STATE FISHERIES SURVEYS, 2008
SURVEYS OF PUBLIC WATERS
PART I STREAMS REGION I

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Part 1 – Streams
Region 1

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PREFACE

Fish populations in Black Hills' streams were surveyed during September 2007 or May – September 2008 to monitor fish populations and to gain an understanding of the distribution and relative abundances of fish within the Northern Black Hills' Watersheds. Watersheds that were included in the survey were Rapid Creek, Boxelder Creek, Elk Creek, Bear Butte Creek, Spearfish Creek, and Crow Creek (Figure 1).

Copies of this report and references to the data can be made with permission form the author of the Director of the Division of Wildlife. South Dakota Department of Game, Fish, and Parks, 523 E. Capitol, Pierre, South Dakota, 57501-3182.

The authors would like the acknowledge the following individuals from the South Dakota Game, Fish, and Parks who assisted with the data collection, data entry, and editing of this manuscript: Gene Galinat, Greg Simpson, Bill Miller, Kristopher Cudmore, James Rasmussen, Jessica Borden, and all volunteers who assisted with stream sampling. Special thanks to Greg Simpson, Gene Galinat, and Bill Miller for edits to this document.

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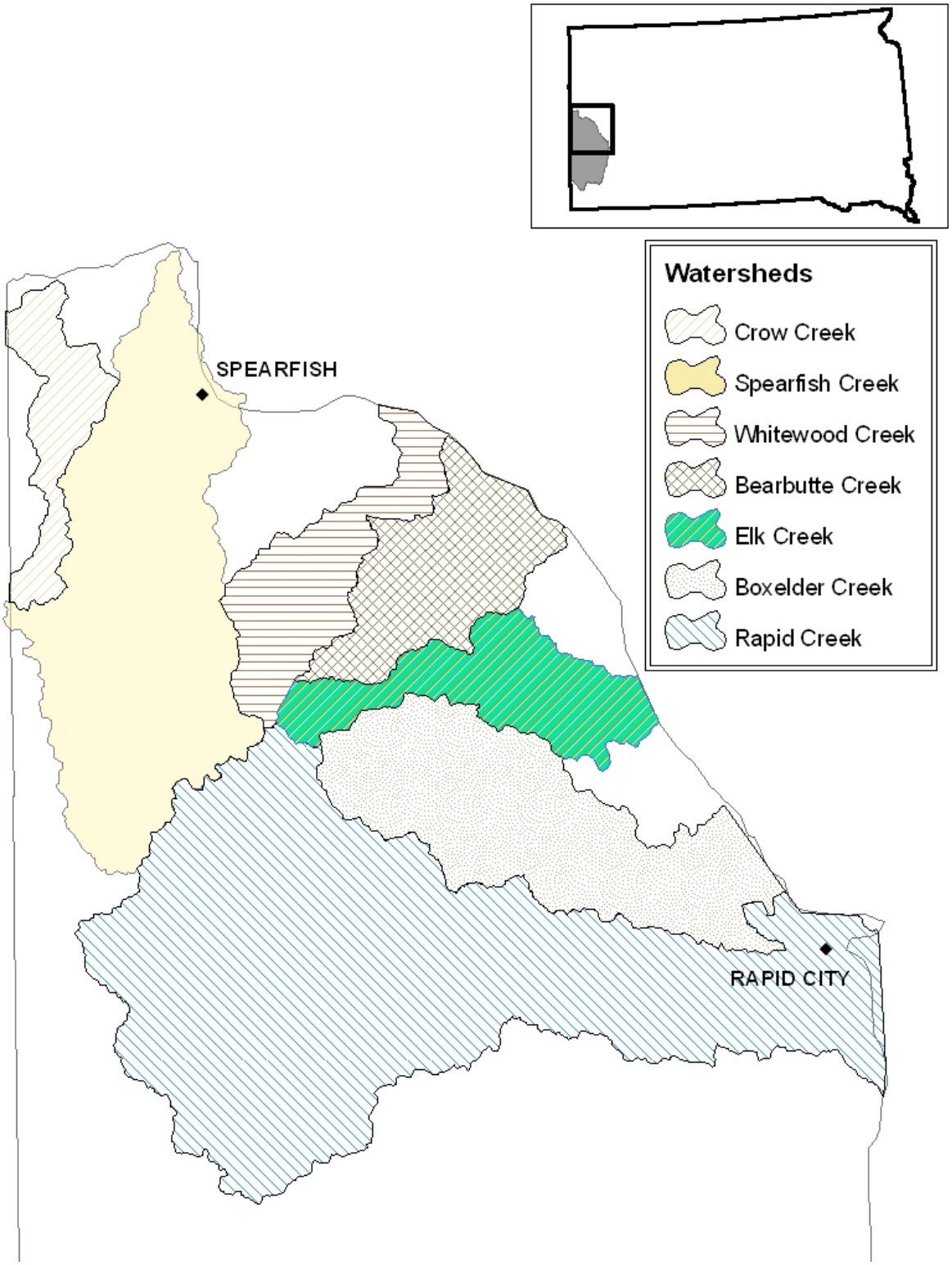

Figure 1. Location of watersheds in the Black Hills Trout Management Area (BHTMA) that were surveyed during 2007 and 2008.

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Rapid Creek Watershed

Counties: Pennington and Lawrence

Fish populations in Rapid Creek and its tributaries were surveyed during 2008 to monitor fish populations. The Rapid Creek Watershed begins at the headwaters of the north and south forks of Rapid Creek north and west of Rochford and the north and south fork of Castle Creek south of Deerfield Lake (Figure 2). Castle Creek runs through Deerfield Lake and enters Rapid Creek near Mystic. Rapid Creek runs east through Pactola Reservoir and Canyon Lake before entering the Cheyenne River about 13 miles east of Farmingdale. A majority of the Rapid Creek Watershed is located in a pine/spruce forest which is managed by the US Forest Service. This Watershed is also the most populated watershed in the Black Hills and due to its proximity to Rapid City, serves as the main source of water for this population. Currently, more fish are stocked in the Rapid Creek Watershed than any other watershed. Sections of Rapid Creek, Castle Creek, Ditch Creek, and Slate Creek, are stocked with rainbow trout. Additionally, Deerfield Lake, Pactola Reservoir, Canyon Lake, and several small bodies of water within the town of Rapid City are also stocked with rainbow trout.

The majority of Rapid Creek and its tributaries are managed under standard regulations with a daily limit of five trout (in any combination) with one allowed 14 inches or longer. Two sections of Rapid Creek are managed under catch-and-release regulations where the harvest of fish and possession of organic bait within 100 feet of the stream are prohibited. The section of stream from Pactola Dam downstream 2 mi to the Placerville foot bridge has been managed under catch-and-release regulations since 1991. Also, the section of stream from Park Drive to Jackson Boulevard in the town of Rapid City has been managed under catch-and-release regulations since 2006.

Most of western South Dakota experienced moderate to severe drought from 2002 to 2008 (US Drought Monitor 2009) which likely has affected fish populations and habitats. However, in 2008 above average moisture brought relief from the prolonged drought. Rapid Creek's 30-year median flow at the USGS gauging station near Silver City for June and July is 97 and 57 CFS respectively, but average daily flow in 2008 was 126 and 151 CFS respectively and exceeded 680 CFS.

Methods

Sample Location

Eight reaches in Rapid Creek and two reaches in Castle Creek were surveyed during September 2008. Twenty-two reaches in 20 tributary creeks were surveyed between May and August 2008. Sampled creeks included Victoria Creek, Prairie Creek, Brush Creek, Deer Creek (Figure 3), Slate Creek, Slate Creek South Fork (Figure 5), Gimlet Creek, Silver Creek (tributary of Rapid Creek), Hop Creek, Rapid Creek Rhodes Fork, Rapid Creek North Fork, Swede Gulch, Tillson Creek, Buskala Creek, Bittersweet Creek (Figure 4), Castle Creek North Fork, Gold Run Gulch, Castle Creek South Fork, Heely Creek, Ditch Creek, Pole Creek, and Silver Creek (tributary of

Castle Creek) (Figure 5). One site was sampled in each tributary creek except for Slate Creek, Bittersweet Creek, and Castle Creek South Fork which had two sample sites each. Due to high flows and increased turbidity, sampling was not completed in Rapid Creek's South Fork or Rapid Creek's North Fork near its confluence with the South Fork.

Sample Methods

Efforts were made to satisfy the assumptions 1) the population is static, 2) capture probability remained constant across sampling periods, and 3) all fish in the population are equally vulnerable to capture (Van Den Avyle and Hayward 1999; Hayes et al. 2007). All sample reaches were 100 m in length. Block nets at the upstream and downstream boundaries were used to prevent fish from emigrating or immigrating within the sample site. Three passes were made in Rapid Creek, and Castle Creek, with two backpack electrofishing units. One pass was made in all other tributary creeks with one backpack electrofishing unit. Captured fish were anesthetized with carbon dioxide, measured to the nearest millimeter total length, weighed to the nearest gram, and returned to the stream. After 50 individual lengths and weights were collected from small fish (< 100mm) of a specific species, bulk counts were collected to expedite data collection. For three-pass surveys, a maximum-likelihood estimator was used to estimate catchability and population (Junge and Libosvarsky 1965; cited in Hayes et al. 2007). For single-pass surveys, relative abundance was calculated as CPUE (number of fish captured per 100 m of stream). Relative abundances were compared to historical data from individual sites when historical sampling occurred within comparable months. For 2008 samples completed in May or June, historical samples in May and June were used for comparison. For 2008 samples completed in July or August, historical samples in July or August were used for comparison. As a result of the small sample size, caution must be given when interpreting the data and extrapolating it to the entire stream.

In addition to fish data, pH, temperature, and specific conductance were measured and recorded. Additionally, stream widths were measured every 10 meters and averaged to obtain an estimate of total area sampled. Stream flow data was also downloaded from the USGS web site for water years 1996-2008 (available at: http://waterdata.usgs.gov/sd/nwis).

During this study, efforts were made to check all drainages for presence of water. Sites were sampled if they had flowing water and several drainages in the Rapid Creek Watershed were not sampled during the 2008 survey due to lack of water. These sites included Brush Creek, Bittersweet Creek site 1, Dutchmen's Creek, and East Gimlet Creek (Figure 3, Figure 4, Figure 5). Cousin Jack creek was almost dry and is located on private land; therefore this creek was also not surveyed.

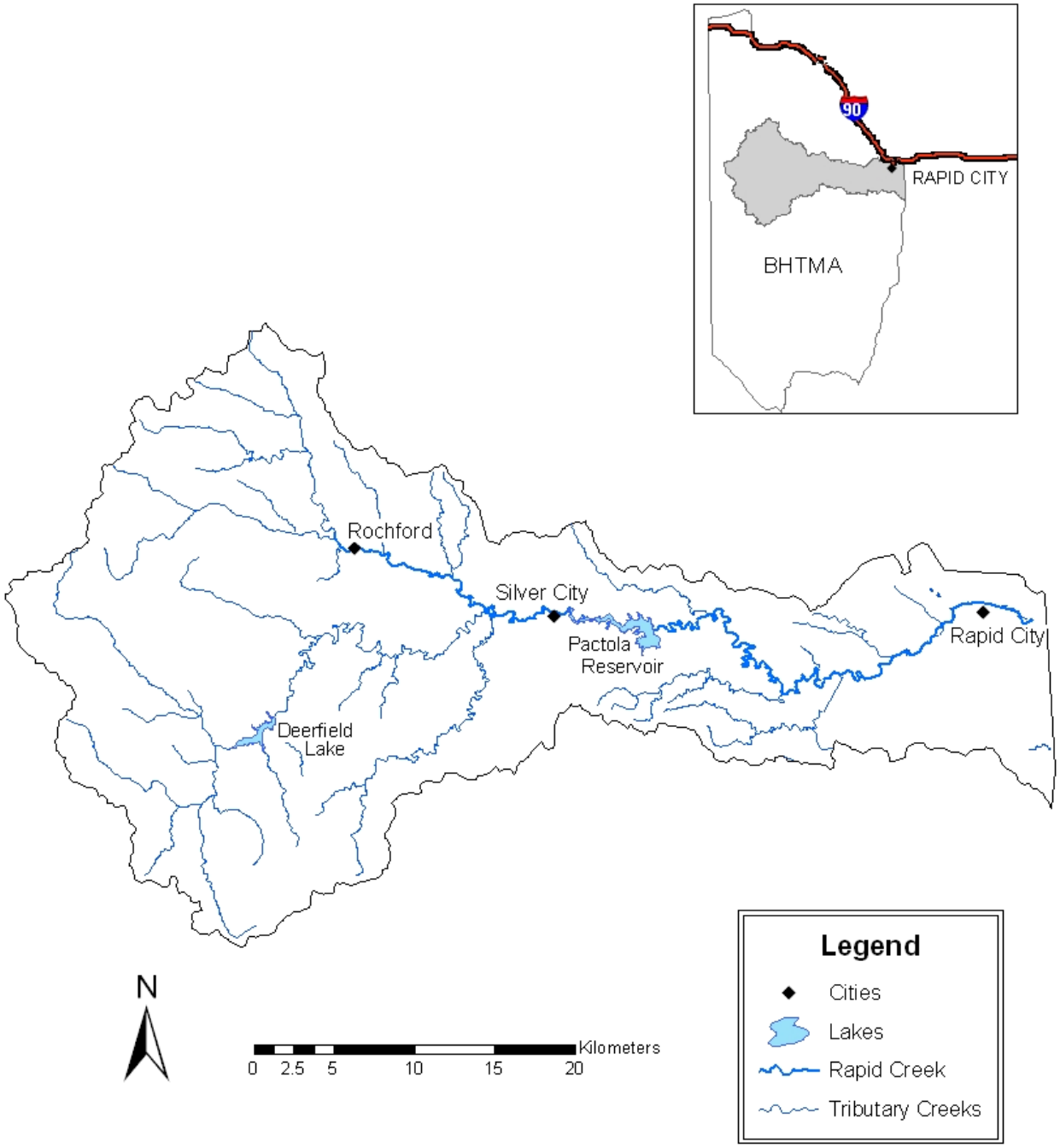


Figure 2. Rapid Creek Watershed within the Black Hills Trout Management area (BHTMA)

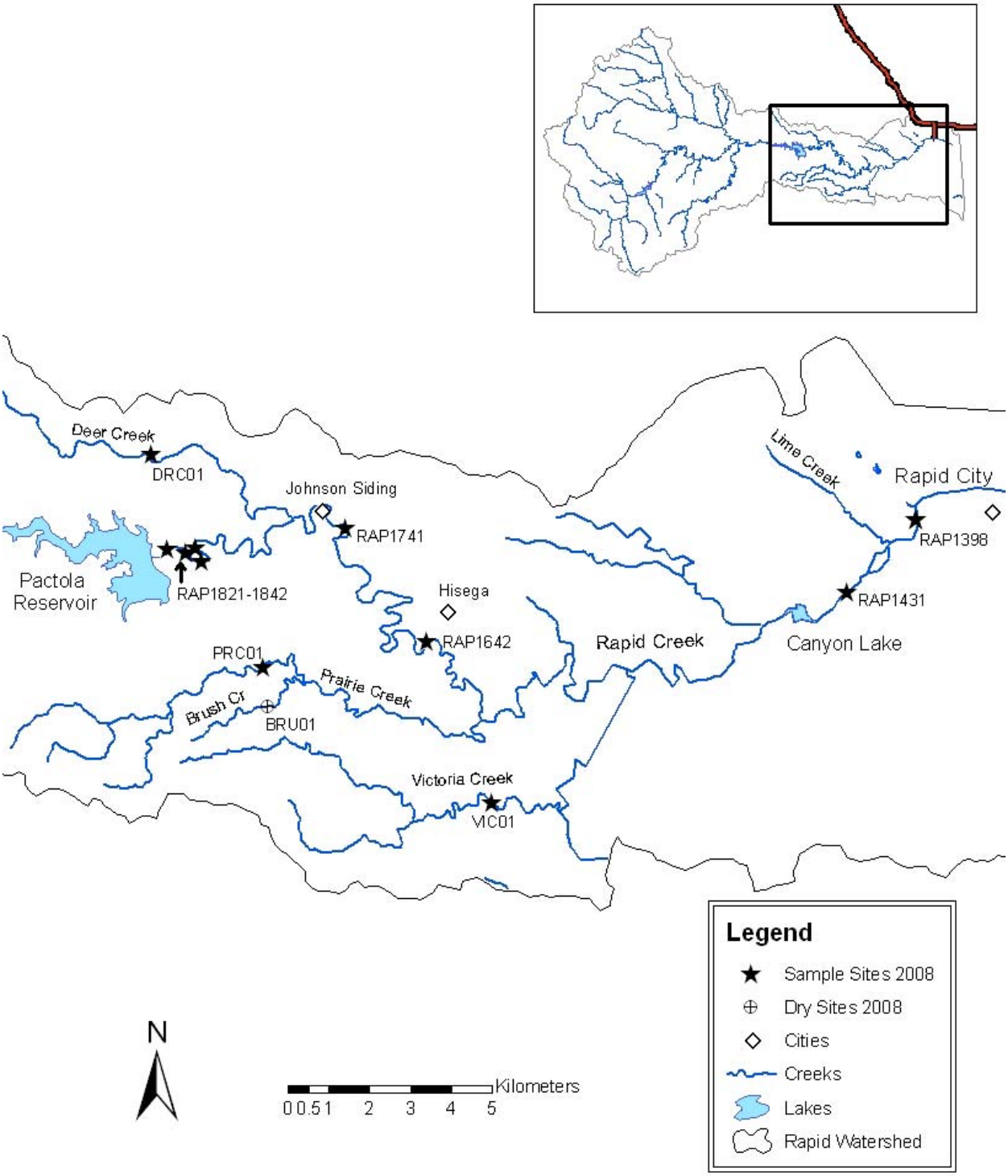


Figure 3. Location of 2008 sample reaches for the eastern part of the Rapid Creek Watershed within the BHTMA.

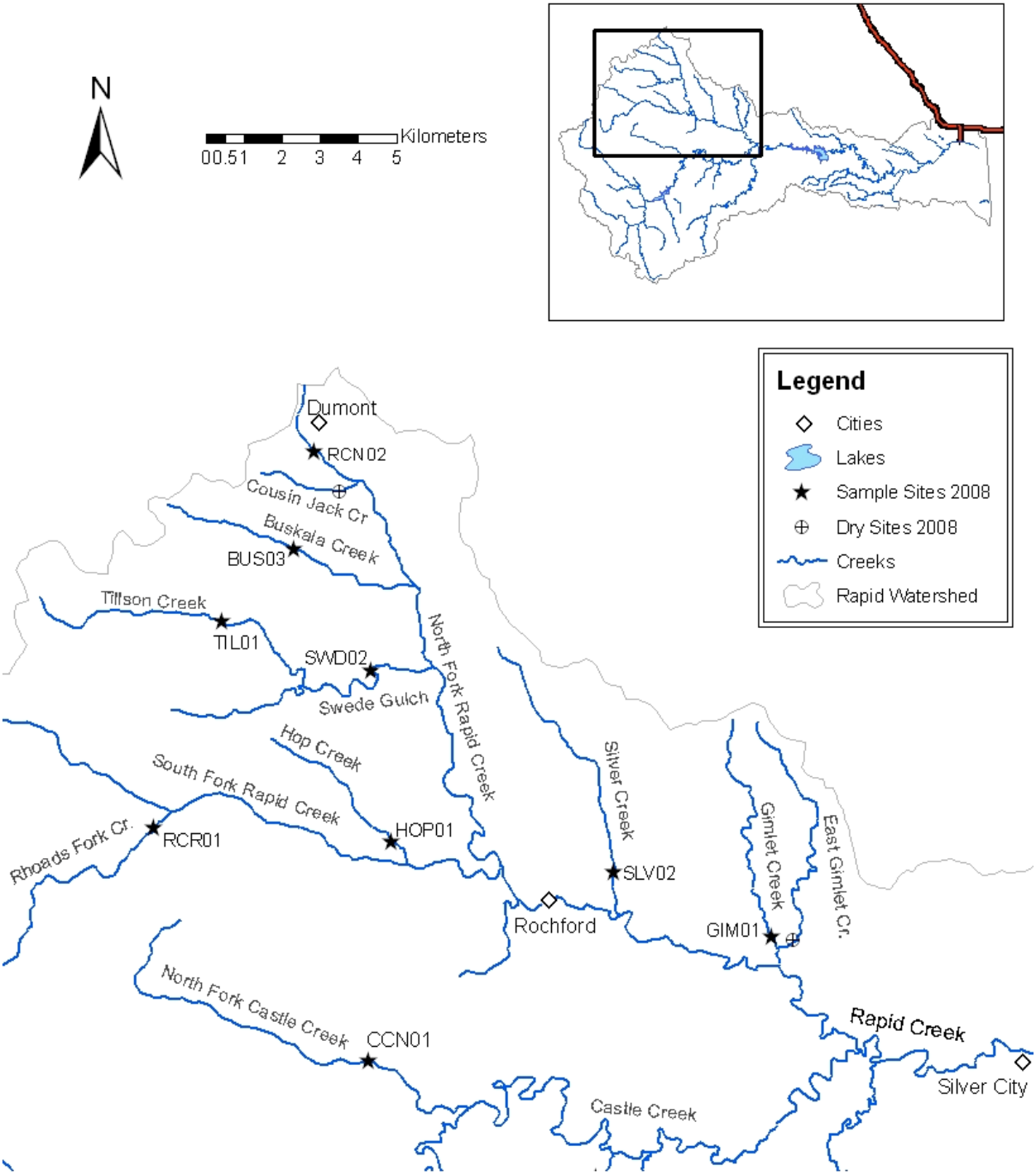


Figure 4. Location of the 2008 sample sites within the north-west section of the Rapid Creek Watershed.

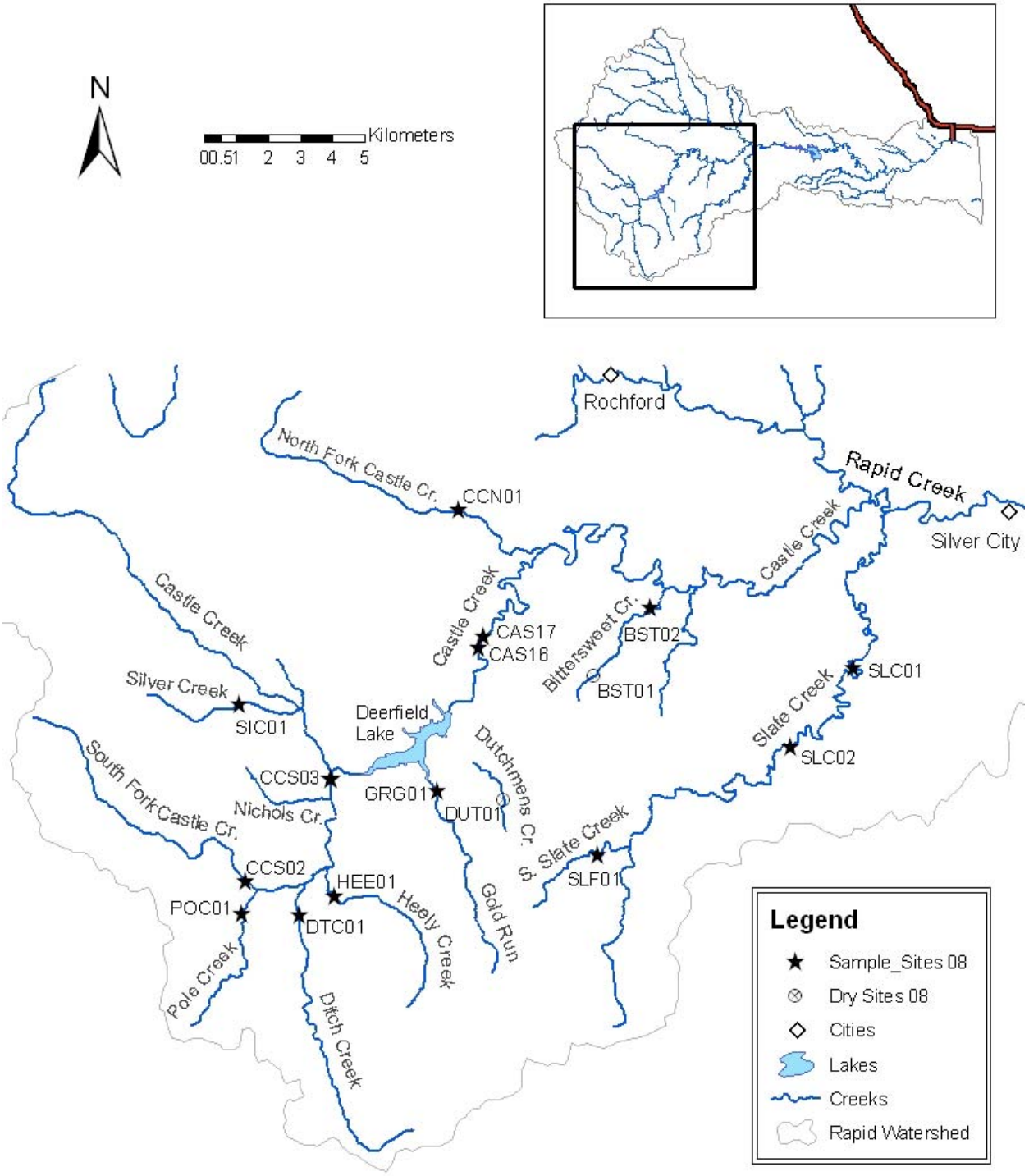


Figure 5. Location of the 2008 sample sites within the south-west section of the Rapid Creek Watershed.

Results and Discussion

Ten species of fish were captured in the Rapid Creek Watershed during 2008 sampling (Table 1). The most abundant species in the watershed was brown trout although most were captured in Rapid Creek itself. The most abundant species in the tributary creeks was brook trout followed by brown trout. Native fish species were present in low abundances, with a majority of them captured in Rapid Creek within the town of Rapid City (Table 2), Slate Creek, and Swede Gulch (Table 3).

Table 1. List of species captured in the Rapid Creek Watershed during the 2008 survey.

Common name	Species code	Scientific name
Brook trout	BKT	*Salvelinus fontinalis*
Brown trout	BNT	*Salmo trutta*
Rainbow trout	RBT	*Oncorhynchus mykiss*
Green sunfish	GSF	*Lepomis cyanellus*
Longnose dace	LND	*Rhinichthys cataractae*
White sucker	WHS	*Catostomus commersoni*
Mountain sucker	MTS	*Catostomus platyrhynchus*
Creek chub	CRC	*Semotilus atromaculatus*
Green sunfish	GSF	Lepomis cyanellus
Largemouth bass	LMB	*Micropterus salmoides*
Rock bass	ROB	*Ambloplites rupestris*

Table 2. Abundance of species in 2008 sample sites within Rapid Creek and Castle Creek. Sites are in order from furthest downstream to upstream.

Site	BKT	BNT	RBT	LND	WSH	GSF	ROB	LMB
RAP1398		229		12	27	8	7	1
RAP1431		360	23	77	13			
RAP1642		185	19					
RAP1741		388	139	1				
RAP1821		263	19					
RAP1832	3	347	60					
RAP1837	3	262	44					
RAP1842	47	195	36					
CAS17	48	40						
CAS16	10	22						

Table 3. Abundance of species in 2008 sample sites of tributary creeks within the Rapid Creek Watershed. Sites are in order from furthest downstream to upstream.

Creek Name	Site	BKT	BNT	RBT	LND	WSH	MTS	CRC
Victoria	VIC01	no fish						
Prairie	PRC01	21						
Deer	DRC01	no fish						
Slate	SLC01				11			9
Slate	SLC02	6			6	1		
Slate South	SLF01				11			
Gimlet	GIM01	2	3					
Silver	SLV02	5						
Hop	HOP01	no fish						
Rhodes Fork	RCR01	1	64					
North Fork	RCN02	16			1			
Swede Gulch	SWD02	5	2		14		1	
Tillson	TIL01	15						
Buskala	BUS03	73						
Bittersweet	BST02	no fish						
Castle North	CCN01				2	1		
Gold Run	GRG01	1				1		2
Castle Creek South	CCS03	87		61				
Heely	HEE01	no fish						
Pole	POC01	no fish						
Castle Creek South	CCS02	12						
Silver of Castle	SIC01	33						

Rapid Creek (RAP)

Discussion on Rapid Creek will be based on the mean population estimates from the sample sites. Ten species of fish were captured in Rapid Creek during the survey (Table 3). Salmonids dominated the fish community, especially in the reaches near Pactola basin (Figure 3) where they were the only species present. Brown trout were sampled in all eight of the sample reaches. Brook trout were only sampled in the sites immediately downstream from Pactola stilling basin. Rainbow trout were sampled in all reaches except site 1398 behind Bakken Park (Figure 3). Aside from one longnose dace in Pactola Basin, native fish were only present in the reaches downstream of Canyon Lake (Figure 3). Rock bass, green sunfish, and large mouth bass were only sampled in the reach behind Bakken Park. The remainder of this report will focus on salmonids as they were the focus of the population investigation.

Table 4. Population estimates in number of fish per 100 meters of stream and per surface acre of water during the 2008 survey for Rapid Creek below Canyon Lake.

Species	Size	Number/100 m	Number/ac
Brown trout	< 200 mm	301	1187
Brown trout	≥ 200 mm	25	113.5
Rainbow trout*	< 200 mm	110	385
Rainbow trout*	≥ 200 mm	1	2.8

*denotes estimates using only sample site 1431
RBT juvenile confidence intervals were wide-spread.

Table 5. Population estimates during the 2008 survey for Rapid Creek between Pactola Reservoir and Canyon Lake.

Species	Size	Number/100 m	Number/ac
Brown trout	< 200 mm	305.5	1313.7
Brown trout	≥ 200 mm	13.7	56.8
Rainbow trout	< 200 mm	74.8	299.7
Rainbow trout	≥ 200 mm	5.5	24.2
Brook trout*	< 200 mm	16.75	63.75
Brook trout*	≥ 200 mm	1	3.75

* denotes estimates using only sample sites within Pactola Basin.
RBT juvenile confidence intervals were wide-spread.

Brown Trout – Rapid Creek appeared to have a relatively large population of juvenile (<200 mm) brown trout (Table 4) and is similar to the previous four years (Figure 6). The adult population of brown trout in Rapid Creek has been decreasing since 2000. The brown trout population appears to have stabilized since 2004 (Figure 6) (Table 4 & Table 5) resulting in Rapid Creek being classified as a class II brown trout fishery (25-150 fish per acre). While adult brown trout numbers have been declining, the numbers of juvenile brown trout have increased since 2003 (Figure 6). This may be due to release from intraspecific predation and competition with adult fish. Numbers of juvenile brown trout over the past three years are two to three times of what was observed over the last 10 years.

Streams are dynamic systems making it difficult to pinpoint factors associated with the divergence in the numbers of juvenile and adult brown trout within Rapid Creek. While there are likely many factors contributing to the decline in adult fish and the proliferation of juvenile fish, two reasons are commonly given for this divergence. One is the presence of *Didymosphenia geminate* (Didymo) within Rapid Creek, and the other is the prolonged drought that the area experienced from 2002 to 2008 (US Drought Monitor). For further discussion please see the SD GF&P Rapid Creek report for 2007 (Wilhite and Carreiro 2008). A three year study is currently underway investigating the effects of didymo on the recruitment of adult fish. Results of this study will not be available until 2011.

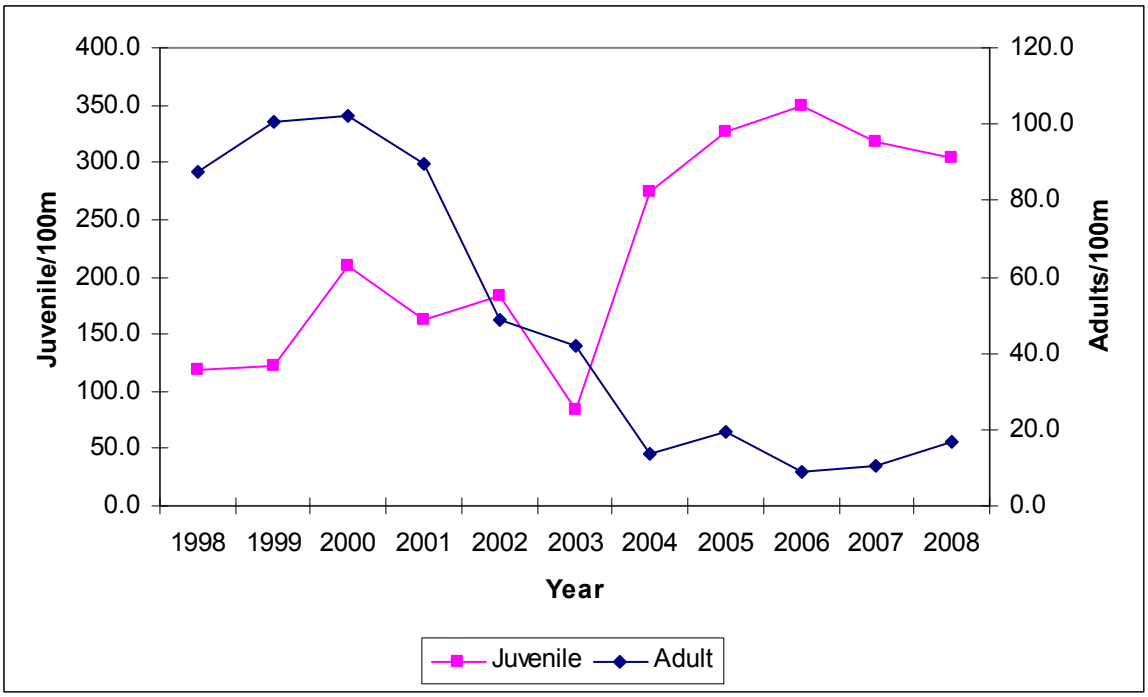


Figure 6. Trends in estimated number of adult (>200 mm) and juvenile (<200 mm) brown trout (BNT) per 100m of stream within Rapid Creek in the Rapid Creek watershed.

Length frequency histogram analysis of sample sites below Canyon Lake (Figure 3) indicated that the number of fish began to decline after reaching a length of about 140 mm indicating a lack of recruitment past age one (Figure 7). Additionally, abundances of fish under 100mm were reduced for 2008 as compared to 2007, which may indicate reduced reproduction. This conclusion; however, is based on two sites and does not represent a statistically valid sample size.

A similar analysis of sites from Canyon Lake to Pactola Reservoir (Figure 3) indicated two year classes with a steady decline after reaching about 200mm (Figure 8). Growth of brown trout above Canyon Lake appeared to be slower than growth of brown trout below Canyon Lake, since age one fish fall in smaller size classes (Figure 7, Figure 8).

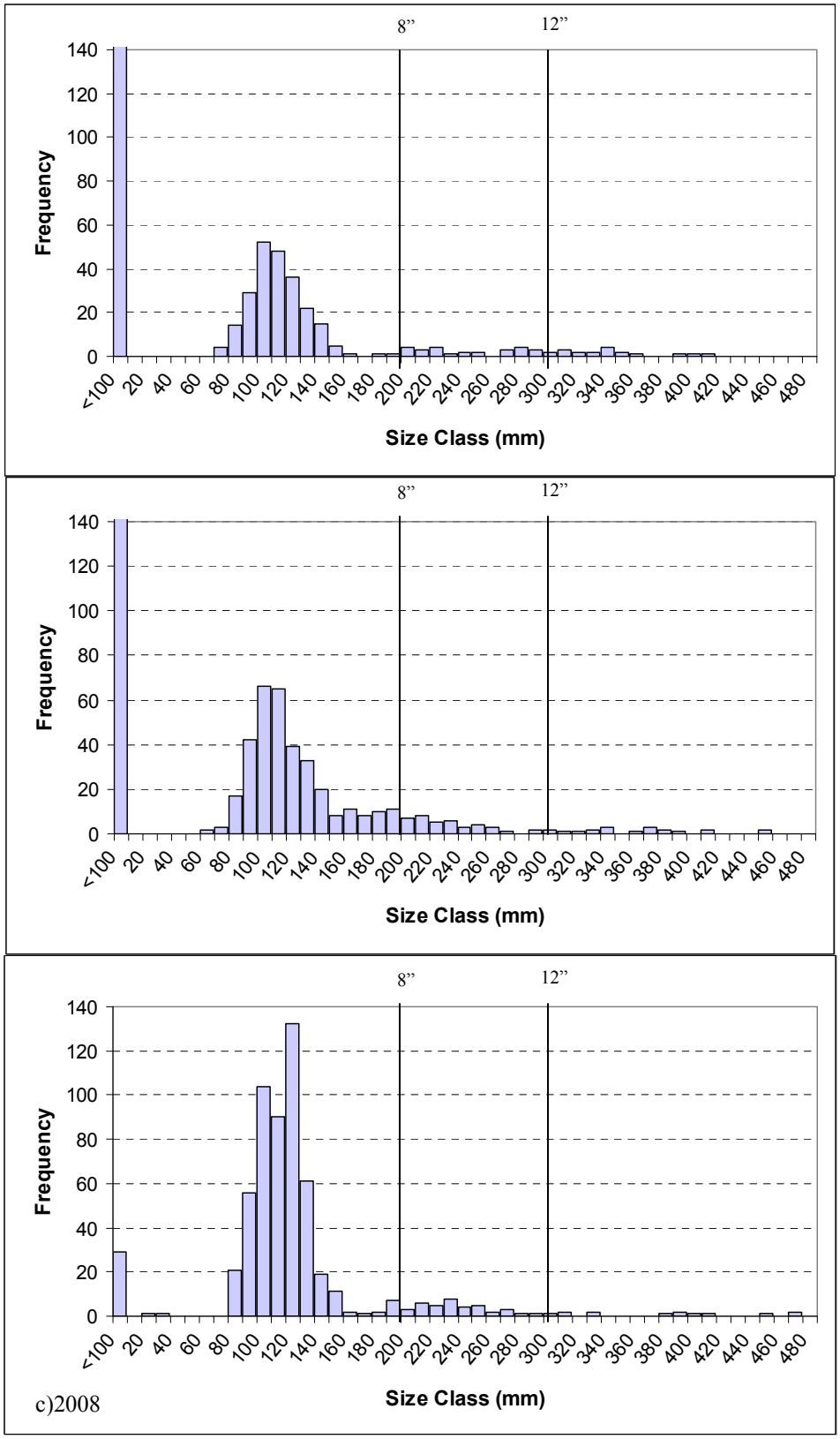


Figure 7. Length frequency histogram trends for BNT in Rapid Creek sites 1398 (Baken Park) and 1438 (Meadowbrook Golf Course) in 2006 (a), 2007 (b), and 2008 (c).

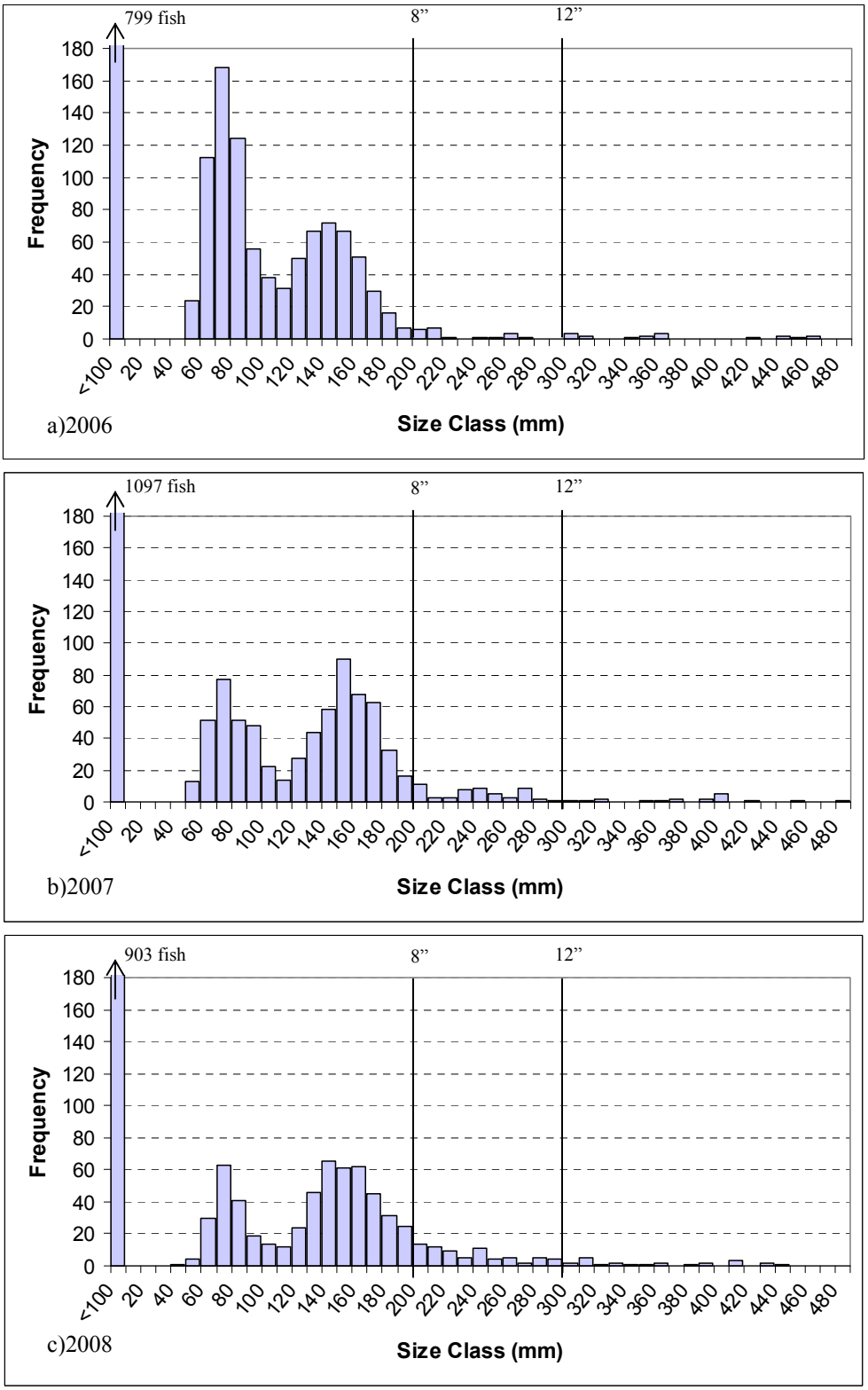


Figure 8. Length frequency histogram trends for BNT in Rapid Creek sites between Pactola Reservoir and Canyon Lake in 2006 (a), 2007 (b), and 2008 (c).

