

**SOUTH**

**DAKOTA**



**Angler Use and Harvest Surveys on  
Spearfish Creek, South Dakota  
May – August 2010**

**South Dakota  
Department of  
Game, Fish and Parks**  
Wildlife Division  
Joe Foss Building  
Pierre, South Dakota 57501-3182

**Completion Report  
No. 11-05**

**Angler Use and Harvest Survey on Spearfish Creek, South Dakota,  
May-August, 2010**

By

Greg Simpson

Rapid City Regional Office  
South Dakota Department of Game, Fish and Parks.

Completion Report

Dingell-Johnson Project  
Job Numbers  
Date

F-21-R-43  
2109  
March 2011

Fisheries Program Administrator  
Geno Adams

Department Secretary  
Jeff Vonk

Division Director  
Tony Lief

Grants Coordinator  
Tanna Zabel

Chief of Fisheries and Aquatic Resources  
John Lott

## PREFACE

This is an annual report. Copies of this report and reference to the data is not for publication and can only be made with written permission from the author(s), Director of the Division of Wildlife, or the Secretary of the South Dakota Department of Game, Fish and Parks, Pierre, South Dakota 57501-3182.

The author would like to acknowledge the following individuals who assisted with the data collection, data entry, and editing this manuscript from the South Dakota Department of Game, Fish and Parks; Will Sayler, Andrew Haekin, Travis March, and an anonymous reviewer.

The collection of data for these surveys was funded, in part, by Federal Aid in Sport Fish Restoration, (D-J) project F-21-R, "Statewide Fish Creel Surveys".



## **EXECUTIVE SUMMARY**

This report includes angler use and harvest information from May 14 – August 13, 2010 for Spearfish Creek, South Dakota. Creel survey information is used in making management decisions by area fisheries managers. Determining angler harvest, catch and satisfaction was one purpose of this survey. Managers also wanted to know anglers opinions of the trout population in Spearfish Creek.

Fishing at Spearfish Creek totaled 5,673 hours from May 14 to August 13, 2010. This level of participation was higher than the last survey estimates of 3,194 hours in 2006. Brown trout harvest was estimated at 3,184. Brown trout catch rates per hour were 2.78 in town and 1.55 within Spearfish Canyon.

Angler satisfaction at Spearfish Creek was ninety-five percent and greatly exceeded the management goal of sixty-six percent. The 2010 satisfaction levels were greater than that of the last survey in 2006. Fewer anglers responded with “dissatisfaction” towards their fishing day. Anglers generally felt that the fish populations in Spearfish Creek were good to excellent.

## TABLE OF CONTENTS

PREFACE .....	3
TABLE OF CONTENTS .....	5
LIST OF TABLES .....	6
LIST OF FIGURES.....	7
INTRODUCTION.....	8
Goals of the 2010 Creel Survey .....	9
SAMPLING METHODS .....	10
Angler Use and Preference Survey .....	10
RESULTS & DISCUSSION.....	11
Angler Use .....	11
Angler Catch .....	12
Angler Harvest .....	15
Angler Satisfaction.....	16
Angler Demographics .....	18
RECOMMENDATIONS .....	19
LITERATURE CITED .....	20

## LIST OF TABLES

Table 1. History of total pressure (h), catch and catch rate (fish/hour) determined from creel surveys at Spearfish Creek within Spearfish Canyon, 2006 and 2010. ....	11
Table 2. Pressure estimates from the 2010 Spearfish Creek creel survey, by month. Estimated fishing pressure, expressed as angler-hours (+/- 95% confidence interval). ....	12
Table 3. Angler use and harvest estimates for surveys conducted on Spearfish Creek, within Spearfish Canyon, South Dakota during the summers of 2006 and 2010. All surveys were conducted during the May-August daylight period. ....	14
Table 4. History of creel survey values from Spearfish Creek, within Spearfish Canyon, 2006 and 2010. Estimated fishing harvest, and harvest rate as (fish/angler-h).....	15

## LIST OF FIGURES

Figure 1. Location of Spearfish Creek and surrounding roads in relation to the State of South Dakota.....	9
Figure 2. Estimated angling pressure by month in Spearfish Creek from May- August, 2010.....	12
Figure 3. Estimated brown trout catch by month in Spearfish Canyon from May- August, 2006 and 2010.	13
Figure 4. Catch rates of rainbow (RBT) and brown (BNT) trout in Spearfish Canyon from May- August, 2010.....	14
Figure 5. Estimated brown trout harvest in Spearfish Canyon by month from May- August, 2010. ....	16
Figure 5. Satisfaction of anglers fishing Spearfish Creek in 2006 and 2010.....	17
Figure 6. Angler responses to the question: “How would you rate the trout population in Spearfish Creek?” .....	18

## INTRODUCTION

Spearfish Creek, named by early pioneers who thought that it made for a good place to spear fish, flows northward within Lawrence County, for 72 Km until it reaches its terminus with the Redwater River (Figure 1). Resident and non-resident anglers pursue the wild trout within the reaches of this easily accessible stream. Spearfish Creek is one of the few waters in the Black Hills where natural reproduction of rainbow trout (*Oncorhynchus mykiss*) occurs and is sufficient to sustain a sport fishery. Brook trout (*Salvelinus fontinalis*) are found in the headwaters and brown trout (*Salmo trutta*) exist throughout much of the creek. This fishery is a destination for anglers. This survey was designed to determine the angler use, harvest and satisfaction at Spearfish Creek during the summer of 2010.

