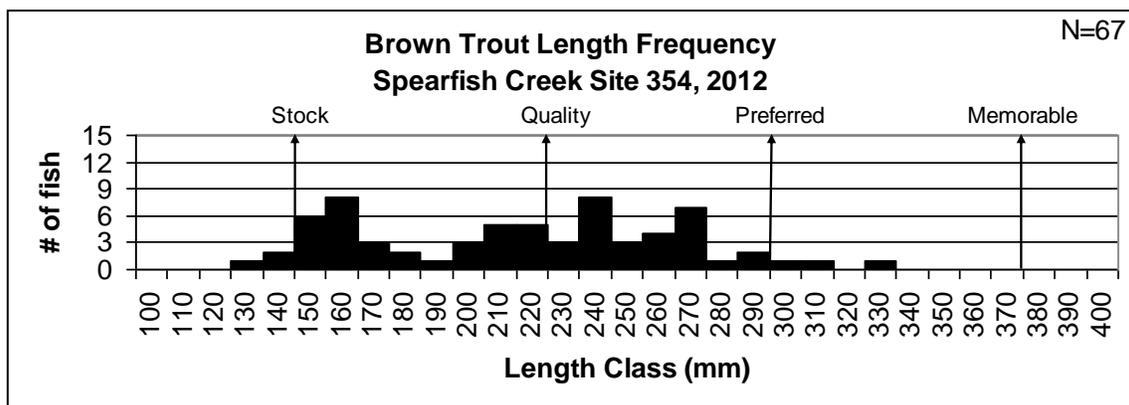


Figure 21. Brown trout length frequency histogram for Spearfish Creek Site 354, 2012. Age-0 fish were not included in the histogram.

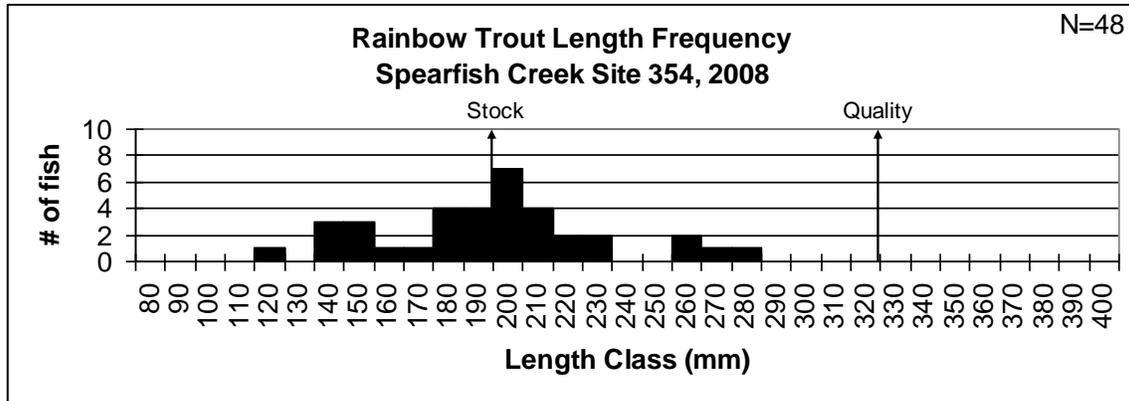


Figure 22. Rainbow trout length frequency histogram for Spearfish Creek Site 354, 2008. Age-0 fish were not included in the histogram.

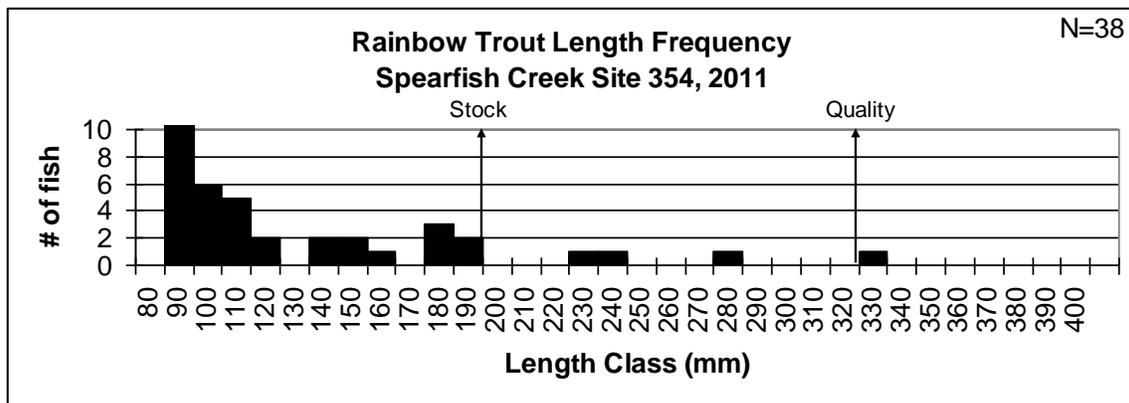


Figure 23. Rainbow trout length frequency histogram for Spearfish Creek Site 354, 2011. Age-0 fish were not included in the histogram.

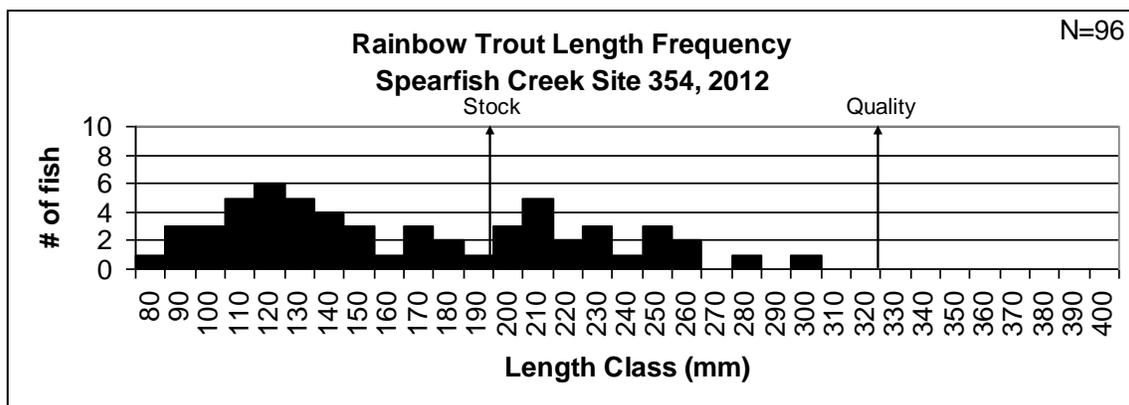


Figure 24. Rainbow trout length frequency histogram for Spearfish Creek Site 354, 2012. Age-0 fish were not included in the histogram.