Rainbow Trout – Rainbow trout were sampled in all reaches within Rapid Creek except site 1398; however, only one fish greater than 200 mm and 22 less than 200 mm were captured in site 1431. Rainbow trout were more abundant above Canyon Lake than below.

The population of rainbow trout within Rapid Creek has varied over the past ten years (Figure 9). It is difficult to draw many conclusions from the trends since rainbow trout occur in relatively low densities. Also, number of sample sites has varied from year to year resulting in high variance in the population estimates. Juvenile (<200mm) rainbow trout populations have increased since 2006 to its highest level in10 years (Figure 9).

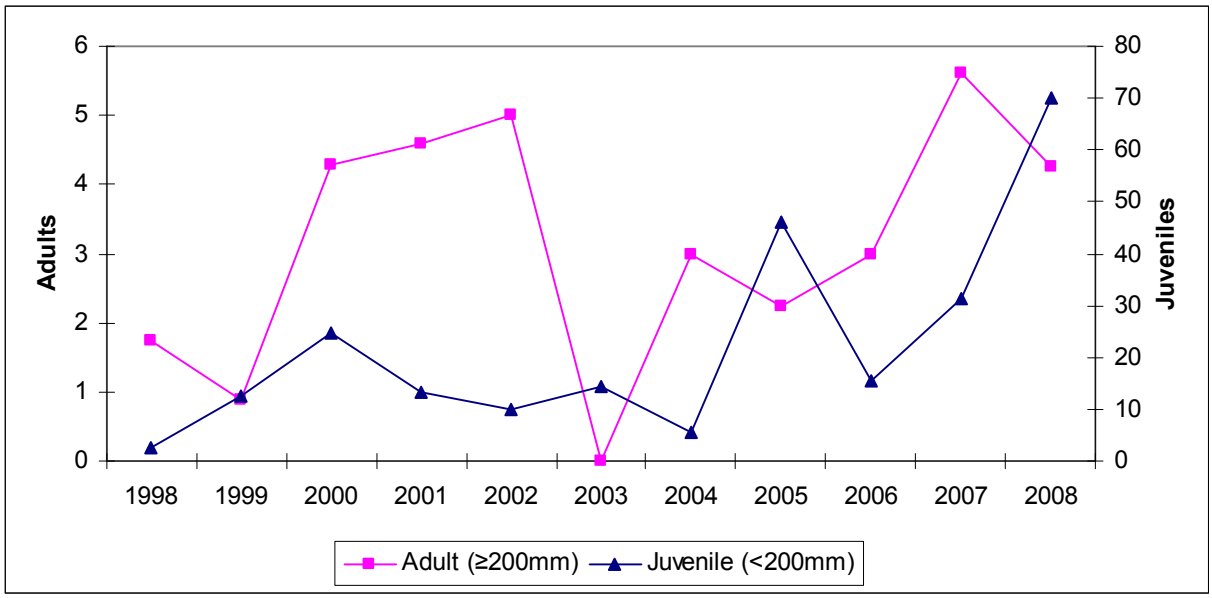


Figure 9. Trends in estimated population of adult (>200 mm) and juvenile (<200 mm) rainbow trout (RBT) per 100m of stream within Rapid Creek in the Rapid Creek watershed.

Numbers of rainbow trout in Rapid Creek are probably dependent on supplemental stocking by South Dakota Game, Fish, and Parks. Catchable (11") rainbow trout were stocked in 2005, 2006, and 2007 from Canyon Lake to Pactola, but in 2008 were only stocked in the lower sections near Canyon Lake. Analysis of a length-frequency histogram for 2007 indicated an absence of fish between 200 and 300 mm. In the 2008 survey, fish were absent between 200 and 360mm which may indicate that stocked fish from 2007 carried over into 2008 (Figure 10). Furthermore, length-frequency histogram analysis indicated that rainbow trout had reproduced but there was little recruitment of into the age-1 population (Figure 10).

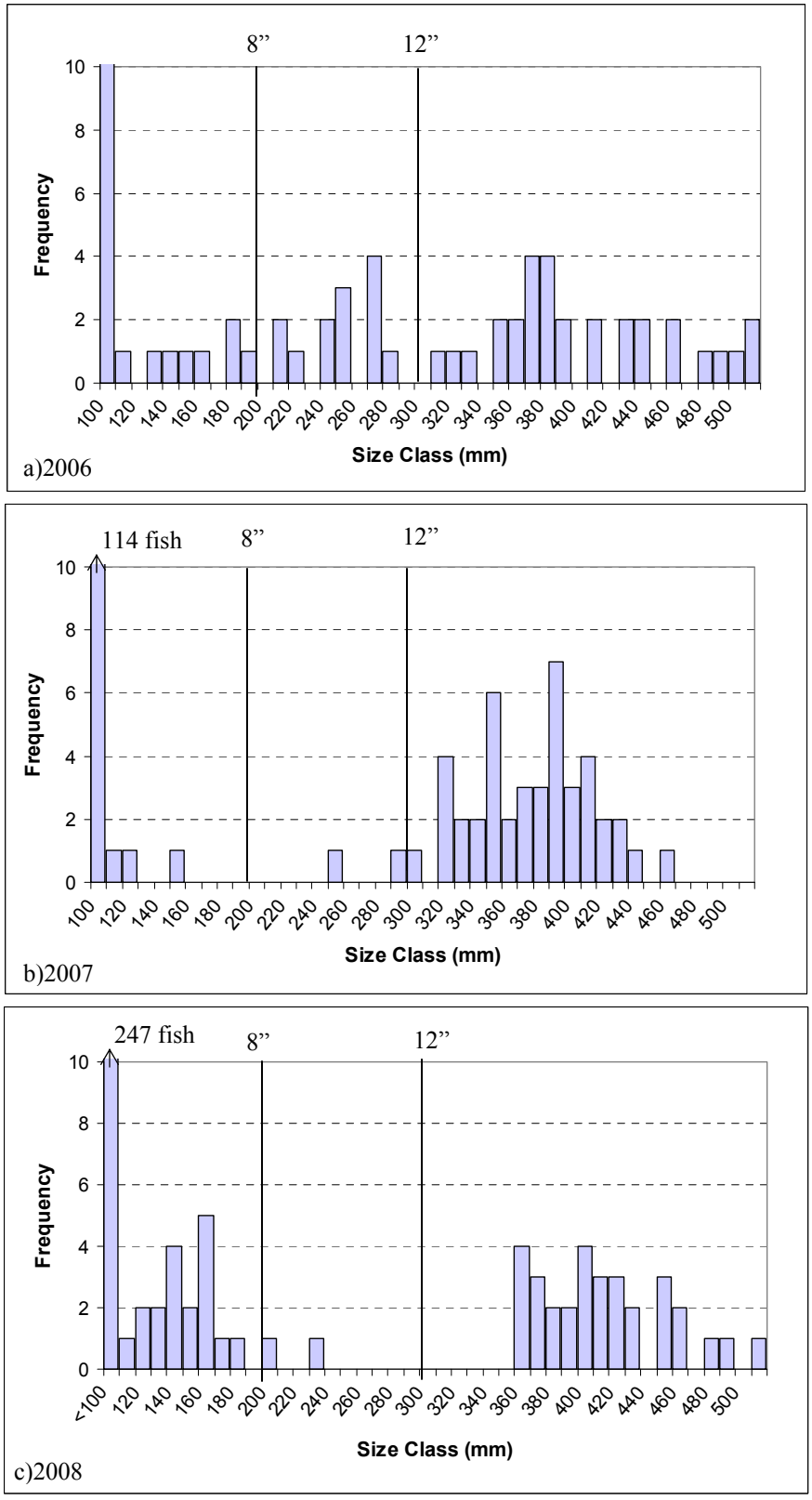


Figure 10. Length frequency histogram trends for RBT in Rapid Creek between Pactola Reservoir and Canyon Lake in 2006 (a), 2007 (b), and 2008 (c).

Brook trout - Brook trout were sampled in the three most upstream sample sites. Consistent with the 2007 survey, the highest densities of brook trout were in the most upstream site directly downstream from the Pactola stilling basin, and abundance declined with downstream progression. The number of brook trout per 100 m of stream is relatively low through these sites (Table 4) resulting in this section of Rapid Creek being classified as a Class III brook trout fishery (< 25 adult fish per acre). Brook trout may occur in these reaches of Rapid Creek due to their proximity to the stilling basin, which contains a population of brook trout. (Miller et al. 2005)

Victoria Creek (VIC)

The May 28th, 2008 survey of Victoria Creek site 1 (Figure 3) yielded no fish. Due to the recent drought, Victoria Creek was dry prior to 2008, which may explain the absence of fish. This site was also surveyed on June 1st 1995 and eight brook trout were detected in a single pass with one over 200 mm.

Prairie Creek (PRC)

Prairie Creek was sampled on May 28th, 2008 at site 1 (Figure 3). During that survey, 21 brook trout, all less than 200mm, were captured. Fish numbers have decreased since this site was last surveyed in June 1994 in which 211 brook trout under 200mm and four over 200mm were captured.

Deer Creek (DRC)

During the survey of Deer Creek site 1 (Figure 3), no fish were captured. Similar results came from a May 1994 survey of this site which only yielded three mountain suckers.

Slate Creek (SLC)

The survey of site 1, below the Slate Creek Dam (Figure 5), on July 21, 2008 yielded nine creek chub and 10 longnose dace. This was less than the 532 dace surveyed at this site in 2006. Numbers of fish have changed since a 1995 survey which yielded 27 brook trout, 29 brown trout, 108 longnose dace, seven white suckers, and two mountain suckers.

Site 2 above Slate Creek Dam (Figure 5) was surveyed on July 2, 2008 and five brook trout less than 200mm were sampled, along with one white sucker and six longnose dace. Slate Creek contained the greatest number of native fish in the Rapid Creek Watershed. It is currently stocked with catchable rainbow trout, but has previously been stocked with catchable brown trout.

Slate Creek South Fork (SLF)

An August 5th, 2008 survey of Slate Creek South Fork (Figure 5) yielded 11 longnose dace. No previous survey had occurred for this stream.

Gimlet Creek (GIM)

The survey of Gimlet Creek site 1 (Figure 4) on June 16th, 2008 yielded two brook trout and one brown trout under 200mm and two brown trout over 200mm. Gimlet Creek had never been surveyed before.

Silver (Tributary of Rapid Creek) (SLV)

Site 2 (Figure 4) was sampled on June 18, 2008 and five brook trout under 200mm were captured. This site was sampled in May 1994 and abundances have decreased since that sample which yielded 12 brook trout under and one over 200mm.

North Fork Rapid Creek (RCN)

North Fork Rapid Creek site 2, below Dumont (Figure 4), was sampled June 23, 2008. During this survey 16 brook trout, with one over 200mm, and one longnose dace were captured. A June 1993 survey of this site yielded 36 longnose dace.

Hop Creek (HOP)

Site 1 (Figure 4) was surveyed on June 18, 2008, but no fish were captured. Hop Creek's pH during this survey was 3.9 which could negatively impact trout and native fish populations (Weiner et al 1986.; Pinder & Morgan 1995; Hulsman et al.1983).

Rhoads Fork Rapid Creek (RCR)

Rhoads Fork site 1 (Figure 4) was sampled on June 16, 2008. Trout abundances have fluctuated at site 1 since its first survey in 1994 with the greatest numbers in May 2003. Based on the 2008 survey, populations of juvenile brown trout have decreased since 2003 and adult populations have remained relatively similar (
Table **6**).

Table 6. Abundance of fish per 100 meters (single pass) for Rhoads Fork Creek site 1 from surveys in 1994, 2003, and 2008.

Species	Sample Date	Number of fish/100m
Brook trout <200mm	June 2008	1
Brown trout <200 mm	July 1994	75
	May 2003	92
	June 2008	57
Brown trout ≥200mm	July 1994	15
	May 2003	15
	June 2008	7
Hatchery brown trout ≥20	May 2003	14

Swede Gulch Creek (SWD)

Swede Gulch Creek was sampled on June 17, 2008 at site 2 (Figure 4). During the survey longnose dace were the most abundant species with 14 captured. Other fish captured included brook trout, brown trout, and mountain sucker with numbers of 5, 2, and 1 captured respectively. Previous surveys of this site were in August and were not compared to this survey.

Tillson Creek (TIL)

On June 17, 2008, Tillson Creek site 1 was sampled above the confluence with Swede Gulch Creek (Figure 4). This survey yielded 15 brook trout less than 200mm TL, an increase from the eight surveyed in June 1995.

Buskala Creek (BUS)

A new sample site (Figure 4) was created on July 30, 2008 due to inaccessibility of previous sites. Seventy-three brook trout were captured. Examination of a length frequency histogram indicated a bi-modal distribution with an age-1 mode at 120mm (Figure 11). Few fish in this site were over 150 mm and none were over 200mm.

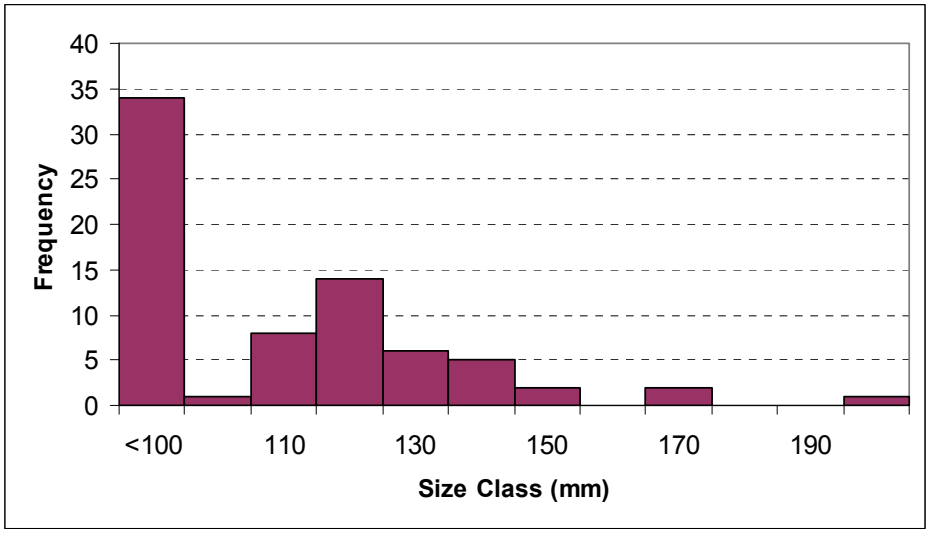


Figure 11. Length-frequency histogram for brook trout sampled at Buskala Creek site 3 on July 30, 2008.

Castle Creek (CAS)

During the 2008 survey of Castle Creek, two sites below Deerfield were sampled within a half mile of one another. The sites proximity to one another and the small sample size resulted in a sample design not statistically robust enough to make valid inferences about the entire Castle Creek stream system (Johnson et al. 2007). Therefore, discussion on Castle Creek will be based exclusively on the population estimates from the two sample sites.

Brown trout – Population estimates of brown trout resulted in the sampled sections of Castle Creek below Deerfield being classified as a class II brown trout fishery (Table 7). Abundances of adult fish within these two sites are about one half of what they were in 2003 (Figure 12). Abundance of juveniles has been variable with a peak in 2004 and a decline from 2004 to 2008 (Figure 12).

Examination of a length-frequency histogram indicated the presence of multiple year classes (Figure 13). The second peak in the bimodal distribution occurs at about 190 mm for both 2007 and 2008 which indicated fish recruit into the adult population at about two years of age.

Table 7. Estimated mean number per 100m of stream and number per acre of juvenile and adult brown trout surveyed September 23, 2008 at sites 16 and 17 on Castle Creek.

Species	Size	Number/ 100 m	Number/ ac
Brown trout	<200 mm	21	147
Brown trout	≥200 mm	11.5	83.5

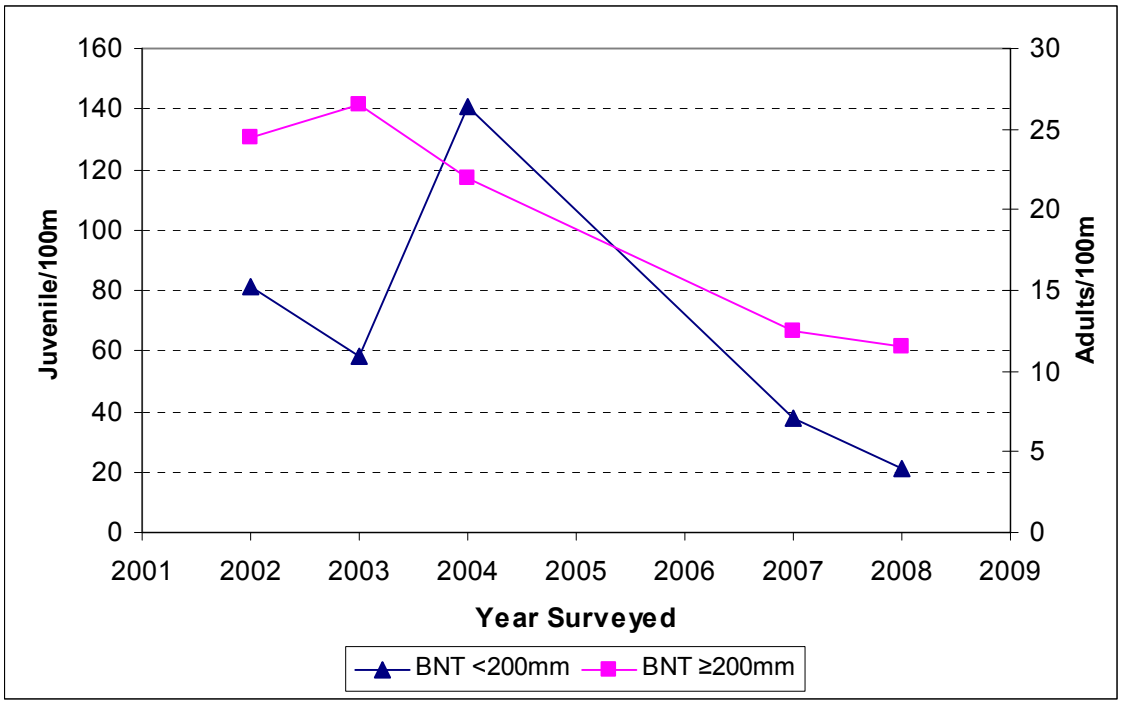
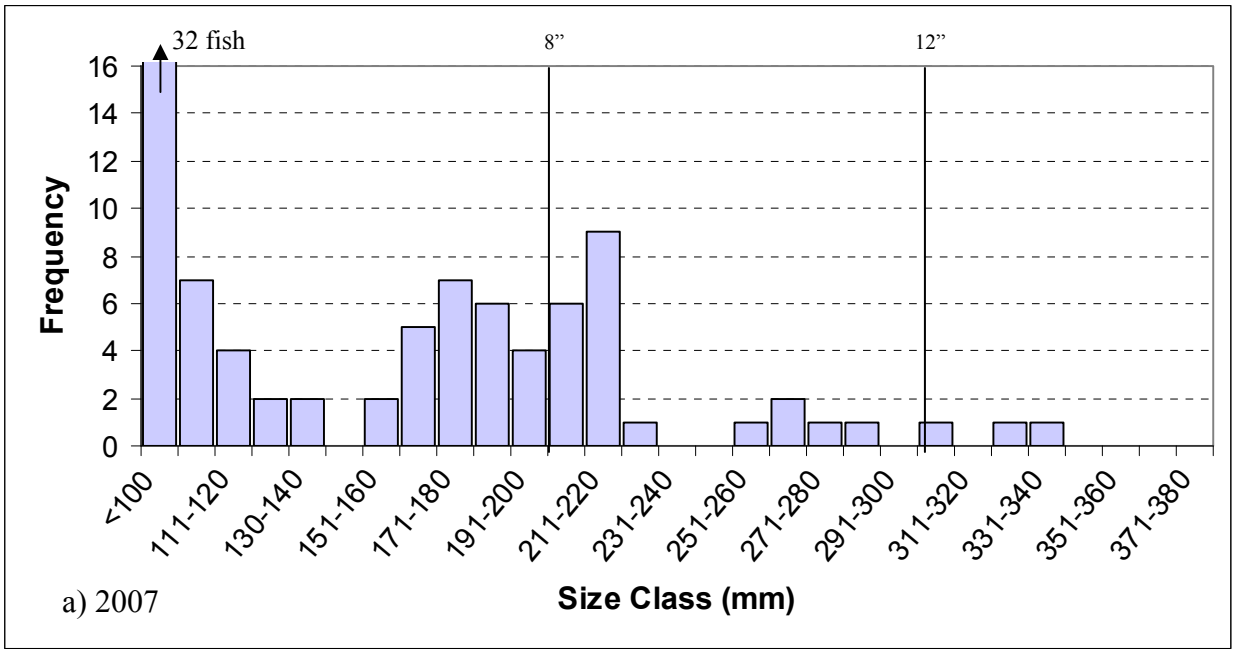


Figure 12. Trends in mean estimated number of adult and juvenile brown trout in sites 16 and 17 within Castle Creek.



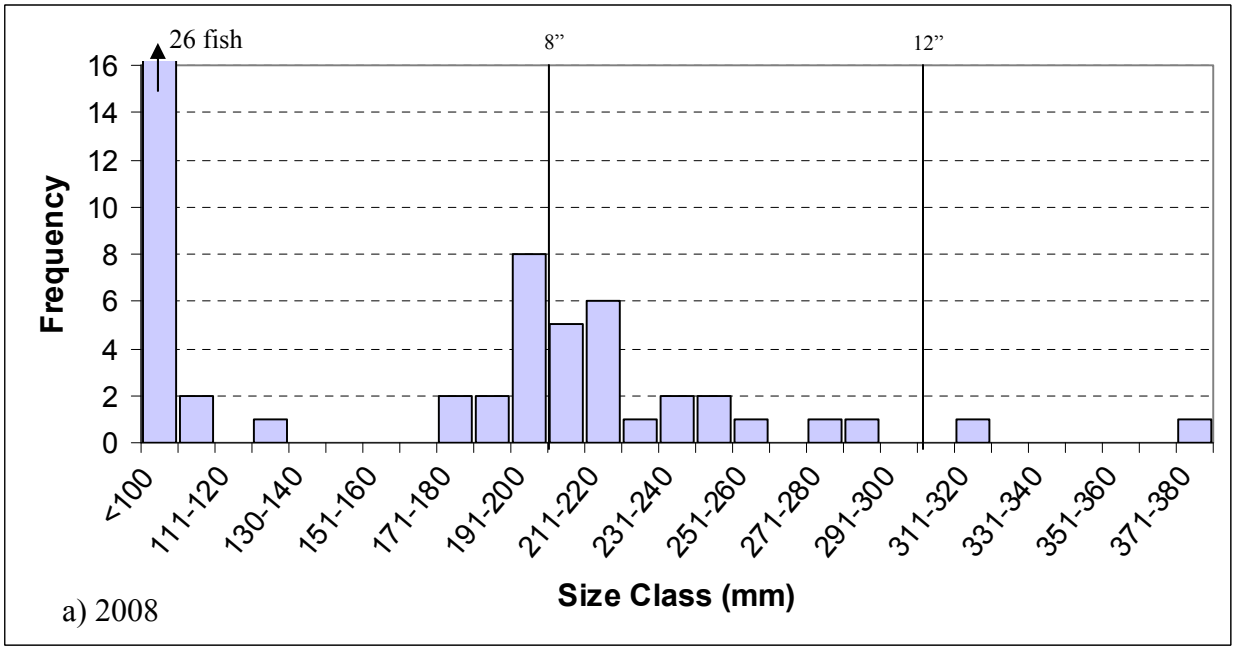


Figure 13. Length frequency histograms for brown trout captured in Castle Creek sites 16 and 17 during stream surveys in (a) 2007 and in (b) 2008.

Brook trout – Numbers of brook trout greater than 200mm within Castle Creek occurred in relatively low abundances in all years they were sampled, but increased in 2008 (Figure 14). Population estimates indicated a class II brook trout fishery based on 2008 data (Table 8).

Table 8. Estimated mean number per 100m of stream and number per acre of brook trout surveyed September 23, 2008 at sites 16 and 17 on Castle Creek

Species	Size	Number/ 100 m	Number/ ac
Brook trout	<200 mm	23	154
Brook trout	≥200 mm	6	43.5

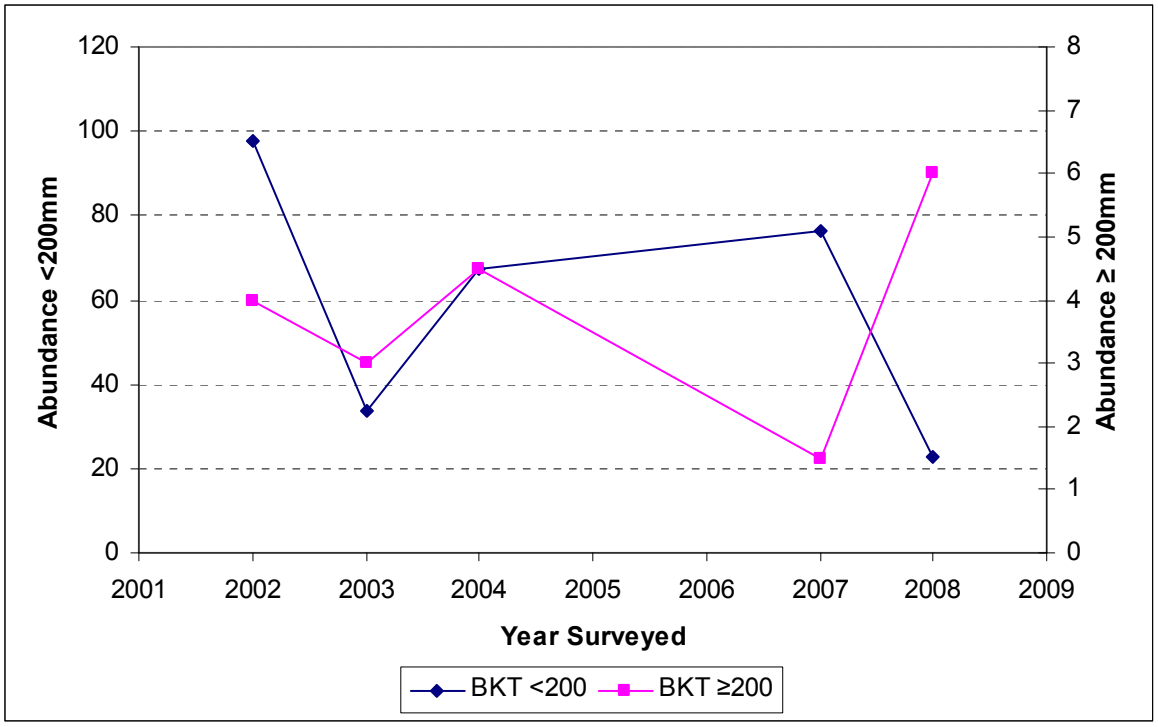
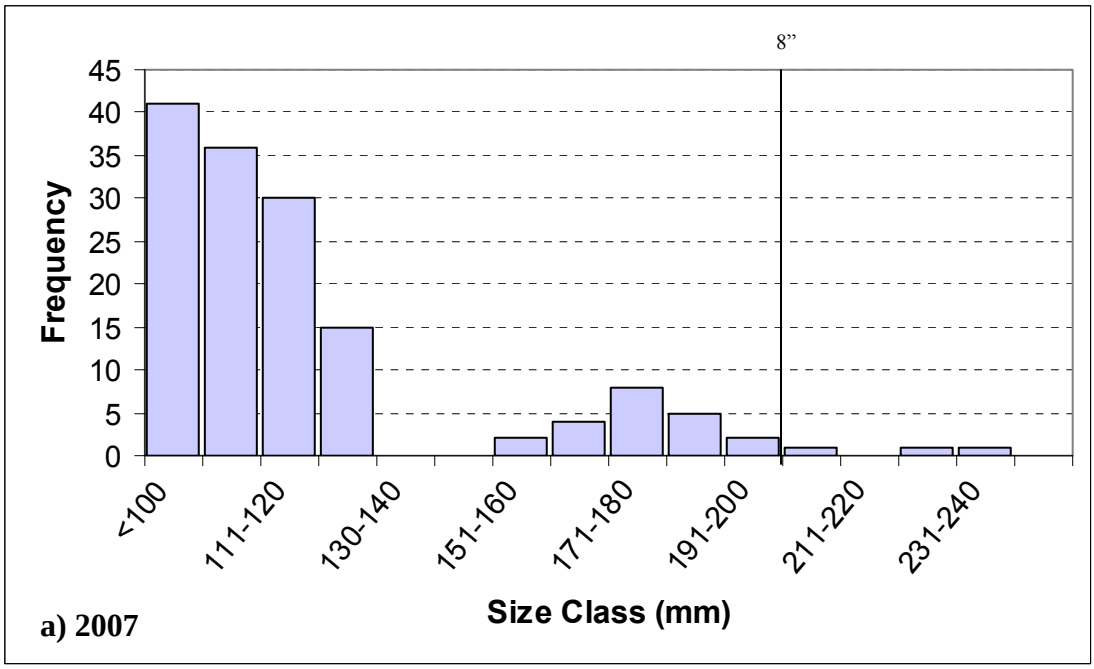


Figure 14. Trends in mean estimated number of adult and juvenile brook trout in sites 16 and 17 within Castle Creek.

The number of brook trout <200 mm increased from 2003 to 2007, but declined in 2008 (Table 8). Examination of a length frequency histogram for brook trout indicated low numbers of age-0 fish (Figure 15), which may indicate diminished reproduction. Also, it is important to note the apparent lack of brook trout older than age two. More intensive sampling over a larger area is needed to better understand population dynamics in Castle Creek.



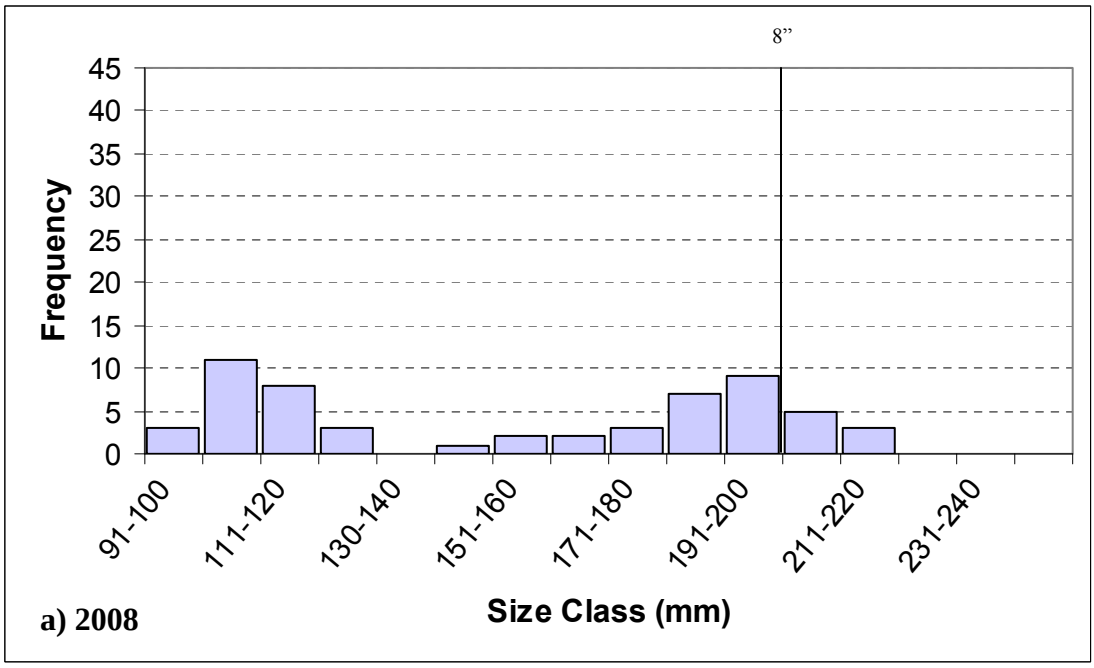


Figure 15. Length frequency histograms for brook trout captured in Castle Creek sites 16 and 17 during stream surveys in 2007 (a) and in 2008 (b).

Bittersweet Creek (BST)

Bittersweet Creek site 2 (Figure 4) was sampled July 2, 2008, but no fish were captured. The pH of Bittersweet Creek during this survey was 3.4, which would negatively impact fish populations (Weiner et al. 1986; Pinder & Morgan 1995; Hulsman et al. 1983). This site was previously sampled in 1994 with no fish captured.

Castle Creek North Fork (CCN)

Site 1 was surveyed June 13, 2008 with two longnose dace and one white sucker sampled. This site has not been previously sampled.

Gold Run Gulch (GRG)

Gold Run Gulch (Figure 5) was surveyed May 29, 2008 and yielded one brook trout under 200mm, two creek chubs, and one white sucker. This site had not been previously sampled.

Castle Creek South Fork (CCS)

Castle Creek South Fork was surveyed May 29, 2008 with brook trout and rainbow trout captured. This site had not been previously sampled.

Brook trout - Brook trout were the most abundant species with 87 sampled, 11 of which were over 200mmTL. Length frequency histogram analysis indicates multiple year classes with distinguishable modes at age 0 and age 1. When compared to other brook trout populations in the Rapid Creek Watershed, these fish seem to have a faster growth rate with the age 1 mode at about 160mm (Figure 16; Figure 15; Figure 18).

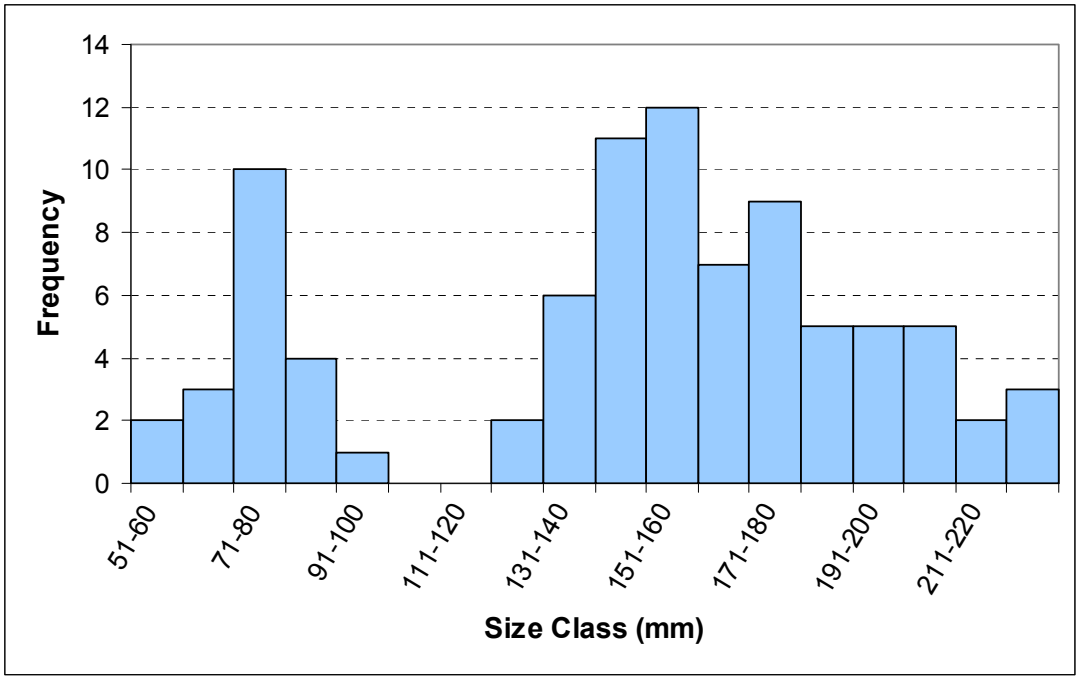


Figure 16. Length frequency histogram for brook trout surveyed May 29, 2008 in Castle Creek South Fork site 3. A total of 87 brook trout were captured during the survey.

Rainbow trout - The 2008 survey yielded 39 rainbow trout less than 200mmTL and 22 greater than 200mmTL. A length-frequency histogram of rainbow trout in this site indicated multiple year classes were present. This area may be an important spawning and nursery area with fish staying in this area until reaching 190mm. One notable observation about this site was that rainbow trout were spawning during the survey. Very few fish were captured between 200 and 300mm with larger fish present again in the population at about 310 mm. It is possible that these larger, spawning fish migrate to the area to spawn, but further investigation is needed.

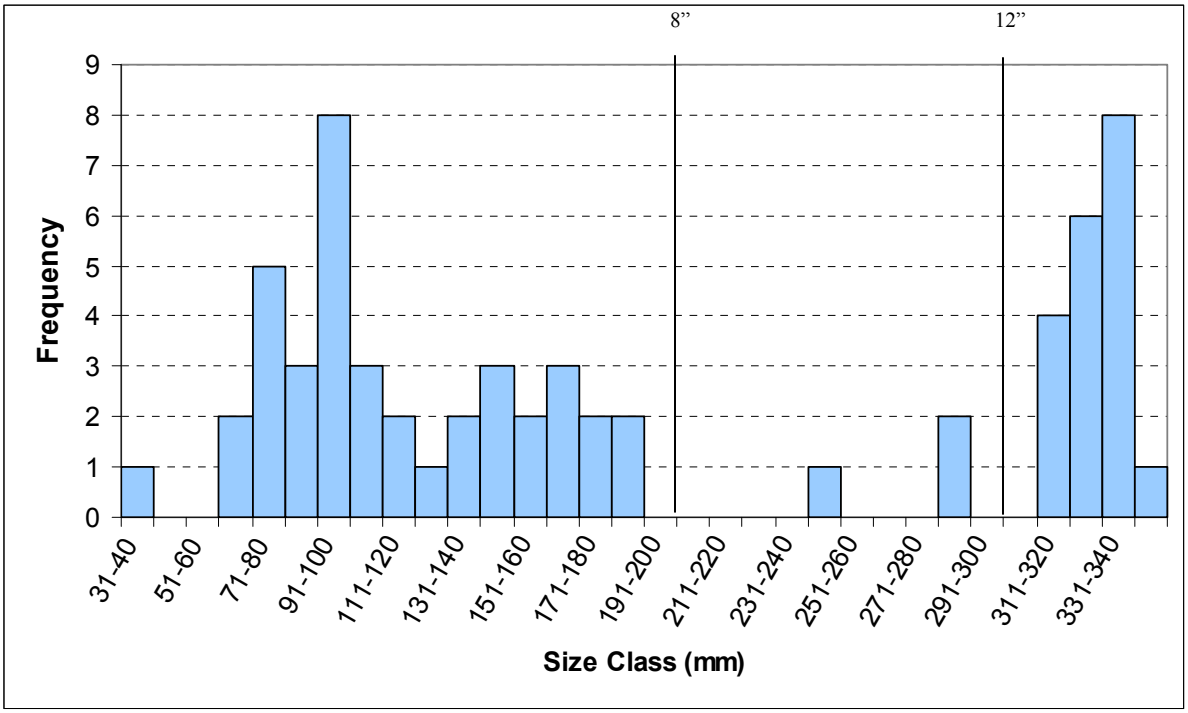


Figure 17. Length-frequency histogram for rainbow trout surveyed May 29, 2008 in Castle Creek South Fork site 3.