The Black Hills Trout Management Area refers to a management area surrounding the Black Hills of South Dakota and encompasses nearly all coldwater trout fisheries in western South Dakota. In creeks, the number of trout and trout species are separated into different management classifications. For example, in the headwater of Spearfish Creek the dominant species is brook trout. These fish populations are normally characterized as consisting of numerous, small individuals and have a management classification of BK1 where the number of wild brook trout is greater than 25 per acre. Downstream the species composition changes when brook trout are replaced with wild brown trout and some occasional wild rainbow trout. These species are in such numbers that the trout classification now becomes BN1 and RT1; number of brown trout (>8 inches) exceeds 150 per acre and number of rainbow trout (>8 inches) exceeds 25 per acre, respectively.

Spearfish Creek has geochemical characteristics that make it unique among streams of the Black Hills (Sieverding 2002). Calcium carbonate precipitates during the summer months with the increase in temperature. Combining with the organic layer of algae present in the summer, the calcium carbonate forms a rind that binds sediment of Spearfish Creek. This partially inhibits the fall spawning brown trout by reducing the area where spawning can occur. During the winter, the calcium carbonate is kept in solution due to its solubility in cold water. Anchor ice and the decay of organic material also break up the rind that has formed during the warmer summer periods. The subsequent voids break up during spring flows and occur when spring spawning rainbow trout attempt to spawn. As a result, Spearfish Creek is one of the few Black Hills streams where rainbow trout are able to successfully compete with brown trout.

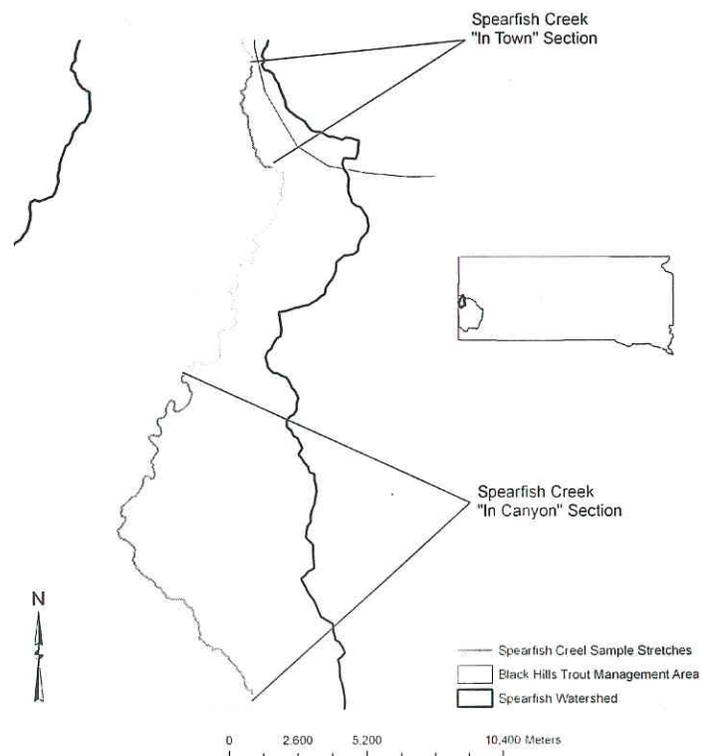
Habitat work in the form of reconstruction of still water areas and instream work has been done in the past decade. In some instances these applications have been highly visual (notably Savoy Intake) and apparent to the public, whereas other development projects are less noticeable by the public (e.g. instream rock placements). Determining the extent of the improvement on the fish populations or increased use by the public is important to justify the expenditures. Experience with these projects and future work is dependent on past successes or knowledge gained from these earlier works.

This study evaluated angler attitudes towards the fish populations in Spearfish Creek. Specific questions to determine angler satisfaction and angler view towards the number of trout present in the creek were asked of all interviewed anglers. Throughout this report the term “creel” refers to a similar name “angler use.”

### Goals of the 2010 Creel Survey

1. Quantify angler use at Spearfish Creek during the summer of 2010.
2. Determine angler catch and harvest of brown trout, rainbow trout and brook trout from Spearfish Creek.
3. Determine angler satisfaction at Spearfish Creek during the summer of 2010.  
Our management objective is to maintain or exceed angler satisfaction on Black Hills waters at the 2003 average of sixty-six percent.
4. Determine angler attitudes towards the number of trout present in Spearfish Creek.

