

## YATES POND POPULATION ESTIMATE

### PROJECT RESULT SUMMARY

1. Estimated Brook Trout population of 239 individuals
2. Estimated Brown Trout population of 772 individuals
3. Estimated trout assemblage of 920 individuals

**Name:** Yates Ponds

**County:** Lawrence

**Legal description:** T 4N, R 2 E Sec. 22

**Location from nearest town:** 20 km Southwest of Spearfish, South Dakota

**Dates of tagging study:** May 25 thru August 13, 2012

**Date last surveyed:** June 16, 2005

**Most recent lake management plan:** None

**Management classification:** Coldwater Permanent

### STUDY AREA

**Surface Area:** 0.54 ha

**Watershed:** none

**Maximum depth:** unknown

**Mean depth:** Unknown

**Lake elevation at survey (from known benchmark):** Full

#### **Ownership of lake and adjacent lakeshore property:**

The land around the Yates Ponds is part of the Black Hills National Forest and is owned by the U. S. Forest Service. Private land ownership is located nearby, but does not include shoreline property.

#### **Fishing access:**

Yates Ponds can be accessed directly off US-14 Scenic Highway. A parking lot is located adjacent to the fishery. All waterfront property is owned by the U.S. Forest Service, which allows anglers to access all areas.

#### **Observations of Water Quality and Aquatic Vegetation:**

The majority of the watershed is timber and grassland administered by the U. S. Forest Service, but there are also significant areas of private ownership. Much of the land adjacent to the watershed streams is publicly owned with a small portion under private ownership. Livestock grazing is widespread on both private and public lands. Much of the public land is under management for production of salable timber products. Roads and livestock grazing are presumed to be major sources of sedimentation in the watershed. Mountain slopes vary from moderate to extreme steepness throughout the watershed. Cheyenne Crossing is a small development that exists near Yates Ponds.

Submergent vegetation is dense throughout a large portion of the ponds. There is a heavy silt bed exists in portions of Yates Pond. No other pollution problems were observed during sampling.

**Observations on conditions of all structures (i.e. spillway, boat ramps and docks, roads, etc.:**

All structures appear to be in good condition.

## **RESEARCH OBJECTIVES**

**Objective 1:** Evaluate the trout assemblage in Yates Ponds and estimate population size.

**Objective 2:** Evaluate effectiveness of prior habitat rehabilitation by documenting change in trout abundance.

## **METHODS**

### **Sampling Effort and Catch**

Fish were collected using backpack electrofishing equipment located in a flat bottomed (john) boat. Following capture, fish were anesthetized using carbon dioxide, weighed to the nearest g and measured to the nearest mm. Additionally, fish received a tissue punch of various fins to differentiate between sampling events. Marking events were spaced between one and five weeks apart to allow adequate recovery time.

Population estimates were calculated using the Schnabel method (Schnabel 1938) which allows for estimating population size from multiple marking and recapturing events over a short period of time. Recapture events were attempted within an eight week period following the initial marking event. No harvest of marked fish between sampling periods was assumed as Yates Ponds are managed as a catch and release fishery. Population estimates were derived using the statistical program R v. 2.15.1 (R Development Core Team 2012).

## **RESULTS AND DISCUSSION**

The Yates Ponds area in Spearfish Canyon is an important recreational fishery. Natural reproduction and recruitment provide a consistent fishery supporting multiple species of salmonids, including Brown *Salmo trutta*, Brook *Salvelinus fontinalis* and Rainbow *Oncorhynchus mykiss* trout.

Based on population estimates, Yates Ponds supports a robust trout assemblage of 920 individuals; which is dominated by Brown Trout (Table 1). Based off the 2012 estimate, the trout population in Yates pond has increased from 429 to 920 from 1997 to 2012, respectively.

Table 1. Population estimates (N) of the trout in Yates Ponds, Lawrence County from 1997, 2000 and 2012 with 95% upper (UCI) and lower (LCI) confidence intervals.

