SOUTH DAKOTA FISHERIES

Angler Use and Harvest Surveys on Deerfield Reservoir, 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. 11-01

Angler Use and Harvest Survey on Deerfield Reservoir, South Dakota, May-August, 2010

By

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Completion Report

Dingell-Johnson Project	F-21-R-43
Job Numbers	2109
Date	January, 2011

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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 Copies of this report and reference to the data is not for publication and can only be made with written permission from the author(s), Director of the Division of Wildlife, or the Secretary of the South Dakota Department of Game,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; Travis March, Andrew Haekin, and anonymous reviewers.

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

Angler use and harvest (creel) survey information from May 14th to August 12th, 2010 are included in this report. Creel information is used in combination with other fisheries data to make management decisions in the Black Hills. Angler harvest, catch, and satisfaction are all criteria utilized in decisions and determining this information were the purpose of this report. The movement of aquatic nuisance species (ANS) can be traced to boat movement and managers wanted to known the likelihood of ANS being transmitted into the higher Black Hills or at least how vulnerable this habitat area would be to ANS. Thus, biologists wanted to know which lakes people were using their boats in prior to Deerfield Reservoir. Seventy-five percent of anglers reported that they previously had only used their boat at Deerfield Reservoir. Other Black Hills waters were noted as the other predominant water where boats were last used.

Angler use at Deerfield Reservoir totaled 20,616 hours from May 14 to August 12, 2010. This pressure was much higher than the survey conducted in 2009 which was 16,156 hours. Rainbow trout harvest was 34 percent of stocked fish with a catch rate of 0.56 trout/hour. Yellow perch were harvested at a rate of over three fish per hour in August. Rainbow trout catch and harvest numbers was the highest during May and lowest in August. Yellow perch had the highest catch and harvest during August.

Overall angler satisfaction at Deerfield Reservoir was 90% and greatly exceeded the management goal of 66%. Similar angler satisfaction was observed in 2009.

Anglers reported last using their boat at Deerfield Reservoir seventy-five percent of the time. Sheridan Lake, Pactola Reservoir, and Stockade Lakes were represented at less than 10% each.

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INTRODUCTION

Lying in the limestone outcropping of the Black Hills of South Dakota rests Deerfield Reservoir. At 167 hectares, Deerfield Reservoir is the second largest reservoir in the Black Hills of South Dakota. The Deerfield Reservoir region, which is the upper reaches of the Rapid Creek watershed, is a destination for anglers, hikers and other outdoor pursuits. Deerfield Reservoir is an important fishery for many anglers throughout the year including ice anglers during the winter months and shore and boat anglers during the summer months.

An angler use and harvest (creel) survey is a common way for managers to obtain information on angler use, harvest and satisfaction of a fishery. Managers have used creel surveys for different reasons including obtaining data on regulations, stocking evaluation and a few attempts at sampling many different waters in the same year (Simpson 2004, 2005, and 2009). The most common reason for sampling the angler in the Black Hills of South Dakota has been to answer specific management questions.

Trout management of Deerfield Reservoir has changed over the years. After dam completion and after rotenone projects, Deerfield Reservoir was managed with fingerling rainbow trout (*Oncorhynchus mykiss*) stockings as a put-and-grow fishery. Slow growth and poor angler satisfaction lead to a change from a put-and-grow to a put-and-take fishery for rainbow trout. Other species found in Deerfield Reservoir include white sucker (*Catostomus commersonii*), rock bass (*Ambloplites rupestris*), and yellow perch (*Perca flavescens*); which have all increased in numbers during the history of the reservoir. Splake (*Salvelinus namaycush X S. fontinalis*) are also stocked as a way to control introduced species and to provide another trout species for anglers. Brook trout (*Salvelinus fontinalis*) reside in natural populations above the reservoir. The problem of the menagerie of species found in Deerfield Reservoir is that managed trout survive less and grow slower when other species are present. Managers presume that there is an interaction or competition of resources between trout and other species.

Catchable trout stockings have occurred for several years (1999-current) in Deerfield Reservoir. Average trout length is 279 mm (11-inches) when stocked. It was noticed during earlier sampling surveys that there were trout seen that were less than the stocked length. Investigations into the differences in fish length began in 2010. Spring run rainbow trout were captured and were surgically implanted with Passive Integrated Transponder (PIT) tags. Each trout stocking had a segment implanted with PIT tags as well. Angler data from 2009 and 2010 and PIT tags that were obtained from anglers and noted by creel clerks in 2010 will be incorporated into the study. This study should determine the contributions of natural trout to the Deerfield Reservoir fishery.

There were four goals and one management objective for the Deerfield Reservoir creel survey. These were:

Goals of the 2010 Creel Survey

1. Quantify angler use at Deerfield Reservoir during the summer of 2010.

2. Determine angler harvest of rainbow trout and other species in Deerfield Reservoir.

3. Determine angler satisfaction at Deerfield Reservoir during the summer of 2010. Our management objective is to maintain angler satisfaction on Black Hills reservoirs at the 2003 average of 66%.