### Location of Sample Reaches along Spearfish Creek in South Dakota



**Figure 1. Location of Spearfish Creek and surrounding roads in relation to the State of South Dakota.**

## **SAMPLING METHODS**

### **Angler Use and Preference Survey**

A full time creel clerk was assigned to Spearfish Creek from May 14 to August 13<sup>th</sup>, 2010. A creel survey is comprised of two independent parts, instantaneous pressure counts and angler interviews conducted between pressure counts. Each creel shift consisted of two random pressure counts. Interviews were only conducted with those anglers who had completed their fishing trip. Angler interviews provided information on trip length, species caught, numbers of fish caught and released, angling method, angler preferences and angler satisfaction.

A stratified random creel survey was used. Creel days were throughout the week and were divided into two strata: 1) weekend/holiday and 2) weekdays. Emphasis was placed on weekends with both days receiving creel attention. It was believed that there would be a greater chance of interviewing anglers during these times. Days were stratified by AM and PM shifts. Half of all shifts, on a monthly basis, were randomly assigned to be conducted in the AM and half were conducted in the PM during daylight hours. Spearfish Creek was divided into two sampling reaches. The first reach (in town) was from the power generating outlet within the city park of Spearfish and continued until the creek reached the interstate (Figure 1). The second reach started at Cheyenne Crossing and continued downstream to Maurice Intake Dam. The length of sampling for reach 1 was 4,900 meters in length and reach 2 was 19,107 meters in length.

Anglers were asked two preference questions during the 2010 Spearfish Creek Creel Survey.

1. Considering all factors, how satisfied are you with your fishing trip today? (Very satisfied, Moderately satisfied, Slightly satisfied, Neutral or no opinion, Slightly dissatisfied, Moderately dissatisfied, or Very dissatisfied)
2. How would you rate the trout population in Spearfish Creek? (very poor, poor, fair, good, excellent).

The South Dakota Department of Game, Fish and Parks analyzed all information after entering into Creel Application Software (CAS) Creel Survey Data Entry/Analysis Program (Soupir and Brown, 2002).

## RESULTS & DISCUSSION

### Angler Use

Within Spearfish Canyon, fishing pressure (hours) increased from 3,194 in 2006 to 5,673 in 2010 (Table 1). In 2006, forty-four percent of anglers on Spearfish Creek responded that they were fishing for trout with only twenty percent fishing for rainbow trout, sixteen percent targeting brown trout and twenty percent for anything that bites. In 2010, most anglers (seventy-five percent) identified brown trout as their target with twenty-three searching for rainbow trout. Only one percent of anglers were fishing for brook trout or “anything” during the 2010 survey.

Water levels in many Black Hills waters were greatly affected by a regional drought during the early and mid-2000 (U.S. Drought Monitor at <http://drought.unl.edu/dm/monitor.html>). Spearfish Creek appears to have been impacted less than other Black Hills streams. Cold water of high quality (e.g. temperature, non polluted) supplies this stream from underground aquifers in the limestone region. Higher catch rates for both rainbow and brown trout were seen in 2010 compared to 2006 for the same area of Spearfish Creek (Table 1). The increase in angling pressure indicates a near two-fold increase between 2006 and 2009 surveys. Several explanations could clarify this occurrence, such as new anglers attracted to the area, fewer anglers participating during the drought or an increase in anglers in general. The exact reasons are unknown, but the net effect was a higher participation or at least more hours of fishing by anglers.

Fishing in Spearfish Creek exists primarily from natural yield of trout. Only in specific instances, such as the reconstruction of Savoy Weir and summer stocking of Iron Creek Lake, has there been any recent hatchery released trout in the watershed. The natural production of brown trout has been the mainstay of the fish population within the sampling area. Rainbow trout are also present and are likely due to a combination of factors such as the occurrence of anchor ice and algal decomposition which breaks up the calcification in the bed material and the presence of feeder creeks that provide a nursery area for these spring run trout (Sieverding 2001, James 2007).

Table 1. History of total pressure (h), catch and catch rate (fish/hour) determined from creel surveys at Spearfish Creek within Spearfish Canyon, 2006 and 2010.

	Pressure (h)	Rainbow Trout		Brown Trout	
		Catch	Catch Rate	Catch	Catch Rate
2006	3,194	875	0.27	1,997	0.10
2010	5,673	98	0.14	8,801	2.78

Angling pressure differed between the two sampling reaches of Spearfish Creek in 2010. For every studied month there was greater fishing pressure in Spearfish Canyon than in the town of Spearfish (Table 2, Figure 2). Combined, the hours of fishing were lowest in May, increased in June and thereafter remained high. The lower estimate of pressure for

May could be from the tourist season just starting. Over three times the angling pressure occurred throughout the summer in Spearfish Canyon compared the in town reach.

Table 2. Pressure estimates from the 2010 Spearfish Creek creel survey, by month. Estimated fishing pressure, expressed as angler-hours (+/- 95% confidence interval).