Site 406 (Longvalley picnic area)

Site 406 is located south of Victoria by the Longvalley picnic area immediately off of highway 14A (Figure 18). This site was recently surveyed on July 30, 2012. This site was also surveyed in 2008 and 2011. During the 2008 survey length and weight data were not collected due to a mishap while sampling and therefore data are not presented graphically for 2008 at this site. In 2011 and 2012, brown trout alone were collected at the site (Figures 5 – 10). Of the 8 sites surveyed in 2012 Site 406 had the 3rd highest abundance of brown trout ≥ 200 mm per 100 m of stream (Figure 4). The brown trout in this site appear to be exhibiting consistent recruitment (Figures 25 and 26). However, there are not many brown trout over preferred length in this site (Figures 25 and 26).

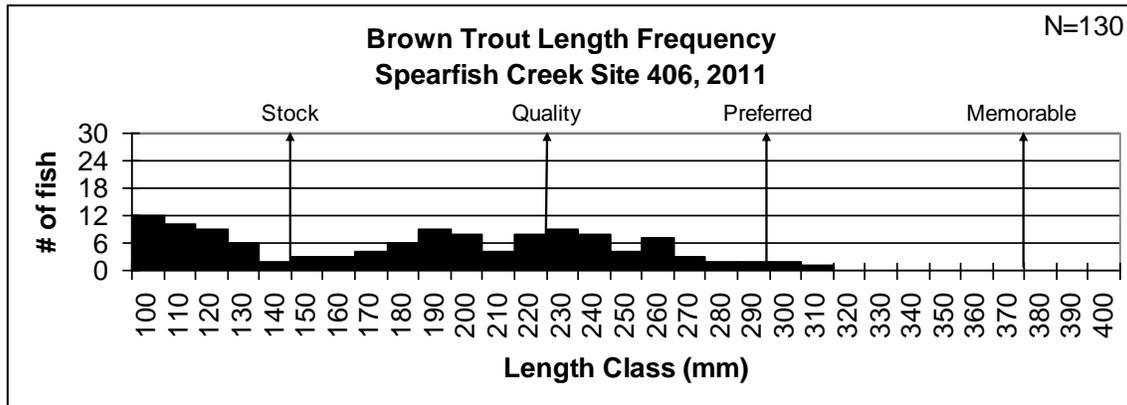


Figure 25. Brown trout length frequency histogram for Spearfish Creek Site 406, 2011. Age-0 fish were not included in the histogram.

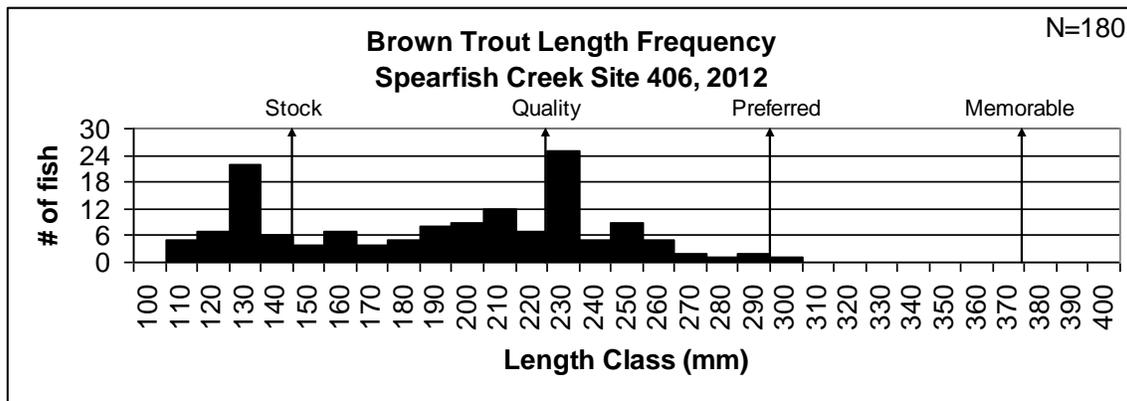


Figure 26. Brown trout length frequency histogram for Spearfish Creek Site 406, 2012. Age-0 fish were not included in the histogram.

Site 490 (Immediately below McKinley Gulch)

Site 490 is located immediately below McKinley Gulch just off of highway 14 A (Figure 27). The site was surveyed on August 1, 2012. Site 490 has mainly held brown trout during the past three surveys (Figures 5-10). However, an adult brook trout was

collected during the 2012 survey of this site (Figure 7). Recruitment appears to be consistent for brown trout at this site (Figures 28, 29 and 30). Juvenile brown trout are abundant at this site while there are few fish over quality length (Figures 28, 29, and 30).