	1997			2000			2012		
	N	LCI	UCI	N	LCI	UCI	N	LCI	UCI
Brook Trout	148	105	231	75	52	121	239	102	Infinite
Brown Trout	282	202	464	333	245	519	772	625	1,008
Total Assemblage	429	325	632	404	308	584	920	746	1,198

### Brown Trout

The Brown Trout population in Yates Ponds has increased in numbers since 2007 (Table 1). Additionally, Brown Trout were in good condition despite the high numbers caught (using relative weight [ $W_r$ ] as an index of condition as described by Anderson and Nuemann 1996; mean  $W_r$  of 99.3; Table 2). Mean proportional stock density (PSD) for Brown Trout sampled in 2012 was 77.8. While this indicates that the majority of the Brown Trout captured were over quality size, it does indicate that the population is not very balanced as the smaller size classes were not present in the sample (Figure 1). Anderson and Wiethman (1978) determined that a balanced fish population is one with a PSD that is intermediate between the extremes of a large number of small fish and small number of large fish.

Table 2. Number (N), mean relative weight ( $W_r$ ), proportional stock density (PSD) for trout sampled from the Yates Ponds, Lawrence County, South Dakota in 2012.

Species	N	$W_r$	PSD
Brown Trout	375	99.3	77.8
Brook Trout	44	98.8	17.4
Rainbow Trout	5	77.3	40.0

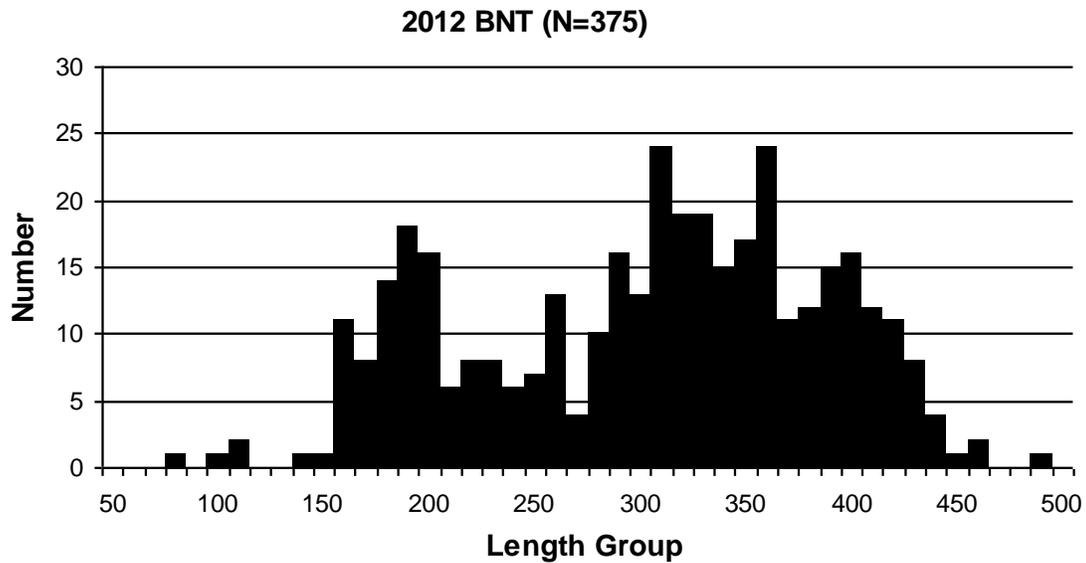


Figure 1. Length frequency histograms for Brown Trout sampled from Yates Ponds Lawrence County, South Dakota, 2012.

Brook Trout

Brook Trout were the second most prevalent salmonid in Yates Ponds in 2012 (N=44). Yates Ponds supports an estimated population of 239 Brook Trout. The extreme upper confidence interval was likely due to the last sampling event in which a number (N=16) of juvenile Brook Trout were captured, which likely inflated the estimates. The 2012 estimate showed an increase in the Brook Trout population from previous population estimates of 148 in 1997 and 75 in 2000. On average, Brook Trout were in good condition with a mean  $W_r$  of 98.8. Brook Trout exhibited a PSD of 17.4, which indicates that more stock length fish are present in the fishery (Figure 2). Once again, this value was likely influenced by the number of juvenile fish that were captured during the last sampling event.