4. Gather information to be used in determining the contribution of wild trout to the Deerfield Reservoir fishery.

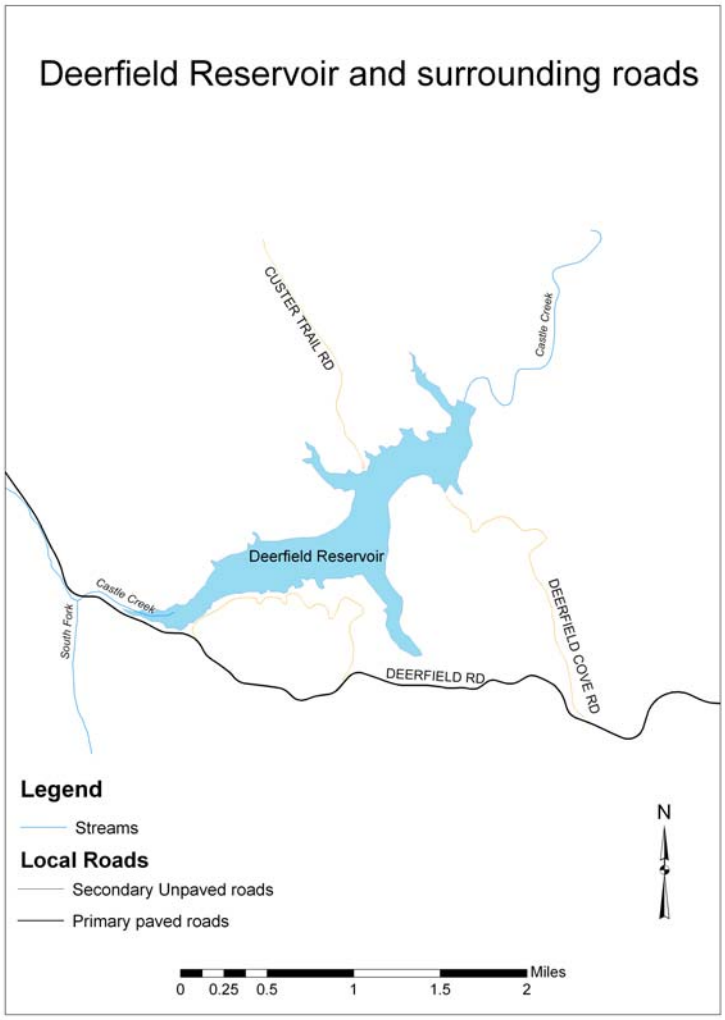

Figure 1. Geographical location of Deerfield Reservoir and surrounding access roads.

SAMPLING METHODS

Angler Use and Preference Survey

An angler use and preference (creel) survey was conducted from May 14th to August 11th, 2010. The creel survey was 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 angler groups that had completed fishing. Angler interviews provided information on trip length, species caught, number of fish caught and released, angling method, angler preferences, and angler satisfaction.

A stratified random creel survey was used. Creel surveys were conducted throughout the week and were divided into two strata: 1) weekend/holiday and 2) weekdays. Emphasis was placed on weekends with both days being sampled. Past surveys have noted that there are more anglers fishing on the weekends and a subsequent increase in completed interviews. Days were divided by AM and PM shifts with half of shifts, on a monthly basis, randomly assigned to be conducted in the AM and half were conducted in the PM during daylight hours.

Anglers were asked two preference questions during the 2010 Deerfield Reservoir Creel Survey. The following are the questions that were asked of anglers and the possible answers that they were given during the interview process.

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. Other than this lake, where was the last place you launched your boat?

Question One was asked during all angler use surveys across the state. Angler satisfaction across many years of surveys aids with management direction and other factors; such as demographic changes in relation to satisfaction. Managers and other Department personnel also wanted to know the extent of boat movement from one lake to Deerfield Reservoir to document the possible routes aquatic nuisance species (ANS) may follow. Aquatic nuisance species are being transported to new waters by angler boats and there may be educational opportunities geared to reduce these threats. Boat anglers were asked during the interview process Question Two which provided information on the possible movement vectors for ANS in and across Black Hills watersheds.

Data was analyzed using the Creel Application Software (CAS) Creel Survey Data Entry/Analysis Program (Soupir and Brown 2002).

RESULTS & DISCUSSION

Angler Use

Total estimates of angling pressure (h) increased from 16,156 h in 2009 to 20,616 h in 2010 (Table 1). Between months, estimated pressure was higher in 2010 than in 2009 for all time periods except June (Figure 2). Ninety-one percent of anglers were targeting rainbow trout in 2009 and this decreased to forty-four percent in 2010 (Figure 3, Table 2). More anglers responded in 2010 that they were targeting "anything" rather than rainbow trout.