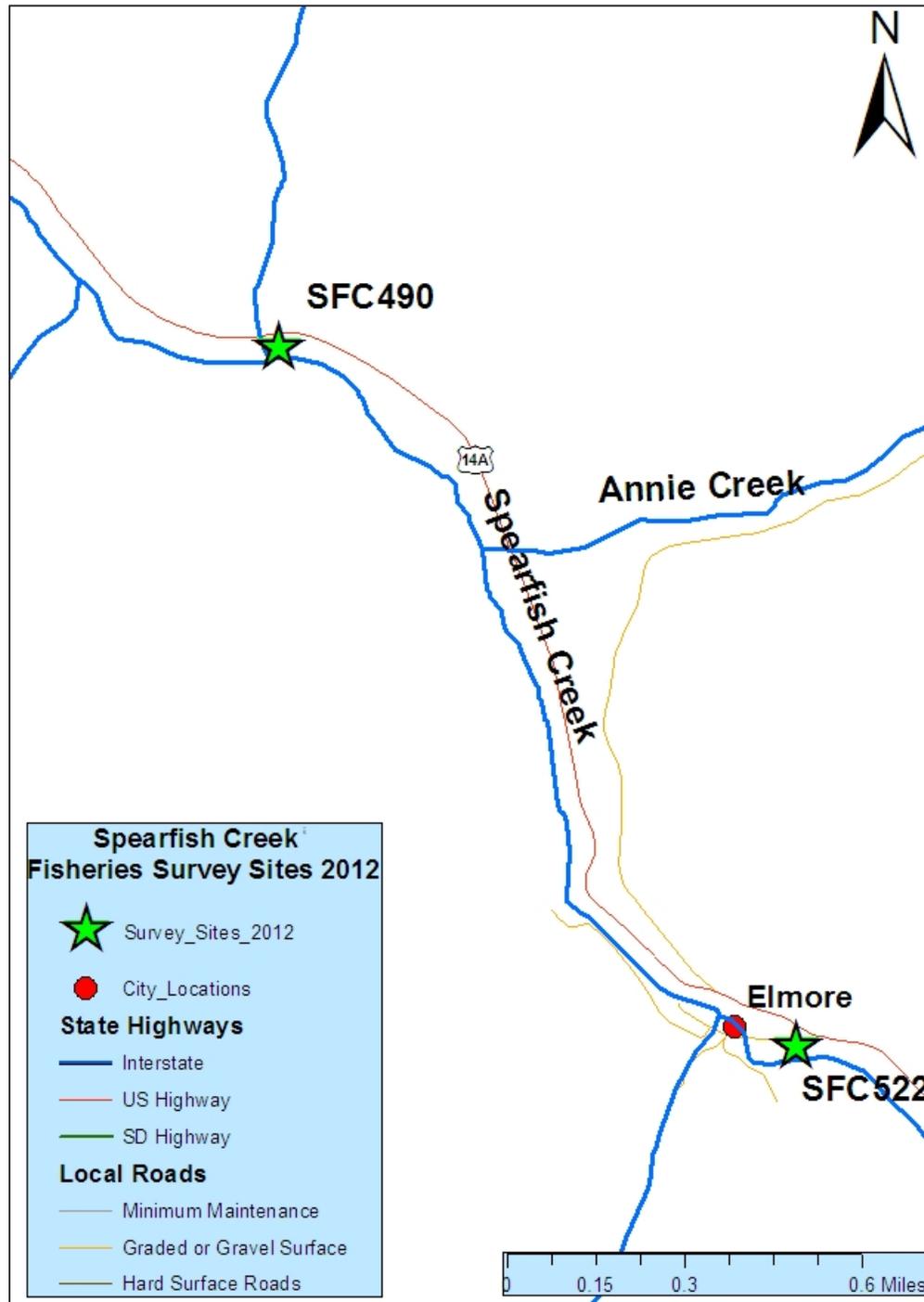


Figure 27. Spearfish Creek fisheries survey sites 354 & 406, 2012.

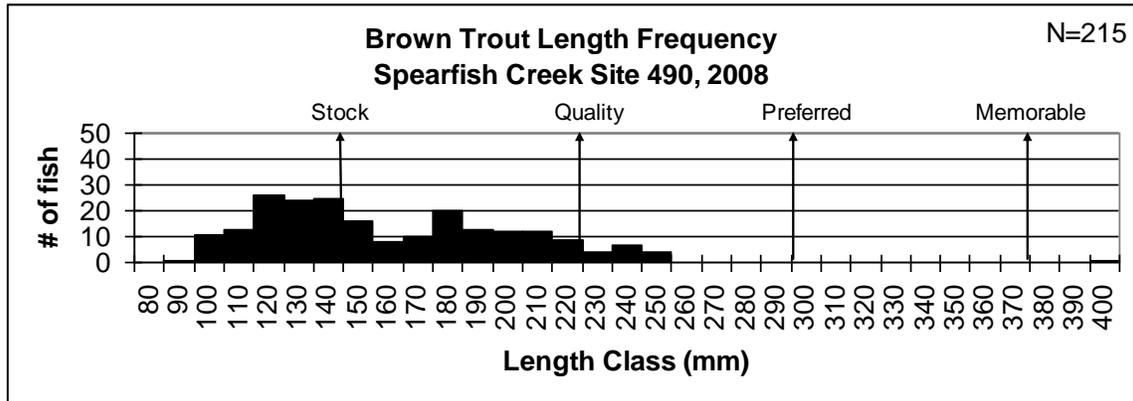


Figure 28. Brown trout length frequency histogram for Spearfish Creek Site 490, 2008. Age-0 fish were not included in the histogram.

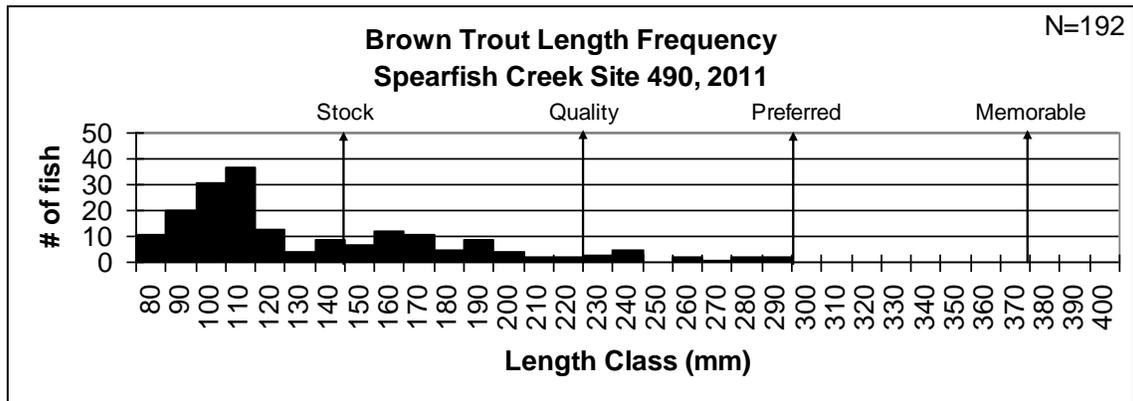


Figure 29. Brown trout length frequency histogram for Spearfish Creek Site 490, 2011. Age-0 fish were not included in the histogram.

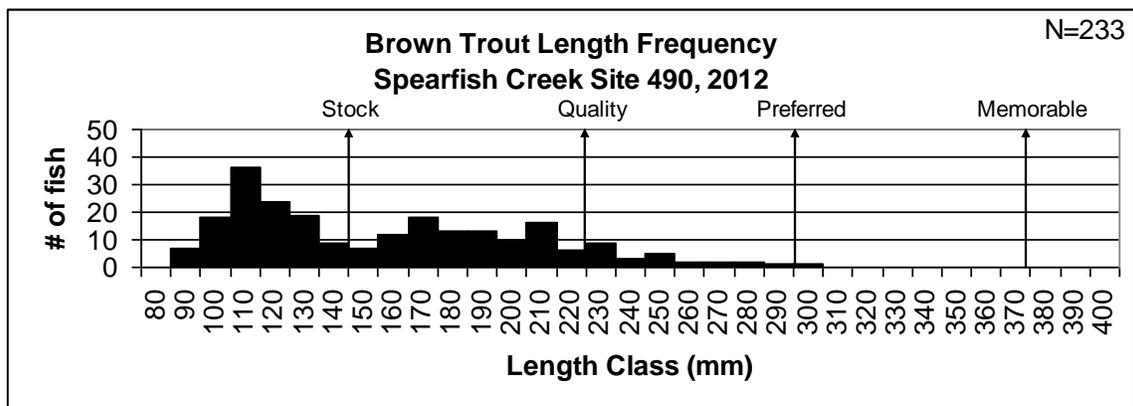


Figure 30. Brown trout length frequency histogram for Spearfish Creek Site 490, 2012. Age-0 fish were not included in the histogram.

