

## FISHES AT RANDOMLY SELECTED SITES ON WADEABLE STREAMS IN SOUTH DAKOTA

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### ABSTRACT

We sampled 110 sites that were randomly selected on wadeable reaches of South Dakota streams during the summers of 2001-04 as part of the Environmental Monitoring and Assessment Program (EMAP) administered by the US Environmental Protection Agency. The goal of the EMAP was a regional assessment of river health, but data were also useful to better understand the status of fishes in South Dakota. We used seining and electrofishing to collect 34,349 fishes of 54 species representing 13 families. Cyprinids made up 84% of the catch with fathead minnow (*Pimephales promelas*), sand shiner (*Notropis stramineus*), and common shiner (*Luxilus cornutus*) composing the majority. Twenty-nine sites sampled in eastern South Dakota produced 20,273 fish and 81 sites sampled in western South Dakota produced 14,076 fish. Eleven species were found only in eastern South Dakota, 17 found only in western South Dakota, and 9 species found statewide were skewed (>90% of catch) in one or the other. Five of the 12 state endangered or threatened species were collected including: eight blacknose shiners *Notropis heterolepis*, 27 central mudminnows *Umbra limi*, 53 northern redbelly dace *Phoxinus eos*, 10 sturgeon chubs *Macrhybopsis gelida*, and 783 Topeka shiners *Notropis topeka*.

### Keywords

Fish, river, stream, distribution, abundance, endangered species.

### INTRODUCTION

The first comprehensive report on the fish fauna of South Dakota was primarily a key to 81 species and general ecological information about each species (Churchill and Over 1933). The next synthesis covered 93 species collected at 137 sites, which included 72 sites on warmwater rivers, 20 sites on Black Hills coldwater streams, and 45 sites on lakes and ponds (Bailey and Allum 1962). In the late 1980s, the need for updated information on river fishes was prompted

by the increase in introduced and exotic species, watershed developments that threatened water quality and habitat, lack of knowledge about species of concern (e.g., rare, threatened or endangered species), and the need for new methods for using fish data to assess river health.

Most fish surveys since 1989 have been sponsored by the South Dakota Department of Game, Fish and Parks (GFP) to address the goals of a strategic plan to improve and protect fisheries resources in the nearly 10,000 miles of classified streams (i.e. have legal designated uses and water quality standards) in 14 river basins (GFP 1994). However, other surveys have added greatly to the volume and diversity of new information on South Dakota river fishes and their habitat. For example, the listing of the Topeka shiner (*Notropis topeka*) as a Federally endangered species in 1992 prompted surveys of many tributaries of the James, Vermillion, and Big Sioux Rivers (Wall et al. 2004). Management of the Missouri River prompted surveys of the remaining free-flowing portions (Berry and Young 2003). There is much information on Black Hills streams because of their recreational importance (e.g., Erickson et al. 2001).

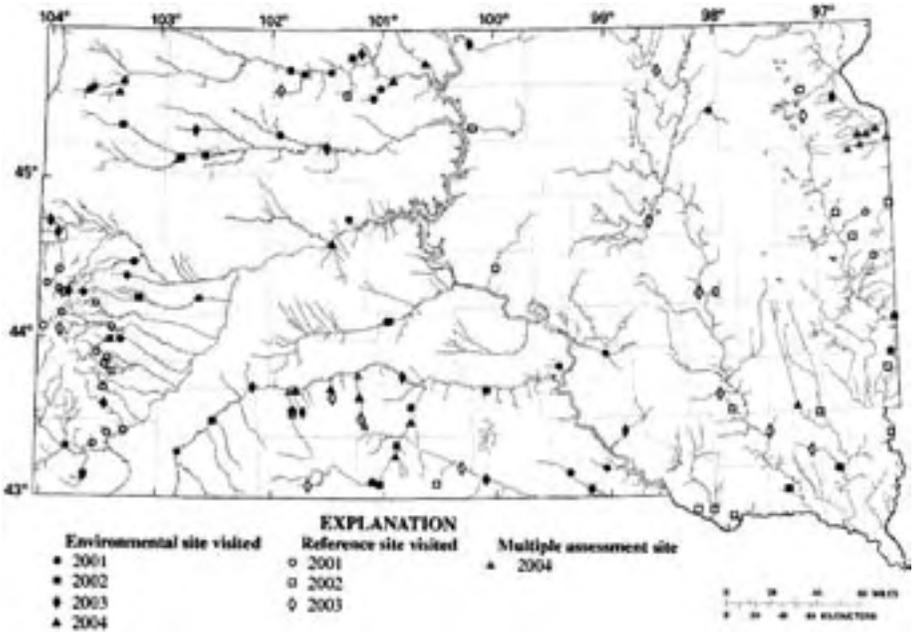
The Environmental Monitoring and Assessment Program (EMAP) also added to the basic information on river fishes and habitat. The goal of the nationwide program was to develop biocriteria to assess the health of the Nation's rivers at regional and national scales (Whittier and Paulsen 1992, Urquhart et al. 1998, USEPA 1998). In South Dakota, two research teams inventoried habitat and biota at randomly selected sites on two types of rivers: wadeable and non-wadeable. We conducted the biotic surveys on wadeable streams and report here the results for the fish collections.