Castle Creek South Fork Site 2 was surveyed July 31, 2008 with 12 brook trout under 200mm sampled. This is a reduced abundance from previous samples in June 1994 and September 2006 where 24 and 17 brook trout were sampled respectively.

Nichols Creek (NIC)

Nichols Creek, (Figure 5), was not sampled in 2008. Site 1 is located on private land and although the landowner gave permission to sample, he indicated that only a trickle was running at the time and that the creek is usually dry. This site was last surveyed in June 1993 and no fish were captured.

Heely Creek (HEE)

Site 1 of Heely Creek (Figure 5) was sampled May 30, 2008 with no fish captured. A June 1994 survey of this site yielded eight brook trout with one over 200mm.

Ditch Creek (DTC)

Ditch Creek site 1 (Figure 5) was surveyed on June 13, 2008. Brook trout were the only species captured with 109 fish sampled, one of which was over 200mm. Length-frequency histogram analysis indicated an age-1 mode around 80 mm and a possible age-2 mode at about 130 mm (Figure 18).

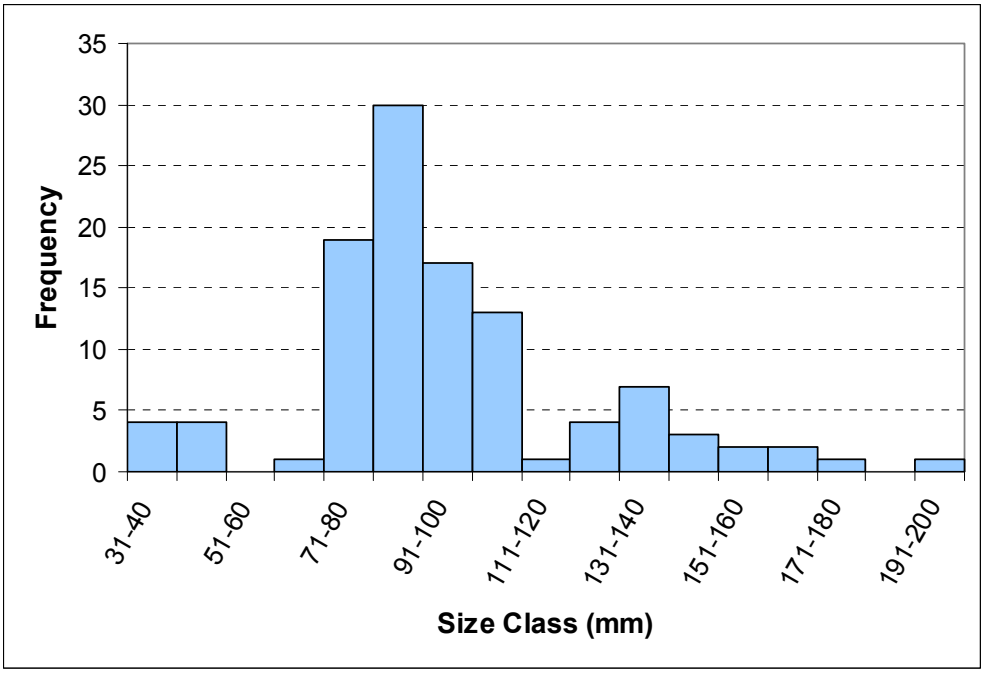


Figure 18. Length frequency histogram for brook trout surveyed June 13, 2008 in Ditch Creek site 2. A total of 109 brook trout were captured during the survey.

Pole Creek (POC)

Pole Creek site 1 (Figure 5) was surveyed on July 22, 2008 with no fish captured. This site has decreased in trout numbers since a June 1994 survey that yielded eight brook trout less than 200 mm and nine unidentifiable young-of-the-year trout.

Silver Creek (Tributary of Castle Creek) (SIC)

Silver Creek was sampled May 30, 2008 at site 1. During this survey 33 brook trout were sampled with one over 200mm This site was last sampled June 1994 which yielded 19 brook trout less than 200mm in a single pass.

Recommendations

1. Continue to monitor trout populations in the didymo affected sections annually until completion of the research project currently underway on Rapid Creek.

2. Intensively sample all of Rapid Creek from the headwaters to the town of Rapid City to gain a better understanding of the population of salmonids within the next three years.

3. Intensively sample all of Castle Creek from the headwaters to the confluence of Rapid Creek to gain a better understanding of the population of salmonids within the next three years.

4. Evaluate the need for supplemental stocking to aid in the recovery of the Rapid Creek fishery.

5. Investigate the possibility of manipulating spring releases from Pactola Reservoir to mimic a spring flushing flow.

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Box Elder Creek Watershed

Counties: Lawrence, Pennington, and Mead

Fish populations in the Box Elder Creek Watershed within the Black Hills Trout Management Area (Figure 19) were surveyed during June and July 2008 to monitor fish populations. The Box Elder Creek Watershed lies between Elk Creek and Rapid Creek Watersheds (Figure 1). The headwaters of Box Elder Creek's forks lie west of Custer Crossing off of highway 385. The creek flows east through the north-west end of Rapid City and drains into the Cheyenne River south of Wasta, SD. The Box Elder Creek Watershed is in a pine/spruce forest and managed by the US Forest Service. As with the rest of the Black Hills, many forest service roads cut through the watershed with a few houses and ranches present. Sections of Box Elder Creek, Roubaix Lake on Middle Box Elder Creek, and Reausaw Lake on Hay Creek are currently stocked with catchable rainbow trout. Box Elder Creek and its tributaries are managed under standard regulations with a daily limit of five trout (in any combination) with one allowed 14 inches or longer.

Methods

Sample Locations

Two reaches in Estes and Jim Creeks, as well as one reach in Bogus Jim, North Box Elder, and Hay Creeks (Figure 19) were surveyed during June and July 2008. Bogus Jim Creek drains into Boxelder Creek at the intersection of Norris Peak Road and Nemo Road. Jim Creek enters Boxelder Creek about 3.5 miles further upstream. About three miles further upstream, Estes Creek enters near Merritt Estes Road. Hay Creek enters Box Elder near Benchmark on Nemo Road. North Box Elder, Middle Box, and Corral Creeks confluence about 1 ½ miles west of Benchmark.

Sample Methods

Efforts were made to satisfy the assumptions 1) the population is static, 2) capture probability remained constant across sampling periods, and 3) all fish in the population are equally vulnerable to capture (Van Den Avyle and Hayward 1999; Hayes et al. 2007). All sample reaches were 100 m in length. Block nets at the upstream and downstream boundaries were used to prevent fish from emigrating or immigrating within the sample site. One pass was made in all creeks with one backpack electrofishing unit. Captured fish were anesthetized with carbon dioxide, measured to the nearest millimeter total length, weighed to the nearest gram, and returned to the stream. After 50 individual lengths and weights were collected from small fish (< 100mm) of a specific species, bulk counts were collected to expedite data collection. Relative abundance was calculated as CPUE (number of fish captured per 100 m of stream). Relative abundances were compared to historical data from individual sites when historical sampling occurred within comparable months. For 2008 samples completed in May or June, historical samples in May and June were used for comparison. For 2008 samples completed in July or

August, historical samples in July or August were used for comparison. As a result of the small sample size, caution must be given when interpreting the data and extrapolating it to the entire stream.

In addition to fish data, pH, temperature, and specific conductance were measured and recorded. Additionally, stream widths were measured every 10 meters and averaged to obtain an estimate of total area sampled. Stream flow data was also downloaded from the USGS web site for water years 1996-2008 (available at: http://waterdata.usgs.gov/sd/nwis).

The Black hills received above average amounts of spring and summer moisture during 2008 (NOAA 2008). Box Elder Creek's average flow at the USGS gauging station near Nemo is usually between 30 and 60 CFS for May and June; whereas, the flows in 2008 exceeded 400 CFS. Therefore, due to high flows and turbid water sampling was not completed in Box Elder Creek, its South and Middle forks, Lang Spring, and Corral Creek.

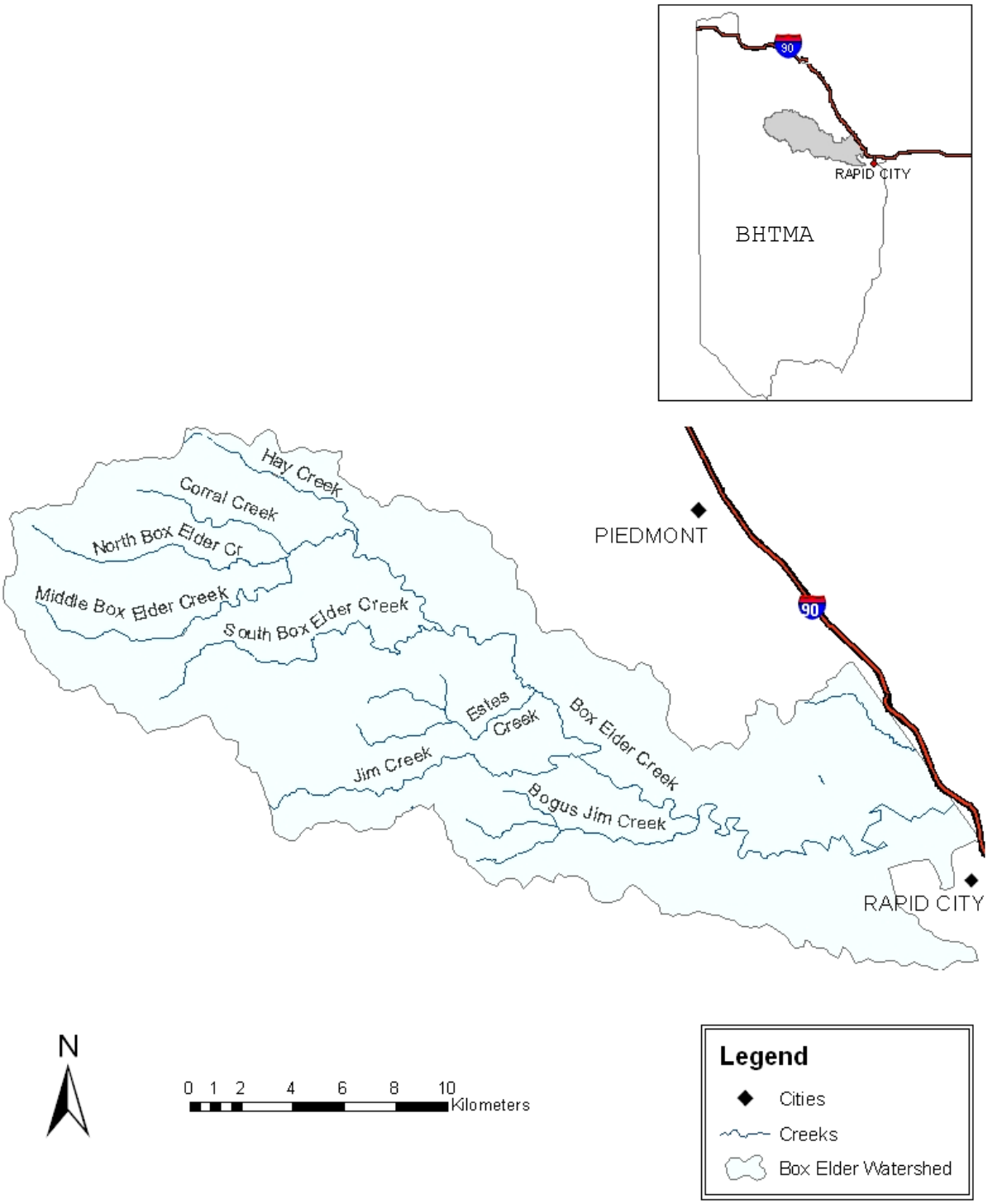

Figure 19. Box Elder Creek Watershed and 2008 sample sites depicted within the Black Hills Trout Management Area (BHTMA).

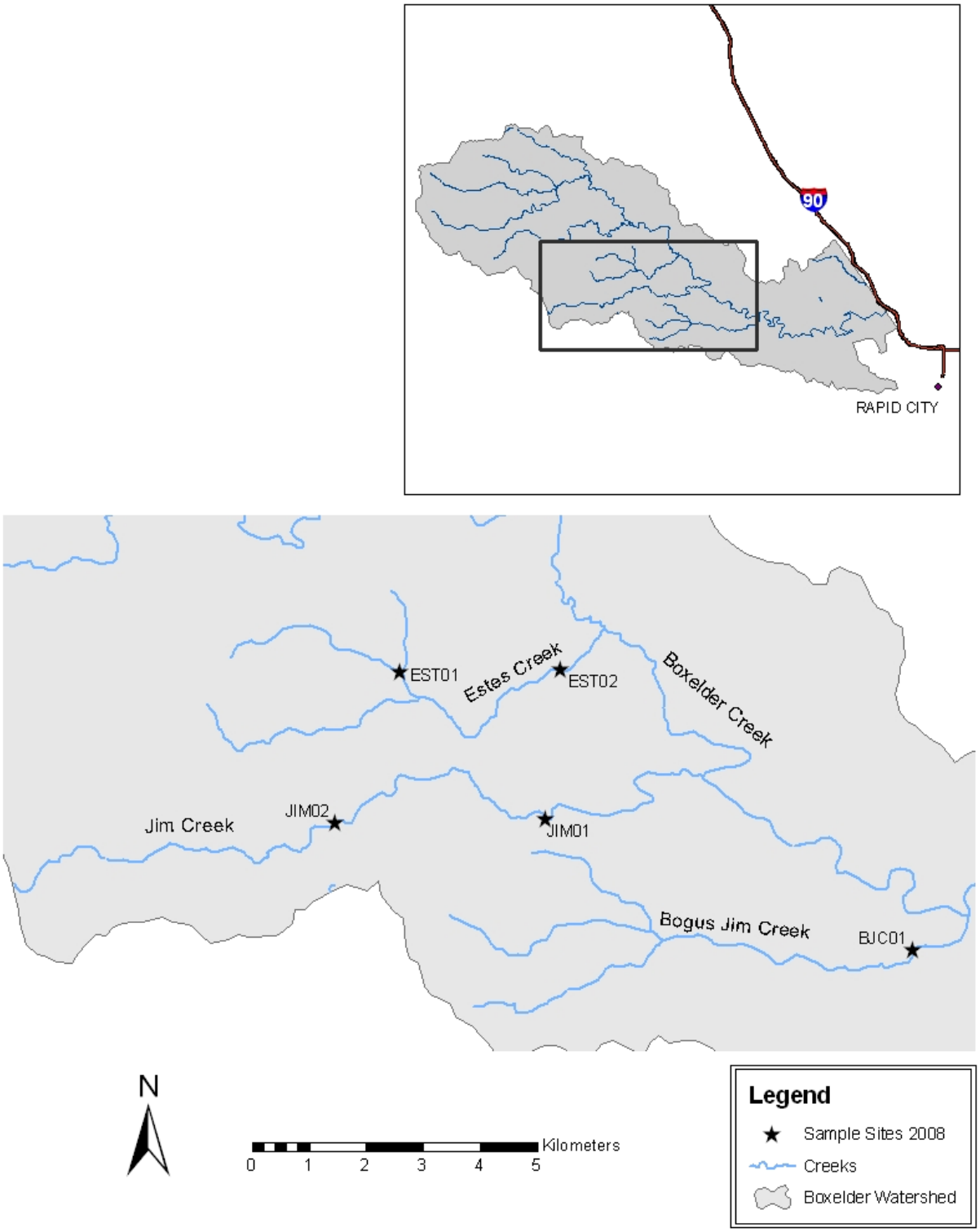

Figure 20: Box Elder Creek Watershed's southern creeks and 2008 sample sites for Estes, Jim, and Bogus Jim Creeks

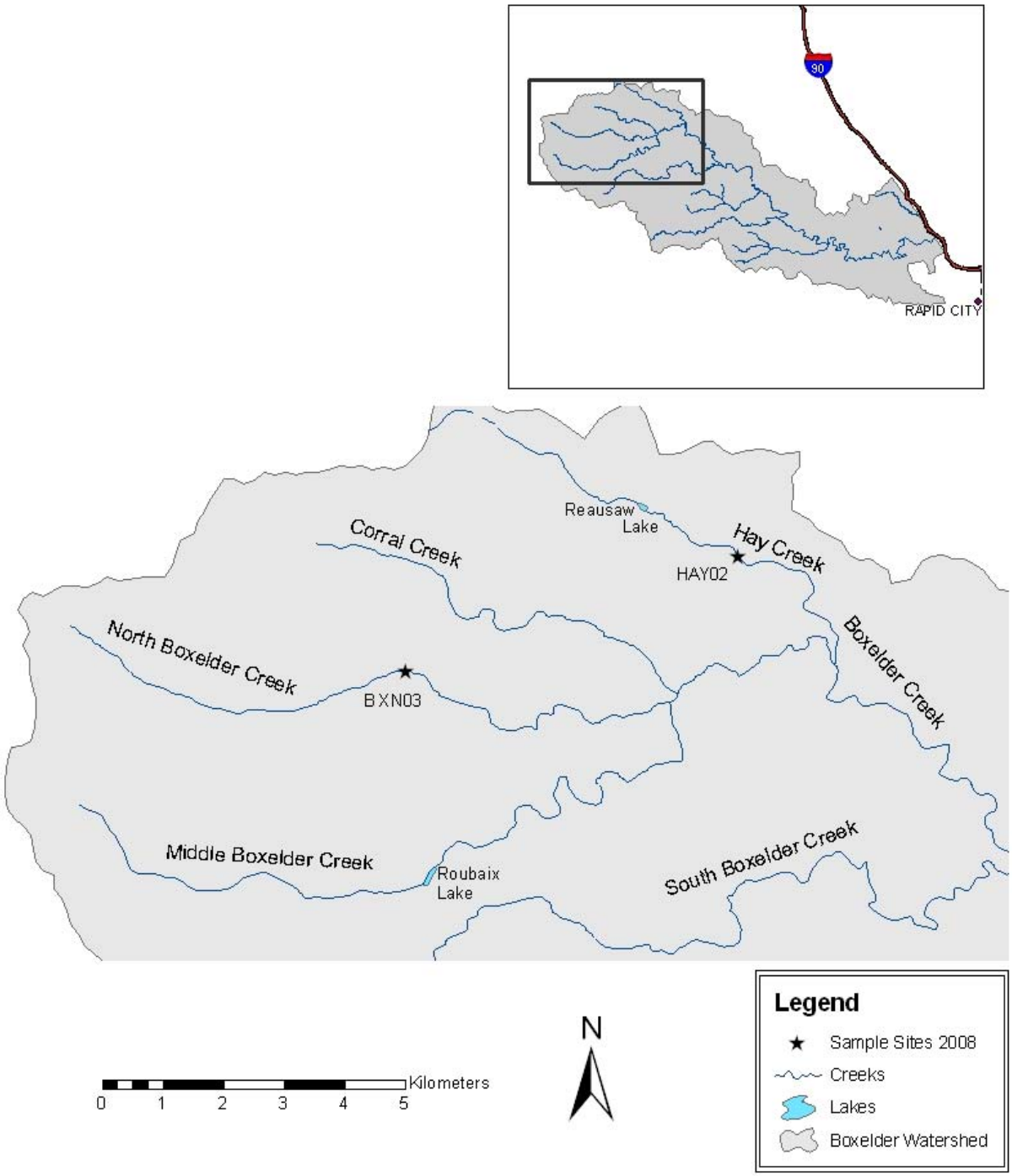

Figure 21: Box Elder Creek Watershed's northern creeks and 2008 sample sites for Hay and North Box Elder Creeks

Results and Discussion

Four species of fish were captured in the Box Elder Creek watershed during 2008 sampling (Table 9). The most abundant species in the watershed was brook trout followed by longnose dace.

Table 9: Presence or absence of species captured in sample sites within five creeks of the Box Elder Creek Watershed.

Species	BJC01	JIM01	JIM02	EST01	EST02	BXN03	HAY02
Brook trout		26	10	(no fish)	20	17	
Longnose dace	7					34	5
Creek chub							1
Green sunfish							2

Bogus Jim Creek (BJC)

In Bogus Jim Creek site 1 (Figure 20) seven longnose dace were captured during the June 2008 sample (Table 9). This site was last sampled in May 1993 where longnose dace, creek chub, and mountain suckers were detected.

Jim Creek (JIM)

Jim Creek's June 2008 sample yielded only brook trout with 26 fish in site 1 (Figure 20) and ten fish in site 2. One of the brook trout in site 2 was over 200mm. Jim creek site 2 was last sampled May 1994, similar numbers of brook trout were captured in a single pass; however, 33 longnose dace and three mountain sucker were also detected.

Estes Creek (EST)

Estes Creek Site 1 (Figure 20) yielded no fish; the same results as the last survey in May 1994. In site 2, 18 brook trout were detected with two fish over 200 mm long. This site had not been sampled previously.

North Box Elder Creek (BXN)

North Box Elder Creek was sampled at site 3 (Figure 21) in July 2008, but it should be noted that the visibility was diminished due to high levels turbidity. During that survey, 34 longnose dace and 17 brook trout were captured with one trout over 200 mm. The last sampling in July 1997 yielded 48 brook trout and one mountain sucker in a single pass.

Hay Creek (HAY)

Few fish were detected in site 2 of Hay Creek (Figure 21) during the June 2008 sampling. Fish captured included one creek chub, two green sunfish, and five longnose dace. During the last survey of this site in May 2000, 18 brook trout and 36 longnose dace were detected.

Recommendations

1. Manage Box Elder Creek Watershed's tributaries as a natural brook trout fishery and monitor on a 3-5 year basis.
2. Survey the main stem of Box Elder Creek and un-sampled tributaries within five years.
3. Perform an intensive survey on Box Elder Creek within five years.

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Elk Creek Watershed

Counties: Meade and Lawrence

Fish populations in Elk Creek, Little Elk Creek, and Meadow Creek within the Black Hills Trout Management Area (Figure 1) were surveyed during 2008 to monitor species presence and relative abundance. The Elk Creek watershed's headwaters are approximately four miles west of Brownsville on Hwy 385 and the creek drains into the Cheyenne River north of Wasta. Most of the Elk Creek Watershed within the Black Hills Trout Management Area is located along a west to east orientation between Hwy 385 and I 90 north and west of Piedmont, SD (**Error! Reference source not found.**). The Elk Creek watershed is in a pine/spruce forest and managed by the US Forest Service. As with the rest of the Black Hills, many forest service roads cut through the watershed with a few houses present. Elk Creek near forest service road 151 was last stocked in 1995 with catchable brown trout, and Elk Creek east of I90 was stocked in 2005 and 2006 with catchable rainbow trout. Dalton Lake on Little Elk Creek is currently stocked with catchable rainbow trout. Elk Creek and its tributaries are managed under standard regulations with a daily limit of five trout (in any combination) with one allowed 14 inches or longer.

Methods

Sample Locations

Six sample reaches in Elk Creek, Little Elk Creek, and Meadow Creek (**Error! Reference source not found.**) were surveyed during June and July 2008. Three sample reaches were surveyed on Elk Creek. Site 2 was the first down stream site and is located about five miles north of Nemo road off of Wanhanen road (FS151) (Figure 22). Site 4 is approximately three miles further upstream. Site 3, the furthest upstream site on Elk Creek, is located almost two miles south of Brownsville Road (**Figure 22**). Also, two sample reaches were surveyed in Little Elk Creek which drains into Elk Creek less than one mile east of I90 (**Error! Reference source not found.**). Site 1 was the first downstream site and is located just outside of northwest Piedmont. Site 2 is located just below Dalton Lake. Lastly, Meadow Creek site 1 was located about one mile south of the confluence with Elk Creek (**Error! Reference source not found.**).

Sample Methods

Efforts were made to satisfy the assumptions 1) the population is static, 2) capture probability remained constant across sampling periods, and 3) all fish in the population are equally vulnerable to capture (Van Den Avyle and Hayward 1999; Hayes et al. 2007). All sample reaches were 100 m in length. Block nets at the upstream and downstream boundaries were used to prevent fish from emigrating or immigrating within the sample site. One pass was made in all creeks with one backpack electrofishing unit. Captured fish were anesthetized with carbon dioxide, measured to the nearest millimeter total length, weighed to the nearest gram, and returned to the stream. After 50 individual lengths and weights were collected from small fish (< 100mm) of a specific species, bulk counts were collected to expedite data collection. Relative abundance was calculated as CPUE (number of fish captured per 100 m of stream). Relative

abundances were compared to historical data from individual sites when historical sampling occurred within comparable months. For 2008 samples completed in May or June, historical samples in May and June were used for comparison. For 2008 samples completed in July or August, historical samples in July or August were used for comparison. As a result of the small sample size, caution must be given when interpreting the data and extrapolating it to the entire stream.

In addition to fish data, pH, temperature, and specific conductance were measured and recorded. Additionally, stream widths were measured every 10 meters and averaged to obtain an estimate of total area sampled. Stream flow data was also downloaded from the USGS web site for water years 1996-2008 (available at: http://waterdata.usgs.gov/sd/nwis).

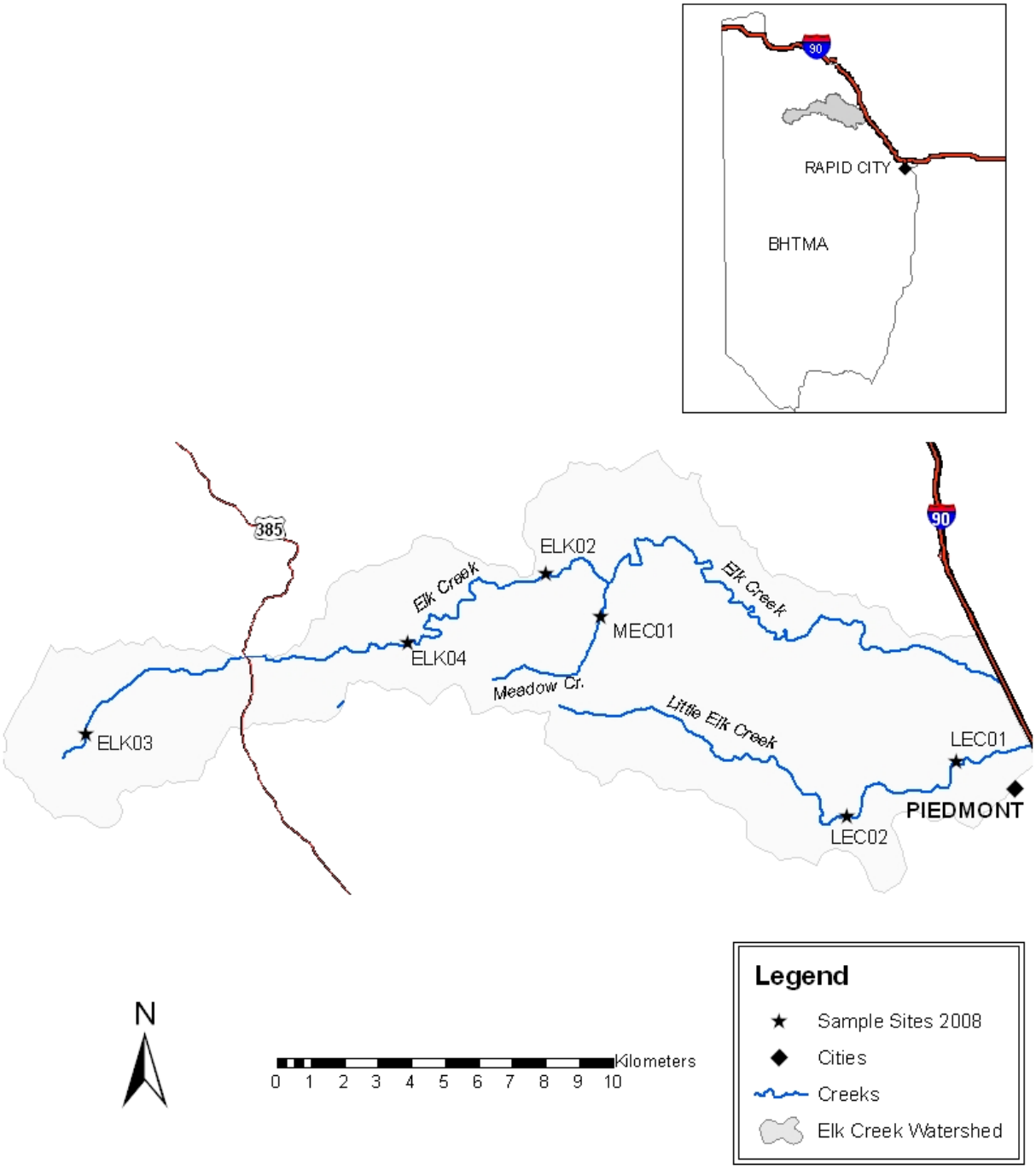

Figure 22. Elk Creek Watershed and 2008 sample site depicted within the Black Hills Trout Management Area (BHTMA).

Results and Discussion

The Black Hills received above average amounts of spring and summer moisture during 2008 (NOAA 2008). The Elk Creek USGS gauging station near the town of Roubaix recorded peak flows over 160 CFS in June; whereas, the daily mean flow at that time is around 15 CFS. Elk Creek near Piedmont usually experiences little or no flow due to a loss zone (Carter et al. 2002), but had flows over 1600 CFS in June 2008. These elevated flows may have had an effect on the fish populations within the Elk Creek watershed.

Six species of fish were captured in the Elk Creek watershed during sampling (Table 9). The most abundant species in the watershed was longnose dace followed by brook trout, mountain sucker, creek chub, white sucker, and fathead minnow.

Table 10. Presence of species captured in six sample sites within three creeks of the Elk Creek Watershed.

Species	Elk 2	Elk 3	Elk 4	Little Elk 1	Little Elk 2	Meadow 1
Brook trout		61	14	19	44	
Longnose dace	125		120			7
Finescale dace					1	
White sucker			24			
Mountain sucker			40			
Creek chub					32	
Fathead minnow					3	

Elk Creek (ELK)

In Elk Creek, four species of fish were captured with longnose dace as the most abundant species in sites 2 and 4. In site 2 (Figure 22) longnose dace were the only species captured (Table 10). The July 2008 sampling indicated some changes since it was last sampled in May 1993. During the 1993 survey, 136 mountain suckers were detected in a single pass; whereas, none were present in the 2008 sample.

In Elk Creek site 4 (Figure 22) longnose dace, mountain suckers, white suckers, and brook trout were sampled (Table 11). This was the only Elk Creek site sampled in 2008 that contained brook trout over 200mm long. Since the last survey of this site in July of 1997, numbers of brook trout greater than 200mm and mountain suckers have decreased (Table 11).

Table 11. Abundance of fish per 100 m of stream sampled in Elk Creek site 4 on July 22, 2008 compared to historical data.

Species	Sample Date	Number of fish/100m (one pass)
Brook trout <200 mm	July 1997	9
	July 2008	12
Brook trout ≥200mm	July 1997	10
	July 2008	2
Longnose dace	July 1997	185
	July 2008	120
Mountain sucker	July 1997	112
	July 2008	40
Brook trout ≥200mm	July 1997	10
	July 2008	2

In Elk Creek sample site 3 (Figure 22) brook trout were the only species detected (Table 10). All fish were less than 200 mm with a majority between 100 and 130mm. Brook tout relative abundance increased since this site was last sampled in May 1993, where only two fish were captured in a single pass.

Little Elk Creek (LEC)

In Little Elk Creek, four species of fish were captured with brook trout being the most abundant. In site 1 (Figure 22) brook trout were the only species captured with 19 fish sampled and one over 200 mm. No differences were observed in this site as compared with the last time it was sampled in June 1995. Further upstream, during the June 2008 survey of Site 2 below Dalton Lake (Figure 22) four species of fish were captured; brook trout, creek chub, fathead minnow, and finescale dace (Table 12). The last survey of this reach occurred in June 1995 with no notable changes between the two surveys.

Table 12: Number of fish sampled in Little Elk Creek site 2 on June 24th, 2008.

Species	Size	Number per100 m
Brook trout	< 200 mm	41
Brook trout	≥ 200 mm	3
Creek chub	All	32
Fathead Minnow	All	3
Finescale dace	All	1

Meadow Creek (MEC)

The survey of Meadow Creek site 1 (Figure 22) in June 2008 yielded seven longnose dace. This site has been sampled two other times: June 1995 and June 1998. Since the last sample date few changes have occurred (Table 13). The 1998 survey detected brook trout, which were not

present in 2008. Longnose dace relative abundance appeared to have declined in this site as compared to the 1995 and 1998 data. Mountain suckers were not detected in 2008, but were present in 1995 and 1998 (Table 13).

Table 13. Number of fish per 100 meters (first pass) for Meadow, Site 2, in 1995, 1998, and 2008.

Species	Sample Date	Number of fish/100m (1st pass)
Brook trout <200 mm	June 29, 1998	9
Brook trout ≥200mm	June 29, 1998	1
Longnose dace	June 13, 1995	178
	June 29, 1998	209
	June 30, 2008	7
Mountain sucker	June 13, 1995	8
	June 29, 1998	27
	June 30, 2008	0

Recommendations

1. Continue to manage the Elk Creek watershed under standard trout regulations.
2. Manage for natural yield wild brook trout.
3. Investigate the option of supplemental stocking of rainbow trout into Elk Creek.
4. Perform a more intensive survey of fish populations in Elk Creek in the next seven years.

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Bear Butte Creek Watershed

Counties: Lawrence and Meade

Fish populations in Bear Butte Creek Watershed within the Black Hills Trout Management Area (BHTMA) (Figure 23) were surveyed during 2007 and 2008 to monitor fish populations. The Bear Butte Creek Watershed within the Black Hills Trout Management Area is located along a southwest to northeast orientation between Englewood (south of Lead) and Sturgis (Figure 1, Figure 23). Bear Butte Creek's headwaters are located about four miles south of Lead and flows north east where it drains into the Belle Fourche River about 22 miles east of Sturgis. The watershed is in a pine/spruce forest and managed by the US Forest Service. Historically, the Bear Butte Watershed played an important role in the gold mining activities. Several small gold mines are located within the watershed with the Gilt Edge Mine, a Superfund Site, located on the Strawberry Creek drainage (EPA Region 8). The Bear Butte Watershed is largely undeveloped aside from the towns of Sturgis and Galena and several campsites and tourist facilities along Hwy 385. Recently, this watershed has seen increased human development with a few golf courses and housing developments added. Bear Butte Creek in Meade County was last stocked with catchable rainbow trout in 2006, but upper reaches in within the BHTMA have not been stocked since 1989. Bear Butte Creek and its tributaries are currently managed under standard regulations with a daily limit of five trout (in any combination) with one 14 inches or longer allowed.

Methods

Sample Locations

Five reaches in Bear Butte Creek and two reaches in Strawberry Creek were surveyed during September 2007. All five reaches of Bear Butte Creek are located above Galena within 1 ½ miles of each other (Figure 24). Strawberry Creek empties into Bear Butte Creek about one stream mile south of Galena (Figure 24). One reach in Two Bit Creek, Two Bit Creek East, and in an unnamed tributary of Bear Butte Creek (Figure 23) were surveyed during August 2008. Bear Butte Creek unnamed tributary drains into Bear Butte Creek about one mile upstream from Strawberry Creek (Figure 24). Two Bit Creek empties into Boulder Creek near Hwy 14A, but is usually dry at this confluence.

Sample Methods

Efforts were made to satisfy the assumptions 1) the population is static, 2) capture probability remained constant across sampling periods, and 3) all fish in the population are equally vulnerable to capture (Van Den Avyle and Hayward 1999; Hayes et al. 2007). All sample reaches were 100 m in length. Block nets at the upstream and downstream boundaries were used to prevent fish from emigrating or immigrating within the sample site. Three passes were made in Bear Butte Creek, and Strawberry Creek, with one or two backpack electrofishing units. One pass was made in all other tributary creeks with one backpack electrofishing unit. Captured fish were anesthetized with carbon dioxide, measured to the nearest millimeter total length, weighed to the nearest gram, and returned to the stream. After 50 individual lengths and weights were collected from small fish (< 100mm) of a specific species, bulk counts were collected to expedite

data collection. For three-pass surveys, a maximum-likelihood estimator was used to estimate catchability and population (Junge and Libosvarsky 1965; cited in Hayes et al. 2007). For single-pass surveys, relative abundance was calculated as CPUE (number of fish captured per 100 m of stream). Relative abundances were compared to historical data from individual sites when historical sampling occurred within comparable months. For 2008 samples completed in May or June, historical samples in May and June were used for comparison. For 2008 samples completed in July or August, historical samples in July or August were used for comparison. As a result of the small sample size, caution must be given when interpreting the data and extrapolating it to the entire stream.

In addition to fish data, pH, temperature, and specific conductance were measured and recorded. Additionally, stream widths were measured every 10 meters and averaged to obtain an estimate of total area sampled. Stream flow data was also downloaded from the USGS web site for water years 1996-2008 (available at: http://waterdata.usgs.gov/sd/nwis).

During the 2008 study, efforts were made to check all drainages for presence of water and sites were sampled if they had flowing water, no matter how shallow. Although 2008 brought above average moisture (NOAA), sample sites in Park Creek, Vanocker Creek, Two Bit West Creek, and lower sites of Two Bit Creek were not surveyed because they were dry during the 2008 sample. Peedee Gulch Creek lies on private property that is currently being developed into a housing community. The land owner was contacted and was interested in letting us sample the creek, but due to time constrains this creek was not sampled.

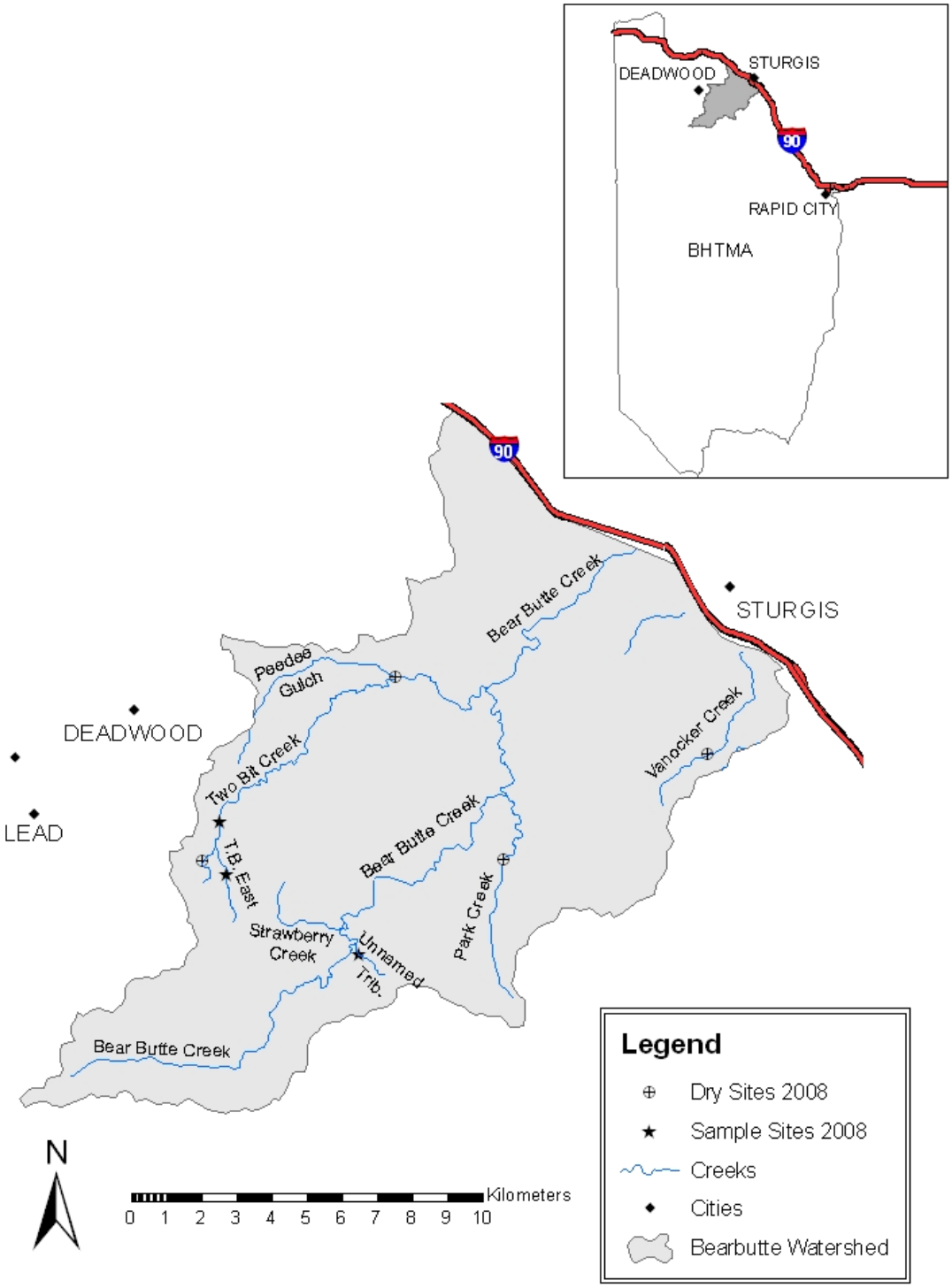

Figure 23. Location of 2008 sample sites within the Bear Butte Creek Watershed of the Black Hills Trout Management Area (BHTMA).