Site 522 (Elmore 50m below Hwy 14A)

Site 522 is located southeast of Elmore 50m below highway 14A (Figure 27). This site was surveyed on August 1, 2012. Site 522 had the 2nd highest population estimate of brown trout ≥ 200 mm of the 8 sites surveyed in 2012 (Figure 3). There was a large number of brown trout < 200 mm as well (Figure 5). Recruitment appears to be consistent in this site as well (Figures 31 and 32). There is also a portion of the brown trout population exceeding quality, and to a lesser extent, preferred length at this site (Figures 31 and 32).

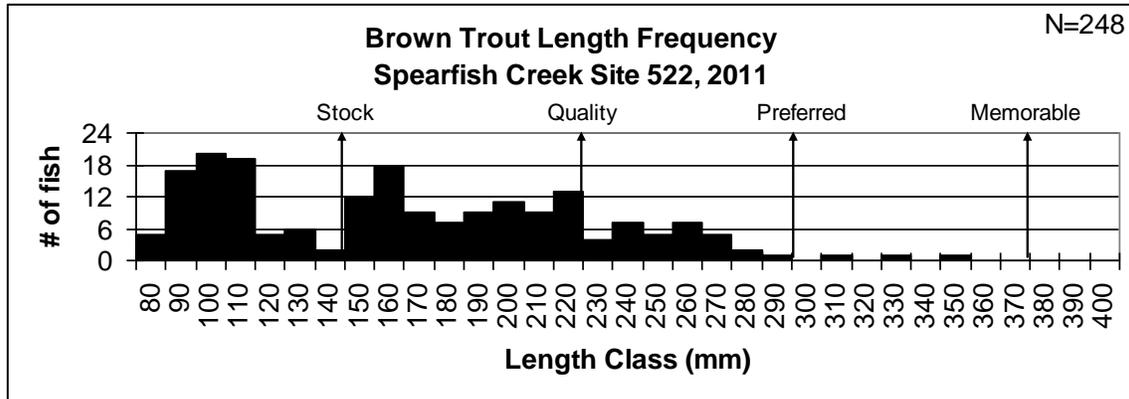


Figure 31. Brown trout length frequency histogram for Spearfish Creek Site 522, 2011. Age-0 fish were not included in the histogram.

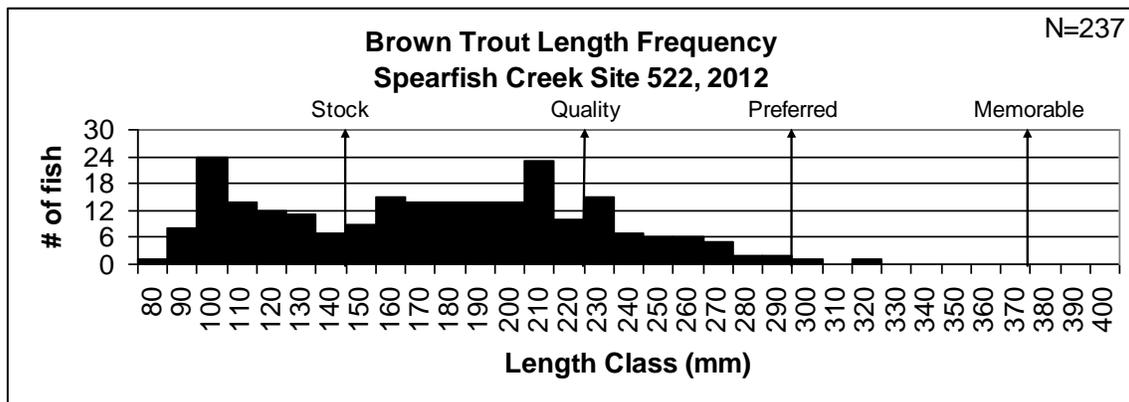


Figure 32. Brown trout length frequency histogram for Spearfish Creek Site 522, 2012. Age-0 fish were not included in the histogram.

Site 585 (At a pullout)

Site 585 is located southwest of Cheyenne Crossing near a road pullout off of highway 85 (Figure 33). This site was surveyed on August 2, 2012. Most of the brown trout were < 200 mm (Figures 5, 33, and 34). A large sample ($n=303$) of brown trout (not including age-0 fish) were collected during this survey (Figure 35). Brook trout were the only other fish species collected at this site during the past two surveys (Figure 8). There were

only a couple brook trout collected in both 2011 and 2012 and they were <200 mm (Figure 9). There are not many brown trout over quality length at this site (Figures 34 and 35).