## 2012 BKT (N=44)

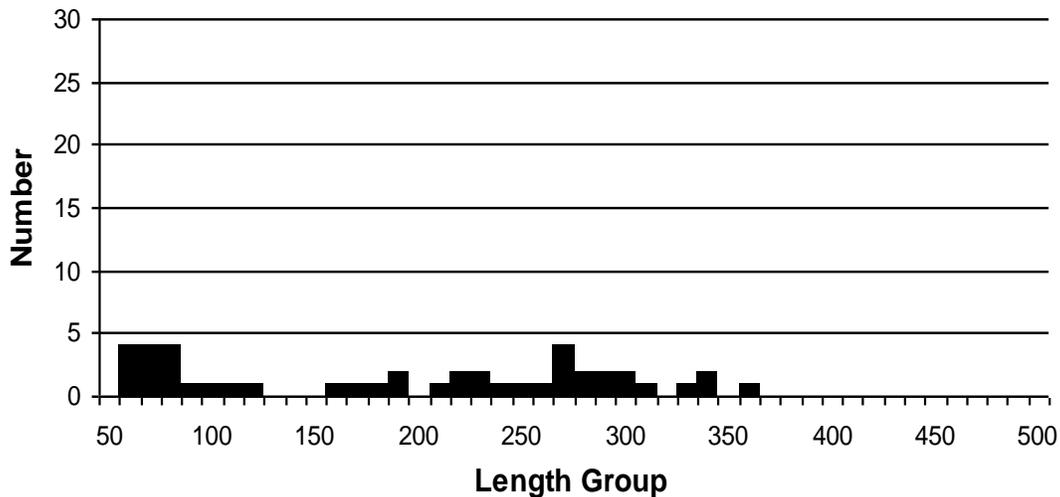


Figure 2. Length frequency histograms for Brook Trout sampled from Yates Ponds Lawrence County, South Dakota, 2012.

### Rainbow Trout

Few Rainbow Trout were captured during the five sampling events (N=5), which did not allow for enough data for a population estimate to be derived. Rainbow Trout do comprise a portion of the assemblage, but in low density. Additionally, no previous population estimates had been conducted on Yates Ponds, making comparison with previous estimates impossible. On average, Rainbow Trout  $W_r$  was 77.3, which indicates that Rainbow Trout captured during sampling were not in good condition. Rainbow Trout PSD was 40.0, which would indicate that the population's size structure is balanced, although the sample size was low.

The Yates Ponds fishery underwent significant habitat rehabilitation in the early 2000's. These modifications included, but were not limited to: construction of a new outlet structure, bank stabilizations and the removal of a secondary outlet structure. The population estimates from 1997 and 2000 provide valuable preliminary data of the trout assemblage prior to any habitat work. The estimates in 2012 indicate that the fishery had a positive response to the habitat work that occurred. Habitat improvement is often a tool utilized by fisheries managers as a way to improve in situ habitat for salmonids. In certain cases, greater available space and greater mean depth can result in biomass increases (Elwood and Waters 1969; Stewart 1972). Additionally, invertebrate production and availability may have increased. While neither invertebrate densities nor diets were analyzed during this study, mean  $W_r$  for both Brook and Brown Trout were good to excellent on average, indicating that limited resources likely do not exist.

### **Management Recommendations**

1. Continue to manage the Yates Ponds as a catch-and-release only with an artificial lures only, no organic bait within 100 feet restriction.
2. Manage Yates Ponds as a wild trout- natural yield fishery. Fish numbers do not seem abnormal and condition of the primary species is satisfactory.

## Literature Cited

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- R Core Team (2012). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org/>.
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