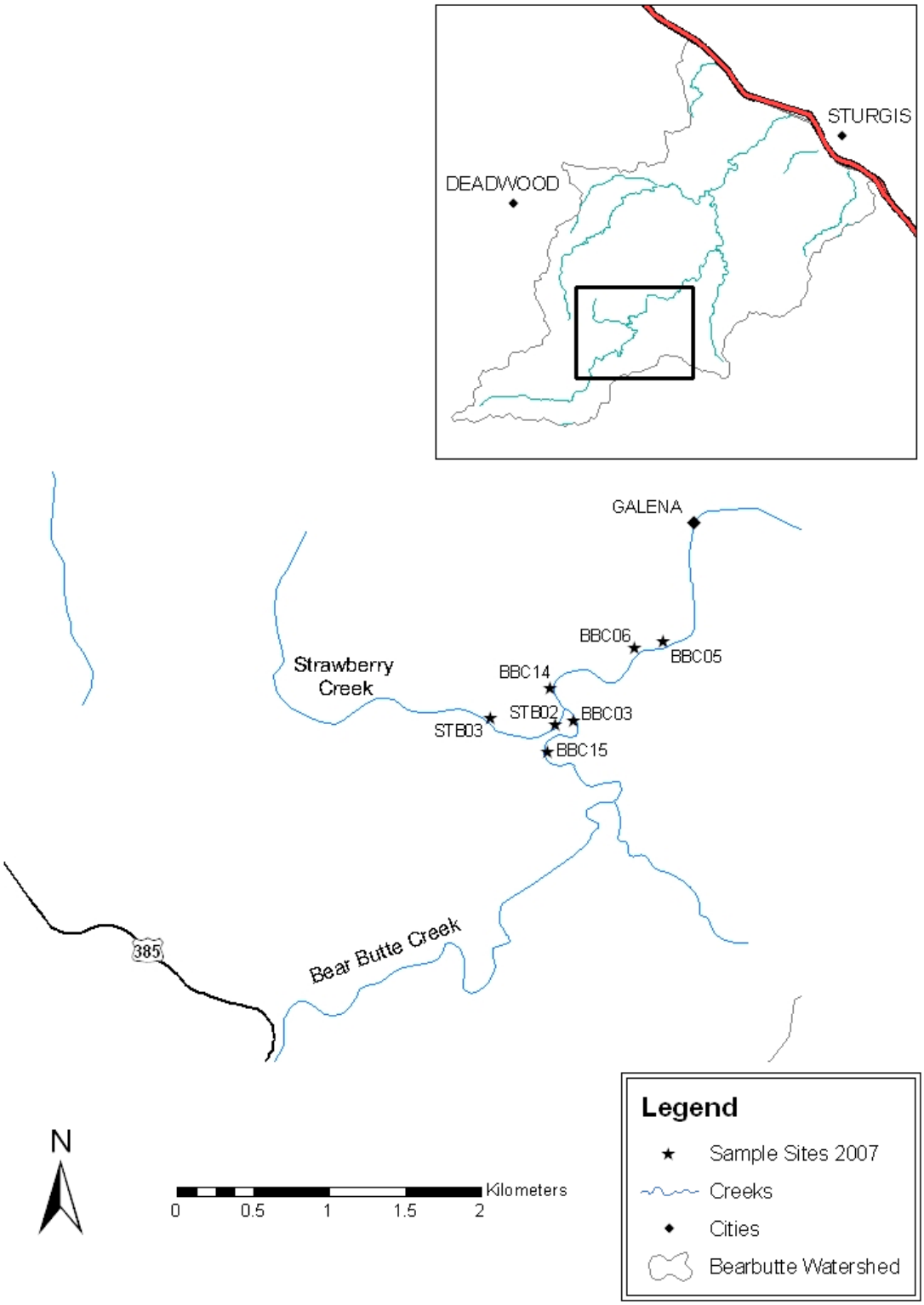

Figure 24: Sample sites in 2007 for Bear Butte Creek and Strawberry Creek are depicted within the Bear Butte Creek Watershed.

Results and Discussion

Six species of fish were captured in the Bear Butte Creek watershed during 2007 and 2008 sampling (Table 14). Brook trout was the only salmonid detected and was the only fish species present in Bear Butte Creek's tributaries except Strawberry Creek.

Table 14. Presence or absence of species captured in sample sites within five creeks of the Bear Butte Creek Watershed.

Species	BBC	TBC	TBE	STB	BBT
Brook trout	X	X	X	X	X
Longnose dace	X			X	
White sucker	X				
Mountain sucker	X				
Rock bass	X				
Green sunfish	X				

Bear Butte Creek (BBC)

Five species of fish were captured in Bear Butte Creek (Figure 24) during the September 2007 survey. Longnose dace were the most abundant species of fish, followed by brook trout, mountain sucker, white sucker, green sunfish, and rock bass (Table 14).

Table 15. Population estimates in number of fish per 100 meters of stream and number of fish per surface acre of water for Bear Butte Creek in the Bear Butte Creek watershed.

Species	Size	Number/100 m	Number/ac	Number captured
Brook trout	< 200 mm	137.2	1691	649
Brook trout	≥ 200 mm	7.4	92.4	37
Mountain sucker	ALL	6.4	92	32
Longnose dace*	ALL	X	X	879
White sucker*	ALL	X	X	25
Green sunfish*	ALL	X	X	12

*Population estimates were not made due to lack of pass reduction or small sample sizes.

Brook trout - Populations of brook trout over 200mm have fluctuated over time, but after a drop in population in 2003 numbers have slightly increased (Figure 25). They also occurred with the greatest densities in the most upstream site. In contrast, brook trout less than 200mm have generally increased since 1999, but decreased in 2007 (Figure 25). Length frequency histogram analysis indicated that a majority of the fish were less than 120mm (Figure 26). Based on the 1993 Black Hills Stream Management Plan, Bear Butte Creek can be classified as BK2 (25-150 fish over 200mm per surface acre).

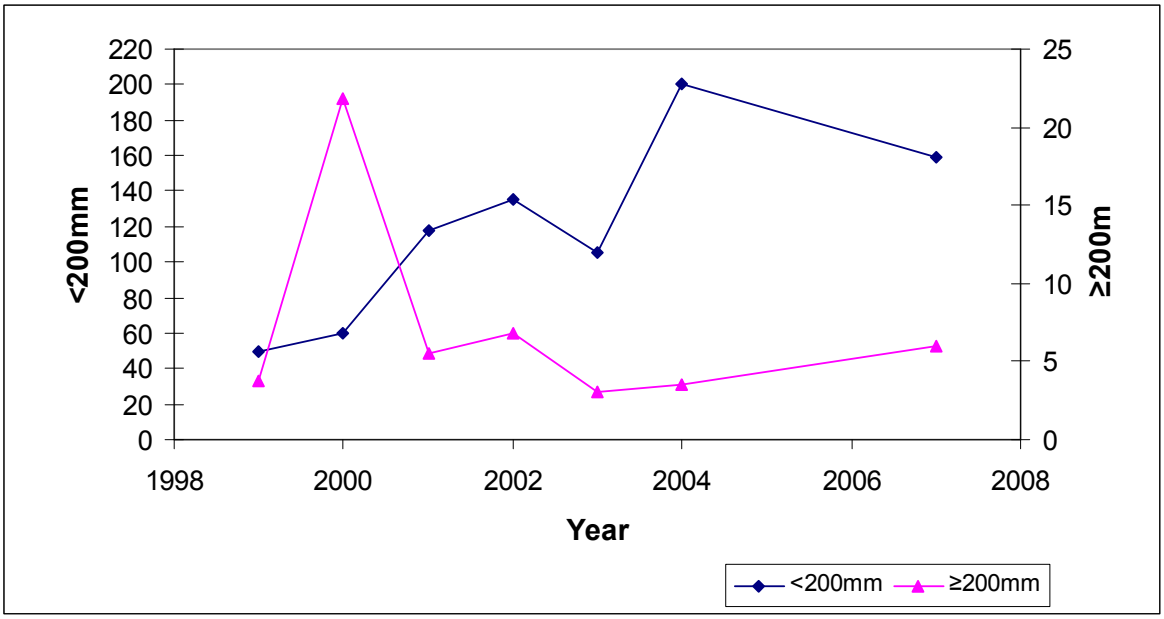

Figure 25. Estimated number of brook trout per 100 m of stream for each survey year within Bear Butte Creek in the Bear Butte Creek Watershed.

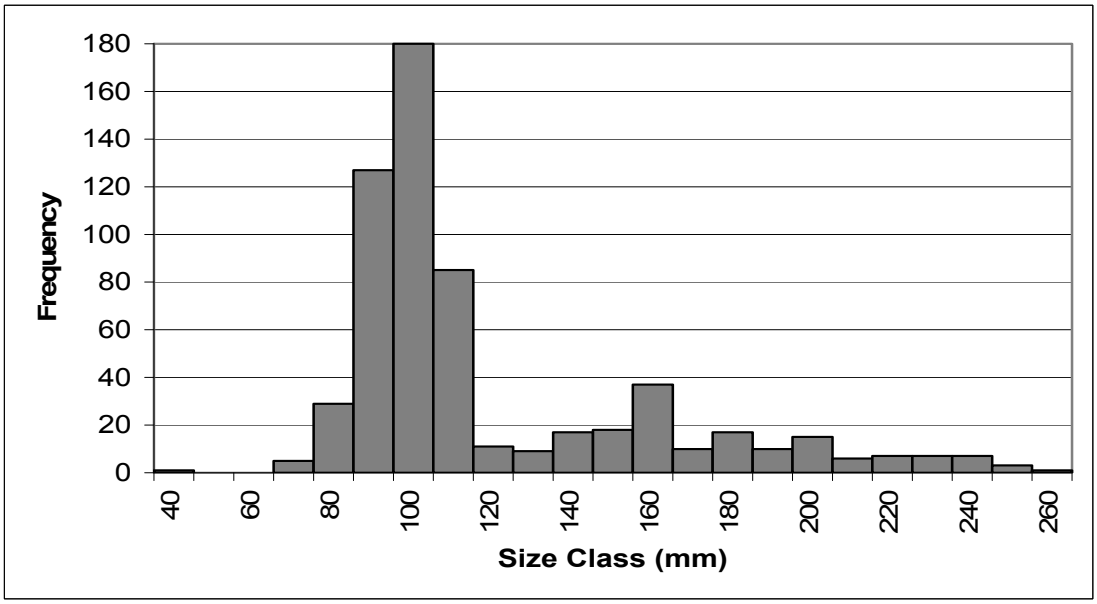

Figure 26. Length frequency histogram for brook trout (BKT) sampled from Bear Butte Creek above Galena in September 2007.

Native fish – Abundance of native fish seems to have changed over the sample years in Bear Butte Creek. Longnose dace populations were evaluated by using number of fish captured rather than by population estimates due to lack of subsequent pass reduction for most sites in most years. Dace populations have been declining since a peak in their population in 2000 (Figure 27). Mountain sucker abundance has been declining since 2000 (Figure 28). In previous sample

years mountain suckers were detected in all sites sampled; whereas, they were only detected in two sites during the 2007 survey with all but one fish captured in site 15 (Figure 24).

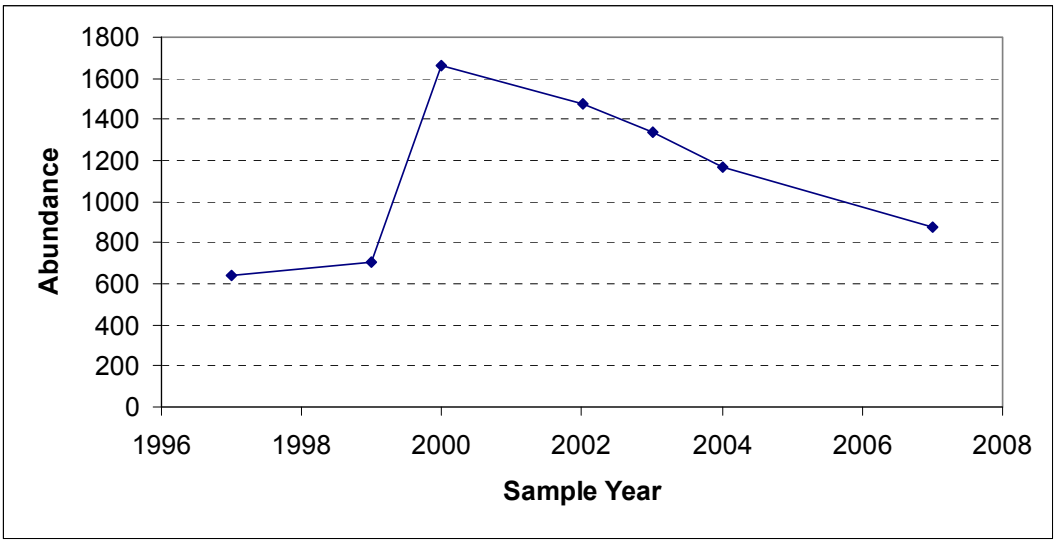

Figure 27. Total number of longnose dace captured during each survey year in Bear Butte Creek sites 3, 5, 6, & 14. Data from 1998 and 2001 was left out due to low sample size.

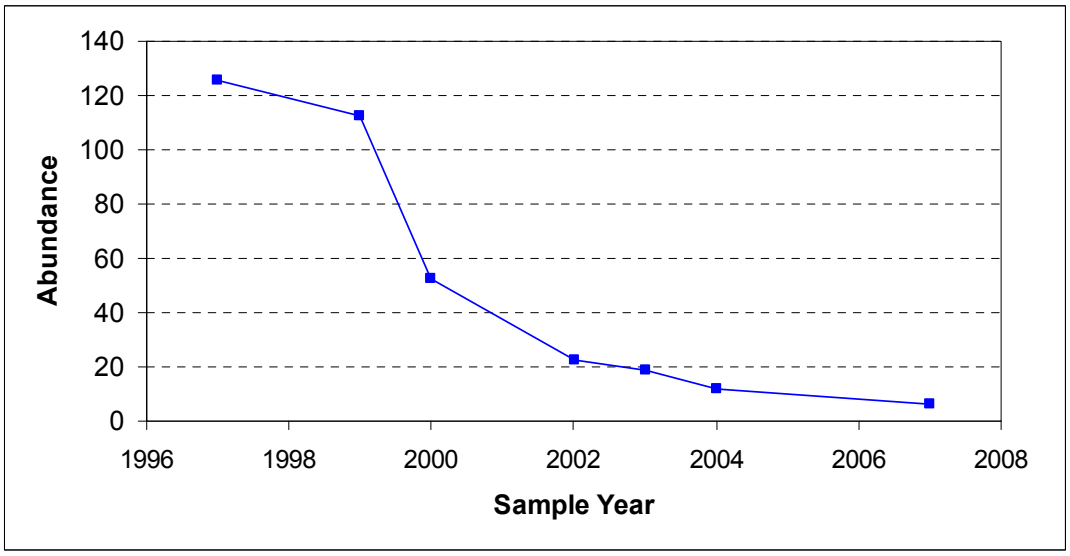

Figure 28. Estimated number of mountain suckers per 100 meters of stream for each survey year within Bear Butte Creek. Data from 1998 and 2001 was left out due to small sample size.

Two Bit Creek (TBC)

Brook Trout were the only species detected in Two Bit Creek site 2 (Figure 23) with three fish over 200mm and 193 fish less than 200mm. This site was also surveyed in 1993 where the abundance of fish greater than 200 mm appears to have decreased (Table 16).

Table 16. Number of fish per 100 meters (single pass) for Two Bit Creek, Site 2, in 1993, 1998, and 2008.

Species	Sample Date	Number of fish/100m (1st pass)
Brook trout <200 mm	July 14, 1993	105
	Aug 12, 2008	193
Brook trout >200mm	July 14, 1993	11
	Aug 12, 2008	3

Two Bit Creek- East Fork (TBE)

Brook trout were the only species of fish detected in Two Bit Creek East Fork site 1 (Figure 23). During this survey 4 fish over 200mm and 15 fish between 140mm and 200mm were detected. Brook trout abundance in this site is similar to the 1997 survey when 26 fish less than 200mm were captured in a single pass.

Strawberry Creek (STB)

Strawberry Creek (Figure 24) was surveyed in September 2007. Brook trout were the most abundant species with no fish over 200mm captured. A majority of the fish were captured in site 2 near the confluence of Bear Butte Creek. The population estimate for brook trout in site 2 was 103 fish per 100 m, but in site 3, (400 meters up stream) the population estimate was 18 fish per 100 meters. Length frequency histogram evaluation for both sites indicated that most of the fish were less than 100 mm and most fish were 80-90 mm in length (Figure 30). Aside from an Oct 2001 survey, populations of brook trout have not changed significantly since the 2000 survey (Figure 29). High population estimates for the 2001 survey may have been affected by fall spawning of brook trout since it was completed in October rather than September like the other surveys.

Longnose dace were the only other species of fish detected in Strawberry Creek during the 2007 survey with 22 captured in site 2 and none in site 3. Previous surveys yielded similar results.

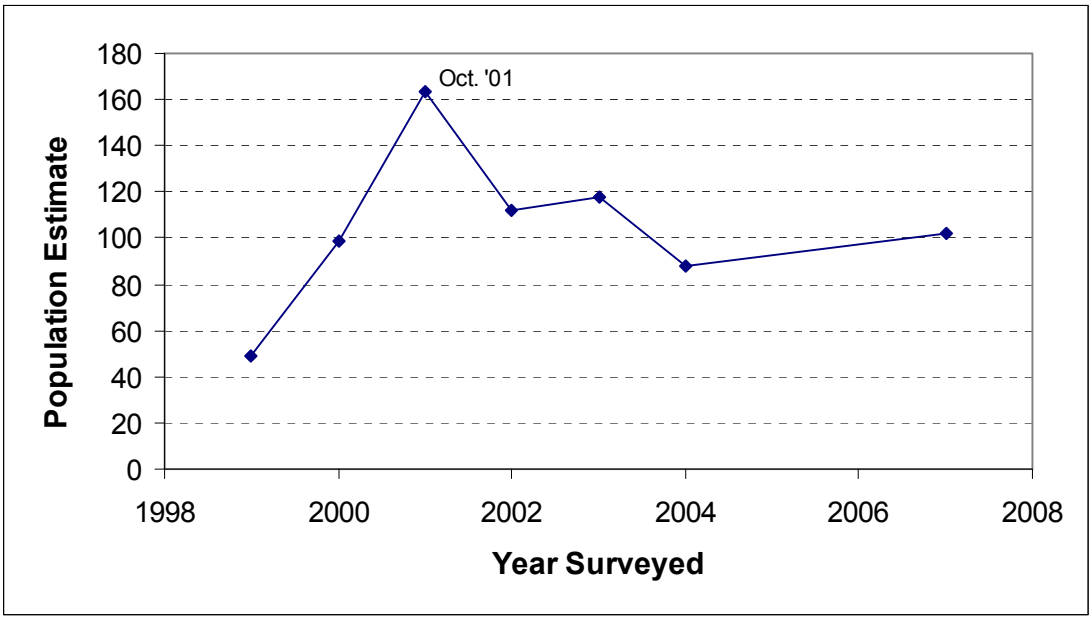

Figure 29. Population Estimates for brook trout in Strawberry Creek site 2 within the Bear Butte Creek Watershed.

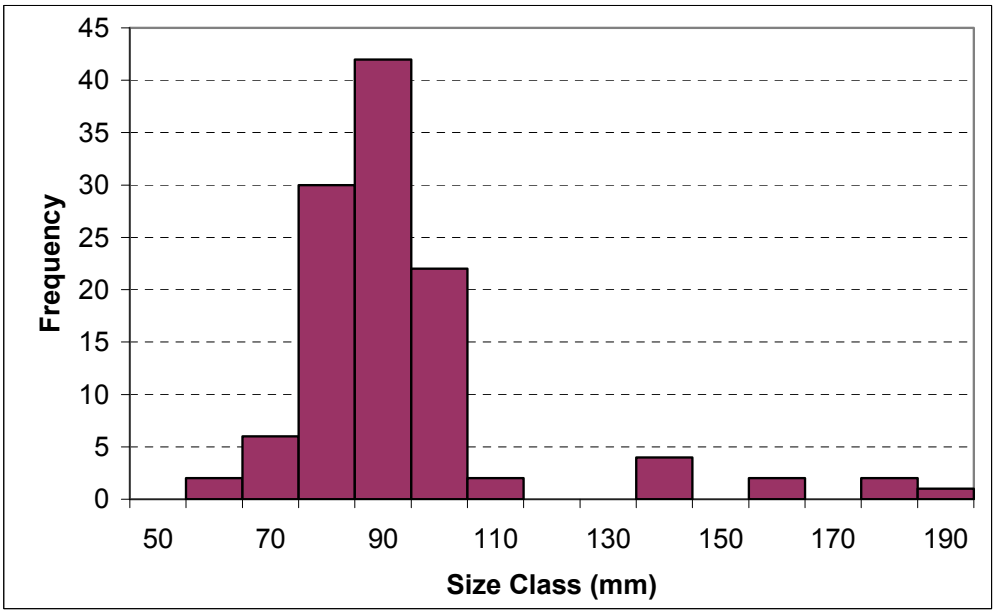

Figure 30. Length frequency histogram for brook trout in Strawberry Creek sites 2 and 3 during the September 2007 survey.

Bear Butte Creek Unnamed Tributary (BBT)

During an August 2008 survey of Bear Butte Creek Unnamed Tributary (Figure 23) 33 brook trout were captured, all between 102 and 161mm long. This was the first time that this creek had been surveyed.

Recommendations

1. Manage the Bear Butte Watershed as a natural brook trout and native fishery and monitor on a 3-5 year basis.
2. Survey the main stem of Bear Butte Creek more intensely within the next 7 years.
3. Continue to manage the Elk Creek watershed under standard trout regulations.
4. Investigate areas of the Bear Butte Watershed that could serve as potential areas of native fish management.

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Spearfish Creek Watershed

County: Lawrence

Introduction

Within the last five years, Spearfish Creek has undergone two specific changes to its hydrologic management. In November of 2003, Homestake Mine ceased using water in Little Spearfish Creek allowing water to flow over Spearfish Falls for the first time in decades and enter Spearfish Creek. In conjunction with the release of water from Little Spearfish Creek, Homestake Mines also stopped taking water from Spearfish Creek at Savoy Intake allowing this water to continue downstream. These actions resulted in a much higher stream flow in Spearfish Creek below Savoy intake and Little Spearfish Creek.

In addition to the hydrologic changes, natural flow events have likely affected the fishery in Spearfish Creek. According to USGS flow data (available at http://waterdata.usgs.gov/sd/nwis), mean flow for June in Spearfish Creek is 81 cfs, but in June of 2007, Spearfish Creek experienced a precipitation event resulting in a peak flow of 1,150 cfs and above average flows for about two weeks thereafter. In 2008, runoff from snowmelt and summer precipitation resulted in above average flows. Peak flow in 2008 was about 271 cfs, but flows remained well above average through November. These hydrologic events resulted in mobilization of large amounts of bed material likely causing significant changes to the morphology of the stream and redistributed habitat throughout the system. These hydrologic events are normal and necessary for the maintenance of habitat features within the stream (Poff et al. 1997; Norris and Thoms 1999) and riparian features which can have direct affects on fish habitat (Schlosser 1991; Kauffman et al. 1997).

The effects of changed hydrology and high flow events on the Spearfish Creek fishery were unknown. Beginning in 2007, South Dakota Game, Fish, and Parks began receiving mixed reports about the fishing in Spearfish Creek. Some anglers contended that the fish population was low since they were not catching many fish. The reports of poor fishing were cause for concern. However, other anglers claimed the fishing was good and reported high catch rates. Spearfish Creek has been sampled nearly every year for the past 20 years, but the number of sites was relatively small. Therefore, South Dakota Game, Fish, and Parks decided to intensively sample Spearfish Creek (Figure 31) to determine the status of the fishery and to evaluate management strategies currently in place.

The majority of Spearfish Creek and its tributaries are managed as a wild trout (natural yield) fishery with standard regulations of a daily limit of five trout (in any combination) with one allowed 14 inches or longer. A one-mile reach of Spearfish Creek from the Maurice Intake upstream to the Hydro #2 building is currently managed with catch and release regulations for rainbow trout. Other trout species may be harvested according to standard regulations. This reach of Spearfish Creek is unique in that it contains the only naturally reproducing rainbow trout population in the Black Hills capable of maintaining a Class I rainbow trout (> 25 fish $\geq$ 200 mm / surface acre) fishery. No creeks within the watershed have been stocked since 1990

except for Iron Creek and East Spearfish Creek. Iron Creek was last stocked in 1997 with brook trout, and East Spearfish Creek was last stocked in 2005 with brown trout.

In addition to sampling the main stem of Spearfish Creek, nine tributary streams within the Spearfish Creek Watershed were sampled. These fish were sampled as part of an effort to sample all streams within the Black Hills. The purpose of these surveys is to evaluate presence/absence and relative abundance of species known to occur in the Black Hills.

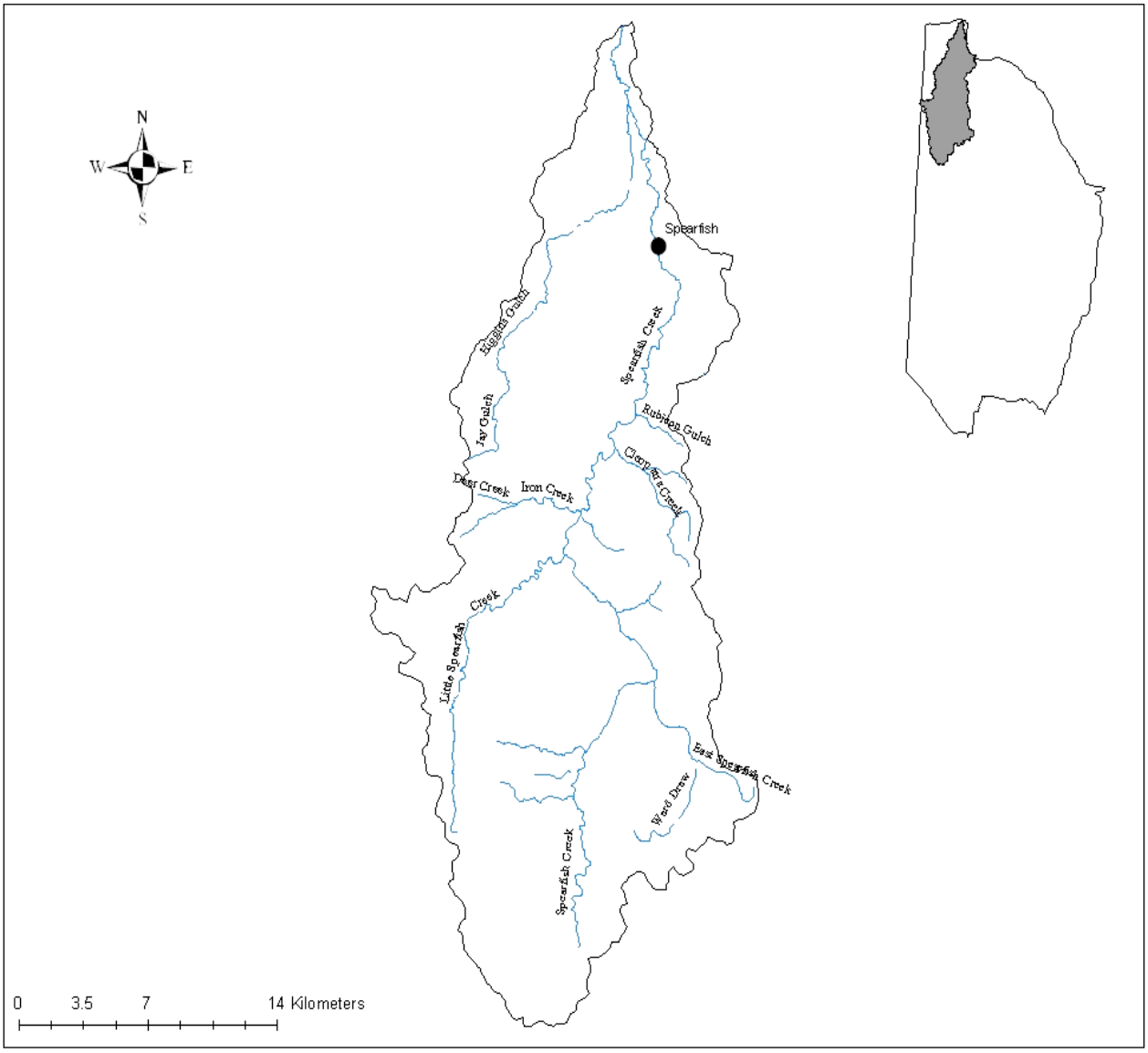

Figure 31. Map of Spearfish Creek Watershed and tributaries within the Black Hills Trout Management Area.

Methods

Spearfish Creek Site Selection

The main stem of Spearfish Creek was divided into six segments (Figure 34) based on morphologic and hydrologic characteristics. Sample reaches measuring 100 m in length were randomly selected within each segment using a random number generator. Segment 1 started near I-90 and ended 4.3 km upstream at the Spearfish Hydro Plant #2 (Figure 35). This segment occurs in an urban setting with relatively high stream flow. Six sample reaches were selected in segment 1. Segment 2 started at the city intake structure and ended 5.3 km upstream at Maurice Intake (Figure 36). This segment had the lowest flow of all the segments due to the removal of water at Maurice Intake. Two sample reaches were selected in segment 2. Segment 3 started at Maurice Intake and ended 10.4 km upstream at the confluence with Little Spearfish Creek (Figure 37). This segment was marked by high water velocity and high discharge due to the steeper slope and input from Little Spearfish Creek. Eight sample reaches were selected in segment 3; however, due to the loss of a holding cage containing sampled fish at one site and mishandling of processed fish at another, population estimates were based on six sites in segment 3. Fish in the excluded segments were counted and that total was included in the total number of fish sampled. Segment 4 started at the confluence of Little Spearfish Creek and ended 10.5 km upstream at the confluence with East Spearfish Creek (Figure 38). This segment had less flow than segment 3, but higher flows than the upstream segments due to input from East Spearfish Creek. Seven sample sites were selected in segment 4. Segment 5 started at the confluence with East Spearfish Creek and ended 6.4 km upstream at the confluence with Dead Ox Creek (Figure 39). This segment had lower flows than to the two downstream segments. Four sites were selected in segment 5. Segment 6 started at the confluence of Dead Ox Creek and ended 3.7 km upstream where surface water first occurs (Figure 40). This segment included the headwaters of Spearfish Creek and had low flow. Three sample sites were selected in segment 6.

Tributary Streams Site Selection

Twelve reaches in nine tributary streams of the Spearfish Creek watershed were sampled in 2008 (Figure 32, Figure 33). Sampled streams included Higgins Gulch, Jay Gulch, Cleopatra Creek, Iron Creek, Deer Creek, Little Spearfish Creek, East Spearfish Creek, Ward Draw, and Intake Gulch. Jay Gulch was dry and no fish were captured in Deer Creek; therefore, it will not be discussed further. All streams had one reach sampled except for Iron Creek, Little Spearfish Creek, and East Spearfish Creek which each had two reaches sampled. Abundances were compared to historical data from individual sites when historical sampling occurred within July or August.

Sample Methods

Efforts were made to satisfy the assumptions 1) the population is static, 2) capture probability remains constant across sampling periods, and 3) all fish in the population are equally vulnerable to capture (Van Den Avyle and Hayward 1999; Hayes et al. 2007). Block nets at the upstream and downstream boundaries were used to prevent fish from emigrating or immigrating within the sample site. For Spearfish Creek, three passes were made with two backpack electrofishing units, and captured fish were removed and held in holding cages between passes until processing.

For tributary stream, one pass was made with one or two backpack electrofishing units depending on stream width. For all sites, captured fish were anesthetized with carbon dioxide, measured to the nearest millimeter, weighed to the nearest gram and returned to the stream. After 50 individual lengths and weights were collected from small fish (< 100 mm) of a specific species, bulk counts were then collected to expedite data collection. For three-pass surveys a maximum-likelihood estimator was used to estimate catchability and population (Junge and Libosvarsky 1965; cited in Hayes et al. 2007). One-pass surveys of tributary creeks were completed to gain an understanding of presence of fish and to get estimate of relative abundance. These abundances were compared to historical data from individual sites when historical sampling occurred within comparable months. For 2008 samples completed in May or June, historical samples in May and June were used for comparison. For 2008 samples completed in July or August, historical samples sampled in July or August were used for comparison.

In addition to fish data, pH, temperature, and specific conductance were measured and recorded. Additionally, stream widths were measured every 10 meters and averaged to obtain an estimate of total area sampled.

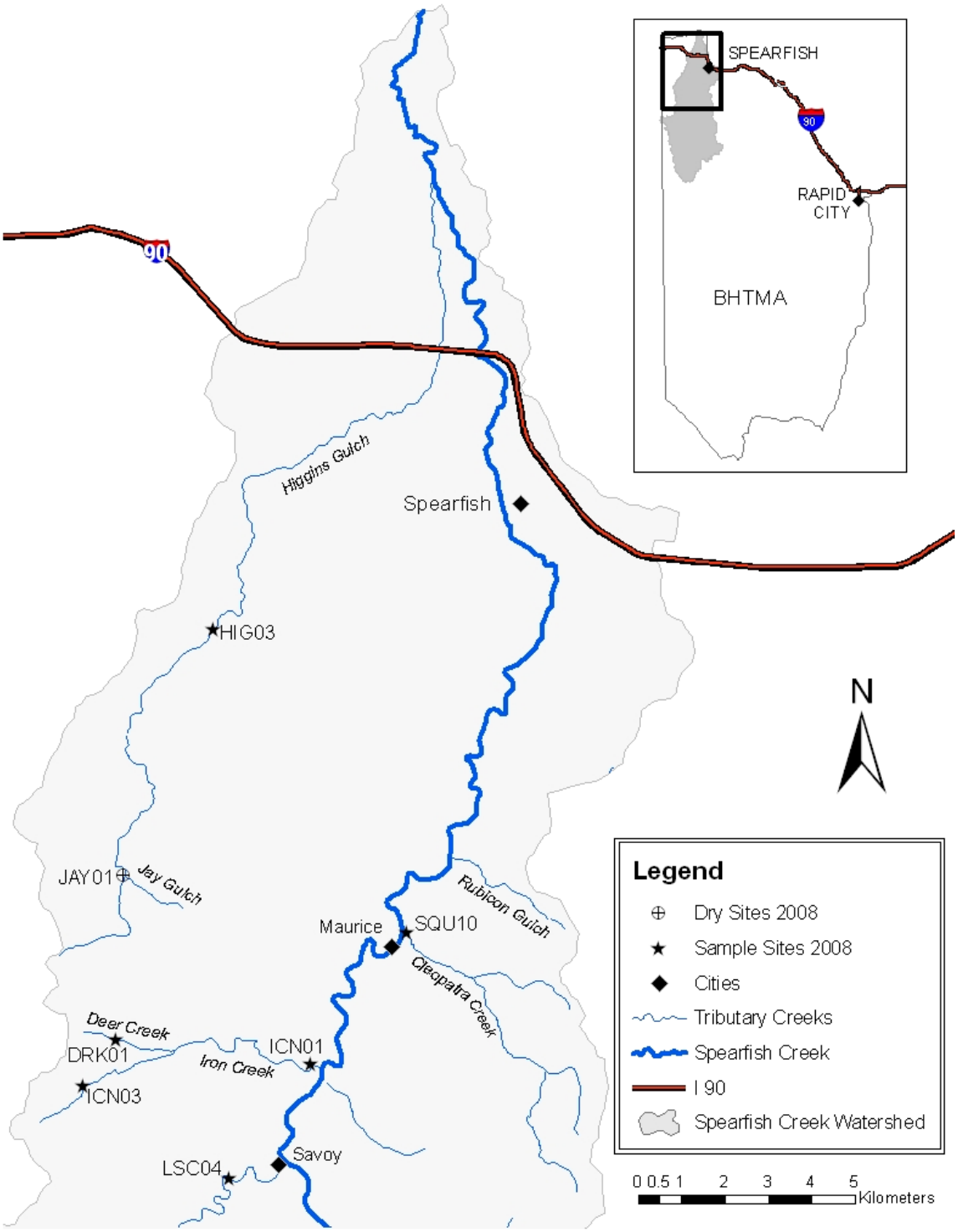

Figure 32. Map of sample locations for tributary streams in the northern Spearfish Creek Watershed.

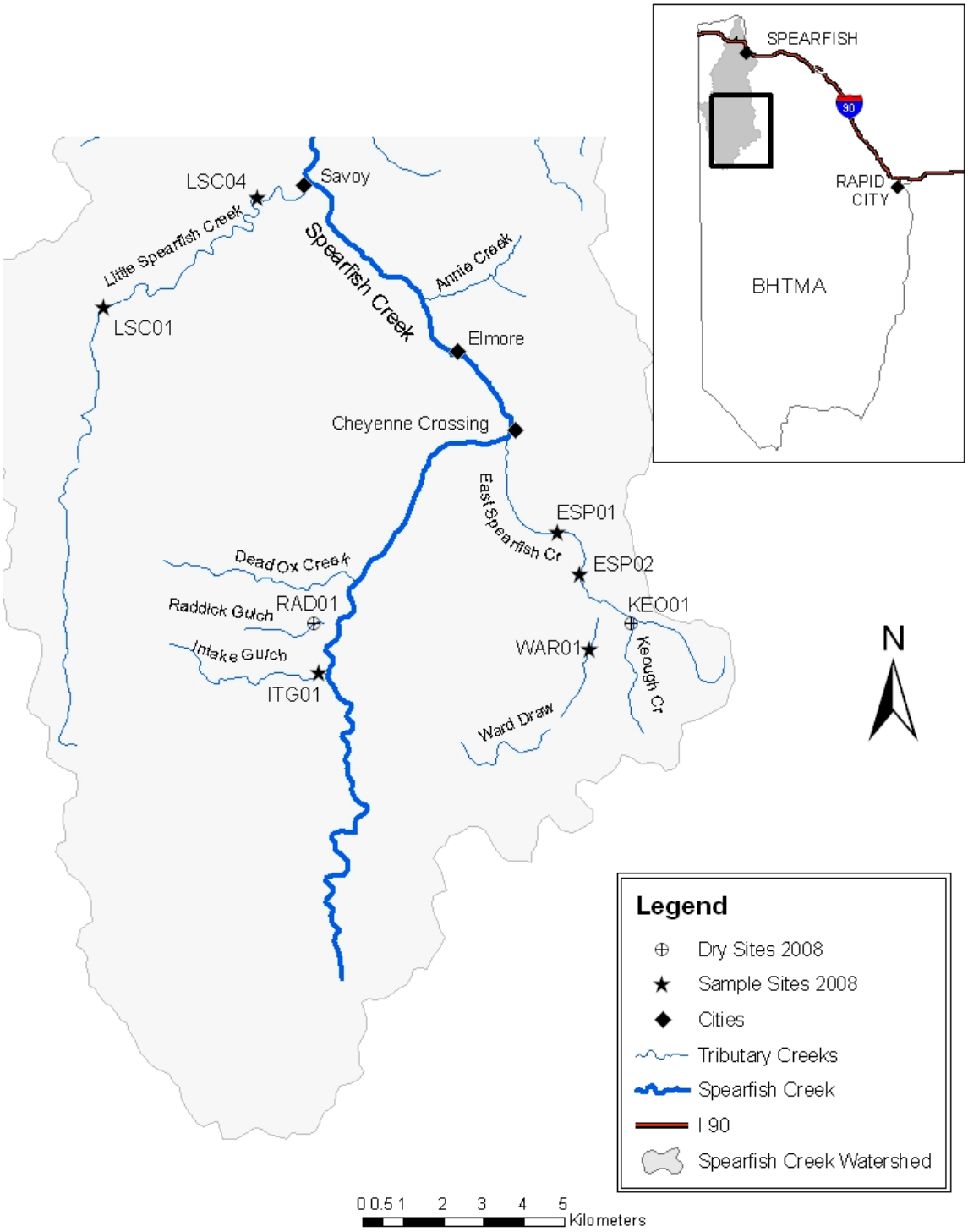

Figure 33. Map of sample locations for tributary streams in the southern Spearfish Creek Watershed.