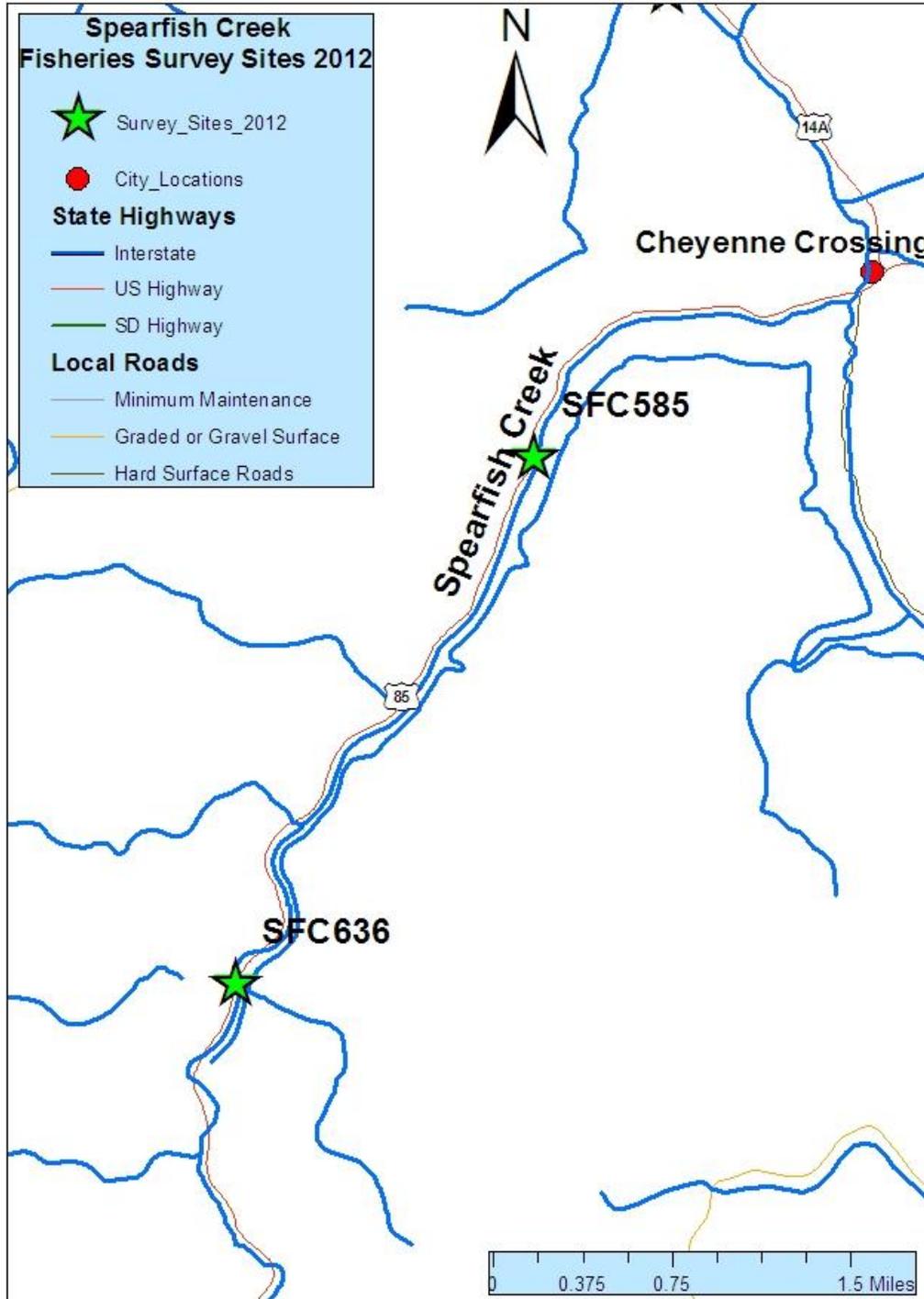


Figure 33. Spearfish Creek fisheries survey sites 354 & 406, 2012.

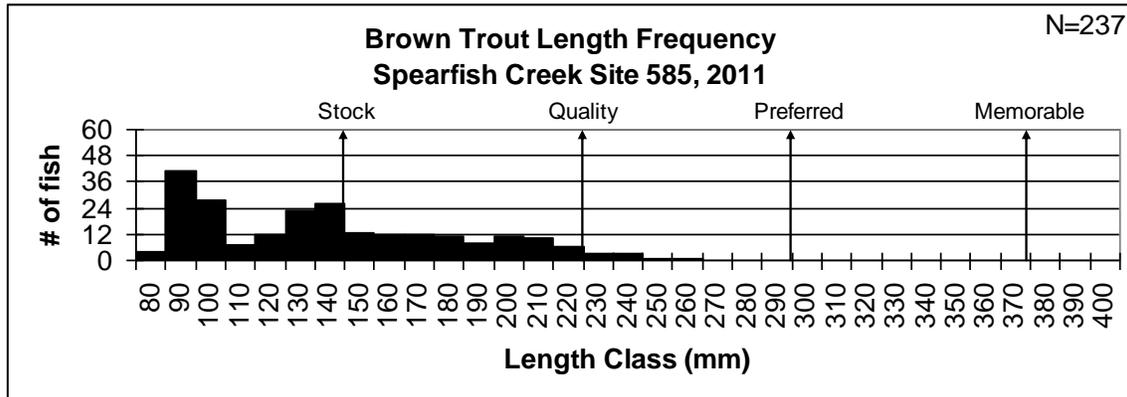


Figure 34. Brown trout length frequency histogram for Spearfish Creek Site 585, 2011. Age-0 fish were not included in the histogram.

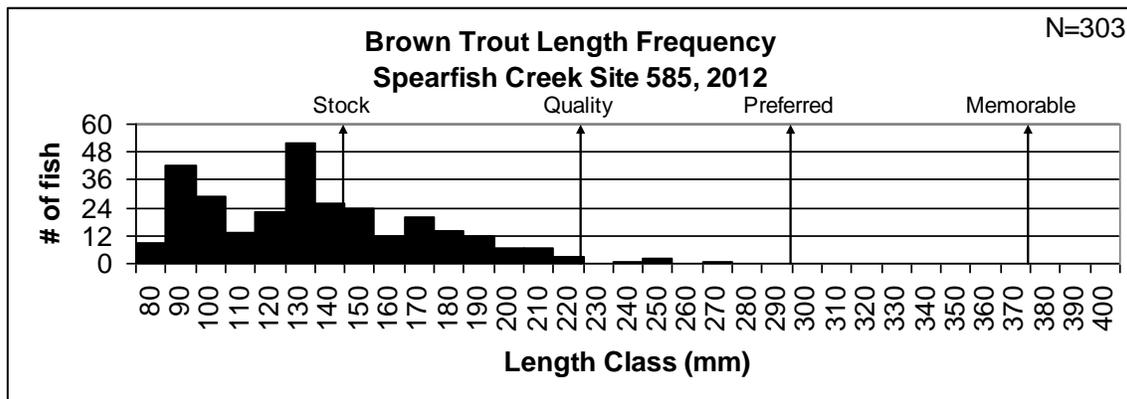


Figure 35. Brown trout length frequency histogram for Spearfish Creek Site 585, 2012. Age-0 fish were not included in the histogram.

Site 636 (0.6 mi up from Dead Ox picnic area)

Site 636 is a historical site located 0.6mi upstream from the Dead Ox picnic area near the headwaters of Spearfish Creek (Figure 33). This site was surveyed on August 2, 2012. Site 636 contains a population of brown trout and brook trout (Figures 3 – 8). Abundances for brown and brook trout <200 mm and \geq 200 mm appear highest in 2012 of the past three surveys (Figures 5, 6, 8, and 9). It also appears that the sizes of brown trout have increased at Site 636 from 2011 to 2012 with several year classes present (Figures 37 and 38). However, the increase in brown trout does not seem to have reduced the population of brook trout (Figures 7 and 8). There appears to be more adult and juvenile brook trout in the 2012 survey than the previous two surveys (Figures 39, 40, and 41).