Trout stocking rates and sizes did not change over the two sampling years. Population characteristics of other species present remained similar during the two consecutive summers. Other targeted species by anglers remained relatively unchanged between years. The same creel clerk collected data for both years which should reduce and limit bias of data collected.

Table 1. History of creel survey values from Deerfield Lake, 2009 and 2010. Estimated fishing pressure, expressed as angler-hours (h), catch as (fish/angler-h), harvest as (fish/angler-h) and trip length in hours.

		Rainbow Trout			
	Pressure (h)	Catch	Harvest	Catch Rate (catch/hr)	Harvest Rate (harvest/hr)
2009	16,156	2,638	1,600	0.40	0.25
2010	20,616	8,883	3,578	0.86	0.56

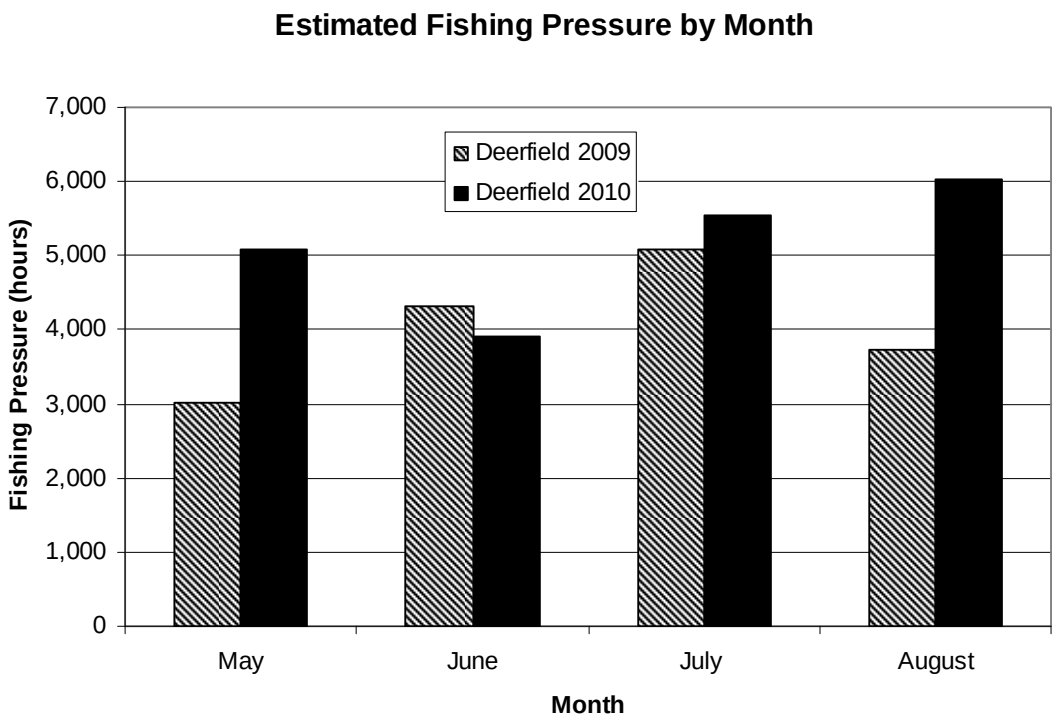

Figure 2. Estimated fishing pressure by month for Deerfield Reservoir, May-August 2010. May and August were only sampled for one-half of the month.