Stream Section	Month				Totals
	May	June	July	August	
Canyon	1,278 (788)	1,820 (1,258)	1,368 (529)	1,207 (1,869)	5,673 (2,445)
Town	350 (290)	242 (475)	459 (486)	767 (1,196)	1,818 (1,406)
Totals	1,628	2,062	1,827	1,974	7,491

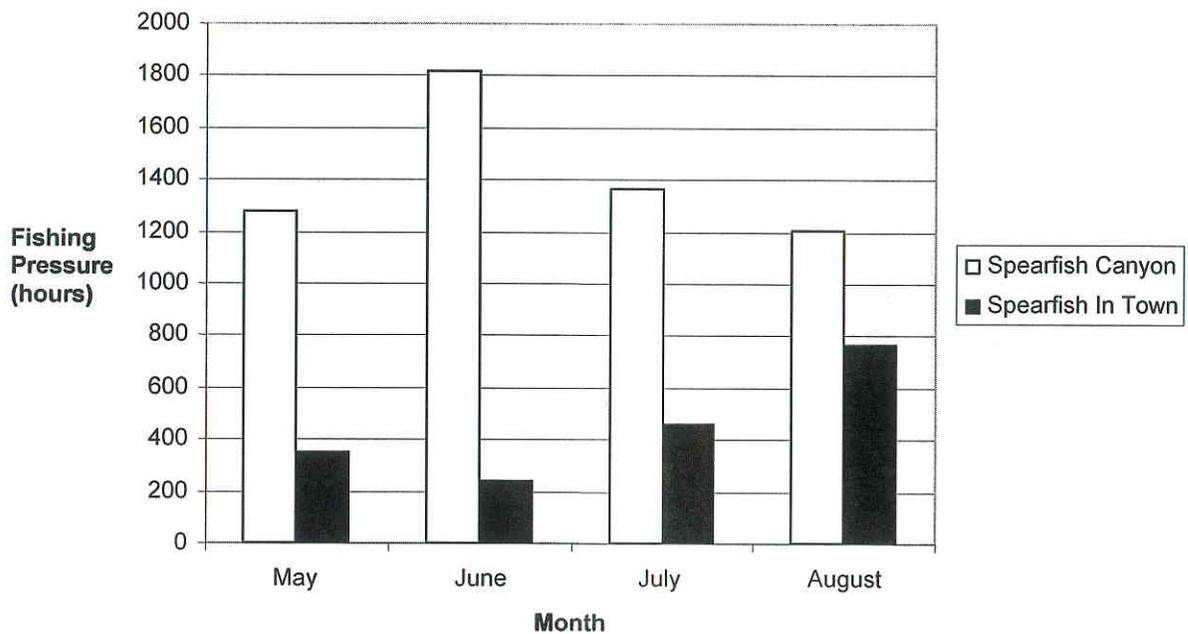


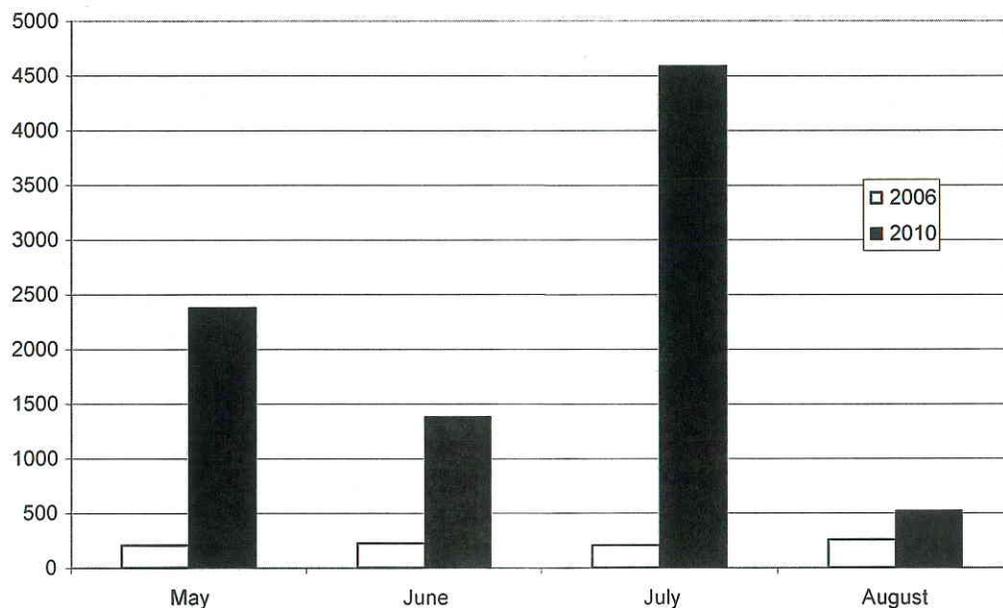
Figure 2. Estimated angling pressure by month in Spearfish Creek from May-August, 2010.