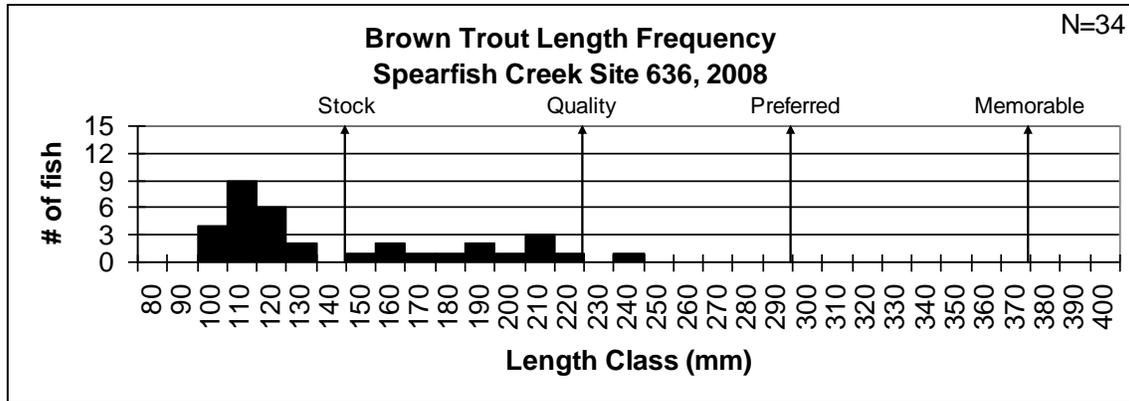


Figure 36. Brown trout length frequency histogram for Spearfish Creek Site 636, 2008. Age-0 fish were not included in the histogram.

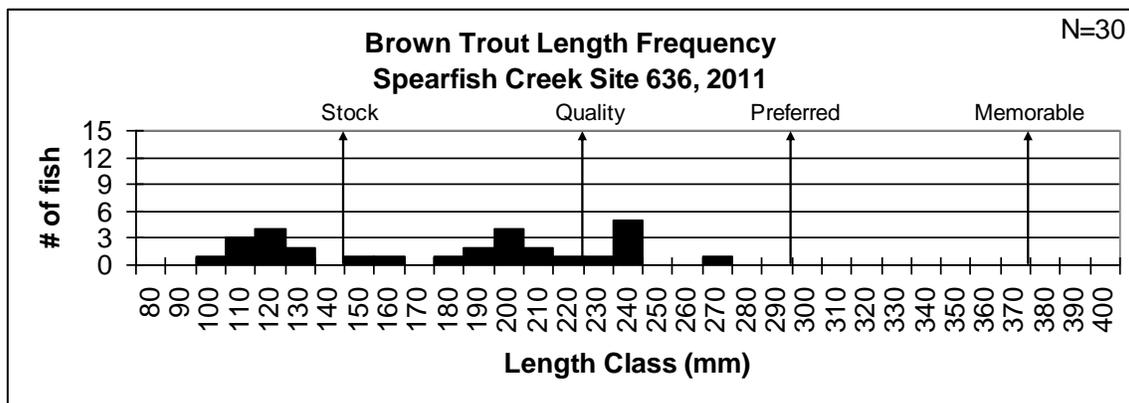


Figure 37. Brown trout length frequency histogram for Spearfish Creek Site 636, 2011. Age-0 fish were not included in the histogram.

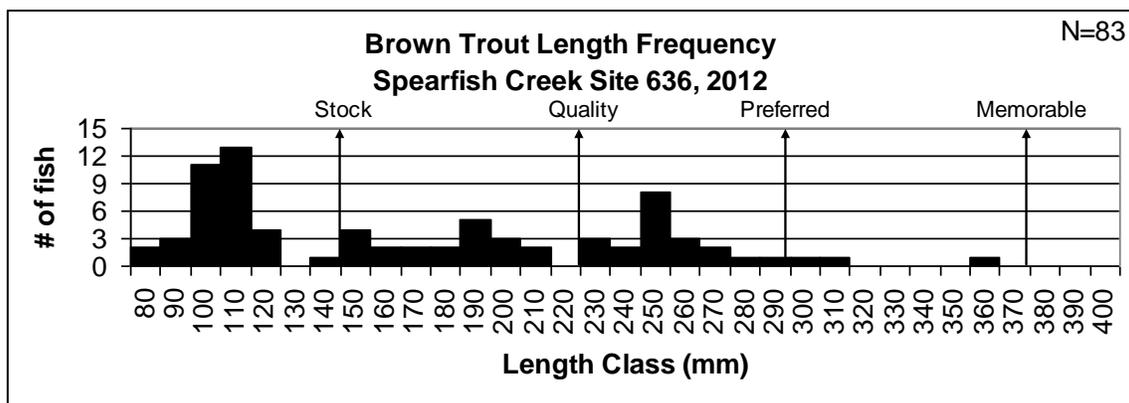


Figure 38. Brown trout length frequency histogram for Spearfish Creek Site 636, 2012. Age-0 fish were not included in the histogram.

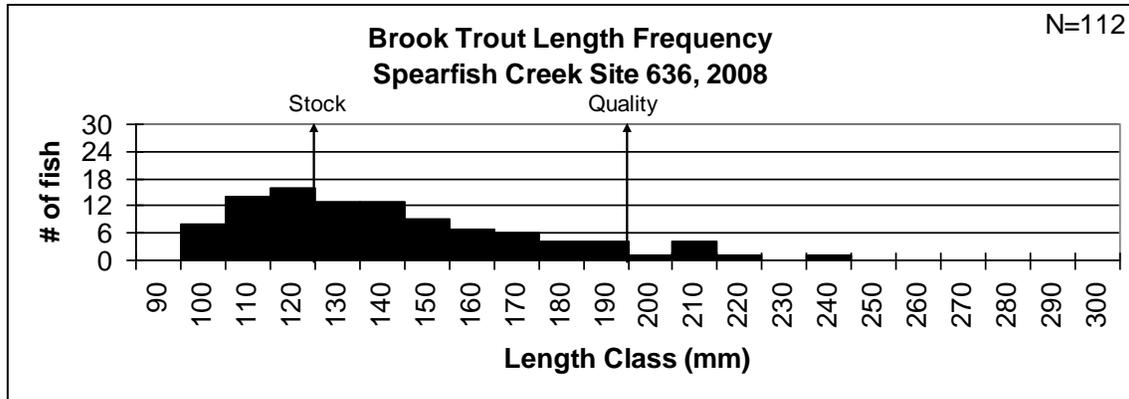


Figure 39. Brook trout length frequency histogram for Spearfish Creek Site 636, 2008. Age-0 fish were not included in the histogram.