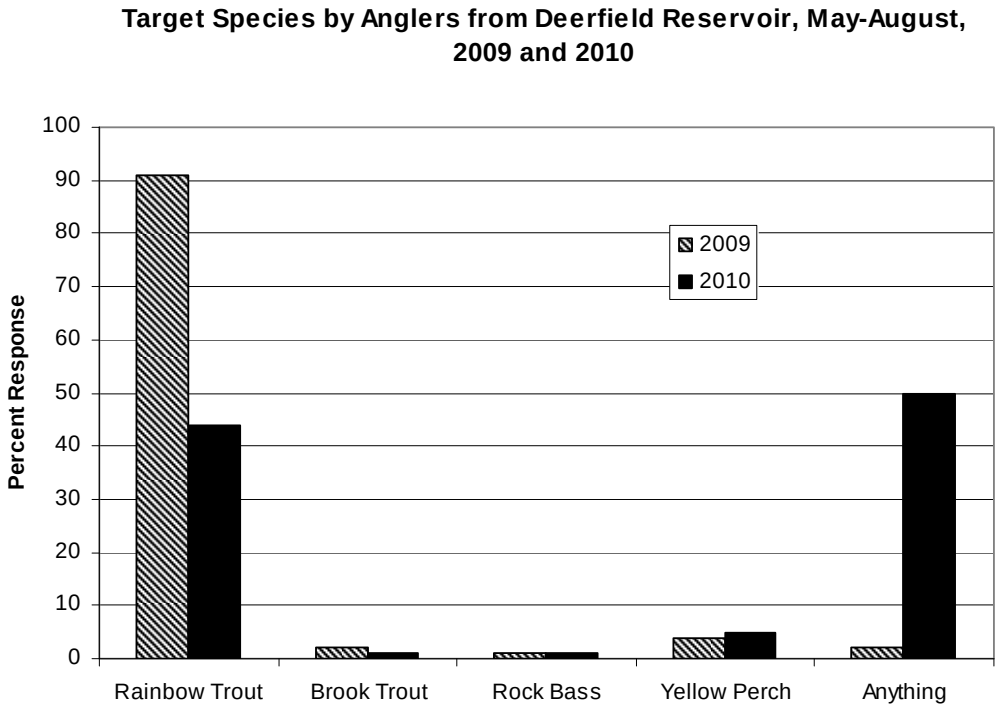

Figure 3. Percent of angler targeted species for Deerfield Reservoir, May – August, 2009 and 2010. May and August were only sampled for one-half of the month.

Angler Harvest

Harvest is a component of the total catch and is defined at the portion of caught fish that are not returned to the water (Malvesto 1983). Previous management goals for the Black Hills fisheries were to have 75% of catchable trout harvested by anglers (South Dakota Department of Game, Fish and Parks, and Bureau of Sport Fisheries Management 1965). Harvest of trout was an important historic measure of success of a hatchery stocking. Long-term harvest data has value in two regards. One regard describes much of a stocked product is used by the public. The second regard is an aid to validate relative population status of wild or carryover populations when associated with population survey data. Total harvest is broken down into the rate that fish are caught per unit period (Ricker 1975).

Estimated harvest of rainbow trout increased over 2.5 times from 2009 to 2010 (Table 1). The estimated harvest of rainbow trout in 2009 was thirteen percent of the rainbow trout stocked. In 2010, the estimated angler harvest of rainbow trout was thirty-four percent of the annual stocking. The harvest rate for trout also increased from 0.25 trout per hour in 2009 to 0.56 in 2010 (Table 1).

Estimated harvest of rainbow trout varied across the summer (Figure 4). In May, there were over 2,000 trout harvested by anglers. Harvest dropped throughout the summer months for rainbow trout to zero in August. Yellow perch harvest shows the opposite trend to the rainbow trout harvest. Yellow perch harvest was low in May, June, and July and then was extremely high in August.

Similar to these results was the harvest rate of rainbow trout and yellow perch (Figure 5). Rainbow trout were caught at nearly 1.25 trout per hour in May and these catch rates decreased for the months of June and July with a slight increase in August. Yellow perch catch rates were low throughout the summer until August when they increased to over three fish per hour.

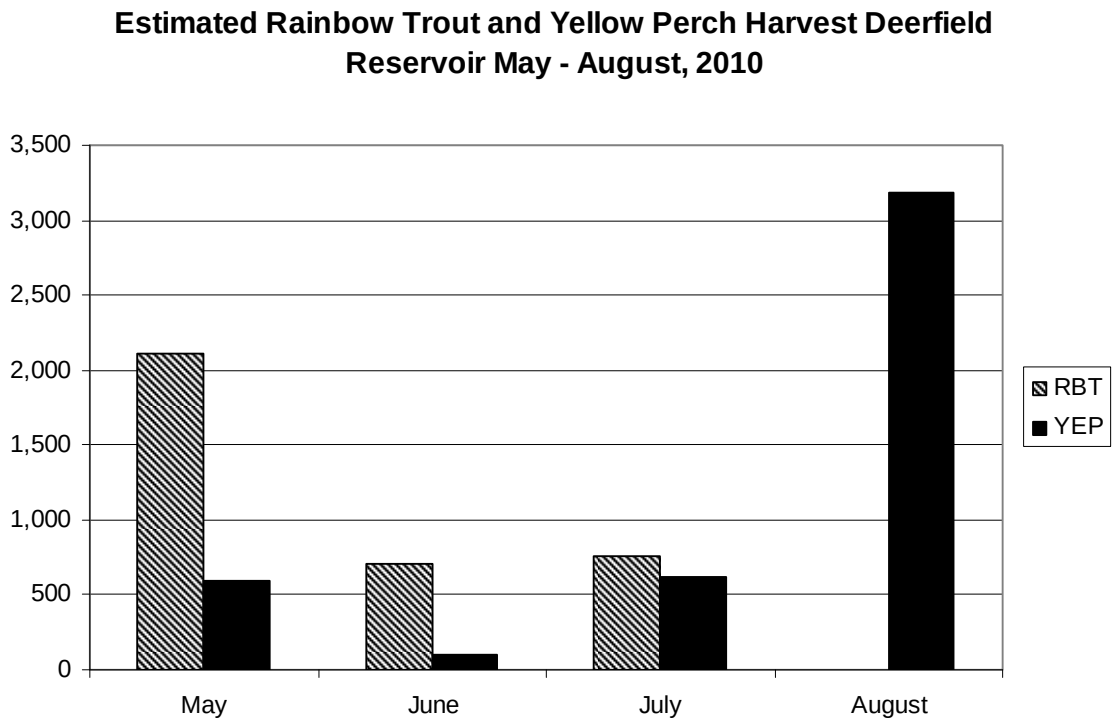

Figure 4. Estimated rainbow trout and yellow perch harvest from Deerfield Reservoir, May – August 2010. May and August were only sampled for one-half of the month.