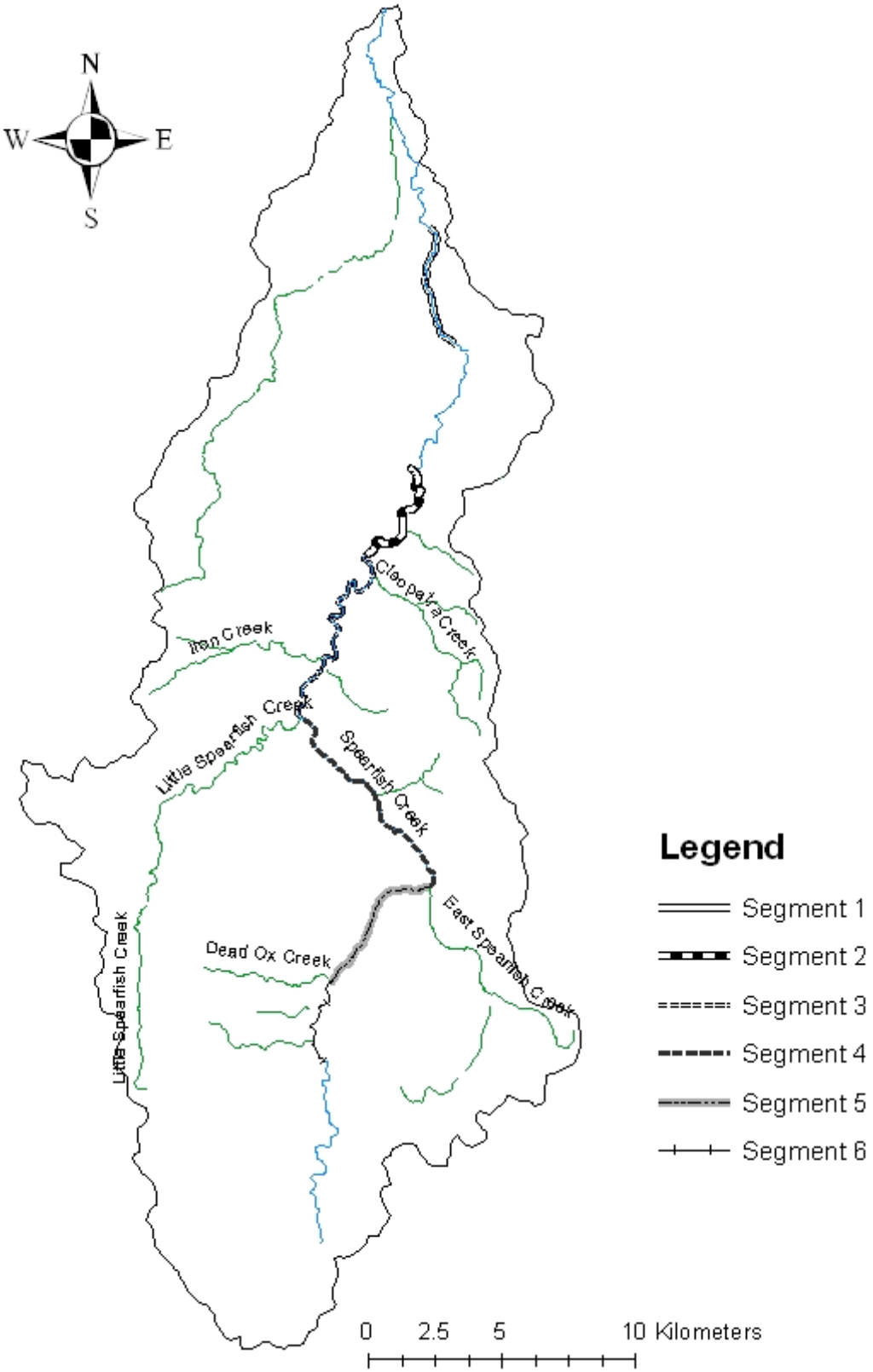

Figure 34. Map of Spearfish Creek Watershed with sample segments of Spearfish Creek delineated.

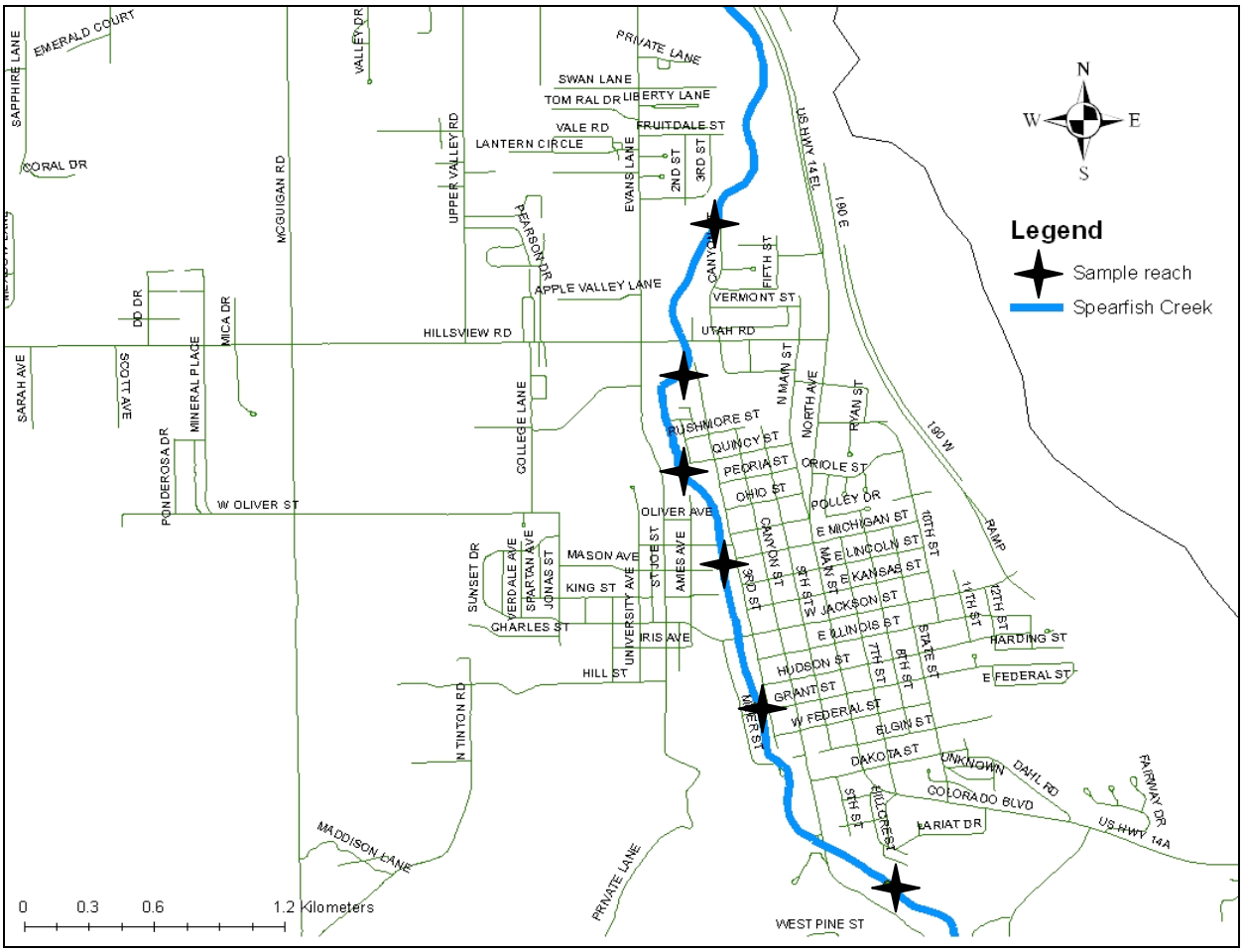

Figure 35. Map of Spearfish Creek and sample reaches in segment 1 in the town of Spearfish.

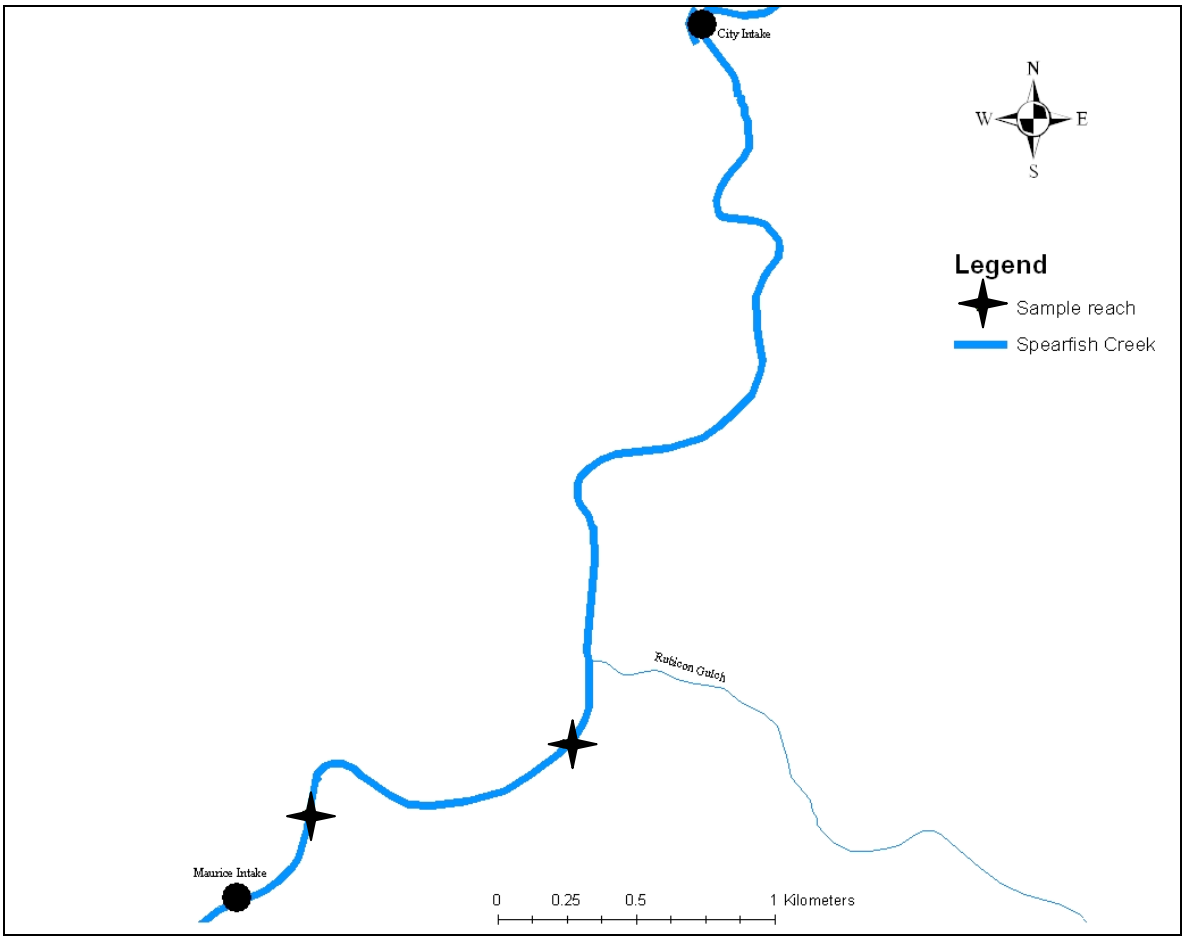

Figure 36. Map of Spearfish Creek and sample reaches in segment 2 from City Intake to Maurice Intake.

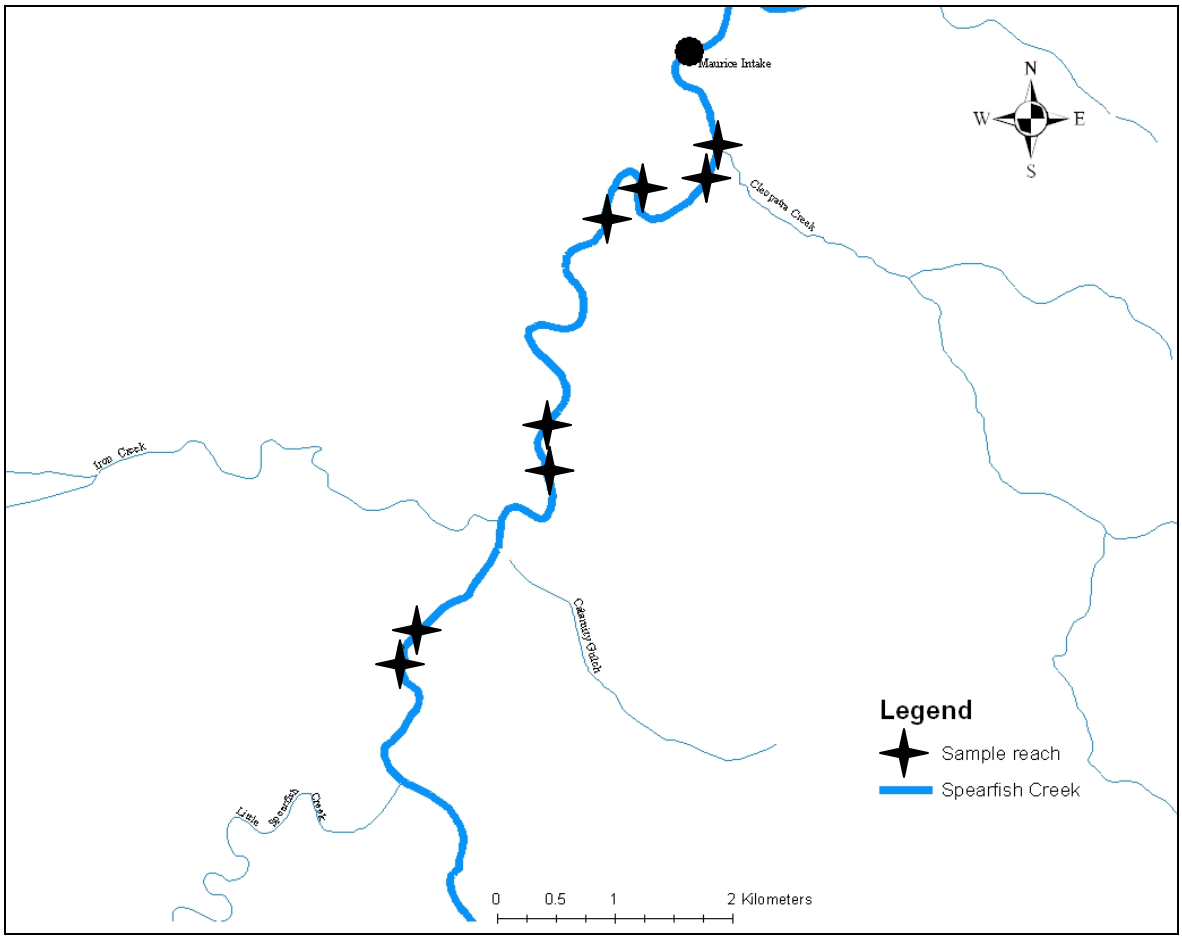

Figure 37. Map of Spearfish Creek and sample reaches in segment 3 from Maurice Intake to the confluence with Little Spearfish Creek.

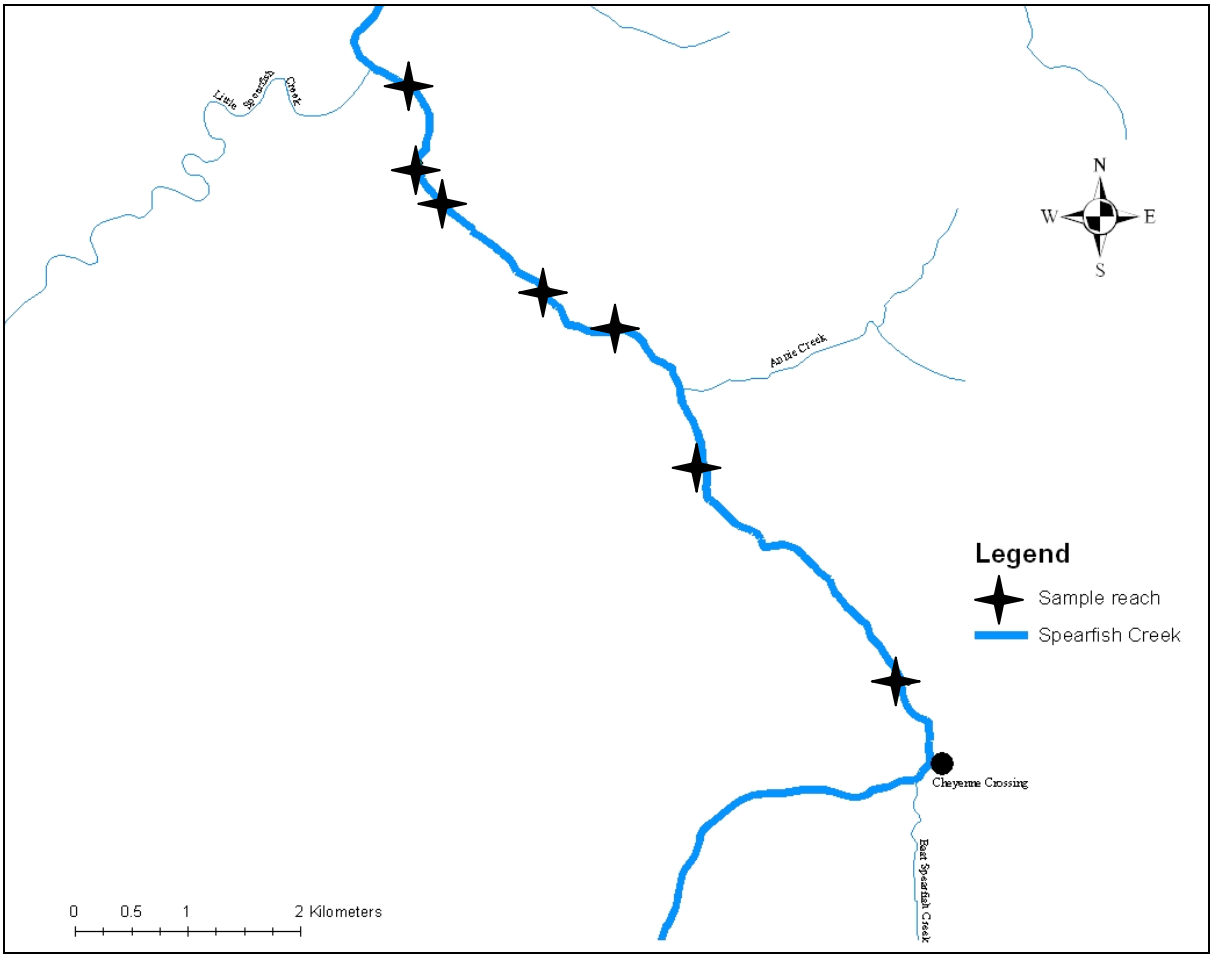

Figure 38. Map of Spearfish Creek and sample reaches in segment 4 from the confluence with Little Spearfish Creek to the confluence with East Spearfish Creek.

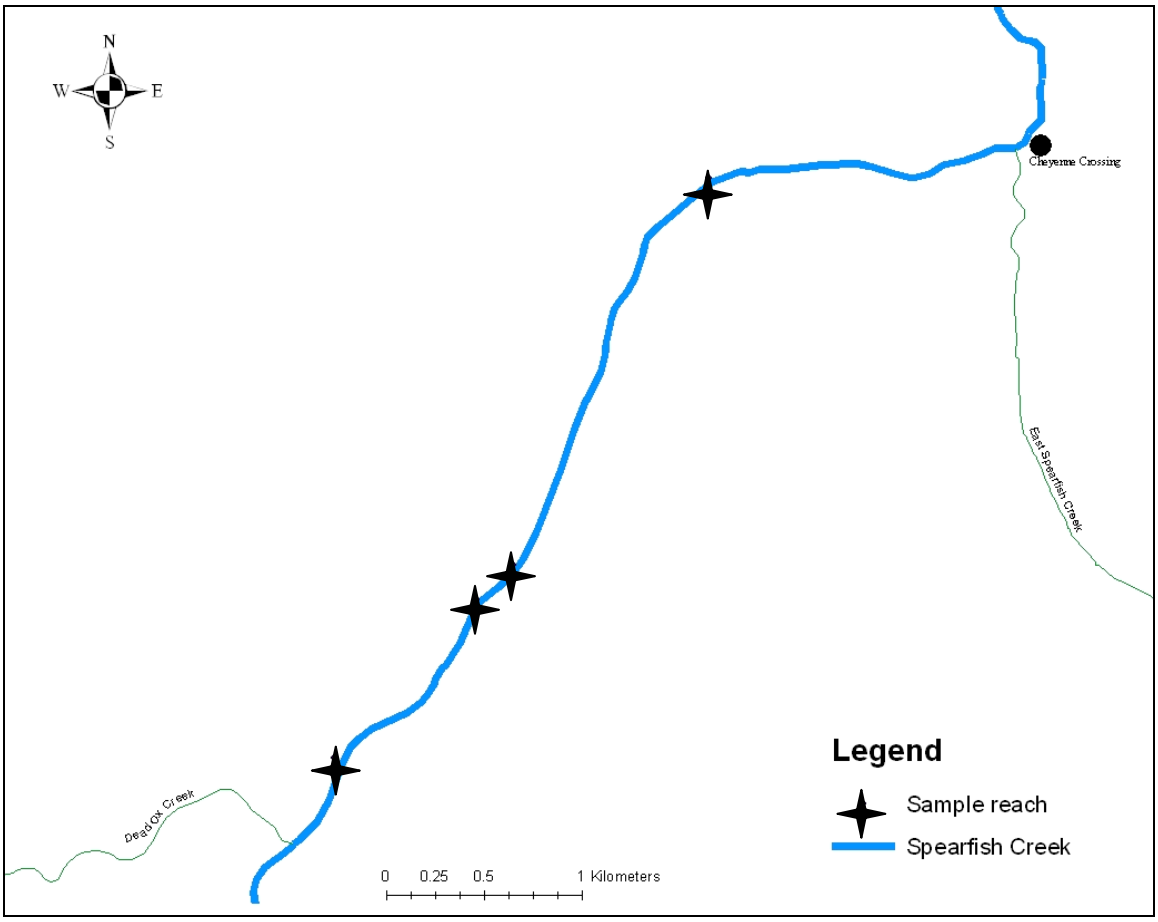

Figure 39. Map of Spearfish Creek and sample reaches in segment 5 from the confluence of East Spearfish Creek to the confluence of Dead Ox Creek.

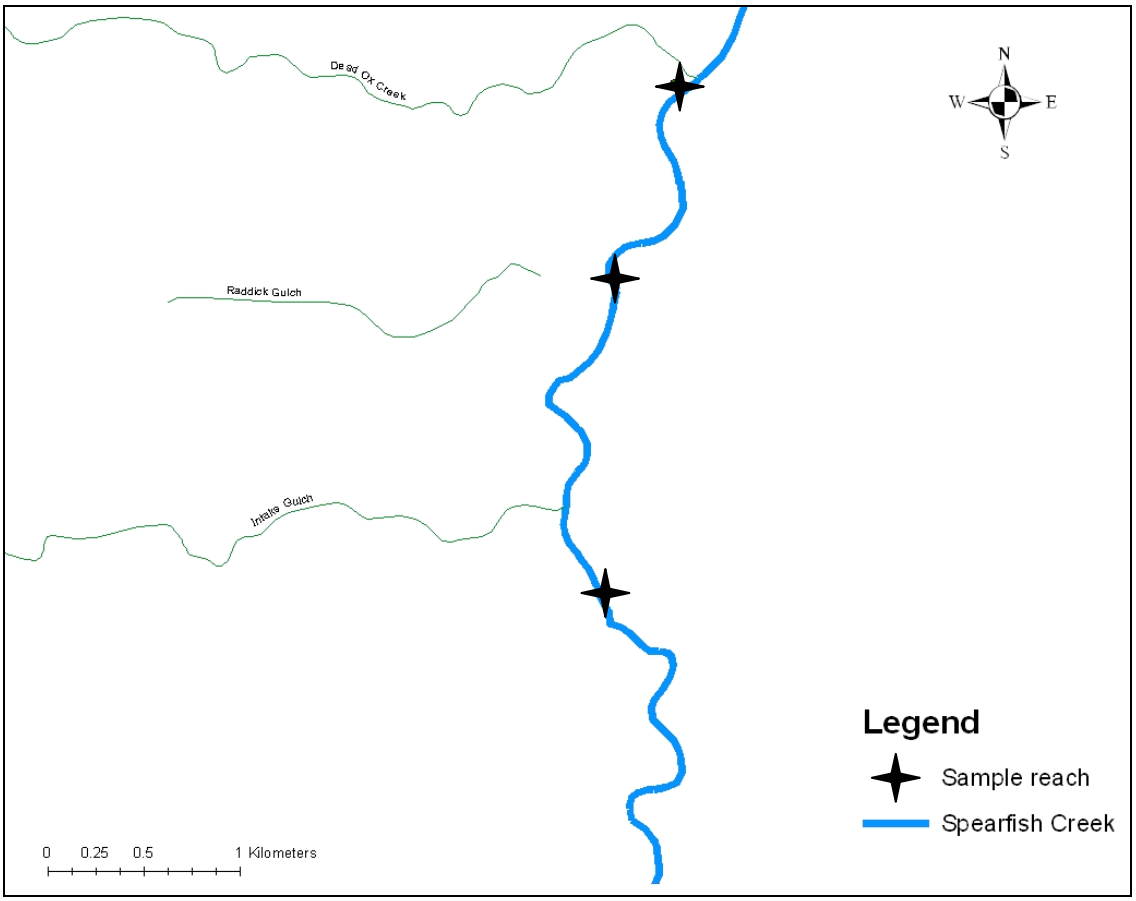

Figure 40. Map of Spearfish Creek and sample reaches in segment 6 from the confluence with Dead Ox Creek to the headwaters.

Results and Discussion

Spearfish Creek (SFC)

Three species of fish were sampled in Spearfish Creek in 2008. These species included brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), and rainbow trout (*Oncorhynchus mykiss*). Brown trout were the most common species sampled followed by brook trout and rainbow trout with 7,455; 565; and 81 fish respectively. Brown trout were sampled in all six segments. Brook trout were sampled in segments 2, 3, 5, and 6. Rainbow trout were sampled in segments 1, 2, and 3.

Brown trout – Population estimates for brown trout varied by segment (Table 17). Juvenile brown trout were most abundant in segment 5, but were least abundant just upstream in segment 6. However, all segments except for segment 6 appeared to have similar numbers of juvenile brown trout per 100 m of stream.

Density and population estimates of brown trout were highest in segment 4 and lowest in segment 6 (Table 17). Densities of brown trout in segments 1-5 were high enough to be classified as a class I (> 150 adult fish per acre) fishery. Densities in segment 6 were at a level consistent with a class II (25-150 adult fish per acre) brown trout fishery. The low estimates observed in segment 6 were a result of a shift from a brown to brook trout dominated fish assemblage with upstream progression towards the headwater.

Table 17. Population (number/100 m) and density (number/ac) estimates of brown trout in Spearfish Creek calculated from 2008 survey.

Segment	Juvenile/100m	Adults/100m	Adults/ac
1	165.33	45.50	243.00
2	177.50	31.00	247.00
3	254.00	56.80	263.80
4	220.00	68.14	401.29
5	325.50	29.25	191.25
6	50.67	6.00	65.67

Size structure of brown trout varied between segments 1, 3, 4, and 5 (Figure 41). Segments 2 and 6 were excluded from this comparison due to the relatively small sample size. Segment 1 appeared to have proportionally more fish over 200 mm and segment 5 had proportionally more fish shorter than 200 mm than the other segments. Additionally, segment 1 approaches 100% at a longer length and segment 5 approaches 100% at a shorter length than the segments 3 and 4. Segment 3 has a higher proportion of fish less than 100 mm than segment 4. Size distribution converges for segments 3 and 4 at about 240 mm.

Caution must be taken when interpreting age data from the length-frequency distribution since hard structures of fish were not collected to verify the age of the length classes. However, since this method typically works well for early age classes (Isely and Grabowski 2007), it will be assumed that length-frequency distributions in this report accurately portray size of fish at ages 0, 1, and 2 when separate modes are distinguishable.

Length-frequency distributions of brown trout in segment 1 appear to portray age 0, 1, 2, and 3+ (Figure 42). Reproduction in 2007 appeared to have been relatively successful with the number of age-0 brown trout captured in segment 1. Fish appear to recruit into the 200 mm size class around age 1 or 2 in segment 1. There also appeared to be a good proportion of fish in the 200-300 mm size class with a number of fish longer than 300 mm with the largest fish sampled measuring 393 mm.

Age 0 and 1 fish were discernible in segment 2 (Figure 43). There was a third mode in the 190-200 mm size class possibly indicating age-2 fish, but it is difficult to determine if this is another age class because of the relatively small difference in the age-1 and age-2 modes. Growth rates

appeared slower in segment 2 with age-1 and age-2 fish being smaller than those age classes in segment 1. There were fewer fish over 200 mm in segment 2 with the largest fish sampled measuring 283 mm.

Length-frequency distributions in segment 3 (Figure 44) were similar to that of segment 1 (Figure 42). Growth rates also appeared to be similar to that of brown trout in segment 1 with lengths of age classes being similar. There were some notable difference between segment 3 and 1 with larger numbers of fish measuring between 200 and 300 mm in segment 3. However, segment 3 had fewer fish over 300 mm in total length with the longest being 429 mm.

Segment 4 length-frequency distributions (Figure 45) were similar to that of segment 2 (Figure 43), but with higher numbers of fish. However, the mode representing age-2 fish is less pronounced resulting in a less distinct age-2 size class. Sizes of age-0 and age-1 brown trout were similar to that of segment 2 indicating a similar growth rate. Segment 4 had the highest numbers of fish between 200 and 300 mm of total length. As with segment 3, there were few fish longer than 300 mm with the largest fish sampled measuring 406 mm.

Age-0 and age-1 fish were the only year classes of brown trout discernable in segment 5 (Figure 46). In fact, the age-1 mode in segment 5 may overlap with other year classes. Therefore, it is not possible to make any assumptions about growth of brown trout in this segment. However, reproduction and rearing appeared to be important functions of segment 5 with the high proportion of juvenile fish present (Figure 41 & Figure 46). There was a lower proportion of fish between 200 and 300 mm than segments 3 and 4 with the largest fish sampled measuring 340 mm.

Length frequency analysis for brown trout was not conducted on segment 6 due to the relatively low numbers of fish sampled. There were 35 brown trout sampled with only six measuring longer than 200 mm in length and the largest being 244 mm. Brook trout become the dominant species in this segment of Spearfish Creek and will be discussed later in this report.

Overall, the population of brown trout in Spearfish Creek appeared to be strong and continues to maintain itself through natural reproduction. Populations of adult brown trout were such that all segments but segment 6 were at a level consistent with a class I brown trout fishery. Despite the high flow events experienced in Spearfish Creek the last two years, reproduction appeared to be good for brown trout in segments 1-5. There appears to be several strong year classes in Spearfish Creek indicating that the population of adult fish will continue to be stable or increase over the next few years.

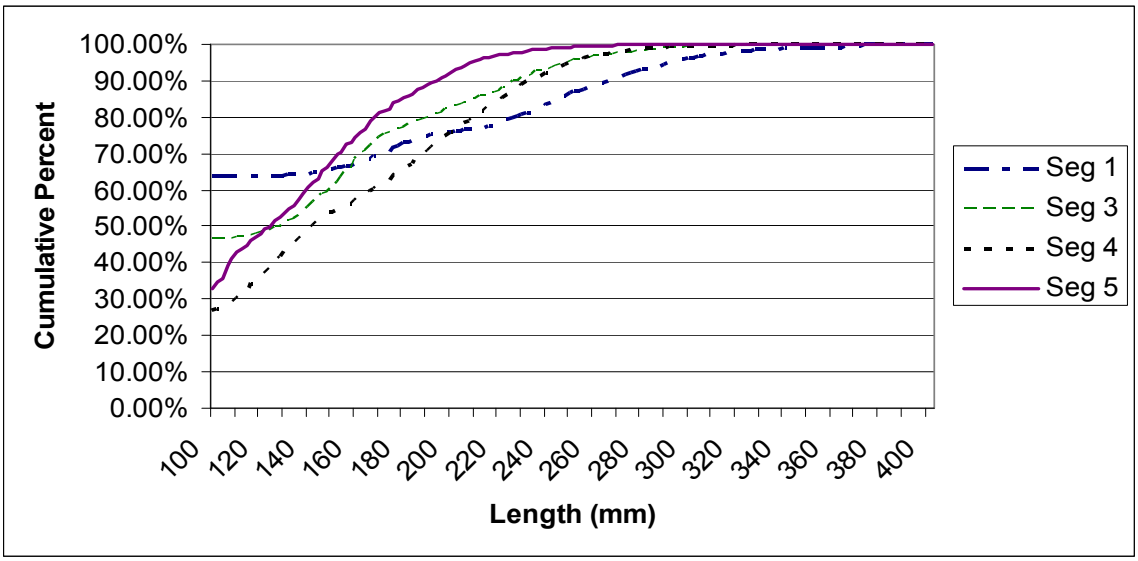

Figure 41. Cumulative length frequency of brown trout in segments 1, 3, 4, and 5 of Spearfish Creek. Segments 2 and 6 were excluded due to small sample size.

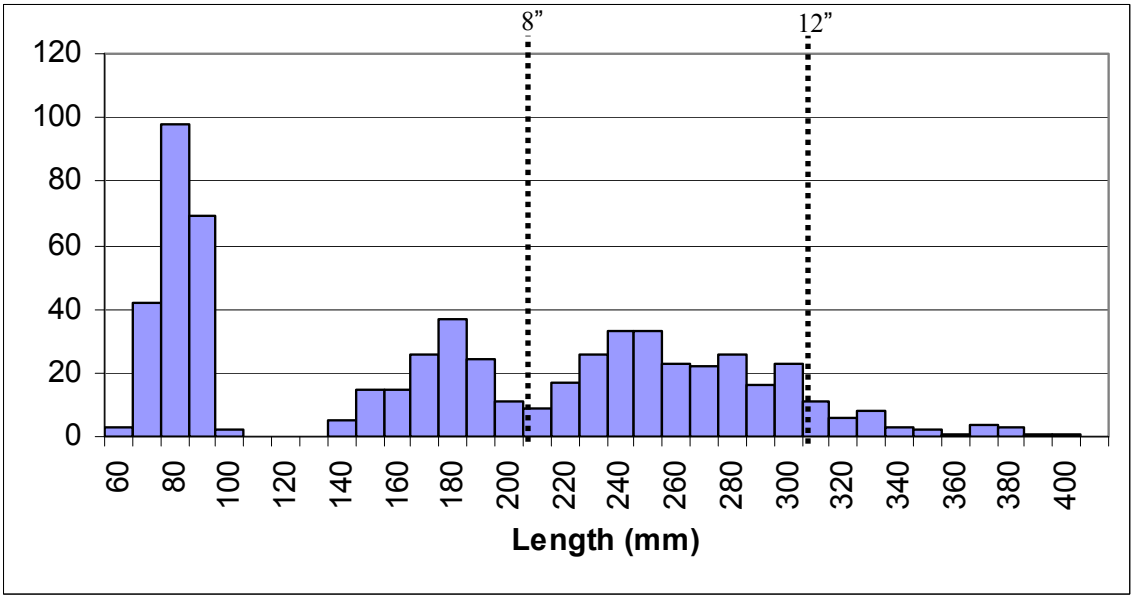

Figure 42. Length-frequency histogram for brown trout in segment 1 of Spearfish Creek sampled in 2008.

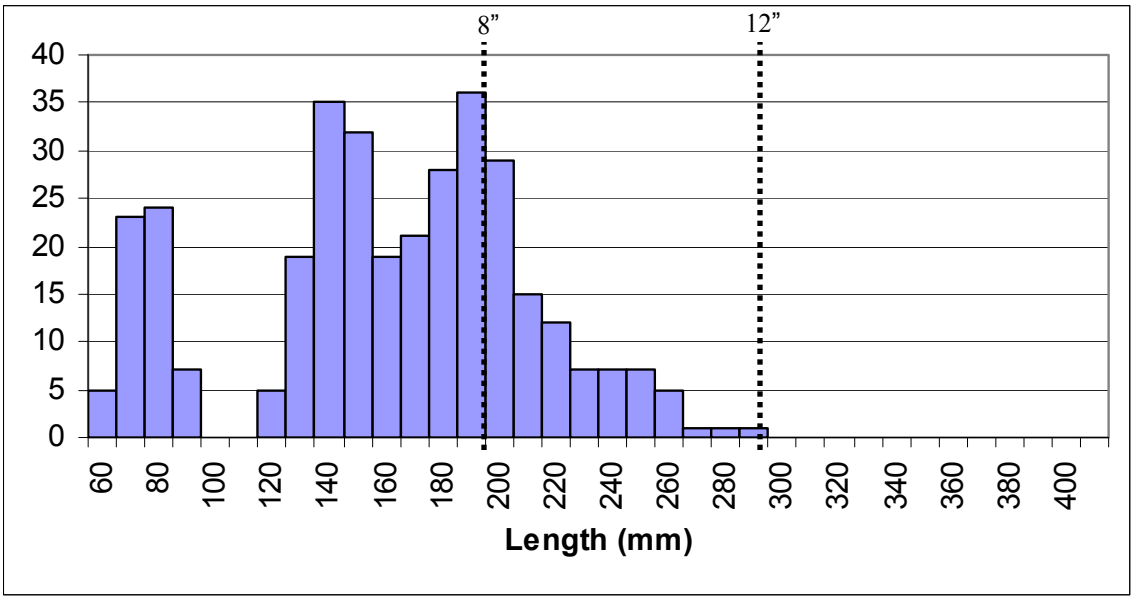

Figure 43. Length-frequency histogram for brown trout in segment 2 of Spearfish Creek sampled in 2008.

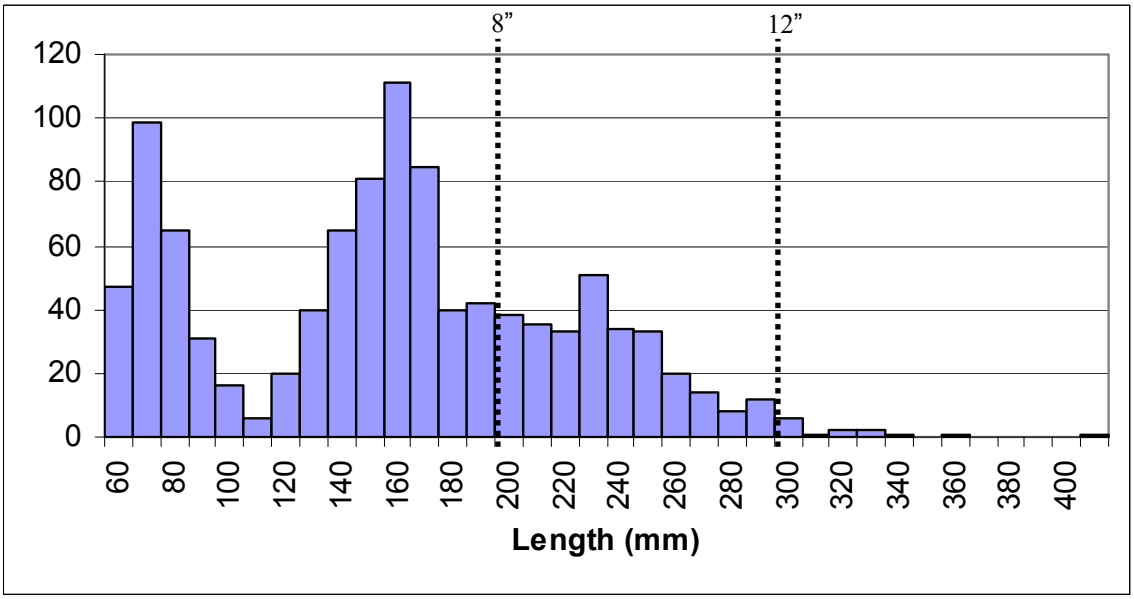

Figure 44. Length-frequency histogram for brown trout in segment 3 of Spearfish Creek sampled in 2008.