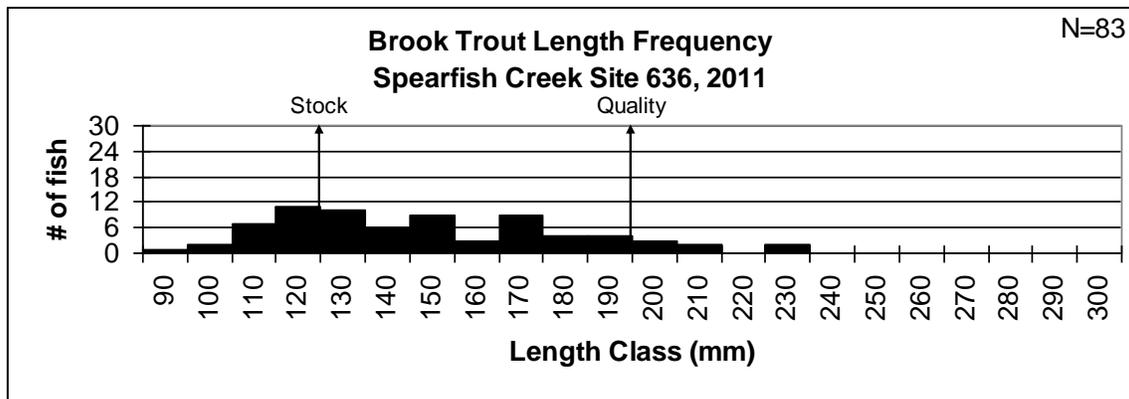


Figure 40. Brook trout length frequency histogram for Spearfish Creek Site 636, 2011. Age-0 fish were not included in the histogram.

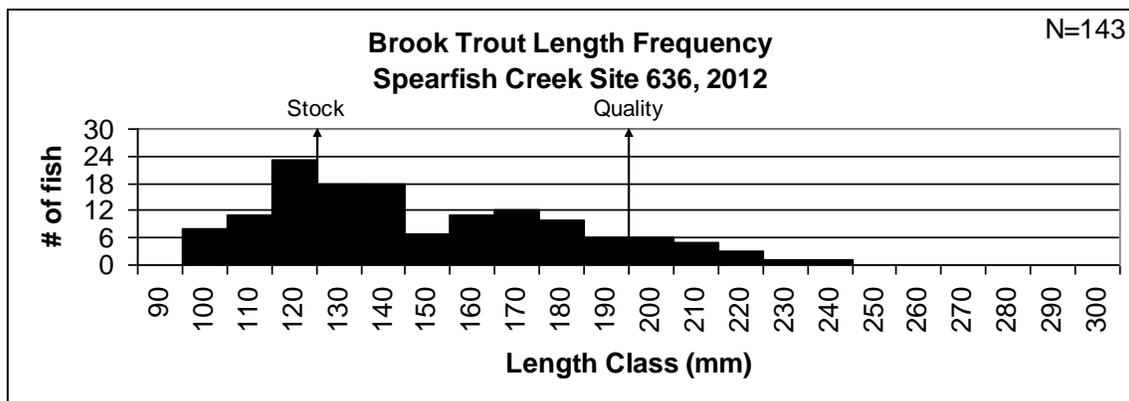


Figure 41. Brook trout length frequency histogram for Spearfish Creek Site 636, 2012. Age-0 fish were not included in the histogram.

Management Recommendations

1. Continue monitoring selected survey sites annually to ensure there are no current or potential problems with the fishery.
2. Conduct an intensive survey every 3 to 5 years as a thorough evaluation of the fishery.
3. Monitor the effects of changing water yield (drought or heavy precipitation events) on the fishery.

Appendix A. Spearfish Creek survey site characteristics 2012.

Site #	189	220	354	406	490	522	585	636
Site Length (m)	100	100	100	100	100	100	100	100
Mean Width (m)	6.5	11.4	10.1	9.3	6.6	7.2	5	3.8
Water Temp (C)	14.2	14.2	12.2	14.1	10.4	11.4	9.2	10.7
pH	NA	8.7	8.6	8.6	8.9	8.9	8.7	8.3
Conductivity (umhos/cm)	425	415	420	416	444	447	463	405
Passes (#)	3	3	3	3	3	3	3	3

References

- Hayes, D. B., J. R. Bence, T. J. Kwak, and B. E. Thompson. 2007. Abundance, biomass, and production. Pages 327-374 *in* C. S. Guy and M. L. Brown, editors. Analysis and interpretation of freshwater fisheries data. American Fisheries Society, Bethesda, Maryland.
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- Van Den Avyle, M. J. and R. S. Hayward. 1999. Dynamics of exploited fish populations. Pages 127-166 *in* C. C. Kohler and W. A. Hubert, editors. Inland fisheries management in North America, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Appendix A. Population and Biomass Estimates for Spearfish Creek during the 2012 survey.

Table 1. Population and Biomass Estimates for Spearfish Creek.

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
<p>Site Number: 189 Survey Completed by: Date Sampled: 31 JUL 2012 Conductivity (µmhos): 425 Site Description: West of High School (Picnic Area) (historic 1) Site Length (m): 100 pH: **** Legal Description: S10,R2E,T6N Mean Width (m): 6.5 Water Temperature (°C): 14.2 Stream Classification: BNT1 Number of Passes: 3 Air Temperature (°C): ****</p>														
Brown Trout	<200 mm	28	28	28	30	430	20.22	280	174	18.05	451	113.6	47.0	1.10
Brown Trout	≥200 mm	101	101	101	103	1,552	348.59	1,010	628	311.25	1,625	273.4	224.7	1.06
Brown Trout	ALL	129	130	129	133	1,997	405.49	1,300	809	362.05	2,092	238.7	203.0	1.07
<p>Site Number: 220 Survey Completed by: South Dakota Game, Fish and Parks Date Sampled: 31 JUL 2012 Conductivity (µmhos): 415 Site Description: City Campground Site Length (m): 100 pH: 8.7 Legal Description: S15,R2E,T6N Mean Width (m): 11.4 Water Temperature (°C): 14.2 Stream Classification: BNT1 RBT2 Number of Passes: 3 Air Temperature (°C): ****</p>														
Brown Trout	<200 mm	299	339	314	364	2,962	110.92	3,390	1,200	99.04	5,455	152.5	37.5	1.03
Brown Trout	≥200 mm	47	47	47	48	411	84.51	470	166	75.45	756	271.6	205.8	0.99
Brown Trout	ALL	346	377	358	396	3,294	512.32	3,770	1,334	457.44	6,066	236.0	155.5	1.00
Rainbow Trout	≥200 mm	1	1	1	1	9	0.83	10	4	0.74	16	212.0	95.0	1.00
Rainbow Trout	ALL	1	1	1	1	9	0.83	10	4	0.74	16	212.0	95.0	1.00