### Angler Catch

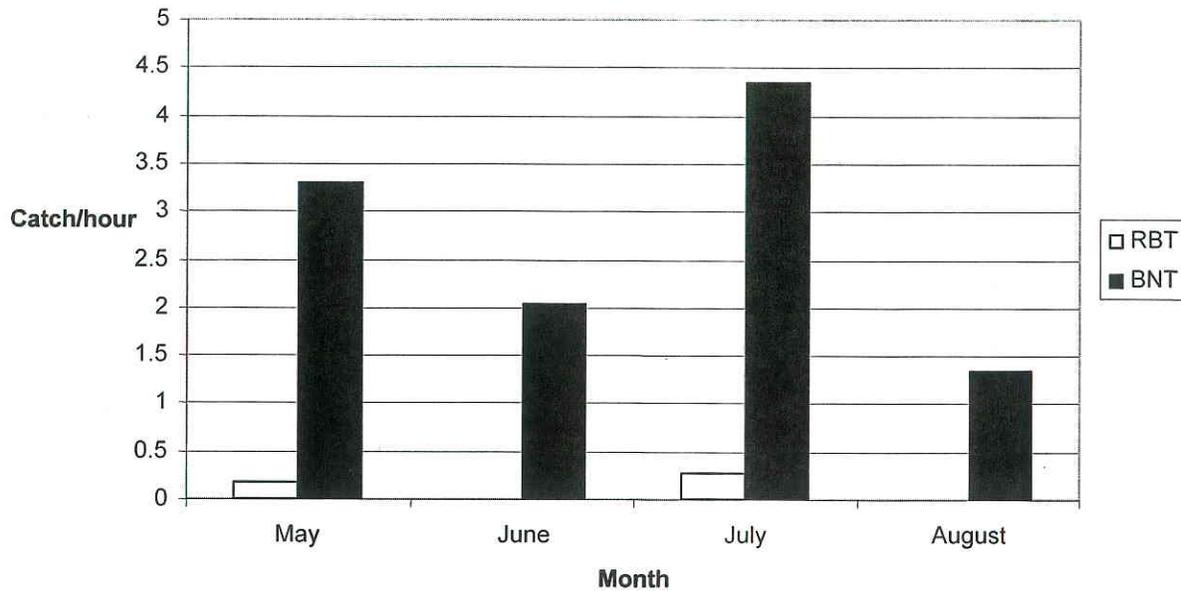
Catch is one of four categories of yield information that can be of great value for managers (Lagler 1956). Changes in fishing regulations, stocking evaluations, and

habitat improvements are just some of the uses of catch in fisheries management. During the summer of 2010 estimated brown trout catch was 8,801 (Table 3). This was an increase over the estimated catch in 2006 of 2,493. Brown trout were the most common fish caught by anglers in 2010. Rainbow trout and an occasional brook trout also contributed to the fishery of Spearfish Creek. Brown trout catch was highest in July 2010 with fewer brown trout caught in May, June and August (Figure 3).

The catch rate is also important to managers. Catch rate can be used as a descriptor to define angler activity (Lockwood 2004). Catch rate can also be used to determine sampling design problems. Anglers that are more skilled do have a greater chance of attaining their limit of fish for a given period of time and may account for bias in certain creel surveys such as when to collect data using a roving method. Catch rates of brown trout in Spearfish Creek were highest in July at almost four and one half fish per hour (Figure 4). In May, anglers were catching fish at over three fish per hour and June at just over two fish per hour. Catch rates in August were much lower at 1.4 fish per hour.



**Figure 3. Estimated brown trout catch by month in Spearfish Canyon from May-August, 2006 and 2010.**



**Figure 4. Catch rates of rainbow (RBT) and brown (BNT) trout in Spearfish Canyon from May- August, 2010.**

Table 3. Angler use and harvest estimates for surveys conducted on Spearfish Creek, within Spearfish Canyon, South Dakota during the summers of 2006 and 2010. All surveys were conducted during the May-August daylight period.

	2006*	2010
Interviews	67	76
Mean Party Size	1.79	2.42 (Canyon) 1.57 (Town)
Trip Length (h)	1.71	2.29 (Canyon) 2.29 (Town)
Total Pressure (h)	2,509	5,673 (Canyon) 1,818 (Town)
Catch	2,493	8,801
Mean Distance Traveled	310 miles	638 miles
Resident Use (%)	57	43

\* Effort differences between two surveys: 2006 survey comprised of 20 hours per week, 2010 survey comprised of 40 hours per week.