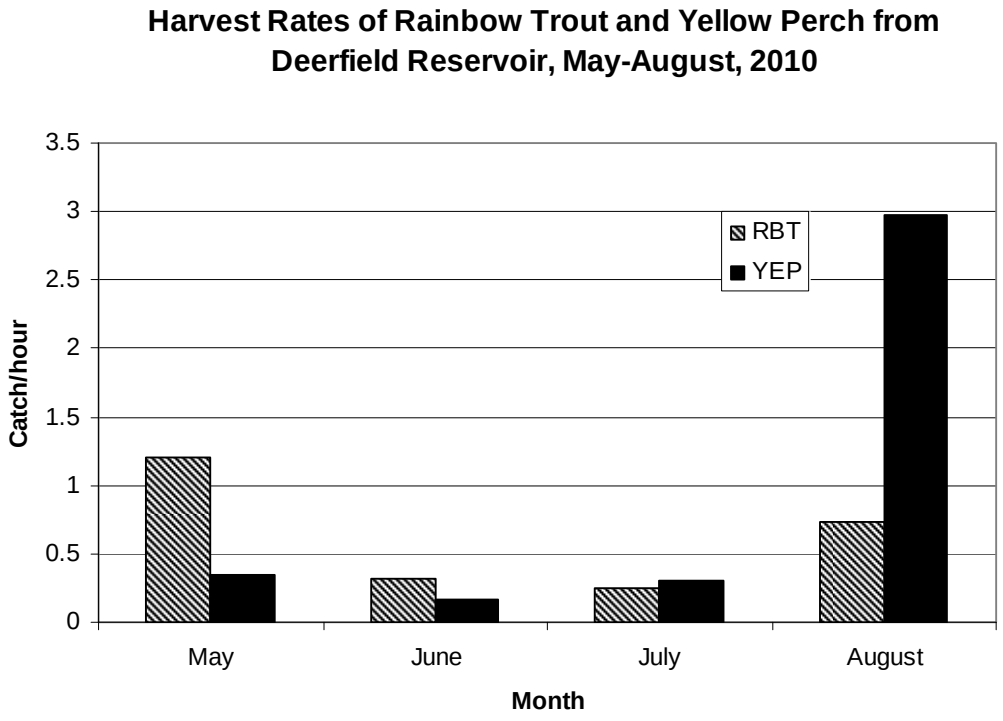

Figure 5. Estimated harvest rates of rainbow trout and yellow perch from Deerfield Reservoir, May – August 2010. May and August were only sampled for one-half of the month.

Table 2. Angler use and harvest estimates for surveys conducted on Deerfield Lake, South Dakota during the summers of 2009 and 2010. All surveys were conducted during the May-August daylight period.

	2009	2010
Interviews	153	126
Mean Party Size	2.51	2.38
Trip Length (h)	3.14	3.09
Total Pressure (h)	16,158	20,617
Total Catch	28,994	34,971
Total Harvest	2,398	5,558
RBT Catch	2,638	8,883
RBT Harvest	1,600	3,578
Mean Distance Traveled	157 miles	193 miles
Resident Use (%)	82	81
Target Species	RBT	Anything

Angler Catch

Catch has been described in earlier reports as being all the fish caught by anglers during a creel survey (Simpson 2009). There are advantages to keeping the catch as a whole for the water or segmenting catch by species. Whole water analysis works well when there is a primary species or to determine the total biomass from a specific water body. Data separated by species can aid in determining when species are being caught by anglers or if a change of management activities is needed. During the summer of 2010 the estimated catch was 34,971 fish (Table 2). This was an increase over the estimated catch in 2009 of 28,994 fish.

Rainbow trout catch increased from 2,638 to 8,883 for 2009 and 2010, respectively. Catch of rainbow trout was higher in 2010 for each month except August when zero rainbow trout were caught. In 2009, catch of rainbow trout was less than 1,000 fish/month and this changed in 2010 where rainbow trout catch was always greater than 1,000 fish/month from May - July (Figure 6). May had the highest number of trout caught per month at over 6,000 fish.

Comparing the catch between rainbow trout and yellow perch shows that there were over 6,000 rainbow trout caught in May and catch decreased to 1,000 to 2,000 fish for the rest of the summer (Figure 7). No rainbow trout were reported caught in August 2010. Yellow perch catch was the lowest in June, with some subtle increases in May and July. August was the highest catch of yellow perch in 2010 with nearly 4,000 fish being caught.