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 354 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: 354-Below Squaw Creek Confluence
 Legal Description: S17,R2E,T5N
 Stream Classification: BKT3 BNT1 RBT1

Date Sampled: 30 JUL 2012 Conductivity (umhos): 420
 Site Length (m): 100 pH: 8.6
 Mean Width (m): 10.1 Water Temperature (°C): 12.2
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	≥200 mm	1	1	1	5	10	1.00	10	4	0.90	16	213.0	101.0	1.05
Brook Trout	ALL	1	1	1	5	10	1.00	10	4	0.90	16	213.0	101.0	1.05
Brown Trout	<200 mm	132	292	132	520	2,902	127.04	2,920	1,175	113.43	4,698	98.3	43.8	1.04
Brown Trout	≥200 mm	44	45	44	48	447	73.38	450	181	65.52	724	248.0	164.1	1.04
Brown Trout	ALL	176	252	187	317	2,504	307.51	2,520	1,014	274.57	4,055	154.6	122.8	1.04
Rainbow Trout	<200 mm	315	458	366	550	4,551	140.59	4,580	1,843	125.53	7,369	95.7	30.9	1.12
Rainbow Trout	≥200 mm	21	22	21	26	219	42.63	220	89	38.06	354	240.4	195.0	1.55
Rainbow Trout	ALL	336	474	389	559	4,710	425.36	4,740	1,908	379.80	7,627	127.7	90.3	1.28

Site Number: 406 Survey Completed by:
 Site Description: 406-Longvalley Picnic Area
 Legal Description: S00,R00E,T
 Stream Classification: BNT1

Date Sampled: 30 JUL 2012 Conductivity (umhos): 416
 Site Length (m): 100 pH: 8.6
 Mean Width (m): 9.3 Water Temperature (°C): 14.1
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	102	135	102	171	1,447	54.07	1,350	586	48.28	2,172	121.3	37.4	1.08
Brown Trout	≥200 mm	78	85	78	95	911	119.81	850	369	106.98	1,368	235.9	131.5	0.98
Brown Trout	ALL	180	216	187	245	2,316	201.38	2,160	938	179.81	3,475	171.0	87.0	1.03

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 490 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: 490-Immediately below McKinley Gulch(old site 15)
 Legal Description: S5,R2E,T4N
 Stream Classification: BKT3 BNT1

Date Sampled: 01 AUG 2012 Conductivity (umhos): 444
 Site Length (m): 100 pH: 8.9
 Mean Width (m): 6.6 Water Temperature (°C): 10.4
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	≥200 mm	1	1	1	1	15	4.18	10	6	3.73	16	292.0	275.0	1.10
Brook Trout	ALL	1	1	1	1	15	4.18	10	6	3.73	16	292.0	275.0	1.10
Brown Trout	<200 mm	307	333	315	351	5,059	169.98	3,330	2,049	151.77	5,358	127.8	33.6	1.09
Brown Trout	≥200 mm	57	57	57	59	866	115.83	570	351	103.43	917	230.1	133.8	1.07
Brown Trout	ALL	364	389	373	405	5,910	343.38	3,890	2,394	306.59	6,259	149.9	58.1	1.08

Site Number: 522 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: 522-Elmore 50m below Hwy 14A
 Legal Description: S9,R2E,T50
 Stream Classification: BNT1

Date Sampled: 01 AUG 2012 Conductivity (umhos): 447
 Site Length (m): 100 pH: 8.9
 Mean Width (m): 7.2 Water Temperature (°C): 11.4
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brown Trout	<200 mm	223	285	240	330	3,963	149.55	2,850	1,605	133.53	4,586	142.6	37.7	1.10
Brown Trout	≥200 mm	92	93	92	96	1,293	175.44	930	524	156.64	1,496	234.3	135.7	1.03
Brown Trout	ALL	315	357	331	383	4,965	377.65	3,570	2,011	337.19	5,744	178.2	76.1	1.07

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 585 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: SFC585-@ a pullout
 Legal Description: S20,R2E,T4
 Stream Classification: BKT0 BNT1

Date Sampled: 02 AUG 2012 Conductivity (µmhos): 463
 Site Length (m): 100 pH: 8.7
 Mean Width (m): 5.0 Water Temperature (°C): 9.2
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	<200 mm	3	3	3	3	60	0.60	30	24	0.54	48	103.7	10.0	0.88
Brook Trout	ALL	3	3	3	3	60	0.60	30	24	0.54	48	103.7	10.0	0.88
Brown Trout	<200 mm	282	294	284	304	5,912	166.62	2,940	2,394	148.77	4,730	130.9	28.2	1.05
Brown Trout	≥200 mm	21	21	21	23	422	44.30	210	171	39.56	338	220.0	104.9	0.97
Brown Trout	ALL	303	316	305	327	6,355	215.01	3,160	2,574	191.98	5,084	137.1	33.8	1.04

Site Number: 636 Survey Completed by: South Dakota Game, Fish and Parks
 Site Description: 636 - 0.6 mi up from Dead Ox Picnic
 Legal Description: S00,R00E,T
 Stream Classification: BKT1 BNT1

Date Sampled: 02 AUG 2012 Conductivity (µmhos): 405
 Site Length (m): 100 pH: 8.3
 Mean Width (m): 3.8 Water Temperature (°C): 10.7
 Number of Passes: 3 Air Temperature (°C): ****

Species	Size Class	Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI	# per hectare	Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor
Brook Trout	<200 mm	132	136	132	142	3,570	122.24	1,360	1,446	109.14	2,188	142.5	34.2	1.02
Brook Trout	≥200 mm	16	16	16	18	420	41.95	160	170	37.46	257	216.4	99.9	0.98
Brook Trout	ALL	148	154	148	161	4,043	168.96	1,540	1,637	150.86	2,478	150.7	41.8	1.02
Brown Trout	<200 mm	61	69	61	81	1,811	53.67	690	734	47.92	1,110	121.8	29.6	1.08
Brown Trout	≥200 mm	28	28	28	30	735	140.09	280	298	125.08	451	256.6	190.6	1.08
Brown Trout	ALL	89	98	89	109	2,573	232.91	980	1,042	207.96	1,577	167.2	90.5	1.08