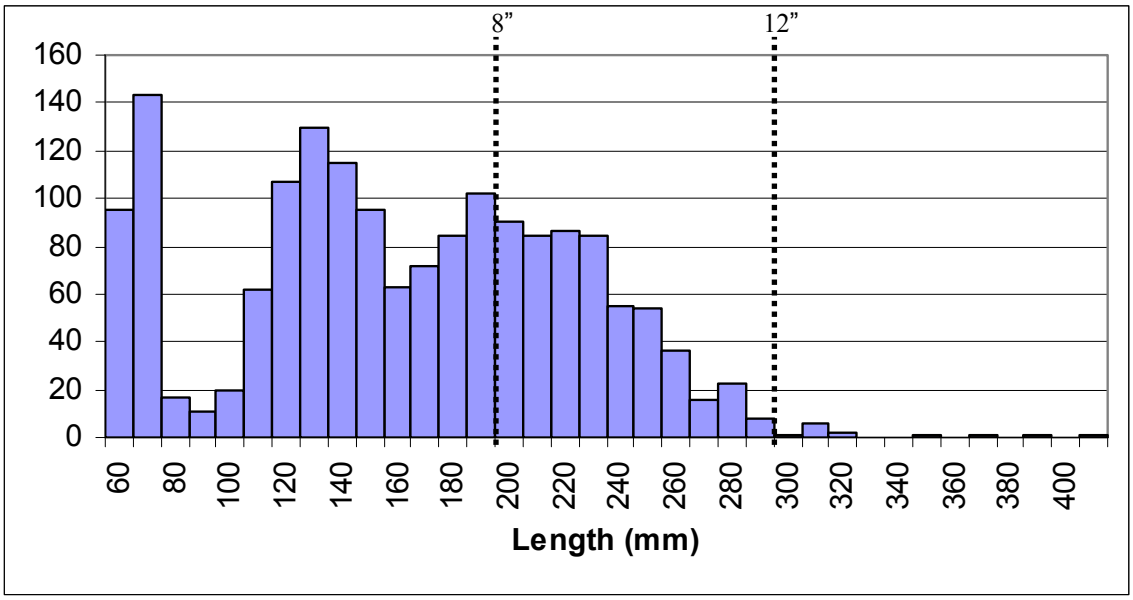

Figure 45. Length-frequency histogram for brown trout in segment 4 of Spearfish Creek sampled in 2008.

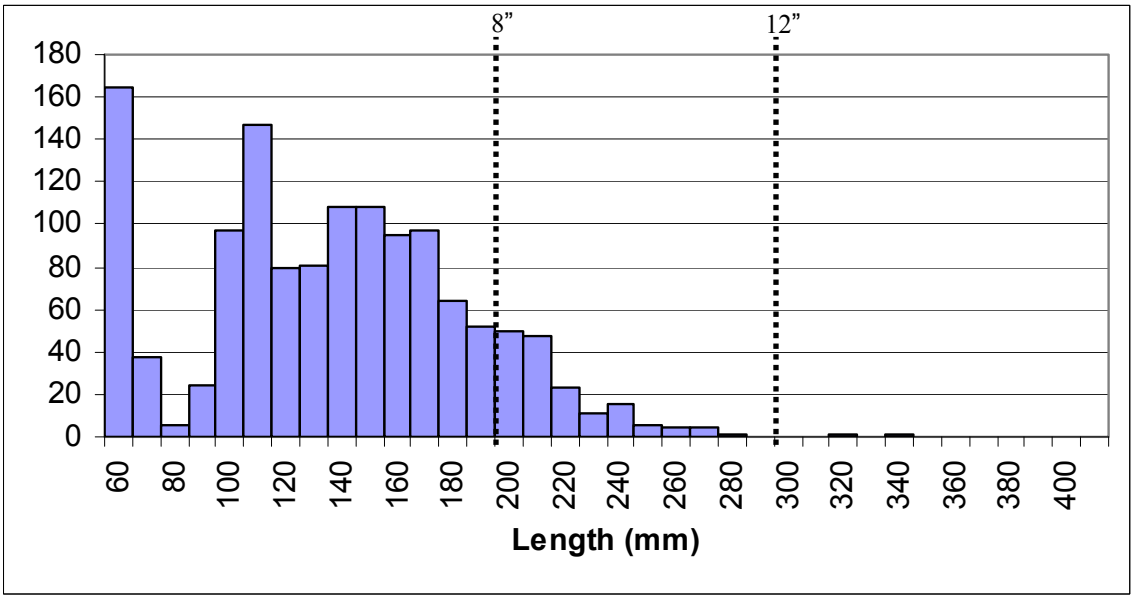

Figure 46. Length-frequency histogram for brown trout in segment 5 of Spearfish Creek sampled in 2008.

While the numbers of adult brown trout in Spearfish Creek were high, there appeared to be a relatively small number of fish over 300 mm in length. A likely explanation for the lack of fish over 300 mm is low reproduction success and recruitment in the age 4+ year classes. Lack of reproduction and recruitment may have been the result of a prolonged drought experienced in the Black Hills. However, Spearfish Creek received a reprieve from the drought beginning in late

2003. Homestake mine ceased removing water from Little Spearfish Creek and Spearfish Creek thus increasing flow. This increased flow likely increased available spawning and rearing habitat resulting in stronger year classes. This scenario seems to be corroborated by reviewing length-frequency histograms of brown trout in Spearfish Creek with the presence of strong year classes from about 2005 to the present. Another possible explanation for the lack of fish larger than 300 mm is fish simply do not get much larger in this system. High densities of brown trout may have resulted in lack of habitat or food resources needed to support larger fish. Further investigation is needed to better understand what factors may be affecting the size structure of brown trout in Spearfish Creek. Research projects are planned for 2009 to address some of these questions.

Brook trout – Brook trout were sampled in segments 2, 3, 5, and 6. Four juvenile (< 200 mm) fish were sampled in one reach in segment 3 and 13 juvenile fish were sampled in segment 5. Abundances in these two segments were low and therefore are not discussed any further in this report. Segment 2 had the highest abundance of juvenile fish with an estimate of 185.5 fish per 100 m of stream compared to 68 fish per 100 m in segment 6. Segment 6 had a slightly higher estimate of adults per 100 m with 2.67 compared to 2.5 in segment 2. While fish larger than 200 mm are considered adult fish by South Dakota Game, Fish, and Parks, it is important to note that brook trout may be sexually mature and capable of successfully spawning at lengths as short as 120 mm (Swenson et al. 2007).

Segment 6 had proportionally longer brook trout than segment 2 (Figure 47). Fish in segment 6 approached 100% of catch at a longer length than that of segment 2. Size structure within segment 2 was dominated by fish less than 100 mm in length with 80% of brook trout falling under this size category.

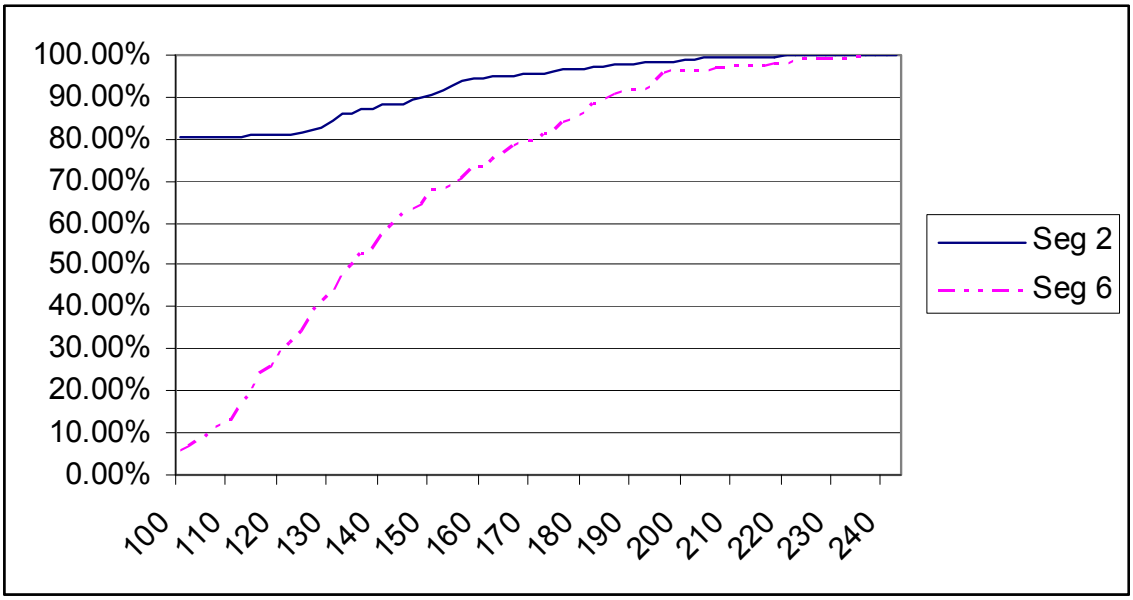

Figure 47. Cumulative length frequency of brook trout in segments 2 and 6 of Spearfish Creek.

Length frequency analysis indicated the presence of age-0, age-1, and age 2+ brook trout in segment 2 (Figure 48). Relatively few fish were sampled over 170 mm in total length. Length-frequency histograms of brook trout in segment 6 are similar to that of segment 2 (Figure 49) except, fish in the age-1 class are smaller in segment 6. The presence of multiple year classes indicated a viable population of wild brook trout in both segments 2 and 6.

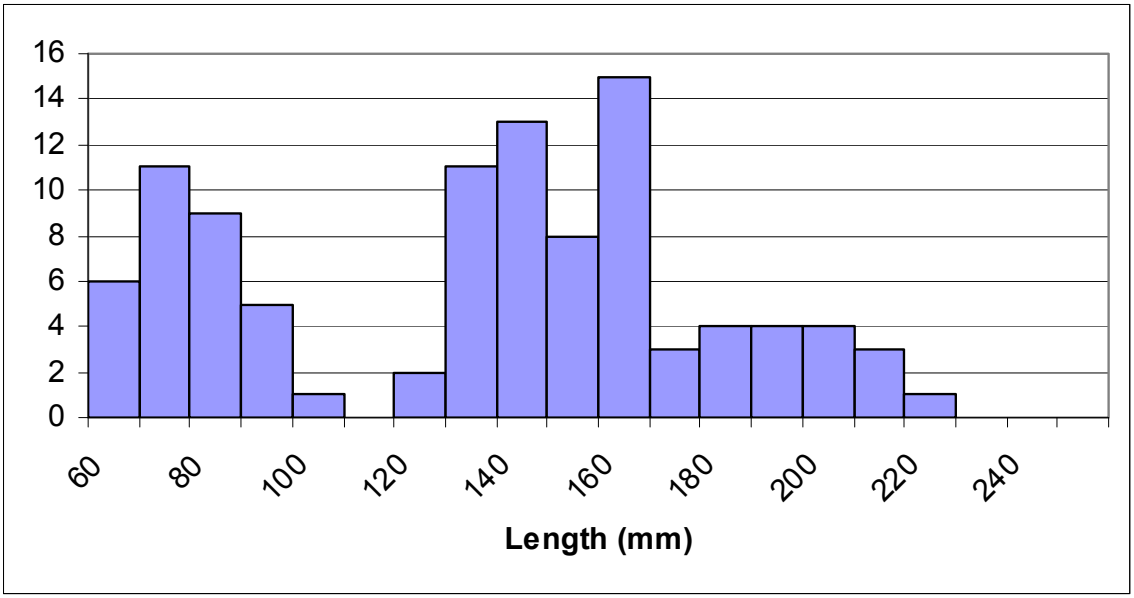

Figure 48. Length-frequency histogram for brook trout in segment 2 of Spearfish Creek sampled in 2008.

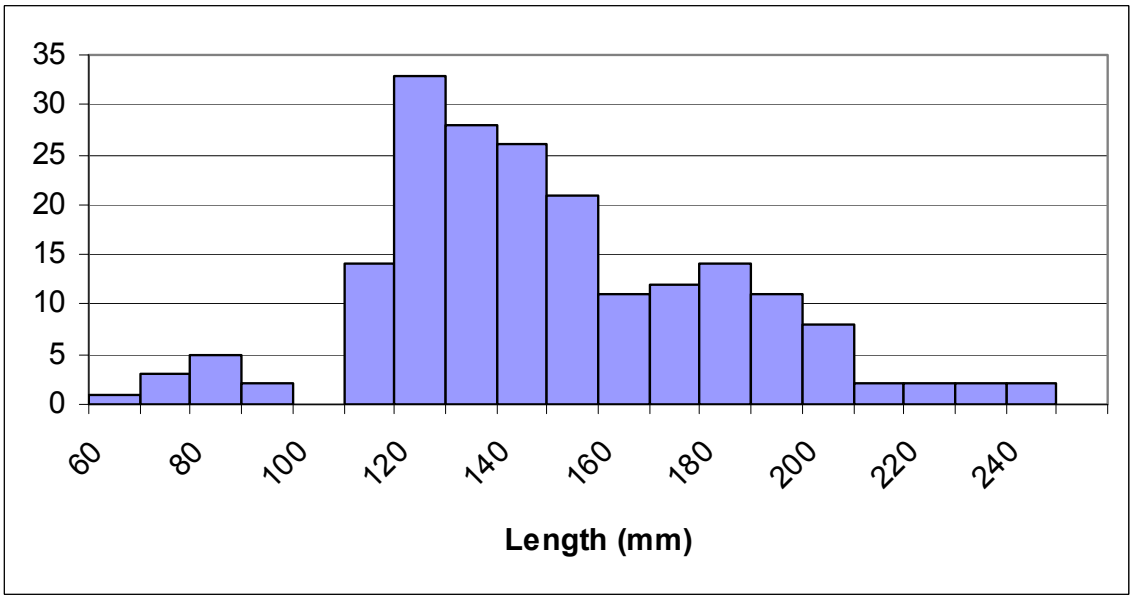

Figure 49. Length-frequency histogram for brook trout in segment 6 of Spearfish Creek sampled in 2008.

Rainbow trout – Rainbow trout were sampled in segments 1, 2, and 3. However, segment 1 had only 14 adults and segment 2 had two juveniles sampled. The adults in segment 1 were likely fish that had escaped from DC Booth fish hatchery during a flood event in June. The juvenile fish captured in segment 2 are likely from rainbow trout being washed over Maurice intake located directly upstream from segment 2. The remainder of discussion for rainbow trout in this report will focus on segment 3.

Survey data yielded a population estimate of 7.0 juvenile and 12.5 adult rainbow trout per 100 m of stream in segment 3 of Spearfish Creek. The density of rainbow trout in segment 3 were at a level to be classified as a class I (> 25 adult fish per surface acre) rainbow trout fishery However, this estimate is somewhat confounded by the distribution of rainbow trout within segment 3. Most of the population of rainbow trout appeared to be concentrated in the lowermost reach of segment 3 (Figure 50). This site is located just downstream of Cleopatra Creek (Figure 32), which is believed to be an important spawning tributary for rainbow trout in Spearfish Creek. Numbers of rainbow trout drop off sharply with upstream progression. One important observation is the presence of rainbow trout more than 7 km upstream in reach 429. This is important because historically rainbow trout were only found in the lower reaches. The presence of rainbow trout this far upstream may indicate that the distribution of rainbow trout in Spearfish Creek is expanding, but future monitoring is required to verify upstream expansion.

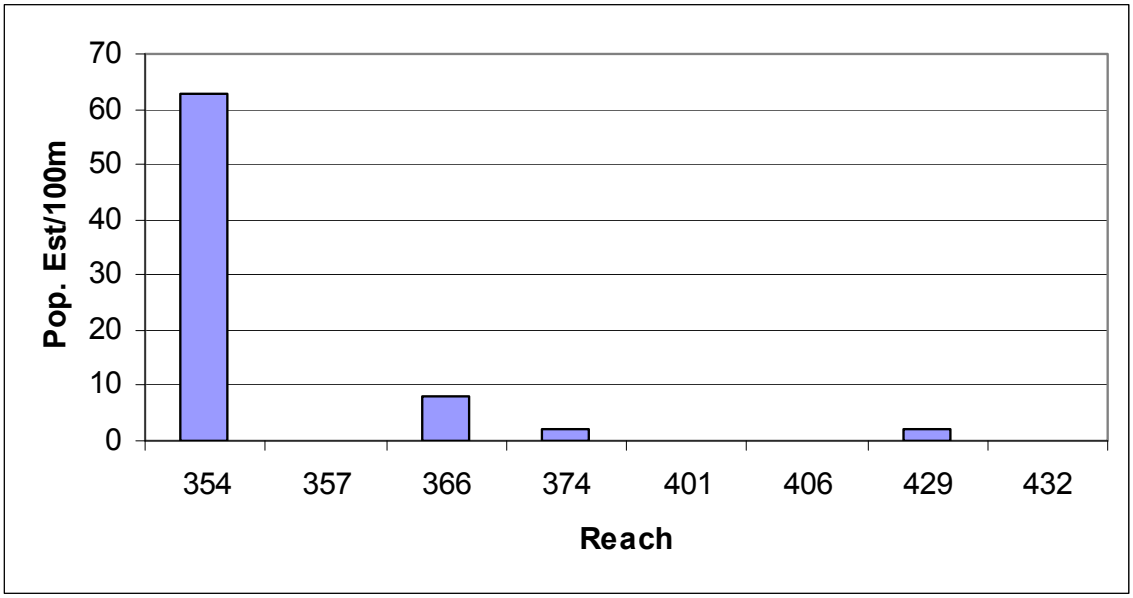

Figure 50. Histogram of population estimates of rainbow trout in eight reaches of segment 3 in Spearfish Creek. Site 354 is the lowermost reach in the segment and the higher the number the further upstream the site is located.

Age-0 is the only age class distinguishable when examining a length-frequency distribution of rainbow trout in segment 3 (Figure 51). There appears to be another mode in 200 mm length class, but these most likely are age-2+ fish as the interval between the first and second mode seems to be too wide for this size class to be age -1. It is possible that most age-1 fish have not

migrated out of Cleopatra Creek as rainbow trout may remain in their natal streams one to two years (Stauffer 1972; Mellina et al. 2005). Another possibility is the high flow event in June of 2007 resulted in the loss young-of-the-year rainbow trout. Despite the missing age-1 fish, there appears to be multiple year classes present with fish up to 329 mm in length being sampled. The presence of multiple year classes indicates that the rainbow trout appear to be maintaining their population through natural reproduction. This is important since this is the only segment of stream in the Black Hills that maintains a completely wild population of fishable rainbow trout.

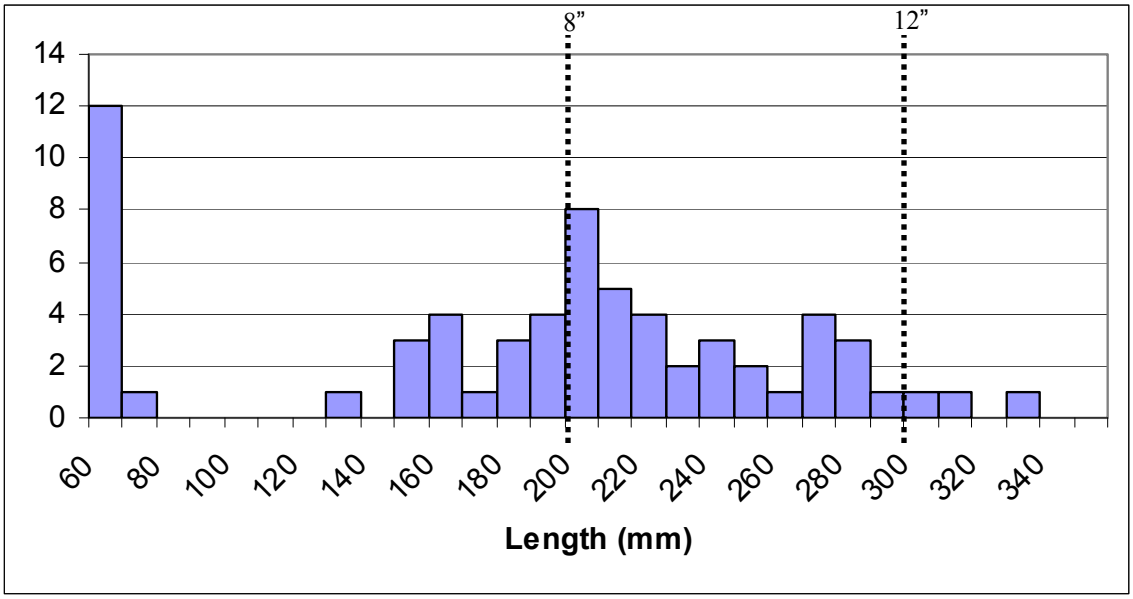

Figure 51. Length-frequency histogram of rainbow trout sampled in segment 3 of Spearfish Creek.

Higgins Gulch (HIG)

Brook trout were the only species of fish captured in Higgins Gulch. Of the 15 fish captured, 14 were less than 200 mm in length. No historical data exists for comparison to 2008 survey data.

Cleopatra Creek /Squaw Creek (SQU)

Brown, rainbow, and brook trout were sampled in Cleopatra Creek. Brook trout were the most abundant species captured with 101 fish. All but one brook trout was less than 200 mm. Rainbow and brown trout had similar abundances with 17 and 14 fish being sampled respectively. All but one rainbow and one brown trout were less than 200 mm in length. No previous samplings occurred in July or August so no historical comparisons could be made.

Iron Creek (ICN)

Brown and rainbow trout were sampled in the downstream reach of Iron Creek. Brown trout were the most abundant species with 61 fish of which 38 were greater than 200 mm. Three

rainbow trout were sampled with one being greater than 200 mm. This reach was last sampled in July of 2004. Numbers of brown trout less than 200 mm were less with 10 fish being sampled, but numbers of fish greater than 200 mm were higher with 50 fish being sampled in a single pass in 2004. Numbers of rainbow trout sampled in 2004 were similar to 2008 with no fish less than 200 mm and two fish greater than 200 mm captured.

Brown, rainbow, and brook trout were sampled in the upstream reach of Iron Creek. Rainbow trout were the most abundant species with 40 fish captured. All rainbow trout were less than 200 mm. Brown and brook trout were similar in abundance with eight of each species being sampled. All but one brown and one brook trout were less than 200 mm. No previous samplings occurred in July or August for this site so no historical comparisons could be made

Little Spearfish Creek (LSC)

Brown trout was the only species of fish captured in Little Spearfish Creek in 2008. A total of 112 fish were sampled in the downstream reach of which 30 were greater than 200 mm. Seventy-eight fish were captured in the upstream reach with 20 being larger than 200 mm. The upstream site was sampled in August of 1994 and 2006. Numbers of brown trout less than 200 mm were greater in 2008 than in 1994 and 2006 where 19 and two fish were captured in a single pass respectively. Numbers of fish greater than 200 mm sampled in 2008 were similar to numbers sampled in 1994 and 2006 where 19 and 11 fish were captured respectively. One other difference was brook trout were sampled in this reach in 1994, but have not been captured since.

East Spearfish Creek (ESP)

Brown trout was the only species of fish captured in both reaches of East Spearfish Creek. A total of 166 fish were captured in the downstream reach with 23 being greater than 200 mm. The upper reach had 75 fish with 10 greater than 200 mm.

Both sites were sampled in August of 2006. Numbers of brown trout, in the lower reach, greater than 200 mm were higher in 2008 than in 2006 where seven were captured, but numbers of fish less than 200 mm were higher in 2006 with 356 fish sampled in a single pass. The number of fish greater than 200 mm sampled in the upper reach was the same in both sampling periods, but the number of fish less than 200 mm was higher in 2006 with 100 captured in a single pass. Additionally, one brook trout was sampled in each reach in 2006, whereas none were captured in 2008.

Ward Draw (WAR)

Brook trout was the only species of fish sampled in Ward Draw. Eighty fish were captured and all were less than 200 mm. This site was last sampled in August of 1994 where 15 brook trout less than 200 mm were captured.

Intake Gulch (ITG)

Brown and brook trout were present in Intake Gulch. Brook trout were the most abundant with 27 fish captured, all less than 200 mm. There were four brown trout sampled in this reach with all fish being less than 200 mm. This site was last sampled in July of 2004. During the 2004 sampling, 27 brook trout, 10 of those fish exceeding 200 mm, and one brown trout, which was greater than 200 mm, were sampled.

Recommendations

1. Continue to manage Spearfish Creek and its tributaries as wild brown trout (natural yield) fisheries with standard regulations of a daily limit of five trout (in any combination) with one allowed 14 inches or longer.

2. Continue managing the section of Spearfish Creek between Maurice Intake and Hydro #2 as a wild rainbow trout (natural yield) fishery with catch-and-release regulations.

3. Perform intensive population surveys in Spearfish Creek at least every three years.

4. Monitor the rainbow trout distribution in segment 3 to determine if they are expanding, and if they continue to expand explore possible removal of catch-and-release regulations.

5. Collect fish for aging of otoliths to determine age structure of the population.

6. Conduct a study to determine spawning tendencies of rainbow and brown trout in Spearfish Creek.

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Crow Creek Watershed

Counties: Lawrence (SD)

Fish populations in Crow Creek Watershed within the Black Hills Trout Management Area (**Error! Reference source not found.**) were surveyed during 2008 to monitor fish populations. Crow Creek Watershed's headwaters begin about five miles west of Savoy with the Beaver Creek Forks. About six miles west of northern Spearfish, Beaver Creek joins Crow Creek, which flows north and drains into the Redwater River about two miles north of I 90. Most of the Crow Creek Watershed within the Black Hills Trout Management Area is located along a south to east orientation between Hwy 385 and I 90 north and west of Piedmont, SD. The Crow Creek watershed within the Black Hills Trout Management Area is mostly forested with pine and spruce trees and is managed by the US Forest Service. A few forest service roads cut through the watershed and a few individual houses exist throughout the watershed, but this portion of the Black Hills is largely undeveloped when compared to the rest of the Black Hills.

Crow Creek was last stocked in 1995 with catchable rainbow trout, and 1990 with catchable brown trout; however, some fish from McNenny State Fish Hatchery have likely escaped into the creek near hatchery grounds. Both Mirror Lakes are currently stocked with catchable rainbow trout, and Beaver Creek was last stocked with fingerling rainbow trout in 1986. Crow Creek and its tributaries are managed under standard regulations with a daily limit of five trout (in any combination) with one allowed 14 inches or longer.

Crow Creek below McNenny State Fish Hatchery is a productive wild brown trout fishery and is managed by South Dakota Game, Fish and Parks as a Class I brown trout (≥ 150 fish ≥ 200 mm / surface acre) fishery. Groundwater inputs comprise a large percentage of the annual flow in Crow Creek (Carter et al. 2002), resulting in a stable hydrograph (Burr et al. 2005). Consequently, drought conditions do not seem to have negatively impacted this section of Crow Creek in regards to brown trout numbers like it has in other Black Hills Streams.

Methods

Sample Locations

Three reaches of stream in Crow Creek (CRW) and one reach each in Datum (DAT), Potato Gulch (PGS), and Beaver Creek (BV3) (Figure 52) were surveyed during June and July 2008. Crow Creek sample sites 1 and 5 are located above and below the McNenny fish hatchery effluent respectively (Figure 53). Site 2 is located is located 1 mile above the Beaver Creek confluence (Figure 52). Datum site 1 is located on private land west of Spearfish (Figure 52). Potato Gulch site 1 is located about ½ mile upstream from the confluence with Beaver Creek (Figure 52). Beaver Creek site 1 is located about ¼ of a mile above the confluence with Potato Gulch (Figure 52).

During this study, efforts were made to check all drainages for presence of water and sites were sampled if they had flowing water. Although 2008 brought above average moisture (NOAA), a

few drainages were dry. North Beaver and Mill Creeks both lay on private property and had minimal flow in July 2008; consequently, these two creeks were not sampled during the survey.

Sample Methods

All sample reaches were 100 meters as measured with a laser rangefinder or hip-chain. Block nets at the upstream and downstream boundaries were used to prevent fish from emigrating or immigrating within the sample site. One pass was made with one backpack electrofishing unit. Captured fish were anesthetized with carbon dioxide, measured to the nearest millimeter total length, weighed to the nearest gram, and returned to the stream. After 50 individual lengths and weights were collected from small fish (< 100mm) of a specific species, bulk counts were collected to expedite data collection. Relative abundance was calculated as CPUE (number of fish captured per 100 m of stream). Relative abundances were compared to historical data from individual sites when historical sampling occurred within comparable months. For 2008 samples completed in May or June, historical samples in May and June were used for comparison. For 2008 samples completed in July or August, historical samples in July or August were used for comparison. As a result of the small sample size, caution must be given when interpreting the data and extrapolating it to the entire stream.

In addition to fish data, pH, temperature, and specific conductance were measured and recorded. Additionally, stream widths were measured every 10 meters and averaged to obtain an estimate of total area sampled. Stream flow data was also downloaded from the USGS web site for water years 1996-2008 (available at: http://waterdata.usgs.gov/sd/nwis).

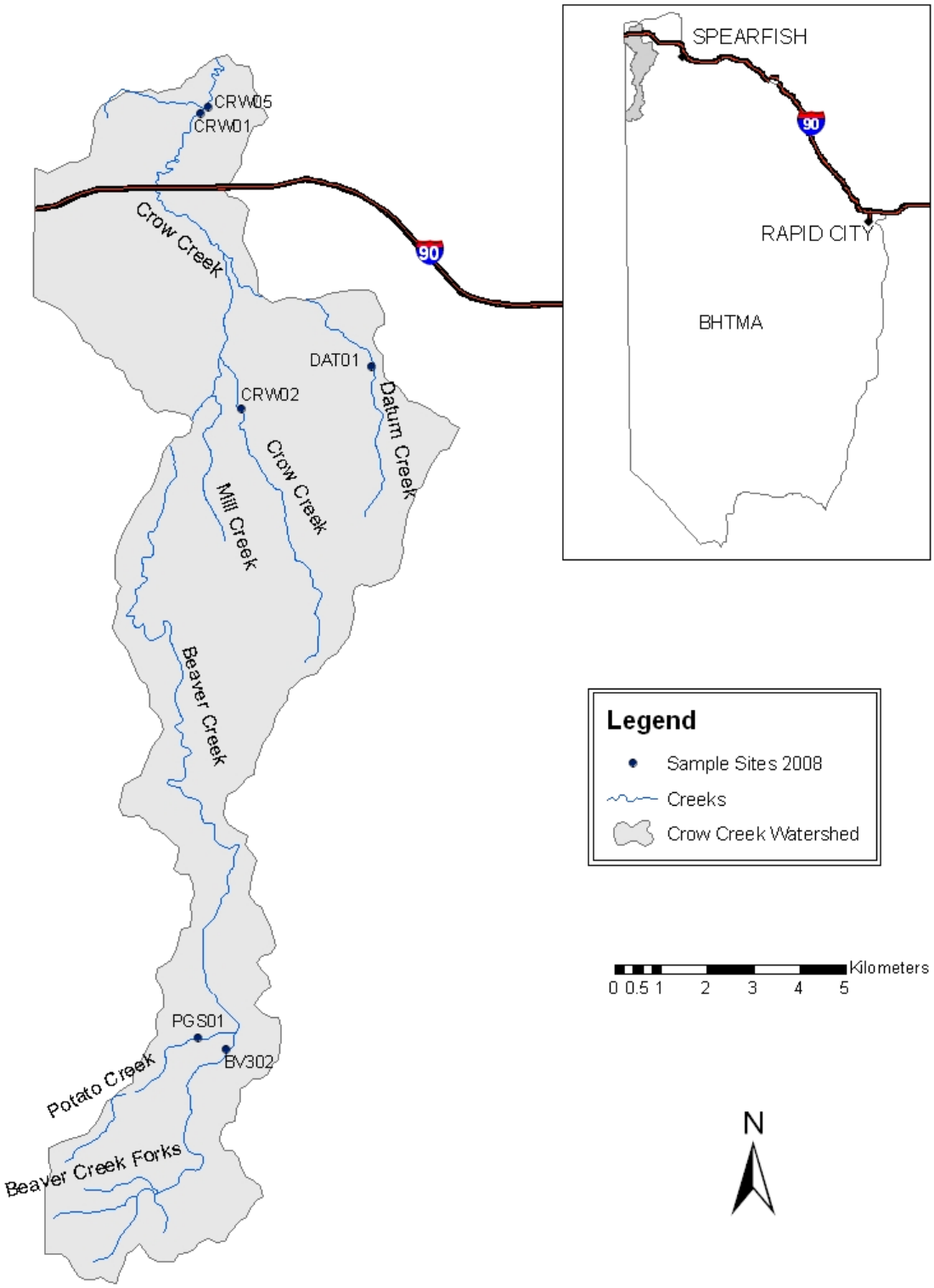

Figure 52. Crow Creek Watershed and 2008 sample sites are depicted within the Black Hills Trout Management Area (BHTMA).

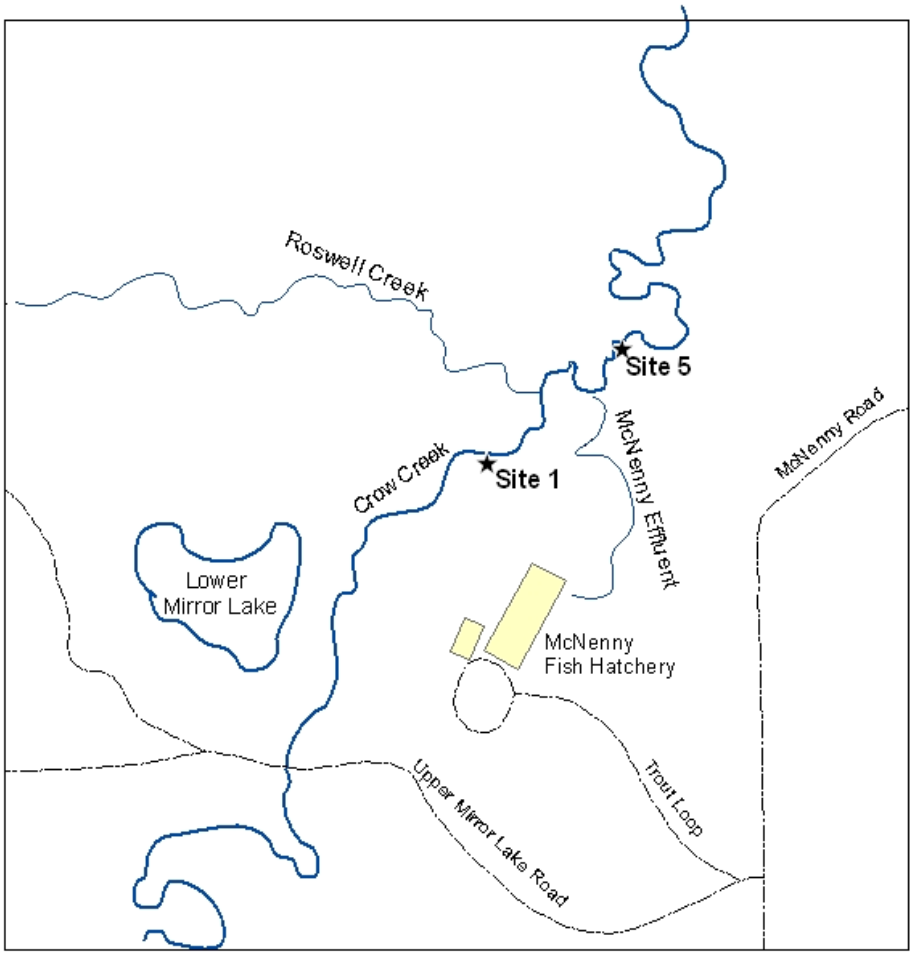

Figure 53. Map of Crow Creek sample sites 1 and 5 above and below McNenny's effluent stream.

Results and Discussion

Nine species of fish were captured in the Crow Creek Watershed during 2008 sampling (Table 18). Longnose dace was the most widespread species, located in every site where fish were detected.

Table 18: Presence of species captured within three creeks of the Crow Creek Watershed.

Species	CRW05	CRW01	CRW02	DAT01	PGS01	BV302
Brook trout			1	(no fish)	36	97
Brown trout	65	45			26	
Rainbow trout	5	9				
Longnose dace	26	7	22		10	23
White sucker		5				
Mountain sucker	1					
Longnose sucker		3				
Green sunfish	6	2				
Creek chub					1	

Crow Creek (CRW)

During a July 28, 2008 survey of site 5 (Figure 53), brown trout were the most abundant species detected followed by longnose dace, green sunfish, rainbow trout, and mountain sucker (Table 19). Adult (≥ 200 mm) brown trout numbers appeared to be lower than in previous surveys. Juvenile (< 200 mm) numbers for 2008 were also lower than the 2006 survey, but were similar to the 1998 survey. White suckers were detected in 1998 and numbers have declined in each sampling thereafter with none detected in 2008. The 2008 survey was the first to detect mountain suckers, but only one was captured. All other populations of fish have been relatively unchanged since the 1998 survey.

Table 19. Fish per 100 meters of stream sampled in Crow Creek site 5 on July 28, 2008.

Species	Sample Date	Number of fish/100m
Brown trout <200 mm	Aug 1998	51
	Aug 2006	99
	July 2008	47
Brown trout ≥200mm	Aug 1998	42
	Aug 2006	42
	July 2008	18
Rainbow trout <200 mm	Aug 1998	0
	Aug 2006	16
	July 2008	1
Rainbow trout ≥200mm	Aug 1998	1
	Aug 2006	1
	July 2008	4
Longnose dace	July 2008	26
Green sunfish	July 2008	6
Mountain sucker	July 2008	1

Crow Creek site 1 (Figure 53) was also dominated by brown trout (Table 20). A similar number of adults (≥ 200mm) were detected during the July 2008 survey as the September 1993 survey and twice as many as the June 1995 survey. The 2008 sample was the first to capture rainbow trout (Table 20). Other species sampled in this site were longnose dace, white sucker, longnose sucker, and green sunfish (Table 20).

Table 20: Abundance of fish per 100 m of stream sampled in Crow Creek site 1 on July 28, 2008

Species	Size	Number/100 m
Brown trout	<200mm	31
Brown tout	≥ 200mm	14
Rainbow trout	≥ 200mm	9
Longnose dace	ALL	7
White sucker	ALL	5
Longnose sucker	ALL	3
Green sunfish	ALL	2

Site 2 in Crow Creek (Figure 53) yielded few fish. Aside from one brook trout, longnose dace were the only species with 22 captured. This site had not been previously surveyed.

Datum Creek (DAT)

No fish were detected in Datum Creek site 1 (Figure 52). The landowner indicated that the creek always flows due to a natural spring upstream, but it is usually dry above that spring. She also indicated that there is a waterfall below their land which may hinder fish passage up into that reach of stream.

Beaver Creek (BV3)

Beaver Creek site 2 was sampled above the confluence with Potato Gulch Creek during the July 2008 survey (Figure 52). Brook trout dominated the fish community with three fish over 200mm and 94 under 200mm. Twenty-three longnose dace were also detected. This site was last sampled in July 1993 with slightly fewer numbers of brook trout and dace detected.

Potato Gulch Creek (PGS)

During a July 1, 2008 survey of Potato Gulch site 1 (Figure 52) brook trout were the most abundant fish species with five fish over 200mm and 54 fish under 200mm. Ten longnose dace and one creek chub were also detected in the sample. Trout populations have increased since the last time this site was surveyed in July 1993 while dace populations have decreased. During the 1993 survey, only 14 brook trout, (all under 200mm), and 158 longnose dace were detected.

Recommendations

1. Continue to manage the Crow Creek Watershed as a wild trout (natural yield) fishery with standard regulations and monitor on a 3-5 year basis.
2. Conduct more intensive surveys on the main stem of Crow Creek with seven years.

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Appendix A. Population and Biomass Estimates for Rapid Creek.