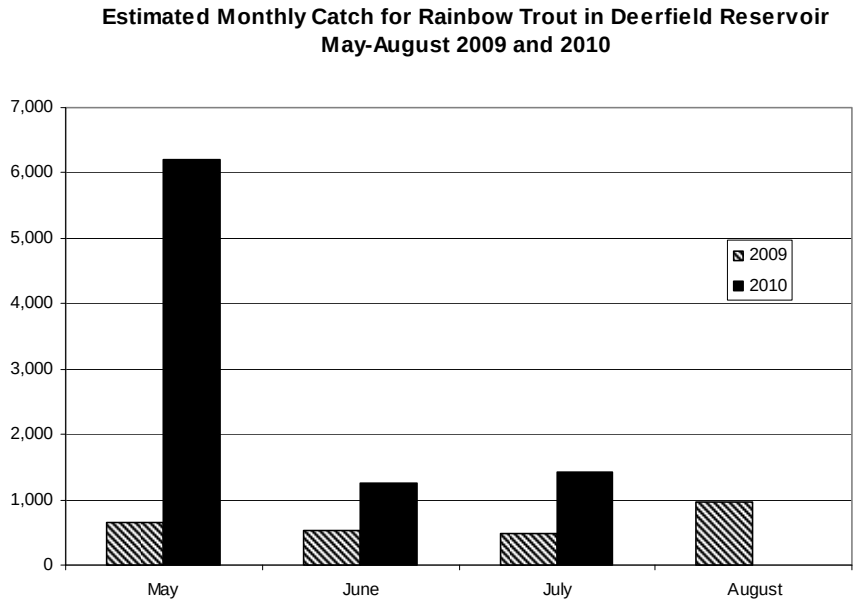

Figure 6. Estimated catch by month of rainbow trout from Deerfield Reservoir, May – August 2010. May and August were only sampled for one-half of the month.

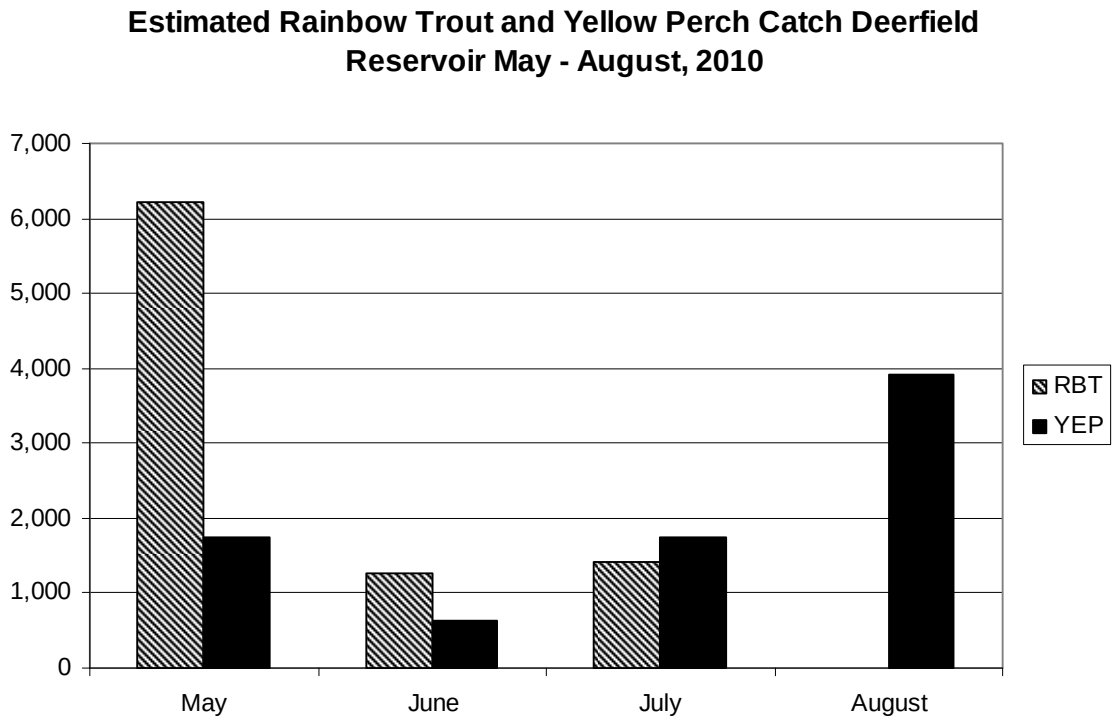

Figure 7. Estimated catch by month of rainbow trout and yellow perch from Deerfield Reservoir, May – August 2010. May and August were only sampled for one-half of the month.

Angler Satisfaction and Boat Use

For nearly twenty years, angler attitudes and their satisfaction have been a focus of Black Hills fishery managers. Angler opinions are important as they describe what the angler actually wants and it provides possible directions for biologists in management efforts. Addressing angler issues also promotes interaction between the users and management staff. Determining the actual reason for the public to use the resources is important in determining their perceptions of these resources. Starting in 2009, the South Dakota Department of Game, Fish and Parks fisheries staff decided that a standardized question needed to be asked during all creel surveys. This allows for statewide comparisons of angler attitudes and gives an overall understanding of satisfaction and not just on a case by case basis. Other questions asked during the 2010 Deerfield Reservoir Creel Survey were determined by managers in an attempt to determine the level of boat movement between Deerfield Reservoir and other lakes.