## Angler Harvest

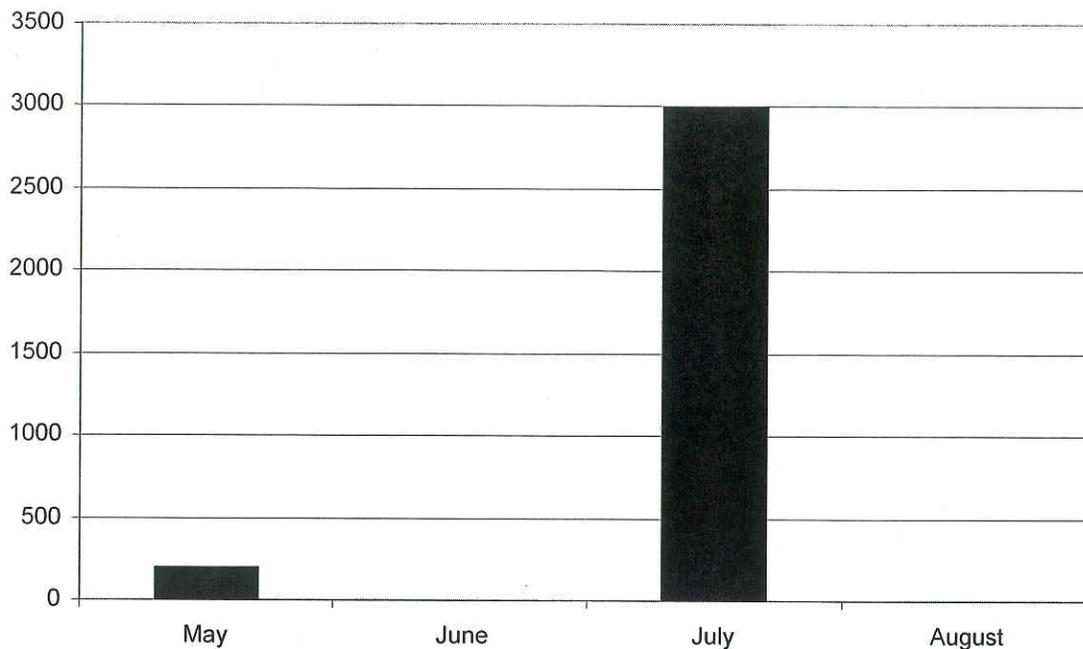
Harvest of fish is an important indicator of overfishing. Past studies have shown that stream anglers in the Black Hills keep few fish (Simpson 2007). Yet harvest is still an important measure as the potential of overuse could cause drastic declines that would take several years to reverse, especially in a creek managed under natural yield.

Malvesto (1983) noted that harvest was a component of catch and, specifically, was the portion of caught fish that are not returned to the water. Gathering long term data on harvest of a wild trout population can be used to validate the relative population when used in combination with population survey data. Often harvest is broken down into a specific rate that fish are caught per unit period, such as harvest per hour (Ricker 1975).

Harvest of rainbow trout is not high in Spearfish Creek (Table 4). In 2006 three rainbow trout were estimated to have been harvested and there were none in 2010. Brown trout harvest estimates varied greatly between the two creel surveys. Ten brown trout were estimated to have been harvested in 2006 and this estimate increased to 3,184 in 2010 (Table 4, Figure 5). While this large increase and corresponding high harvest rate may appear to be an alarming increase, many of these trout were harvested from Savoy Intake. Savoy Intake is a newly renovated pond within Spearfish Canyon and has improved access which many anglers and visitors enjoy. During the creel survey in 2006, Savoy Intake was under construction and it is certainly feasible that anglers were simply not fishing and thus, not harvesting trout from the creek system. Examination of this trend should occur during the next survey and determine if the 2010 data is an anomaly or a common aspect of this fishery.

Table 4. History of creel survey values from Spearfish Creek, within Spearfish Canyon, 2006 and 2010. Estimated fishing harvest, and harvest rate as (fish/angler-h).

	Rainbow Trout		Brown Trout	
	Harvest	Harvest Rate	Harvest	Harvest Rate
2006	3	0.001	10	0.003
2010	0	0	3,184	0.56