Site Number: 1398 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Baken Park (site 7)
Legal Description: S3,R7E,T1N
Stream Classification: BNT1

Date Sampled: 15 SEP 2008
Site Length 100
Mean Width (m): 8.5
Number of 3

Conductivity 550
pH: 8.6
Water Temperature 15.1
Air Temperature ****

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	192	209	195	223	2,464	42.71	2,090	998	38.13	3,363	108.9	17.3	8.92
Brown Trout	≥200 mm	37	38	37	42	448	115.58	380	181	103.19	611	286.8	258.0	1.07
Brown Trout	ALL	229	248	233	263	2,924	166.90	2,480	1,184	149.02	3,990	137.6	57.1	7.62
Green Sunfish	ALL	8	8	8	10	94	1.36	80	38	1.22	129	78.5	14.4	2.07
Largemouth Bass	ALL	1	1	1	1	12	0.50	10	5	0.44	16	150.0	42.0	1.24
Rock Bass	ALL	7	7	7	7	83	1.78	70	33	1.59	113	96.6	21.6	1.89
Longnose Dace	ALL	12	60	12	593	707	***	600	286	***	965	***	***	***
White Sucker	ALL	27	28	27	32	330	***	280	134	***	451	***	***	***

Site Number: 1431 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Downstream of Meadowbrook Golf Course Pro Shop (site 22)
Legal Description: S9,R7E,T1N
Stream Classification: BNT2 RBT2

Date Sampled: 15 SEP 2008
Site Length 100
Mean Width (m): 11.6
Number of 3

Conductivity 398
pH: 8.9
Water Temperature 15.8
Air Temperature ****

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	347	393	366	420	3,399	60.01	3,930	1,376	53.58	6,323	108.0	17.7	1.22
Brown Trout	≥200 mm	13	13	13	13	112	32.16	130	46	28.72	209	286.2	286.1	1.11
Brown Trout	ALL	360	401	377	425	3,468	98.81	4,010	1,404	88.22	6,452	115.0	28.5	1.21
Rainbow Trout	<200 mm	22	110	22	795	951	25.05	1,100	385	22.37	1,770	130.3	26.3	1.14
Rainbow Trout	≥200 mm	1	1	1	1	9	3.13	10	4	2.80	16	310.0	362.0	1.22
Rainbow Trout	ALL	23	90	23	490	778	85.81	900	315	76.62	1,448	175.3	110.3	1.16
White Sucker	ALL	13	13	13	15	112	98.71	130	46	88.13	209	428.7	878.0	1.10
Longnose Dace	ALL	77	77	77	79	666	***	770	270	***	1,239	***	***	***

Population and Biomass Estimates for Rapid Creek. (Continued)

Site Number: 1642 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Hisega (stream improvement area) (site 13)
Legal Description: S9,R6E,T1N
Stream Classification: BNT2 RBT0

Date Sampled: 16 SEP 2008
Site Length 100
Mean Width (m): 9.0
Number of 3

Conductivity 385
pH: 9.7
Water Temperature 13.8
Air Temperature ****

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	164	226	172	280	2,514	110.08	2,260	1,018	98.29	3,636	161.0	43.8	0.99
Brown Trout	≥200 mm	21	21	21	22	234	30.48	210	95	27.21	338	234.4	130.5	0.97
Brown Trout	ALL	185	235	195	275	2,614	178.76	2,350	1,059	159.61	3,781	181.8	68.4	0.99
Rainbow Trout	<200 mm	19	25	19	41	278	18.63	250	113	16.63	402	189.0	67.0	0.99
Rainbow Trout	ALL	19	25	19	41	278	18.63	250	113	16.63	402	189.0	67.0	0.99

Site Number: 1741 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Below Johnson Siding (1984 site 25) (site 16)
Legal Description: S5,R6E,T1N
Stream Classification: BNT2 RBT2

Date Sampled: 16 SEP 2008
Site Length 100
Mean Width (m): 10.7
Number of 3

Conductivity 411
pH: 9.2
Water Temperature 9.3
Air Temperature ****

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	258	311	276	346	2,907	91.24	3,110	1,177	81.47	5,004	134.4	31.4	1.00
Brown Trout	≥200 mm	30	30	30	32	280	51.09	300	114	45.62	483	255.3	182.2	0.97
Brown Trout	ALL	288	337	306	368	3,150	211.09	3,370	1,276	188.48	5,422	160.7	67.0	1.00
Rainbow Trout	<200 mm	138	164	140	188	1,533	***	1,640	621	***	2,639	61.8	***	***
Rainbow Trout	≥200 mm	1	1	1	1	9	8.40	10	4	7.50	16	444.0	899.0	1.03
Rainbow Trout	ALL	139	165	141	189	1,542	1,386.	1,650	625	1,237.	2,655	84.2	899.0	1.03
Longnose Dace	ALL	1	1	1	1	9	***	10	4	***	16	***	***	***

Population and Biomass Estimates for Rapid Creek. (Continued)

Site Number: 1821 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Pactola Basin (Flume Trestle) (site 14)
Legal Description: S2,R5E,T1N
Stream Classification: BNT2 RBT2

Date Sampled: 17 SEP 2008
Site Length 100
Mean Width (m): 9.6
Number of 3

Conductivity 389
pH: 9.2
Water Temperature 12.5
Air Temperature ****

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	254	284	263	305	2,958	117.78	2,840	1,198	105.16	4,570	134.9	39.8	1.07
Brown Trout	≥200 mm	9	9	9	10	94	23.56	90	38	21.04	145	267.1	251.3	1.10
Brown Trout	ALL	263	292	272	312	3,042	182.69	2,920	1,232	163.12	4,698	145.6	60.1	1.08
Rainbow Trout	<200 mm	16	16	16	17	167	7.42	160	68	6.62	257	88.1	44.5	1.33
Rainbow Trout	≥200 mm	3	3	3	3	31	13.00	30	13	11.61	48	294.7	416.0	1.18
Rainbow Trout	ALL	19	19	19	20	198	33.32	190	80	29.75	306	120.7	168.3	1.28

Site Number: 1832 Survey Completed by: SD School of Mines and Technology
Site Description: Pactola Basin (new channel) (site 8)
Legal Description: S2,R5E,T1N
Stream Classification: BKT0 BNT3 RBT1

Date Sampled: 17 SEP 2008
Site Length 100
Mean Width (m): 8.2
Number of 3

Conductivity 392
pH: 9.7
Water Temperature 9.3
Air Temperature ****

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	4	37	1.06	30	15	0.95	48	108.0	29.0	0.90
Brook Trout	ALL	3	3	3	4	37	1.06	30	15	0.95	48	108.0	29.0	0.90
Brown Trout	<200 mm	346	428	381	475	5,231	154.76	4,280	2,119	138.18	6,887	109.8	29.6	1.18
Brown Trout	≥200 mm	1	1	1	5	12	2.19	10	5	1.95	16	257.0	179.0	1.05
Brown Trout	ALL	347	432	383	481	5,280	166.32	4,320	2,138	148.50	6,951	111.0	31.5	1.18
Rainbow Trout	<200 mm	54	57	54	63	697	21.60	570	282	19.28	917	57.2	31.0	1.09
Rainbow Trout	≥200 mm	6	6	6	7	73	43.17	60	30	38.54	97	388.8	588.7	0.99
Rainbow Trout	ALL	60	64	60	71	782	351.41	640	317	313.77	1,030	125.8	449.3	1.02

Population and Biomass Estimates for Rapid Creek. (Continued)

Site Number: 1837 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above foot bridge between Sites 8 and 9 in Catch and
Legal Description: S2,R5E,T1N
Stream Classification: BKT3 BNT2 RBT1

Date Sampled: 18 SEP 2008
Site Length 100
Mean Width (m): 9.3
Number of 3

Conductivity 394
pH: 9.0
Water Temperature 8.6
Air Temperature ****

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	2	2	2	3	22	1.55	20	9	1.38	32	128.5	72.0	1.08
Brook Trout	≥200 mm	1	1	1	1	11	1.42	10	4	1.27	16	238.0	132.0	0.98
Brook Trout	ALL	3	3	3	4	32	3.29	30	13	2.94	48	165.0	102.0	1.03
Brown Trout	<200 mm	247	305	266	344	3,283	102.22	3,050	1,330	91.27	4,907	111.4	31.1	1.08
Brown Trout	≥200 mm	15	17	15	24	183	86.24	170	74	77.00	274	342.6	471.3	1.07
Brown Trout	ALL	262	324	283	365	3,487	424.02	3,240	1,412	378.59	5,213	143.3	121.6	1.08
Rainbow Trout	<200 mm	25	27	25	32	291	10.32	270	118	9.21	434	59.9	35.5	1.14
Rainbow Trout	≥200 mm	19	19	19	20	205	128.78	190	83	114.99	306	398.6	629.7	0.98
Rainbow Trout	ALL	44	45	44	48	484	277.60	450	196	247.86	724	243.7	573.1	1.00

Site Number: 1842 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Pactola Basin (immediately below USGS bridge) (site 9)
Legal Description: S2,R5E,T1N
Stream Classification: BKT3 BNT3 RBT2

Date Sampled: 18 SEP 2008
Site Length 100
Mean Width (m): 10.9
Number of 3

Conductivity 389
pH: 9.2
Water Temperature 9.8
Air Temperature ****

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	44	62	44	93	571	21.00	620	231	18.75	998	105.1	36.8	1.18
Brook Trout	≥200 mm	3	3	3	4	28	7.96	30	11	7.11	48	263.0	288.3	1.30
Brook Trout	ALL	47	63	47	89	580	45.65	630	235	40.76	1,014	121.4	78.7	1.20
Brown Trout	<200 mm	191	279	206	352	2,568	99.12	2,790	1,040	88.50	4,489	114.2	38.6	1.22
Brown Trout	≥200 mm	4	4	4	4	37	14.20	40	15	12.68	64	301.3	385.8	1.21
Brown Trout	ALL	195	276	211	341	2,541	161.05	2,760	1,029	143.80	4,441	123.0	63.4	1.22
Rainbow Trout	<200 mm	32	160	32	988	1,473	35.20	1,600	596	31.43	2,574	87.4	23.9	1.25
Rainbow Trout	≥200 mm	4	4	4	5	37	41.57	40	15	37.12	64	463.8	1,129.0	1.13
Rainbow Trout	ALL	36	180	36	1,052	1,657	562.76	1,800	671	502.47	2,896	152.9	339.6	1.22

Appendix B. Population and Biomass Estimates for Victoria Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Upstream of USFS 159 (1985 site 4.2)
Legal Description: S27,R6E,T1N
Stream Classification: No Fish Captured

Date Sampled: 28 MAY 2008
Site Length 100
Mean Width (m): 4.5
Number of 1

Conductivity 154
pH: 7.6
Water Temperature 10.4
Air Temperature 13.1

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

Appendix C. Population and Biomass Estimates for Prairie Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Below Prairie Creek Dam
Legal Description: S13,R6E,T1N
Stream Classification: BKT0

Date Sampled: 28 MAY 2008
Site Length 100
Mean Width (m): 2.8
Number of 1

Conductivity 239
pH: 8.4
Water Temperature 10.9
Air Temperature 17.0

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	21	21	21	21	762	19.46	210	309	17.37	338	128.0	25.5	1.02
Brook Trout	ALL	21	21	21	21	762	19.46	210	309	17.37	338	128.0	25.5	1.02

Appendix D. Population and Biomass Estimates for Deer Creek (Trib. of Rapid).

Site Number: 1 Survey Completed by:
Site Description: 1.5 miles below HWY 44 and 385 junction
Legal Description: S35,R5E,T2N
Stream Classification: No Fish Captured

Date Sampled: 08 JUL 2008
Site Length ****
Mean Width (m): ****
Number of 1

Conductivity ****
pH: ****
Water Temperature ****
Air Temperature ****

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

Appendix E. Population and Biomass Estimates for Slate Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Below Slate Creek Dam (1985 site 12)
Legal Description: S15,R4E,T1N
Stream Classification: No Fish Captured

Date Sampled: 21 JUL 2008
Site Length 100
Mean Width (m): 4.8
Number of 1

Conductivity 217
pH: 8.2
Water Temperature 19.7
Air Temperature 32.6

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
Creek Chub	ALL	9	9	9	9	186	***	90	75	***	145	***	***	***
Longnose Dace	ALL	11	11	11	11	227	***	110	92	***	177	***	***	***

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above Mystic Road at Kaubisch Ranch
Legal Description: S28,R4E,T1N
Stream Classification: BKT0

Date Sampled: 02 JUL 2008
Site Length 100
Mean Width (m): 2.6
Number of 1

Conductivity 244
pH: 8.0
Water Temperature 14.8
Air Temperature 17.1

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	5	5	5	5	193	10.34	50	78	9.24	80	119.2	53.6	6.35
Brook Trout	ALL	6	6	6	6	232	12.41	60	94	11.08	97	119.2	53.6	6.35
White Sucker	ALL	1	1	1	1	39	2.43	10	16	2.17	16	195.0	63.0	0.85
Longnose Dace	ALL	6	6	6	6	232	***	60	94	***	97	***	***	***

Appendix F. Population and Biomass Estimates for Slate Creek - South Fork.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1/2 mile above Slate Creek confluence
Legal Description: S2,R3E,T1S
Stream Classification: No Fish Captured

Date Sampled: 05 AUG 2008
Site Length 100
Mean Width (m): 1.2
Number of 1

Conductivity 190
pH: 8.5
Water Temperature 15.4
Air Temperature 32.2

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
Longnose Dace	ALL	11	11	11	11	945	***	110	383	***	177	***	***	***

Appendix G. Population and Biomass Estimates for Gimlet Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Below confluence with West Fork. (1984 site 2)
Legal Description: S17,R4E,T2N
Stream Classification: BKT0 BNT2

Date Sampled: 16 JUN 2008
Site Length 100
Mean Width (m): 1.9
Number of 1

Conductivity 152
pH: 8.0
Water Temperature 11.9
Air Temperature 19.9

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	2	2	2	2	108	2.75	20	44	2.46	32	134.0	25.5	1.05
Brook Trout	ALL	2	2	2	2	108	2.75	20	44	2.46	32	134.0	25.5	1.05
Brown Trout	<200 mm	1	1	1	1	54	4.10	10	22	3.66	16	185.0	76.0	1.20
Brown Trout	≥200 mm	2	2	2	2	108	22.86	20	44	20.41	32	307.5	212.0	0.73
Brown Trout	ALL	3	3	3	3	162	26.96	30	66	24.07	48	266.7	166.7	

Appendix H. Population and Biomass Estimates for Silver Creek (Trib. of Rapid).

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 2 miles above confluence with Rapid Creek (1984 site 2)
Legal Description: S12,R3E,T2N
Stream Classification: BKT0

Date Sampled: 18 JUN 2008
Site Length 100
Mean Width (m): 1.6
Number of 1

Conductivity 230
pH: 8.6
Water Temperature 11.5
Air Temperature ****

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	5	5	5	5	318	8.90	50	129	7.95	80	113.6	28.0	1.17
Brook Trout	ALL	5	5	5	5	318	8.90	50	129	7.95	80	113.6	28.0	

Appendix I. Population and Biomass Estimates for Rapid Creek - North Fork.

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above confluence with South Fork (1984 site 8)
Legal Description: S15,R3E,T2N
Stream Classification: BKT3

Date Sampled: 23 JUN 2008
Site Length 100
Mean Width (m): 1.6
Number of 1

Conductivity 472
pH: 8.5
Water Temperature 14.0
Air Temperature 27.0

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	15	15	15	15	922	37.98	150	373	33.91	241	148.9	41.2	1.21
Brook Trout	≥200 mm	1	1	1	1	61	6.39	10	25	5.71	16	211.0	104.0	1.11
Brook Trout	ALL	16	16	16	16	983	44.37	160	398	39.62	257	152.8	45.1	1.20
Longnose Dace	ALL	1	1	1	1	61	0.98	10	25	0.88	16	113.0	16.0	1.11

Appendix J. Population and Biomass Estimates for Hop Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 0.5 miles above USFS 231 (Rochford road)
Legal Description: S16,R3E,T2N
Stream Classification: No Fish Captured

Date Sampled: 18 JUN 2008
Site Length 100
Mean Width (m): 1.1
Number of 1

Conductivity 321
pH: 3.9
Water Temperature 19.0
Air Temperature 26.0

		Total Number Captured	Est. # in site	Lower 95% CI	Upper 95% CI		Kg per hectare	# per Km	# per acre	lb. per acre	# per mile	Mean Length (mm)	Mean Weight (grams)	Mean Fulton K-factor

Appendix K. Population and Biomass Estimates for Rapid Creek - Rhodes Fork.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1/4 mile above Black Fox Campground (1985 site 6)
Legal Description: S11,R2E,T2N
Stream Classification: BKT0 BNT2

Date Sampled: 16 JUN 2008
Site Length 100
Mean Width (m): 2.3
Number of 1

Conductivity 412
pH: 8.6
Water Temperature 11.0
Air Temperature 19.5

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	43	0.74	10	18	0.66	16	125.0	17.0	0.87
Brook Trout	ALL	1	1	1	1	43	0.74	10	18	0.66	16	125.0	17.0	0.87
Brown Trout	<200 mm	57	57	57	57	2,469	61.24	570	1,000	54.68	917	122.8	24.8	2.62
Brown Trout	≥200 mm	7	7	7	7	303	30.27	70	123	27.03	113	219.6	99.9	0.94
Brown Trout	ALL	64	64	64	64	2,772	91.51	640	1,123	81.70	1,030	133.3	33.0	2.44

Appendix L. Population and Biomass Estimates for Swede Gulch.

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1/4 mile above confluence with Rapid Creek-North Fork
Legal Description: S33,R3E,T3N
Stream Classification: BKT0 BNT0

Date Sampled: 17 JUN 2008
Site Length 100
Mean Width (m): 1.9
Number of 1

Conductivity 145
pH: 7.8
Water Temperature 15.7
Air Temperature 25.0

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	5	5	5	5	267	4.49	50	108	4.00	80	110.4	16.8	1.20
Brook Trout	ALL	5	5	5	5	267	4.49	50	108	4.00	80	110.4	16.8	1.20
Brown Trout	<200 mm	2	2	2	2	107	2.08	20	43	1.86	32	120.0	19.5	1.11
Brown Trout	ALL	2	2	2	2	107	2.08	20	43	1.86	32	120.0	19.5	1.11
Longnose Dace	ALL	14	14	14	14	748	12.71	140	303	11.35	225	83.3	17.0	0.94
Mountain Sucker	ALL	1	1	1	1	53	3.26	10	22	2.91	16	185.0	61.0	0.96

Appendix M. Population and Biomass Estimates for Tillson Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1985 riparian site 2
Legal Description: S25,R2E,T3N
Stream Classification: BKT0

Date Sampled: 17 JUN 2008
Site Length 100
Mean Width (m): 0.9
Number of 1

Conductivity 373
pH: 5.1
Water Temperature 12.7
Air Temperature 20.2

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	15	15	15	15	1,650	43.34	150	668	38.70	241	122.9	26.3	1.95
Brook Trout	ALL	15	15	15	15	1,650	43.34	150	668	38.70	241	122.9	26.3	1.95

Appendix N. Population and Biomass Estimates for Buskala Creek.

Site Number: 3 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Historic Ranch
Legal Description: S19,R3E,T3
Stream Classification: BKT0

Date Sampled: 30 JUL 2008
Site Length 100
Mean Width (m): 1.0
Number of 1

Conductivity 395
pH: 8.3
Water Temperature 12.3
Air Temperature 31.6

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	73	73	73	73	7,435	182.64	730	3,011	163.07	1,175	123.8	24.6	1.20
Brook Trout	ALL	73	73	73	73	7,435	182.64	730	3,011	163.07	1,175	123.8	24.6	1.20

Appendix O. Population and Biomass Estimates for Castle Creek.

Site Number: 16 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Cattle crossing immediatley below USFS 188
Legal Description: S20,R3E,T1N
Stream Classification: BKT2 BNT2

Date Sampled: 23 SEP 2008
Site Length 100
Mean Width (m): 5.0
Number of 3

Conductivity 388
pH: 9.3
Water Temperature 9.4
Air Temperature ****

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	5	5	5	5	101	5.04	50	41	4.50	80	157.8	50.0	1.11
Brook Trout	≥200 mm	5	5	5	5	101	10.40	50	41	9.28	80	206.0	103.2	1.17
Brook Trout	ALL	10	10	10	10	201	15.43	100	82	13.78	161	181.9	76.6	1.14
Brown Trout	<200 mm	12	12	12	14	242	7.64	120	98	6.82	193	125.8	31.6	1.07
Brown Trout	≥200 mm	10	10	10	10	201	25.12	100	82	22.43	161	218.5	124.7	1.18
Brown Trout	ALL	22	22	22	24	443	32.76	220	180	29.25	354	168.0	73.9	1.12

Site Number: 17 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 0.3 Miles downstream of Deerfield Walkin
Legal Description: S20,R3E,T1N
Stream Classification: BKT2 BNT2

Date Sampled: 23 SEP 2008
Site Length 100
Mean Width (m): 6.2
Number of 3

Conductivity 392
pH: 9.1
Water Temperature 8.3
Air Temperature ****

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	41	41	41	42	660	26.64	410	267	23.78	660	139.5	40.3	1.15
Brook Trout	≥200 mm	7	7	7	8	113	12.24	70	46	10.93	113	207.3	108.6	1.21
Brook Trout	ALL	48	48	48	49	773	38.88	480	313	34.71	772	149.4	50.3	1.16
Brown Trout	<200 mm	27	30	27	37	483	11.65	300	196	10.40	483	113.8	24.1	1.08
Brown Trout	≥200 mm	13	13	13	14	209	43.97	130	85	39.26	209	249.5	210.0	1.18
Brown Trout	ALL	40	42	40	47	676	57.18	420	274	51.05	676	157.9	84.5	1.11

Appendix P. Population and Biomass Estimates for Bittersweet Creek.

Site Number: 1 Survey Completed by:
Site Description: Headwaters area
Legal Description: S14,R3E,T1N
Stream Classification: No Fish Captured

Date Sampled: 28 MAY 2008
Site Length ****
Mean Width (m): ****
Number of 1

Conductivity ****
pH: ****
Water Temperature ****
Air Temperature ****

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

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 0.6 miles above confluence with Castle Creek
Legal Description: S12,R3E,T1N
Stream Classification: No Fish Captured

Date Sampled: 02 JUL 2008
Site Length 100
Mean Width (m): 1.5
Number of 1

Conductivity 443
pH: 3.4
Water Temperature 10.7
Air Temperature 17.3

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

Appendix Q. Population and Biomass Estimates for Castle Creek - North Fork.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Below Black Tunnel Mine (1986 site 5)
Legal Description: S32,R3E,T2N
Stream Classification: NWT

Date Sampled: 13 JUN 2008
Site Length 100
Mean Width (m): 2.9
Number of 1

Conductivity 364
pH: 7.7
Water Temperature 11.8
Air Temperature 23.8

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
Longnose Dace	ALL	2	2	2	2	68	0.37	20	28	0.33	32	84.0	5.5	0.93
White Sucker	ALL	1	1	1	1	34	0.95	10	14	0.85	16	142.0	28.0	0.98

Appendix R. Population and Biomass Estimates for Gold Run Gulch (Castle Creek Trib).

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: GRG
Legal Description: S00,R00E,T
Stream Classification: BKT0

Date Sampled: 29 MAY 2008
Site Length 100
Mean Width (m): 2.3
Number of 1

Conductivity 221
pH: 7.5
Water Temperature 13.3
Air Temperature 23.4

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	43	3.48	10	18	3.11	16	158.0	80.0	2.03
Brook Trout	ALL	1	1	1	1	43	3.48	10	18	3.11	16	158.0	80.0	2.03
Creek Chub	ALL	2	2	2	2	87	0.43	20	35	0.39	32	60.0	5.0	2.31
White Sucker	ALL	1	1	1	1	43	***	10	18	***	16	445.0	***	***

Appendix S. Population and Biomass Estimates for Castle Creek - South Fork.

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above confluence with Pole Creek (1986 site 5)
Legal Description: S4,R2E,T1S
Stream Classification: BKT0

Date Sampled: 21 JUL 2008
Site Length 100
Mean Width (m): 1.8
Number of 1

Conductivity 437
pH: 8.7
Water Temperature 17.5
Air Temperature 29.5

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	12	12	12	12	657	22.55	120	266	20.13	193	134.0	34.3	1.33
Brook Trout	ALL	12	12	12	12	657	22.55	120	266	20.13	193	134.0	34.3	1.33

Site Number: 3 Survey Completed by: South Dakota Game, Fish and Parks
Site Description:
Legal Description: S14,R2E,T1S
Stream Classification: BKT2 RBT1

Date Sampled: 29 MAY 2008
Site Length (m): 100
Mean Width (m): 4.6
Number of Passes: 1

Conductivity (µmhos): 426
pH: 8.7
Water Temperature (°C): 13.8
Air Temperature (°C): 18.1

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	76	76	76	76	1,659	54.32	760	672	48.50	1,223	138.0	32.8	1.16
Brook Trout	≥200 mm	11	11	11	11	240	22.59	110	97	20.17	177	212.4	94.1	0.98
Brook Trout	ALL	87	87	87	87	1,899	76.91	870	769	68.67	1,400	147.4	40.5	1.14
Rainbow Trout	<200 mm	39	39	39	39	851	25.95	390	345	23.17	628	114.7	30.5	16.47
Rainbow Trout	≥200 mm	22	22	22	22	480	148.91	220	194	132.96	354	320.8	310.1	0.93
Rainbow Trout	ALL	61	61	61	61	1,331	174.87	610	539	156.13	981	189.0	131.3	10.87

Appendix T. Population and Biomass Estimates for Heely Creek.

Site Number: 1 Survey Completed by:

Site Description: 0.4 miles above confluence with Castle Creek - South Fork

Legal Description: S12,R2E,T1S

Stream Classification: No Fish Captured

Date Sampled:	30 MAY 2008	Conductivity	500
Site Length	100	pH:	8.2
Mean Width (m):	0.5	Water Temperature	12.9
Number of	1	Air Temperature	19.1

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

Appendix U. Population and Biomass Estimates for Ditch Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description:
Legal Description: S00,R00E,T
Stream Classification: BKT3

Date Sampled: 13 JUN 2008
Site Length 100
Mean Width (m): 2.0
Number of 1

Conductivity 440
pH: 7.7
Water Temperature 9.9
Air Temperature 20.4

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	108	108	108	108	5,304	120.58	1,080	2,148	107.66	1,738	94.4	22.7	1.07
Brook Trout	≥200 mm	1	1	1	1	49	4.32	10	20	3.86	16	200.0	88.0	1.10
Brook Trout	ALL	109	109	109	109	5,353	131.68	1,090	2,168	117.57	1,754	95.4	24.6	1.07

Appendix V. Population and Biomass Estimates for Pole Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1 mile above Castle Creek, South Fork confluence
Legal Description: S15,R2E,T1S
Stream Classification: No Fish Captured

Date Sampled: 22 JUL 2008
Site Length 100
Mean Width (m): 1.3
Number of 1

Conductivity 458
pH: 8.5
Water Temperature 15.9
Air Temperature 30.0

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

Appendix W. Population and Biomass Estimates for Silver Creek (Trib. of Castle).

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1.0 mile above confluence with Castle Creek
Legal Description: S22,R2E,T1N
Stream Classification: BKT3

Date Sampled: 30 MAY 2008
Site Length 100
Mean Width (m): 2.3
Number of 1

Conductivity 447
pH: 8.5
Water Temperature 14.3
Air Temperature 16.7

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	32	32	32	32	1,408	36.12	320	570	32.25	515	130.5	25.7	1.07
Brook Trout	≥200 mm	1	1	1	1	44	4.22	10	18	3.77	16	202.0	96.0	1.16
Brook Trout	ALL	33	33	33	33	1,452	40.35	330	588	36.03	531	132.7	27.8	1.08

Appendix X. Population and Biomass Estimates for Bogus Jim Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Approx. 100 meters below Norris Peak Road
Legal Description: S20,R6E,T2N
Stream Classification: No Fish Captured

Date Sampled: 23 JUN 2008
Site Length 100
Mean Width (m): 3.0
Number of 1

Conductivity 330
pH: 8.3
Water Temperature 18.0
Air Temperature 25.0

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
Longnose Dace	ALL	7	7	7	7	234	***	70	95	***	113	***	***	

Appendix Y. Population and Biomass Estimates for Jim Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above USFS 231 (1985 site 3)
Legal Description: S10,R5E,T2N
Stream Classification: BKT0

Date Sampled: 23 JUN 2008
Site Length 100
Mean Width (m): 3.9
Number of 1

Conductivity 308
pH: 8.2
Water Temperature 16.0
Air Temperature 26.0

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	26	26	26	26	665	25.81	260	269	23.04	418	131.8	38.8	1.04
Brook Trout	ALL	26	26	26	26	665	25.81	260	269	23.04	418	131.8	38.8	1.04

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 0.3 miles East of Pilot Knob trailhead
Legal Description: S8,R5E,T2N
Stream Classification: BKT3

Date Sampled: 23 JUN 2008
Site Length 100
Mean Width (m): 2.8
Number of 1

Conductivity 280
pH: 7.9
Water Temperature 16.0
Air Temperature 24.0

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	9	9	9	9	319	15.22	90	129	13.59	145	159.7	47.7	1.13
Brook Trout	≥200 mm	1	1	1	1	35	4.01	10	14	3.58	16	206.0	113.0	1.29
Brook Trout	ALL	10	10	10	10	355	19.23	100	144	17.17	161	164.3	54.2	1.14

Appendix Z. Population and Biomass Estimates for Estes Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1985 site 2
Legal Description: S4,R5E,T2N
Stream Classification: No Fish Captured

Date Sampled: 23 JUN 2008
Site Length 100
Mean Width (m): 3.0
Number of 1

Conductivity 376
pH: 8.5
Water Temperature 15.0
Air Temperature 26.0

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

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: EST
Legal Description: S00,R00E,T
Stream Classification: BKT2

Date Sampled: 24 JUN 2008
Site Length 100
Mean Width (m): 2.8
Number of 1

Conductivity 408
pH: 7.7
Water Temperature 11.1
Air Temperature 22.2

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	18	18	18	18	653	25.32	180	265	22.61	290	98.6	38.8	1.09
Brook Trout	≥200 mm	2	2	2	2	73	7.33	20	29	6.55	32	208.0	101.0	1.12
Brook Trout	ALL	20	20	20	20	726	37.17	200	294	33.19	322	109.6	51.2	1.09

Appendix AA. Population and Biomass Estimates for Boxelder - North Fork.

Site Number: 3 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: East of Custer Crossing on private land
Legal Description: S17,R4E,T3N
Stream Classification: BKT3

Date Sampled: 30 JUL 2008
Site Length 100
Mean Width (m): 2.2
Number of 1

Conductivity 265
pH: 8.2
Water Temperature 24.9
Air Temperature 17.6

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	16	16	16	16	736	36.71	160	298	32.77	257	159.8	49.8	1.18
Brook Trout	≥200 mm	1	1	1	1	46	9.07	10	19	8.10	16	259.0	197.0	1.13
Brook Trout	ALL	17	17	17	17	782	47.23	170	317	42.17	274	166.9	60.4	1.18
Longnose Dace	ALL	34	34	34	34	1,565	***	340	634	***	547	***	***	***

Appendix BB. Population and Biomass Estimates for Hay Creek (Trib. of Boxelder).

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above Reausaw Lake
Legal Description: S34,R4E,T4N
Stream Classification: No Fish Captured

Date Sampled: 25 JUN 2008
Site Length 100
Mean Width (m): 1.4
Number of 1

Conductivity 107
pH: 7.6
Water Temperature 20.6
Air Temperature 27.0

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
Creek Chub	ALL	1	1	1	1	73	***	10	30	***	16	***	***	***
Green Sunfish	ALL	2	2	2	2	147	***	20	59	***	32	***	***	***
Longnose Dace	ALL	5	5	5	5	367	***	50	149	***	80	***	***	***

Appendix CC. Population and Biomass Estimates for Elk Creek.

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: (1985 riparian site 12) below Vigoren property
Legal Description: S24,R4E,T4N
Stream Classification: No Fish Captured

Date Sampled: 30 JUN 2008
Site Length 100
Mean Width (m): 5.0
Number of 1

Conductivity 295
pH: 8.7
Water Temperature 18.4
Air Temperature 30.2

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
Longnose Dace	ALL	125	125	125	125	2,518	***	1,250	1,020	***	2,011	***	***	***

Site Number: 3 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Near headwaters (1985 riparian site 3) Bob Jensen property
Legal Description: S33,R3E,T4N
Stream Classification: BKT0

Date Sampled: 01 JUL 2008
Site Length 100
Mean Width (m): 2.9
Number of 1

Conductivity 399
pH: 8.5
Water Temperature 13.1
Air Temperature 25.6

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	61	61	61	61	2,130	50.50	610	863	45.09	981	121.1	23.7	1.11
Brook Trout	ALL	61	61	61	61	2,130	50.50	610	863	45.09	981	121.1	23.7	1.11

Site Number: 4 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Andy Larson Ranch (1985 site 8)
Legal Description: S27,R4E,T4N
Stream Classification: BKT3

Date Sampled: 22 JUL 2008
Site Length 100
Mean Width (m): 5.1
Number of 1

Conductivity 333
pH: 9.0
Water Temperature 19.9
Air Temperature 28.7

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	12	12	12	12	234	11.03	120	95	9.84	193	136.8	47.1	1.11
Brook Trout	≥200 mm	2	2	2	2	39	4.76	20	16	4.25	32	220.5	122.0	1.14
Brook Trout	ALL	14	14	14	14	273	16.58	140	111	14.81	225	148.7	60.7	1.11
Mountain Sucker	ALL	40	40	40	40	780	16.52	400	316	14.75	644	122.1	21.2	1.12
Longnose Dace	ALL	120	120	120	120	2,340	***	1,200	948	***	1,931	***	***	***
White Sucker	ALL	24	24	24	24	468	***	240	190	***	386	***	***	***

Appendix DD. Population and Biomass Estimates for Little Elk Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1985 site 8
Legal Description: S5,R6E,T3N
Stream Classification: BKT3

Date Sampled: 31 JUL 2008
Site Length 100
Mean Width (m): 4.1
Number of 1

Conductivity 450
pH: 8.5
Water Temperature 18.3
Air Temperature 26.7

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	18	18	18	18	437	29.35	180	177	26.20	290	178.3	67.1	1.17
Brook Trout	≥200 mm	1	1	1	1	24	3.21	10	10	2.86	16	218.0	132.0	1.27
Brook Trout	ALL	19	19	19	19	461	34.72	190	187	31.00	306	183.3	75.3	1.19

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1985 site 5
Legal Description: S12,R5E,T3N
Stream Classification: BKT2

Date Sampled: 24 JUN 2008
Site Length 100
Mean Width (m): 3.9
Number of 1

Conductivity 429
pH: 8.5
Water Temperature 16.5
Air Temperature 32.8

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	41	41	41	41	1,059	34.35	410	429	30.67	660	131.7	32.4	1.05
Brook Trout	≥200 mm	3	3	3	3	77	9.32	30	31	8.32	48	215.3	120.3	1.18
Brook Trout	ALL	44	44	44	44	1,136	44.54	440	460	39.77	708	137.4	39.2	1.06
Creek Chub	ALL	32	32	32	32	826	***	320	335	***	515	***	***	***
Fathead Minnow	ALL	3	3	3	3	77	***	30	31	***	48	***	***	***
Finescale Dace	ALL	1	1	1	1	26	***	10	10	***	16	***	***	***

Appendix EE. Population and Biomass Estimates for Meadow Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1/2 mile below confluence with Virkula Gulch
Legal Description: S19,R5E,T4N
Stream Classification: No Fish Captured

Date Sampled: 30 JUN 2008
Site Length 100
Mean Width (m): 2.1
Number of 1

Conductivity 453
pH: 8.5
Water Temperature 13.3
Air Temperature 33.2

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
Longnose Dace	ALL	7	7	7	7	332	***	70	134	***	113	***	***	***

Appendix FF. Population and Biomass Estimates for Bear Butte Creek.

Site Number: 3 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above Strawberry Cr. Confluence (Brohm M.C. BB-1)
Legal Description: S9,R4E,T4N
Stream Classification: BKT2

Date Sampled: 12 SEP 2007
Site Length 100
Mean Width (m): 2.9
Number of 3

Conductivity 297
pH: 8.7
Water Temperature 12.2
Air Temperature 20.5

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	57	58	57	61	1,981	24.26	580	802	21.66	933	101.3	12.2	0.97
Brook Trout	≥200 mm	2	2	2	2	68	8.51	20	28	7.59	32	225.5	124.5	1.09
Brook Trout	ALL	59	60	59	63	2,050	32.90	600	830	29.37	965	105.5	16.1	0.97
Green Sunfish	ALL	1	1	1	2	34	0.48	10	14	0.43	16	82.0	14.0	2.54
Longnose Dace	ALL	534	2,670	534	6,141	91,211	***	26,700	36,941	***	42,960	***	***	***
White Sucker	ALL	17	17	17	18	581	***	170	235	***	274	***	***	***

Site Number: 5 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Immediately below Ruby Gulch Confluence (Brohm M.C. BB-4)
Legal Description: S9,R4E,T4N
Stream Classification: BKT2

Date Sampled: 11 SEP 2007
Site Length 100
Mean Width (m): 3.8
Number of 3

Conductivity 435
pH: 8.7
Water Temperature 10.5
Air Temperature 20.9

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	204	236	212	260	6,181	120.04	2,360	2,503	107.18	3,797	110.3	19.4	1.31
Brook Trout	≥200 mm	7	7	7	9	183	24.41	70	74	21.79	113	225.3	133.1	1.14
Brook Trout	ALL	211	244	219	269	6,390	163.86	2,440	2,588	146.30	3,926	116.6	25.6	1.30
Longnose Dace	ALL	33	165	33	1,035	4,321	***	1,650	1,750	***	2,655	***	***	***

Population and Biomass Estimates for Bear Butte Creek. (Continued)

Site Number: 6 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Immediately above Ruby Gulch Confluence (Brohm M.C. BB-3)
Legal Description: S9,R4E,T4N
Stream Classification: BKT2

Date Sampled: 11 SEP 2007
Site Length 100
Mean Width (m): 4.2
Number of 3

Conductivity 435
pH: 8.7
Water Temperature 10.5
Air Temperature 20.9

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	101	102	101	105	2,413	38.32	1,020	977	34.21	1,641	107.0	15.9	1.04
Brook Trout	≥200 mm	9	9	9	9	213	26.52	90	86	23.68	145	222.9	124.6	1.12
Brook Trout	ALL	110	111	110	114	2,626	65.05	1,110	1,063	58.08	1,786	116.5	24.8	1.05
Green Sunfish	ALL	3	5	3	24	118	0.75	50	48	0.67	80	85.0	6.3	1.17
Mountain Sucker	ALL	1	1	1	5	24	0.38	10	10	0.34	16	115.0	16.0	1.05
White Sucker	ALL	2	2	2	3	47	2.22	20	19	1.99	32	150.5	47.0	1.20
Longnose Dace	ALL	209	453	209	724	10,716	***	4,530	4,340	***	7,289	***	***	***

Site Number: 14 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Below culverts approximately 120 meters downstream of
Legal Description: S9,R4E,T4N
Stream Classification: BKT2

Date Sampled: 12 SEP 2007
Site Length 100
Mean Width (m): 2.9
Number of 3

Conductivity 966
pH: 8.2
Water Temperature 9.5
Air Temperature 12.8

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	237	242	237	248	8,478	118.26	2,420	3,433	105.59	3,894	105.8	13.9	0.98
Brook Trout	≥200 mm	6	6	6	6	210	22.53	60	85	20.11	97	218.3	107.2	1.02
Brook Trout	ALL	243	248	243	254	8,688	141.19	2,480	3,519	126.06	3,990	108.5	16.3	0.98
Longnose Dace	ALL	103	515	103	1,988	18,041	***	5,150	7,307	***	8,286	***	***	***

Population and Biomass Estimates for Bear Butte Creek. (Continued)

Site Number: 15 Survey Completed by:
Site Description: Approximately 1/4 mile upstream from confluence with
Legal Description: S9,R4E,T4N
Stream Classification: BKT1

Date Sampled: 12 SEP 2007
Site Length 100
Mean Width (m): 2.8
Number of 3

Conductivity 310
pH: 8.5
Water Temperature 17.7
Air Temperature 17.6

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	50	51	50	54	1,827	39.36	510	740	35.14	821	122.5	21.5	0.93
Brook Trout	≥200 mm	13	13	13	13	466	49.20	130	189	43.93	209	221.1	105.6	0.96
Brook Trout	ALL	63	63	63	65	2,257	87.79	630	914	78.38	1,014	142.8	38.9	0.94
Green Sunfish	ALL	8	8	8	9	287	3.98	80	116	3.55	129	91.5	13.9	1.77
Mountain Sucker	ALL	31	31	31	32	1,111	37.34	310	450	33.34	499	145.2	33.6	1.09
Rock Bass	ALL	2	2	2	3	72	1.97	20	29	1.76	32	113.5	27.5	1.88
White Sucker	ALL	6	6	6	6	215	8.35	60	87	7.45	97	151.8	38.8	1.03
Longnose Dace	ALL	453	516	484	548	18,489	***	5,160	7,488	***	8,302	***	***	***

Appendix GG. Population and Biomass Estimates for Two Bit Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Immediately above Confluence with Boulder Creek
Legal Description: S21,R4E,T5N
Stream Classification: No Fish Captured

Date Sampled: 12 AUG 2008
Site Length 100
Mean Width (m): ****
Number of 1

Conductivity ****
pH: ****
Water Temperature ****
Air Temperature ****

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

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above USFS 540 - Olson property
Legal Description: S36,R4E,T5N
Stream Classification: BKT2

Date Sampled: 12 AUG 2008
Site Length 100
Mean Width (m): 1.8
Number of 1

Conductivity 249
pH: 8.5
Water Temperature 19.0
Air Temperature 26.7

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	193	193	193	193	10,832	320.07	1,930	4,387	285.78	3,105	138.5	29.5	1.01
Brook Trout	≥200 mm	3	3	3	3	168	15.49	30	68	13.83	48	210.7	92.0	0.98
Brook Trout	ALL	196	196	196	196	11,000	352.89	1,960	4,455	315.09	3,154	141.5	32.1	1.01

Appendix HH. Population and Biomass Estimates for Two Bit Creek - East Fork.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Below power transmission line
Legal Description: S7,R4E,T4N
Stream Classification: BKT1

Date Sampled: 13 AUG 2008
Site Length 100
Mean Width (m): 0.7
Number of 1

Conductivity 240
pH: 8.2
Water Temperature 17.0
Air Temperature 29.1

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	15	15	15	15	2,063	107.11	150	835	95.64	241	167.7	51.9	1.06
Brook Trout	≥200 mm	4	4	4	4	550	61.46	40	223	54.88	64	215.5	111.8	1.09
Brook Trout	ALL	19	19	19	19	2,613	168.58	190	1,058	150.52	306	177.7	64.5	1.06

Appendix II. Population and Biomass Estimates for Strawberry Creek.