Anglers at Deerfield Reservoir were very satisfied with their fishing. During the 2009 Deerfield Creel survey, angler satisfaction was 83 percent (Figure 8). Even higher satisfaction was noted by anglers during the 2010 creel survey (90 percent). Anglers that expressed dissatisfaction dropped from by one half from, 16 percent to eight percent for the years 2009 and 2010, respectively.

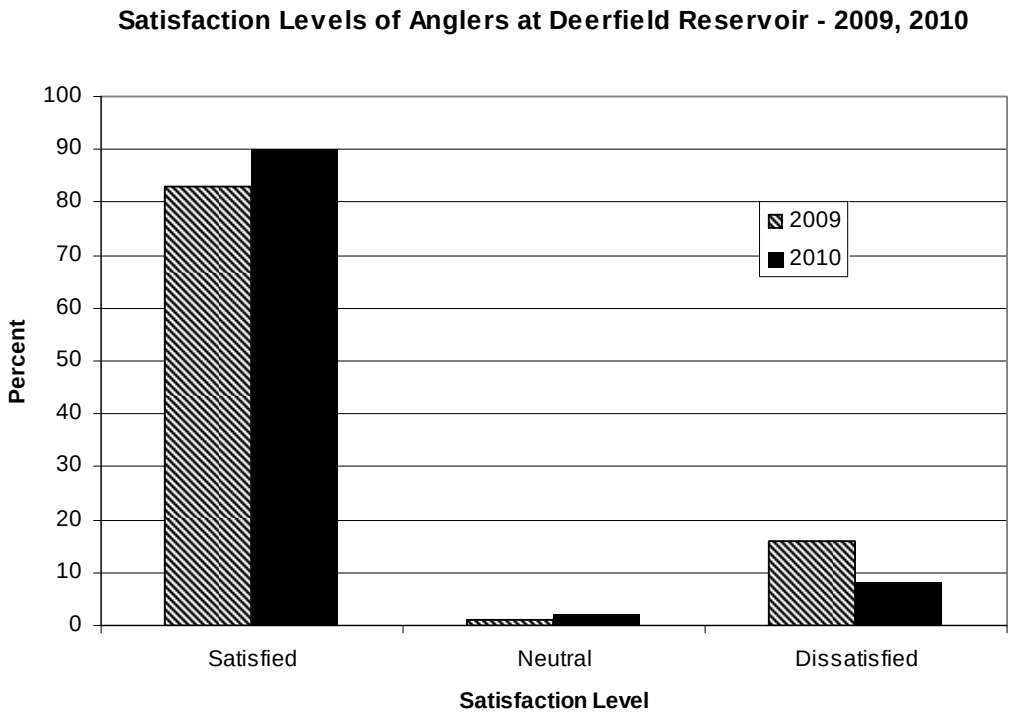

Figure 8. Percent satisfaction of anglers from Deerfield Reservoir, for May – August 2009 and 2010. May and August were only sampled for one-half of the month.

Angler satisfaction has been described in other creel surveys for the Black Hills (Simpson 2009). The need for this information is important for the management of fisheries in the Black Hills. Angler preferences are used to determine issues and are necessary to address public concerns. Statewide and historic lake specific satisfaction can provide insight to the acceptance of regulations and management activities. Simpson (2009) discussed qualities of angler success and the angler attitudes that extend to satisfaction beyond

catching fish. For many anglers, the non-catching aspect of fishing can be a large component of the overall angling satisfaction.

Black Hills angler opinions have been measured and described by Gigliotti (1997, 2006). In these publications, Gigliotti found that there is no easy way to describe anglers of this region as they expressed differences in opinions. These efforts show that it is important to realize that not all anglers will be in approval of management actions. Each individual group will have their own idea of satisfaction and individual goals for that day.

Angler satisfaction in South Dakota has changed over time. Gigliotti, in a survey of South Dakota anglers, found satisfaction at the level of 73.4% (Gigliotti 1999). The value used for this survey is based off a more recent study where Gigliotti determined, from an exhaustive statewide survey, anglers which used the Black Hills fisheries were 66% satisfied with only 20% dissatisfied (Gigliotti 2003). Anglers interviewed during the 2010 Deerfield Reservoir Creel Survey responded with a level of satisfaction of 90 %, much higher than described by Gigliotti in 2003 (Figure 8).