**Figure 5. Estimated brown trout harvest in Spearfish Canyon by month from May-August, 2010.**

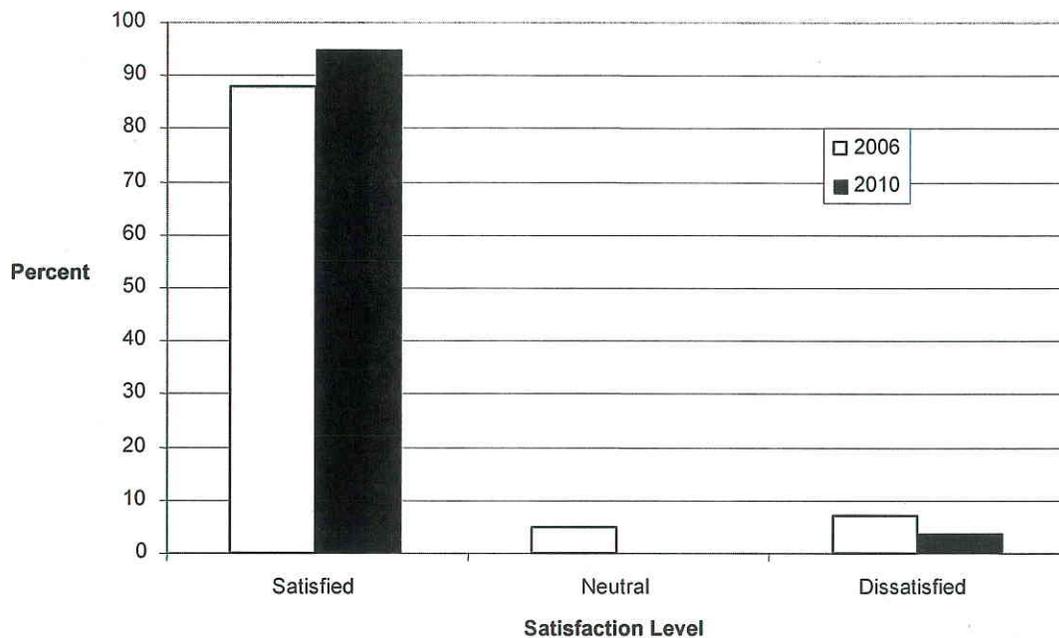
### **Angler Satisfaction**

For nearly twenty years angler attitudes and satisfaction have been measured for Black Hills fisheries. Assessing the opinions of anglers is important to managers because it can determine what the anglers want and might provide management direction. In 2009, the South Dakota fisheries staff decided that one standardized question needed to be asked in all future creel surveys. Statewide opinions can be compared in an overall sense and not just for the particular water or survey. Other questions asked during the 2010 Spearfish Creek Creel Survey were determined from a consensus of fisheries managers in an attempt to obtain information on hatchery practices and angler preferences.

Angler satisfaction at Spearfish Creek is high (Figure 6). Satisfaction percentage increased from eighty-eight to ninety-five from 2006 to 2010. Dissatisfied anglers decreased from seven to four percent during this same time period. Neutral opinions to the question dropped from five percent to zero. It should be noted that there was construction work being done at the popular Savoy Intake area during the 2006 survey and this may have had an impact on satisfaction levels at that time.

Recent creel surveys on Black Hills waters have measured angler satisfaction and the need for this information for fisheries management (Simpson 2009). Satisfaction can be

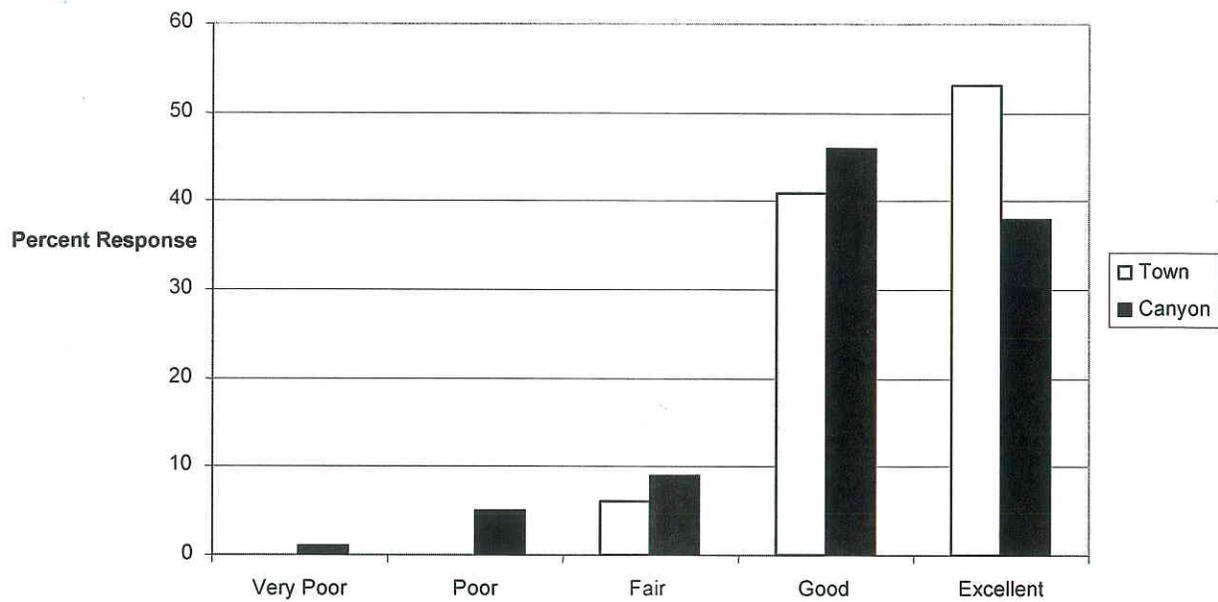
influenced by many different factors, includes many aesthetic aspects of fishing such as beauty of the area and weather. Other works have shown that there are several types of anglers that use the Black Hills (Gigliotti 1997). Acknowledging that these different angling types exist is important as they each will have different goals or preferences towards fishing. Specific surveys in the Black Hills and across the state have been used to measure the average satisfaction of anglers (Gigliotti 1997, 2003, and 2006). Gigliotti (2003) conducted an extensive statewide survey of South Dakota anglers who actually fish in the Black Hills and calculated a satisfaction level of sixty-six percent. Anglers fishing Spearfish Creek in 2006 and 2010 expressed a satisfaction level of ninety-five percent, much higher than that reported by Gigliotti.