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Immediately above confluence with Bear Butte Creek
Legal Description: S9,R4E,T4N
Stream Classification: BKT0

Date Sampled: 11 SEP 2007
Site Length 100
Mean Width (m): 1.9
Number of 3

Conductivity 1595
pH: 8.2
Water Temperature 13.5
Air Temperature ****

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	96	102	96	110	5,318	42.65	1,020	2,154	38.08	1,641	88.3	8.0	0.98
Brook Trout	ALL	96	102	96	110	5,318	42.65	1,020	2,154	38.08	1,641	88.3	8.0	0.98
Longnose Dace	ALL	22	54	22	179	2,815	***	540	1,140	***	869	***	***	***

Site Number: 3 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Immediately upstream of confluence with Boomer Gulch Creek
Legal Description: S8,R4E,T4N
Stream Classification: BKT0

Date Sampled: 12 SEP 2007
Site Length 100
Mean Width (m): 1.5
Number of 3

Conductivity 1903
pH: 8.1
Water Temperature 15.6
Air Temperature 16.9

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	18	18	18	18	1,200	20.93	180	486	18.69	290	102.1	17.4	2.05
Brook Trout	ALL	18	18	18	18	1,200	20.93	180	486	18.69	290	102.1	17.4	2.05

Appendix JJ. Population and Biomass Estimates for Bear Butte Creek (unnamed Trib.).

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Approximately 100m above USFS 534 in 170 Junction
Legal Description: S9,R4E,T4N
Stream Classification: BKT0

Date Sampled: 14 AUG 2008
Site Length 100
Mean Width (m): 1.0
Number of 1

Conductivity 403
pH: 8.4
Water Temperature 11.2
Air Temperature 17.2

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	33	33	33	33	3,425	90.56	330	1,387	80.86	531	132.2	26.4	1.09
Brook Trout	ALL	33	33	33	33	3,425	90.56	330	1,387	80.86	531	132.2	26.4	1.09

Appendix KK. Population and Biomass Estimates for Spearfish Creek.

Site Number: 179 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S3,R2E,T6
Stream Classification: BNT1

Date Sampled: 27 AUG 2008
Site Length 100
Mean Width (m): 7.4
Number of 3

Conductivity 440
pH: 8.9
Water Temperature 10.9
Air Temperature 18.9

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	105	141	105	180	1,894	45.26	1,410	767	40.42	2,269	95.4	23.9	1.13
Brown Trout	≥200 mm	40	40	40	42	537	113.33	400	218	101.19	644	270.1	211.0	1.02
Brown Trout	ALL	145	169	147	191	2,270	240.88	1,690	919	215.07	2,719	148.3	106.1	1.08

Site Number: 189 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: West of High School (Picnic Area) (historic 1)
Legal Description: S10,R2E,T6N
Stream Classification: BNT1 RBT2

Date Sampled: 26 AUG 2008
Site Length 100
Mean Width (m): 6.5
Number of 3

Conductivity 440
pH: 8.9
Water Temperature 12.6
Air Temperature 19.0

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	74	131	74	220	2,024	110.53	1,310	820	98.69	2,108	111.7	54.6	1.12
Brown Trout	≥200 mm	71	71	71	73	1,097	231.79	710	444	206.96	1,142	268.7	211.3	1.05
Brown Trout	ALL	145	162	146	178	2,503	449.55	1,620	1,014	401.39	2,607	206.2	179.6	1.06
Rainbow Trout	≥200 mm	2	2	2	2	31	8.08	20	13	7.21	32	285.0	261.5	1.03
Rainbow Trout	ALL	2	2	2	2	31	8.08	20	13	7.21	32	285.0	261.5	1.03

Site Number: 195 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S10,R2E,T6
Stream Classification: BNT1

Date Sampled: 26 AUG 2008
Site Length 100
Mean Width (m): 6.5
Number of 3

Conductivity 452
pH: 8.7
Water Temperature 11.7
Air Temperature 19.5

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	66	84	66	108	1,301	75.39	840	527	67.31	1,352	122.9	57.9	1.20
Brown Trout	≥200 mm	36	36	36	38	558	101.43	360	226	90.57	579	259.0	181.9	0.99
Brown Trout	ALL	102	114	102	127	1,766	225.44	1,140	715	201.29	1,834	180.6	127.6	1.08

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 200 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Lions Memorial Park
Legal Description: S00,R00E,T
Stream Classification: BNT1 RBT1

Date Sampled: 25 AUG 2008
Site Length 100
Mean Width (m): 8.3
Number of 3

Conductivity 438
pH: 8.8
Water Temperature 12.2
Air Temperature 34.5

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	259	259	259	260	3,110	138.02	2,590	1,260	123.23	4,167	112.2	44.4	1.04
Brown Trout	≥200 mm	48	48	48	50	576	112.56	480	233	100.50	772	265.8	195.3	0.98
Brown Trout	ALL	307	307	307	309	3,687	640.43	3,070	1,493	571.82	4,940	225.6	173.7	0.99
Rainbow Trout	≥200 mm	6	6	6	6	72	14.94	60	29	13.34	97	276.7	207.3	0.96
Rainbow Trout	ALL	6	6	6	6	72	14.94	60	29	13.34	97	276.7	207.3	0.96

Site Number: 208 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Frank Brady Park
Legal Description: S00,R00E,T
Stream Classification: BNT1

Date Sampled: 27 AUG 2008
Site Length 100
Mean Width (m): 8.0
Number of 3

Conductivity ****
pH: 8.7
Water Temperature 10.6
Air Temperature 16.1

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	64	70	64	79	876	42.92	700	355	38.33	1,126	121.8	49.0	1.03
Brown Trout	≥200 mm	39	43	39	51	538	97.37	430	218	86.94	692	257.9	180.9	1.04
Brown Trout	ALL	103	114	103	126	1,427	184.61	1,140	578	164.84	1,834	181.4	129.4	1.03

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 220 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: City Campground
Legal Description: S15,R2E,T6N
Stream Classification: BNT2

Date Sampled: 25 AUG 2008
Site Length 100
Mean Width (m): 11.9
Number of 3

Conductivity 423
pH: 8.7
Water Temperature 10.9
Air Temperature 33.1

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	279	307	288	326	2,572	129.88	3,070	1,042	115.97	4,940	118.6	50.5	1.05
Brown Trout	≥200 mm	35	35	35	36	293	53.13	350	119	47.44	563	256.9	181.2	1.01
Brown Trout	ALL	314	338	322	354	2,832	306.97	3,380	1,147	274.08	5,438	157.0	108.4	1.03
Hatchery Rainbow Trout	≥200 mm	6	6	6	6	50	11.56	60	20	10.32	97	281.5	230.0	0.98
Hatchery Rainbow Trout	ALL	6	6	6	6	50	11.56	60	20	10.32	97	281.5	230.0	0.98

Site Number: 327 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S9,R2E,T5
Stream Classification: BKT0 BNT1 RBT0

Date Sampled: 28 AUG 2008
Site Length 100
Mean Width (m): 5.1
Number of 3

Conductivity 432
pH: 8.7
Water Temperature 9.9
Air Temperature 20.0

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	20	0.10	10	8	0.09	16	85.0	5.0	0.81
Brook Trout	ALL	1	1	1	1	20	0.10	10	8	0.09	16	85.0	5.0	0.81
Brown Trout	<200 mm	245	254	245	263	5,016	242.60	2,540	2,032	216.62	4,087	146.2	48.4	1.12
Brown Trout	≥200 mm	57	57	57	58	1,126	138.06	570	456	123.27	917	223.5	122.6	1.08
Brown Trout	ALL	302	310	302	318	6,122	405.01	3,100	2,479	361.62	4,988	162.5	66.2	1.11
Rainbow Trout	<200 mm	2	2	2	2	39	1.20	20	16	1.08	32	133.0	30.5	1.12
Rainbow Trout	ALL	2	2	2	2	39	1.20	20	16	1.08	32	133.0	30.5	1.12

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 339 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S8,R2E,T5
Stream Classification: BKT2 BNT2

Date Sampled: 28 AUG 2008
Site Length 100
Mean Width (m): 5.3
Number of 3

Conductivity 434
pH: 8.5
Water Temperature 11.8
Air Temperature 22.9

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	345	370	354	386	6,981	269.27	3,700	2,827	240.43	5,953	122.9	38.6	1.11
Brook Trout	≥200 mm	5	5	5	7	94	10.72	50	38	9.57	80	206.8	113.6	1.29
Brook Trout	ALL	350	376	359	393	7,094	312.78	3,760	2,873	279.27	6,050	127.1	44.1	1.13
Brown Trout	<200 mm	92	101	92	112	1,906	84.75	1,010	772	75.67	1,625	123.2	44.5	1.12
Brown Trout	≥200 mm	5	5	5	5	94	13.87	50	38	12.38	80	231.8	147.0	1.17
Brown Trout	ALL	97	105	97	115	1,981	111.73	1,050	802	99.76	1,689	131.2	56.4	1.12

Site Number: 354 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Below Squaw Creek Confluence
Legal Description: S17,R2E,T5N
Stream Classification: BKT0 BNT2 RBT1

Date Sampled: 11 SEP 2008
Site Length 100
Mean Width (m): 10.2
Number of 3

Conductivity 416
pH: 8.9
Water Temperature 9.8
Air Temperature ****

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	4	4	4	7	39	1.59	40	16	1.42	64	105.8	40.5	1.08
Brook Trout	ALL	4	4	4	7	39	1.59	40	16	1.42	64	105.8	40.5	1.08
Brown Trout	<200 mm	102	115	102	130	1,125	50.62	1,150	456	45.20	1,850	132.6	45.0	1.09
Brown Trout	≥200 mm	34	34	34	36	333	58.87	340	135	52.56	547	251.4	176.9	1.06
Brown Trout	ALL	136	149	136	162	1,458	144.40	1,490	591	128.93	2,397	174.3	99.0	1.08
Rainbow Trout	<200 mm	30	38	30	55	372	21.44	380	151	19.14	611	118.6	57.6	1.13
Rainbow Trout	≥200 mm	19	63	19	310	617	82.94	630	250	74.06	1,014	226.3	134.5	1.12
Rainbow Trout	ALL	49	83	49	146	812	79.78	830	329	71.24	1,335	160.3	98.2	1.12

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 357 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: .18mi down from Hydro 2
Legal Description: S00,R00E,T
Stream Classification: No Fish Captured

Date Sampled: 11 SEP 2008
Site Length 100
Mean Width (m): 13.1
Number of 3

Conductivity 420
pH: 8.9
Water Temperature 9.5
Air Temperature ****

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	ALL	350	350	350	350	2,674	***	3,500	1,083	***	5,632	***	***	***

Site Number: 366 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1/4 mi up from Hydro 2
Legal Description: S00,R00E,T
Stream Classification: BNT1 RBT1

Date Sampled: 10 SEP 2008
Site Length 100
Mean Width (m): 7.9
Number of 3

Conductivity 433
pH: 8.9
Water Temperature 9.5
Air Temperature ****

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	120	197	120	286	2,505	114.10	1,970	1,015	101.87	3,170	123.8	45.5	1.43
Brown Trout	≥200 mm	29	57	29	135	725	131.55	570	294	117.46	917	249.7	181.5	1.07
Brown Trout	ALL	149	261	149	383	3,319	325.62	2,610	1,344	290.74	4,199	160.3	98.1	1.29
Rainbow Trout	<200 mm	3	3	3	4	38	1.95	30	15	1.74	48	171.3	51.0	1.02
Rainbow Trout	≥200 mm	8	8	8	10	102	23.22	80	41	20.73	129	276.3	228.3	1.07
Rainbow Trout	ALL	11	11	11	13	140	25.17	110	57	22.47	177	247.6	179.9	1.06

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 374 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S00,R00E,T
Stream Classification: BNT2 RBT2

Date Sampled: 09 SEP 2008
Site Length 70
Mean Width (m): 8.7
Number of 3

Conductivity 414
pH: 8.8
Water Temperature 12.0
Air Temperature ****

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	116	148	116	180	2,443	87.61	2,114	989	78.23	3,402	136.3	35.9	1.67
Brown Trout	≥200 mm	6	6	6	6	99	13.35	86	40	11.92	138	234.7	134.8	0.99
Brown Trout	ALL	122	149	123	175	2,459	140.37	2,129	996	125.33	3,425	157.4	57.1	1.53
Rainbow Trout	<200 mm	1	1	1	2	17	1.40	14	7	1.25	23	199.0	85.0	1.08
Rainbow Trout	≥200 mm	2	2	2	2	33	3.83	29	13	3.42	46	222.0	116.0	1.04
Rainbow Trout	ALL	3	3	3	4	50	5.23	43	20	4.67	69	214.3	105.7	1.05

Site Number: 401 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S00,R00E,T
Stream Classification: BNT1

Date Sampled: 09 SEP 2008
Site Length 100
Mean Width (m): 12.2
Number of 3

Conductivity 448
pH: 8.8
Water Temperature 9.1
Air Temperature ****

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	323	343	329	357	2,803	118.03	3,430	1,135	105.39	5,519	142.9	42.1	1.27
Brown Trout	≥200 mm	81	81	81	83	662	89.36	810	268	79.78	1,303	232.3	135.0	1.05
Brown Trout	ALL	404	423	410	436	3,457	242.97	4,230	1,400	216.94	6,806	167.6	70.3	1.21

Site Number: 406 Survey Completed by:
Site Description: Longvalley Picnic Area
Legal Description: S00,R00E,T
Stream Classification: No Fish Captured

Date Sampled: 10 SEP 2008
Site Length 100
Mean Width (m): ****
Number of 3

Conductivity 437
pH: 8.9
Water Temperature 9.9
Air Temperature ****

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	ALL	378	378	378	378	***	***	3,780	***	***	6,082	***	***	***

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 429 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: .8 mi down from Little Spearfish confluence
Legal Description: S00,R00E,T
Stream Classification: BNT1 RBT2

Date Sampled: 08 SEP 2008
Site Length 100
Mean Width (m): 7.0
Number of 3

Conductivity 431
pH: 8.9
Water Temperature 10.9
Air Temperature 13.7

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	209	219	210	228	3,125	115.02	2,190	1,265	102.70	3,524	116.7	36.8	1.35
Brown Trout	≥200 mm	45	46	45	49	656	108.35	460	266	96.74	740	250.8	165.1	0.99
Brown Trout	ALL	254	266	256	276	3,795	295.07	2,660	1,537	263.46	4,280	148.2	77.8	1.23
Rainbow Trout	≥200 mm	2	2	2	2	29	6.15	20	12	5.49	32	273.0	215.5	1.06
Rainbow Trout	ALL	2	2	2	2	29	6.15	20	12	5.49	32	273.0	215.5	1.06

Site Number: 432 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Downstream of 1st bridge below Savoy
Legal Description: S30,R2E,T5N
Stream Classification: BNT1

Date Sampled: 08 OCT 2008
Site Length 100
Mean Width (m): 7.5
Number of 3

Conductivity 450
pH: 8.8
Water Temperature 8.7
Air Temperature 11.4

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	328	396	356	436	5,274	218.64	3,960	2,136	195.22	6,372	119.4	41.5	1.12
Brown Trout	≥200 mm	65	66	65	69	879	104.61	660	356	93.40	1,062	225.9	119.0	1.03
Brown Trout	ALL	393	453	420	486	6,033	383.50	4,530	2,443	342.42	7,289	140.4	63.6	1.10

Site Number: 453 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1/4 mi up from Little Spearfish
Legal Description: S00,R00E,T
Stream Classification: BNT1

Date Sampled: 04 SEP 2008
Site Length 100
Mean Width (m): 7.6
Number of 3

Conductivity 413
pH: 9.0
Water Temperature 10.0
Air Temperature 16.3

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	261	297	273	321	3,927	183.41	2,970	1,590	163.77	4,779	133.0	46.7	12.16
Brown Trout	≥200 mm	106	108	106	112	1,428	212.26	1,080	578	189.52	1,738	235.8	148.7	1.09
Brown Trout	ALL	367	401	381	421	5,302	496.72	4,010	2,147	443.51	6,452	173.2	93.7	7.06

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 462 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S31,R2E,T5
Stream Classification: BNT1

Date Sampled: 04 SEP 2008
Site Length 100
Mean Width (m): 6.6
Number of 3

Conductivity 438
pH: 9.0
Water Temperature 8.6
Air Temperature 13.1

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	118	124	118	132	1,887	76.49	1,240	764	68.30	1,995	126.1	40.5	1.18
Brown Trout	≥200 mm	86	88	86	92	1,339	180.95	880	542	161.56	1,416	233.5	135.2	1.04
Brown Trout	ALL	204	213	204	222	3,241	282.92	2,130	1,312	252.62	3,427	171.4	87.3	1.11

Site Number: 465 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S6,R2E,T4
Stream Classification: BNT1

Date Sampled: 03 SEP 2008
Site Length 100
Mean Width (m): 5.9
Number of 3

Conductivity 433
pH: 8.9
Water Temperature 10.3
Air Temperature 24.0

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	101	121	101	143	2,038	74.23	1,210	826	66.28	1,947	137.9	36.4	1.16
Brown Trout	≥200 mm	48	49	48	52	825	126.34	490	334	112.81	788	240.9	153.1	1.05
Brown Trout	ALL	150	168	151	185	2,830	213.10	1,680	1,146	190.27	2,703	171.0	75.3	1.12

Site Number: 480 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S5,R2E,T4
Stream Classification: BNT1

Date Sampled: 22 SEP 2008
Site Length 100
Mean Width (m): 7.0
Number of 3

Conductivity 439
pH: 9.0
Water Temperature 8.4
Air Temperature ****

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	256	275	261	289	3,929	153.29	2,750	1,591	136.87	4,425	136.9	39.0	1.08
Brown Trout	≥200 mm	84	84	84	86	1,200	165.01	840	486	147.34	1,352	230.7	137.5	1.08
Brown Trout	ALL	340	357	345	369	5,100	369.82	3,570	2,066	330.20	5,744	165.8	72.5	1.08

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 490 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Immediately below McKinley Gulch
Legal Description: S5,R2E,T4N
Stream Classification: BNT1

Date Sampled: 03 SEP 2008
Site Length 100
Mean Width (m): 6.6
Number of 3

Conductivity ****
pH: 9.0
Water Temperature 8.3
Air Temperature 17.9

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	253	274	258	290	4,146	156.52	2,740	1,679	139.75	4,409	120.8	37.8	1.11
Brown Trout	≥200 mm	49	49	49	50	741	100.56	490	300	89.79	788	226.6	135.6	1.09
Brown Trout	ALL	302	319	306	332	4,827	287.93	3,190	1,955	257.08	5,133	138.8	59.7	1.10

Site Number: 510 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S9,R2E,T4
Stream Classification: BNT1

Date Sampled: 02 SEP 2008
Site Length 100
Mean Width (m): 6.8
Number of 3

Conductivity 433
pH: 8.9
Water Temperature 9.2
Air Temperature ****

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	197	210	198	222	3,080	118.15	2,100	1,247	105.49	3,379	121.3	38.4	1.15
Brown Trout	≥200 mm	40	41	40	44	601	73.15	410	244	65.32	660	224.1	121.7	1.07
Brown Trout	ALL	237	252	240	264	3,696	220.21	2,520	1,497	196.62	4,055	141.5	59.6	1.13

Site Number: 543 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S15,R2E,T4
Stream Classification: BNT1

Date Sampled: 02 SEP 2008
Site Length 100
Mean Width (m): 7.2
Number of 3

Conductivity 450
pH: 8.8
Water Temperature 8.1
Air Temperature 11.7

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	231	239	231	247	3,303	116.37	2,390	1,338	103.91	3,846	130.7	35.2	1.46
Brown Trout	≥200 mm	58	58	58	59	802	109.12	580	325	97.43	933	233.4	136.1	1.04
Brown Trout	ALL	289	296	289	303	4,090	240.27	2,960	1,657	214.53	4,763	152.2	58.7	1.36

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 574 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above Cheyenne Crossing (1985 site 5)
Legal Description: S21,R2E,T4N
Stream Classification: BNT1

Date Sampled: 18 AUG 2008
Site Length 100
Mean Width (m): 10.8
Number of 3

Conductivity 448
pH: 8.7
Water Temperature 10.1
Air Temperature 28.6

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	245	261	248	274	2,409	86.73	2,610	975	77.44	4,199	145.4	36.0	1.09
Brown Trout	≥200 mm	55	56	55	59	517	58.76	560	209	52.47	901	223.9	113.7	0.99
Brown Trout	ALL	300	316	304	328	2,916	147.54	3,160	1,181	131.73	5,084	160.1	50.6	1.07

Site Number: 599 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S29,R2E,T4
Stream Classification: BKT0 BNT2

Date Sampled: 19 AUG 2008
Site Length 100
Mean Width (m): 6.8
Number of 3

Conductivity 433
pH: 9.1
Water Temperature 11.6
Air Temperature 26.5

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	44	1.44	30	18	1.29	48	147.7	32.7	1.02
Brook Trout	ALL	3	3	3	3	44	1.44	30	18	1.29	48	147.7	32.7	1.02
Brown Trout	<200 mm	439	459	446	472	6,759	198.88	4,590	2,737	177.57	7,385	120.5	29.4	1.10
Brown Trout	≥200 mm	11	11	11	13	162	16.36	110	66	14.61	177	215.4	101.0	0.99
Brown Trout	ALL	450	471	457	485	6,936	222.34	4,710	2,809	198.52	7,578	123.4	32.1	1.10

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 601 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S29,R2E,T4
Stream Classification: BKT0 BNT1

Date Sampled: 19 AUG 2008
Site Length 100
Mean Width (m): 4.0
Number of 3

Conductivity 452
pH: 8.6
Water Temperature 8.0
Air Temperature 14.7

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	5	5	5	6	124	1.96	50	50	1.75	80	113.0	15.8	0.98
Brook Trout	ALL	5	5	5	6	124	1.96	50	50	1.75	80	113.0	15.8	0.98
Brown Trout	<200 mm	173	187	174	200	4,643	149.78	1,870	1,881	133.73	3,009	131.9	32.3	1.20
Brown Trout	≥200 mm	45	45	45	47	1,117	112.73	450	453	100.65	724	217.4	100.9	0.96
Brown Trout	ALL	218	231	220	242	5,736	273.15	2,310	2,323	243.89	3,717	149.6	47.6	1.15

Site Number: 614 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S32,R2E,T4
Stream Classification: BKT0 BNT2

Date Sampled: 20 AUG 2008
Site Length 100
Mean Width (m): 5.5
Number of 3

Conductivity 442
pH: 8.4
Water Temperature 9.3
Air Temperature 25.4

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	4	4	4	4	72	1.44	40	29	1.29	64	127.5	20.0	0.85
Brook Trout	ALL	4	4	4	4	72	1.44	40	29	1.29	64	127.5	20.0	0.85
Brown Trout	<200 mm	374	395	381	409	7,123	171.25	3,950	2,885	152.90	6,356	107.2	24.0	1.01
Brown Trout	≥200 mm	5	5	5	6	90	8.44	50	37	7.54	80	213.6	93.6	0.96
Brown Trout	ALL	379	400	386	414	7,213	183.74	4,000	2,921	164.06	6,436	108.8	25.5	1.01

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 622 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S31,R2E,T4
Stream Classification: BKT0 BNT2

Date Sampled: 21 AUG 2008
Site Length 100
Mean Width (m): 3.4
Number of 3

Conductivity 460
pH: 9.0
Water Temperature 8.2
Air Temperature 20.5

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	2	29	0.55	10	12	0.49	16	124.0	19.0	1.00
Brook Trout	ALL	1	1	1	2	29	0.55	10	12	0.49	16	124.0	19.0	1.00
Brown Trout	<200 mm	123	124	123	127	3,599	125.44	1,240	1,458	112.00	1,995	115.8	34.9	1.40
Brown Trout	≥200 mm	12	12	12	12	348	38.57	120	141	34.44	193	217.2	110.8	1.07
Brown Trout	ALL	135	136	135	139	3,947	178.90	1,360	1,599	159.73	2,188	125.9	45.3	1.35

Site Number: 636 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: .6 mi down from Dead Ox Picknic
Legal Description: S00,R00E,T
Stream Classification: BKT3 BNT2

Date Sampled: 21 AUG 2008
Site Length 100
Mean Width (m): 4.3
Number of 3

Conductivity 448
pH: 8.4
Water Temperature 9.5
Air Temperature 22.5

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	77	88	77	102	2,029	64.52	880	822	57.61	1,416	132.8	31.8	1.02
Brook Trout	≥200 mm	1	1	1	5	23	2.68	10	9	2.39	16	216.0	116.0	1.15
Brook Trout	ALL	78	91	78	107	2,099	69.28	910	850	61.86	1,464	133.8	33.0	1.02
Brown Trout	<200 mm	28	28	28	30	646	17.85	280	262	15.94	451	131.8	27.6	1.07
Brown Trout	≥200 mm	6	6	6	9	138	16.72	60	56	14.93	97	220.3	120.8	1.12
Brown Trout	ALL	34	35	34	39	807	35.58	350	327	31.77	563	147.4	44.1	1.08

Population and Biomass Estimates for Spearfish Creek. (Continued)

Site Number: 656 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: SFC
Legal Description: S7,R2E,T3
Stream Classification: BKT2

Date Sampled: 18 AUG 2008
Site Length 100
Mean Width (m): 4.3
Number of 3

Conductivity 451
pH: 8.3
Water Temperature 8.1
Air Temperature 15.3

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	112	115	112	120	2,680	88.75	1,150	1,085	79.25	1,850	140.1	33.1	1.08
Brook Trout	≥200 mm	7	7	7	8	163	18.22	70	66	16.27	113	221.4	111.7	1.01
Brook Trout	ALL	119	122	119	127	2,843	107.30	1,220	1,152	95.81	1,963	144.9	37.7	1.08

Appendix LL. Population and Biomass Estimates for Higgins Gulch.

Site Number: 3 Survey Completed by:
Site Description: Below confluence with East Fork
Legal Description: S24,R1E,T6N
Stream Classification: BKT3

Date Sampled: 10 JUL 2008
Site Length 100
Mean Width (m): 3.5
Number of 1

Conductivity 407
pH: 8.3
Water Temperature 13.5
Air Temperature 28.3

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	14	14	14	14	405	14.88	140	164	13.29	225	147.0	36.7	1.06
Brook Trout	≥200 mm	1	1	1	1	29	2.75	10	12	2.46	16	212.0	95.0	1.00
Brook Trout	ALL	15	15	15	15	434	17.63	150	176	15.74	241	151.3	40.6	1.05

Appendix MM. Population and Biomass Estimates for Cleopatra Creek.

Site Number: 10 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 100 meters above confluence with Spearfish Creek
Legal Description: S17,R2E,T5N
Stream Classification: BKT3 BNT3 RBT2

Date Sampled: 09 JUL 2008
Site Length 100
Mean Width (m): 4.6
Number of 1

Conductivity 279
pH: 8.6
Water Temperature 16.0
Air Temperature 26.1

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	100	100	100	100	2,178	65.48	1,000	882	58.46	1,609	136.2	30.1	1.03
Brook Trout	≥200 mm	1	1	1	1	22	1.79	10	9	1.59	16	201.0	82.0	1.01
Brook Trout	ALL	101	101	101	101	2,200	67.26	1,010	891	60.06	1,625	136.9	30.6	1.03
Brown Trout	<200 mm	13	13	13	13	283	5.29	130	115	4.73	209	115.3	18.7	1.14
Brown Trout	≥200 mm	1	1	1	1	22	1.92	10	9	1.71	16	202.0	88.0	1.07
Brown Trout	ALL	14	14	14	14	305	7.21	140	124	6.44	225	121.5	23.6	1.13
Rainbow Trout	<200 mm	16	16	16	16	349	9.30	160	141	8.30	257	124.7	26.7	1.18
Rainbow Trout	≥200 mm	1	1	1	1	22	2.29	10	9	2.04	16	216.0	105.0	1.04
Rainbow Trout	ALL	17	17	17	17	370	11.59	170	150	10.35	274	130.1	31.3	1.17

Appendix NN. Population and Biomass Estimates for Iron Creek (North).

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 200 meters above Spearfish Creek Confluence (1986 site 4.5)
Legal Description: S30,R2E,T5N
Stream Classification: BNT1 RBT1

Date Sampled: 08 JUL 2008
Site Length 100
Mean Width (m): 2.8
Number of 1

Conductivity 388
pH: 8.6
Water Temperature 12.3
Air Temperature 26.0

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	23	23	23	23	821	34.65	230	333	30.94	370	143.4	42.2	1.29
Brown Trout	≥200 mm	38	38	38	38	1,357	195.04	380	550	174.14	611	236.7	143.7	1.05
Brown Trout	ALL	61	61	61	61	2,179	231.98	610	882	207.13	981	201.5	106.5	1.13
Rainbow Trout	<200 mm	1	1	1	1	36	2.71	10	14	2.42	16	197.0	76.0	0.99
Rainbow Trout	≥200 mm	2	2	2	2	71	14.00	20	29	12.50	32	268.0	196.0	0.92
Rainbow Trout	ALL	3	3	3	3	107	16.71	30	43	14.92	48	244.3	156.0	0.94

Site Number: 3 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above Iron Creek Lake (1985 site 1.2)
Legal Description: S27,R1E,T5N
Stream Classification: BKT2 BNT2 RBT0

Date Sampled: 09 JUL 2008
Site Length 100
Mean Width (m): 1.0
Number of 1

Conductivity 235
pH: 8.2
Water Temperature 14.2
Air Temperature 26.7

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	7	7	7	7	706	15.89	70	286	14.19	113	78.6	22.5	1.03
Brook Trout	≥200 mm	1	1	1	1	101	10.19	10	41	9.10	16	210.0	101.0	1.09
Brook Trout	ALL	8	8	8	8	807	39.29	80	327	35.08	129	95.0	48.7	1.05
Brown Trout	<200 mm	7	7	7	7	706	16.01	70	286	14.30	113	120.9	22.7	1.06
Brown Trout	≥200 mm	1	1	1	1	101	9.18	10	41	8.20	16	201.0	91.0	1.12
Brown Trout	ALL	8	8	8	8	807	26.18	80	327	23.38	129	130.9	32.4	1.07
Rainbow Trout	<200 mm	40	40	40	40	4,037	146.52	400	1,635	130.82	644	139.6	36.3	1.10
Rainbow Trout	ALL	40	40	40	40	4,037	146.52	400	1,635	130.82	644	139.6	36.3	1.10

Appendix OO. Population and Biomass Estimates for Little Spearfish Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above Timon Campgroud (1985 site 5)
Legal Description: S10,R1E,T4N
Stream Classification: BNT1

Date Sampled: 08 JUL 2008
Site Length 100
Mean Width (m): 3.0
Number of 1

Conductivity 440
pH: 8.5
Water Temperature 13.2
Air Temperature 25.5

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	58	58	58	58	1,963	75.04	580	795	67.01	933	146.4	38.2	1.10
Brown Trout	≥200 mm	20	20	20	20	677	93.82	200	274	83.77	322	239.4	138.6	0.99
Brown Trout	ALL	78	78	78	78	2,640	169.75	780	1,069	151.56	1,255	170.2	64.3	1.07

Site Number: 4 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Immediately upstream of Roughlock Falls parking lot.
Legal Description: S00,R00E,T
Stream Classification: BNT1

Date Sampled: 08 JUL 2008
Site Length 66
Mean Width (m): 4.9
Number of 1

Conductivity 450
pH: 8.4
Water Temperature 10.9
Air Temperature 25.2

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	82	82	82	82	2,529	92.64	1,242	1,024	82.72	1,999	133.8	36.6	1.04
Brown Trout	≥200 mm	30	30	30	30	925	116.40	455	375	103.93	731	229.7	125.8	1.02
Brown Trout	ALL	112	112	112	112	3,454	223.81	1,697	1,399	199.83	2,730	159.5	64.8	1.03

Appendix PP. Population and Biomass Estimates for East Spearfish Creek (Hanna).

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Downstream of the first bridge below Hanna Campground
Legal Description: S26,R2E,T4N
Stream Classification: BNT1

Date Sampled: 07 JUL 2008
Site Length 100
Mean Width (m): 4.2
Number of 1

Conductivity 399
pH: 8.6
Water Temperature 12.3
Air Temperature 16.0

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	143	143	143	143	3,376	84.39	1,430	1,367	75.35	2,301	124.3	25.0	1.03
Brown Trout	≥200 mm	23	23	23	23	543	84.67	230	220	75.60	370	242.5	156.0	1.03
Brown Trout	ALL	166	166	166	166	3,918	169.06	1,660	1,587	150.95	2,671	140.7	43.1	1.03

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above Campground (1/2 mile)
Legal Description: S35,R2E,T4N
Stream Classification: BNT2

Date Sampled: 03 JUL 2008
Site Length 100
Mean Width (m): 4.7
Number of 1

Conductivity 451
pH: 8.5
Water Temperature 9.3
Air Temperature 19.2

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	65	65	65	65	1,396	55.82	650	566	49.84	1,046	145.5	40.0	1.29
Brown Trout	≥200 mm	10	10	10	10	215	26.73	100	87	23.86	161	227.7	124.4	1.03
Brown Trout	ALL	75	75	75	75	1,611	82.54	750	653	73.70	1,207	156.5	51.2	1.25

Appendix QQ. Population and Biomass Estimates for Ward Draw.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1/2 mile above confluence with East Spearfish (1985 site 3)
Legal Description: S2,R2E,T3N
Stream Classification: BKT0

Date Sampled: 03 JUL 2008
Site Length 100
Mean Width (m): 2.0
Number of 1

Conductivity 439
pH: 8.5
Water Temperature 8.0
Air Temperature 19.9

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	80	80	80	80	4,018	62.44	800	1,627	55.75	1,287	102.8	15.5	1.12
Brook Trout	ALL	80	80	80	80	4,018	62.44	800	1,627	55.75	1,287	102.8	15.5	1.12

Appendix RR. Population and Biomass Estimates for Intake Gulch.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Approximately 200 m upstream of confluence with Spearfish
Legal Description: S6,R2E,T3N
Stream Classification: BKT0 BNT0

Date Sampled: 08 JUL 2008
Site Length 100
Mean Width (m): 3.5
Number of 1

Conductivity 479
pH: 8.3
Water Temperature 9.4
Air Temperature 22.4

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	27	27	27	27	780	20.30	270	316	18.13	434	124.9	26.0	1.04
Brook Trout	ALL	27	27	27	27	780	20.30	270	316	18.13	434	124.9	26.0	1.04
Brown Trout	<200 mm	4	4	4	4	115	1.82	40	47	1.62	64	113.8	15.8	0.94
Brown Trout	ALL	4	4	4	4	115	1.82	40	47	1.62	64	113.8	15.8	0.94

Appendix SS. Population and Biomass Estimates for Crow Creek (Trib. of Redwater).

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Above McNenny Hatchery effluent (1985 site 2)
Legal Description: S21,R1E,T7N
Stream Classification: BNT2 RBT1

Date Sampled: 28 JUL 2008
Site Length 100
Mean Width (m): 5.0
Number of 1

Conductivity 1237
pH: 8.1
Water Temperature 21.8
Air Temperature 30.2

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	31	31	31	31	625	27.34	310	253	24.41	499	122.4	43.8	1.11
Brown Trout	≥200 mm	14	14	14	14	282	55.89	140	114	49.90	225	265.5	198.1	0.96
Brown Trout	ALL	45	45	45	45	907	124.87	450	367	111.50	724	191.5	137.7	1.02
Longnose Sucker	ALL	3	3	3	3	60	25.91	30	24	23.13	48	354.7	428.7	0.96
Rainbow Trout	≥200 mm	9	9	9	9	181	177.87	90	73	158.82	145	417.7	981.0	1.16
Rainbow Trout	ALL	9	9	9	9	181	177.87	90	73	158.82	145	417.7	981.0	1.16
Green Sunfish	ALL	2	2	2	2	40	***	20	16	***	32	***	***	***
Longnose Dace	ALL	7	7	7	7	141	***	70	57	***	113	***	***	***
White Sucker	ALL	5	5	5	5	101	***	50	41	***	80	***	***	***

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 1 mile above Beaver Creek confluence
Legal Description: S9,R1E,T6N
Stream Classification: BKT0

Date Sampled: 29 JUL 2008
Site Length 100
Mean Width (m): 1.8
Number of 1

Conductivity 462
pH: 8.1
Water Temperature 19.4
Air Temperature 31.2

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	56	3.02	10	23	2.69	16	165.0	54.0	1.20
Brook Trout	ALL	1	1	1	1	56	3.02	10	23	2.69	16	165.0	54.0	1.20
Longnose Dace	ALL	22	22	22	22	1,228	***	220	498	***	354	***	***	***

Population and Biomass Estimates for Crow Creek (Trib. of Redwater). (Continued)

Site Number: 5 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Below McNenny Effluent
Legal Description: S16,R1E,T7N
Stream Classification: BNT2 RBT1

Date Sampled: 28 JUL 2008
Site Length 100
Mean Width (m): 5.8
Number of 1

Conductivity 1276
pH: 8.2
Water Temperature 19.2
Air Temperature 30.2

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	47	47	47	47	813	19.31	470	329	17.24	756	110.4	23.8	1.01
Brown Trout	≥200 mm	18	18	18	18	311	158.65	180	126	141.66	290	358.4	509.6	0.98
Brown Trout	ALL	65	65	65	65	1,124	473.60	650	455	422.87	1,046	304.5	421.3	0.98
Mountain Sucker	ALL	1	1	1	1	17	0.50	10	7	0.45	16	137.0	29.0	1.13
Rainbow Trout	<200 mm	1	1	1	1	17	0.22	10	7	0.20	16	112.0	13.0	0.93
Rainbow Trout	≥200 mm	4	4	4	4	69	49.47	40	28	44.17	64	406.0	715.0	1.03
Rainbow Trout	ALL	5	5	5	5	86	49.69	50	35	44.37	80	347.2	574.6	1.01
Green Sunfish	ALL	6	6	6	6	104	***	60	42	***	97	***	***	***
Longnose Dace	ALL	26	26	26	26	450	***	260	182	***	418	***	***	***

Appendix TT. Population and Biomass Estimates for Datum.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: 01-Private land
Legal Description: S00,R00E,T
Stream Classification: No Fish Captured

Date Sampled: 25 JUL 2008
Site Length 100
Mean Width (m): 2.0
Number of 1

Conductivity 580
pH: 8.4
Water Temperature 19.6
Air Temperature 28.8

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

Appendix UU. Population and Biomass Estimates for Beaver Creek (Law. Co.).

Site Number: 2 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Upstream of Beaver Crossing (1982 site 2)
Legal Description: S21,R1E,T5N
Stream Classification: BKT2

Date Sampled: 10 JUL 2008
Site Length 100
Mean Width (m): 2.6
Number of 1

Conductivity 250
pH: 8.3
Water Temperature 16.5
Air Temperature 28.1

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	94	94	94	94	3,615	91.33	940	1,464	81.55	1,512	121.5	25.3	1.13
Brook Trout	≥200 mm	3	3	3	3	115	16.88	30	47	15.08	48	232.7	146.3	1.07
Brook Trout	ALL	97	97	97	97	3,731	109.82	970	1,511	98.06	1,561	124.9	29.4	1.13
Longnose Dace	ALL	23	23	23	23	885	***	230	358	***	370	***	***	***

Appendix VV. Population and Biomass Estimates for Potato Gulch Creek.

Site Number: 1 Survey Completed by: South Dakota Game, Fish and Parks
Site Description: Immediately upstream of private land
Legal Description: S20,R1E,T5N
Stream Classification: BKT2 BNT0

Date Sampled: 01 JUL 2008
Site Length 100
Mean Width (m): 1.9
Number of 1

Conductivity 131
pH: 8.2
Water Temperature 16.2
Air Temperature 24.6

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	31	31	31	31	1,608	37.36	310	651	33.36	499	120.0	23.2	1.07
Brook Trout	≥200 mm	5	5	5	5	259	31.81	50	105	28.40	80	220.8	122.6	1.11
Brook Trout	ALL	36	36	36	36	1,868	69.17	360	757	61.76	579	134.0	37.0	1.07
Brown Trout	<200 mm	23	23	23	23	1,193	19.69	230	483	17.58	370	99.8	16.5	1.07
Brown Trout	ALL	26	26	26	26	1,349	22.26	260	546	19.87	418	99.8	16.5	1.07
Creek Chub	ALL	1	1	1	1	52	***	10	21	***	16	***	***	***
Longnose Dace	ALL	10	10	10	10	519	***	100	210	***	161	***	***	***