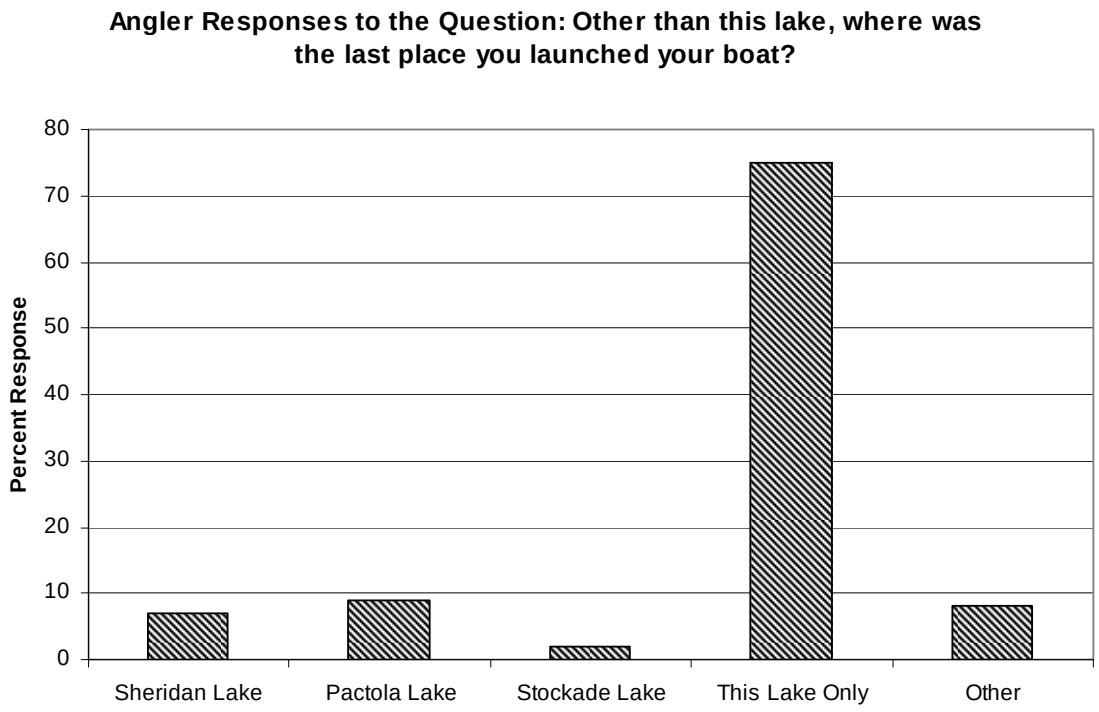

Figure 9. Angler responses to the question: Other than this lake, where was the last place you launched your boat?

Seventy-five percent of surveyed boat anglers responded that they used the boat previously at Deerfield Reservoir (Figure 9). Anglers responded that they last launched

their boat at other area lakes (Sheridan Lake, Pactola Reservoir, and Stockade Lake) fewer than ten percent of the interviews. While it only takes a single boat incident to move aquatic nuisance species across watersheds, the predominant use of boats using only Deerfield Reservoir was interesting as movement of these organisms by angler's boats may be limited.

Angler Demographics

Demographic characteristics are used to describe the anglers that use a fishery (Table 2). Many of the demographics commonly presented in earlier Black Hills creel surveys were not available for this survey. This was due to the trial use of electronic data loggers during the sampling and demographic data was not transferred into the database. Some data was available which included: state of residency, distance traveled, and age range. Gender was not available for analysis in 2010.

Of the 126 interviews conducted in 2010, 81 percent of anglers were residents of South Dakota (Table 2). Non-residents comprised the other 19 percent of interviews. The non-residents were from eleven states with the farthest being from Florida. Seventy-three percent of anglers fishing at Deerfield Reservoir live within 75 miles of the lake. Ninety-six percent of anglers were of three different age classes. Most anglers were between 40 and 59 years of age, but there were also many anglers from the 20-39 age class and the greater than sixty years of age class. These results are very similar to 2009 values (Simpson 2010).

RECOMMENDATIONS

1. Continue to monitor the fish populations at Deerfield Reservoir. Specifically follow the yellow perch, white sucker, and rock bass to determine their relative population size and possible contribution to the Deerfield Reservoir fishery.

2. Utilize the results from the current SDSU study that is being conducted on natural production of rainbow trout in Deerfield Reservoir. This information may have implications to the number, strain, and species stocked in Deerfield Reservoir in the future.

3. Continue to manage the Deerfield Reservoir fishery in a manner that keeps angler satisfaction at a high level. Current levels of satisfaction exceed that of the statewide average.

4. Angler attitudes that were examined during this study should be documented, when appropriate, in future creel surveys in the Black Hills. Size and number of trout stocked should remain at a level where angler satisfaction does not drop below the statewide average. Questions concerning the size of trout caught and relating trout size to the angler satisfaction could also help determine important management directions. Continue to monitor the angler harvest verses release attitudes and observe impacts that this may have on the long-term fishery of Deerfield Reservoir.

5. Future creel surveys should be scheduled to address particular issues at the water. Changes in management strategies, stocking changes, public satisfactions, or participation issues should all be considered during future creel surveys.

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