**Figure 6. Satisfaction of anglers fishing Spearfish Creek in 2006 and 2010.**

Starting in 2007, public concerns about the number of trout in Spearfish Creek were received by Game, Fish and Parks personnel (Jerry Wilhite, pers. comm., February 20, 2010). Other anglers reported that they were catching fish in good numbers. Stream fisheries survey data was collected in the fall of 2008 along much of the mainstem of Spearfish Creek. Data from many of the sample sites showed an abundance of many age classes of trout and the overall population was adequate for perceived angling pressure (Bucholz and Wilhite 2009). The 2010 Spearfish Creel survey allowed for further investigations into the perceived problem of trout populations in Spearfish Creek.

Managers wanted to know the anglers perceptions of the trout populations in Spearfish Creek. Anglers responded, in general, that they felt the trout populations were quite good (Figure 7). Well over eighty percent of anglers felt that trout populations were good to excellent. Few anglers surveyed thought that the trout were doing poorly in Spearfish Creek. This survey helps to confirm that there are only a small number of anglers that feel trout are lacking in Spearfish Creek during the time of this study.



**Figure 6. Angler responses to the question: “How would you rate the trout population in Spearfish Creek?”**

### Angler Demographics

A greater number of nonresident anglers fished Spearfish Creek in 2010 than in 2006 (Table 3). Fifty-seven percent of anglers were residents in 2006. In 2010, resident anglers made up forty-three percent of those surveyed. This trend was not only seen in the general demographic data of residency but also in the mean distance of travel. Anglers journeyed over twice the distance in 2010 (mean = 638) compared to 2006 (mean = 310). Most anglers were either young adults or middle aged. Forty-one percent of anglers did not catch any brown trout in 2010. Party size (2.42) and trip length (2.29) was an increase over the 2006 survey.

## **RECOMMENDATIONS**

1. Schedule follow-up creel surveys for 2015 to determine trout harvest, catch and angler satisfaction levels. Determine the amount of fishing pressure and what sections of Spearfish Creek receive the greatest efforts.
2. Continue to monitor the fishery using catch as an emphasis in future creel surveys.
3. Angler satisfaction should be monitored during all creel surveys. Efforts should be made to maintain the high satisfaction levels observed in this study.
4. Schedule future fisheries management survey work during the fall of 2011 to monitor fish populations. Electrofishing in similar units as in 2008 will allow for comparison and also yield information on the fish populations throughout this system.
5. Continue to manage the Spearfish Creek fishery as a natural yield fishery. The natural product appears to be satisfactory in maintaining trout populations under the current harvest and natural mortality seen within the creek.

## LITERATURE CITED

- Bucholz, M., and J. Wilhite. 2009. State Fisheries Surveys, 2008 Surveys of Public Waters Part I Streams Region. D.J. Report No. 09-09
- Gigliotti, L.M. 1997. "What Black Hills Anglers Think: What's important to them". South Dakota Conservation Digest. July-August 64(4): 5-9.
- Gigliotti, L.M. 2003. . Fishing in South Dakota: 2003 Statewide Fishing Activity, Harvest and Angler Opinion Survey. HD-6(2)-04.
- Gigliotti, L.M. 2006. Resident Fishing in South Dakota - 2006. Annual, Combination, Senior, and Jr. Combination Licenses, Special Focus on the Black Hills HD-7-07.AMS, South Dakota Game, Fish and Parks. Pierre.
- James, D.A. 2007. Spearfish Creek Rainbow Trout Radio-Telemetry Study. D.J Report No. 07-28.
- Lagler, K.F. 1956. Freshwater Fishery Biology (2<sup>nd</sup> ed.). Dubuque, IA: WM.C. Brown Company.
- Lockwood, R. N. 2004. Comparison of access and roving catch rate estimates under varying within-trip catch-rates and different roving minimum trip lengths. Michigan Department of Natural Resources, Fisheries Research Report 2069, Ann Arbor.
- Malvestuto, S.P. 1983. Sampling the Recreational Fishery. *In*: Nielson, L.A. and Johnson D.L. Fisheries Techniques. Bethesda, American Fisheries Society. p397-419.
- Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Department of the Environment, Fisheries and Marine Service, Fisheries Research Board of Canada Bulletin 191, Ottawa, Canada.
- Sieverding, H.L. 2001. Encironmental Controls on Fish Spawning Habitat in Spearfish Creek between Hydro No. 2 and Maurice Intake. (Masters Thesis, South Dakota School of Mines and Technology, 2001).
- Simpson, G. 2009. Summary of Angler Use and Harvest Surveys for selected Black Hills waters with revised results from previous surveys, May 2006 – September 2007. D.J. Completion Report No. 09-05.
- Soupir, C.A., and M.L. Brown. 2002. Comprehensive evaluation and modification of the South Dakota angler creel program. South Dakota Department of Game, Fish and Parks, Wildlife Division, Completion Report, Pierre.