## METHODS

The study was conducted during the summers of 2001-04; 110 sites were sampled (Figure 1). Eighty-two sites were on tributaries to major rivers, the remainder was wadeable sites on the main stem of the Bad, Big Sioux, Cheyenne, Grand, James, Keya Paha, Moreau, and Vermillion and White rivers.

The site selection method was a unique feature of this study. Most sites were randomly selected by an Environmental Protection Agency computer program that produced a list of latitude and longitude coordinates for a point (termed the "X-location" at "environmental" sites, Figure 1) on each stream. In addition, a group of least-impacted "reference" sites were selected based on best professional judgment of biologists and hydrologists. Some reference sites were sampled each year as "multiple assessment" sites. Field verification for each site was the first step to gain approved access, determine water conditions and develop an itinerary. Each site consisted of a stream reach that was 40 times the mean wetted width or a minimum of 150 m with the X-location in the center of the reach. A variety of physical and biological measurements were made at transects along the reach.

Fish were collected by electrofishing and seining depending on water quality and habitat. A Smith-Root model 12-B, P.O.W. backpack electrofisher (DC pulsed, volts: 100 – 500, pulse rate: 60 Htz, pulse width: 6 ms) was used for



**Figure 1. Map of South Dakota depicting 110 sites sampled from 2001-2004.**

electrofishing. Seines (9.23-m wide, 1.23-m high, 4.8-mm mesh; 1.23-m x 1.23-m x 1.23-m bag and 4.64-m wide, 1.23-m high, 4.8-mm mesh; 1.23-m x 1.23-m x 1.23-m bag) were used when water clarity was too low or conductivity was too high (>1500 uS) to electrofish. Each fish was identified to species (see Table 1 for scientific name); exceptions were the *Hybognathus sp.*, which are difficult to identify in the field (Loomis 1997). Voucher specimens of each species were preserved for shipment to the Smithsonian Institution.

## RESULTS

A total of 34,349 fishes representing 55 species and 12 families (Table 1) were sampled from 2001-2004. Native species made up 80 % of the catch. Cyprinids (84%) were the dominant family followed by Centrarchidae (4.1%), Catostomidae (3.8%) and Ictaluridae (3.1%). Fathead minnows (24.2%), sand shiners (21.2%), and common shiners (7.7%) were dominant species. The most common game fish was the channel catfish (n=346) for western South Dakota, while the black bullhead (n=247) was the most common in eastern South Dakota. The common carp was the only exotic species; we found 10 introduced species and one hybrid (Table 1). Five threatened or endangered species were collected: blacknose shiner, central mudminnow, northern redbelly dace, sturgeon chub, and Topeka shiner (Table 1).

Twenty-nine sites in eastern South Dakota produced 20,273 fish and 81 sites sampled in western South Dakota produced 14,076 fish. Eastern South Dakota

was dominated by fathead minnow (34%), sand shiner (15%) and common shiner (13%), while western South Dakota was dominated by sand shiner (30%), fathead minnow (10%), and flathead chub (9%). Number of species was about the same but more fish were captured at fewer sites in Eastern South Dakota than in Western South Dakota (Table 1). Eleven species were only found in eastern South Dakota and 17 only found in western South Dakota. Nine were found statewide but were dominant (>90%) in one or the other (Table 1).

## DISCUSSION

The EMAP project produced an abundance of data on the physical habitat and water quality of South Dakota streams, and on the invertebrates, periphyton, and fishes present. Fish tissues were submitted for contaminant analysis. These data are (or will be) available on the Internet (<http://www.epa.gov/emap/>, accessed 12/12/05). A regionwide analysis of the data is forthcoming and may be similar to that for the Mid-Atlantic Highland Region (Angermeier et al. 2000).

For South Dakota specifically, the EMAP data added to knowledge of the distribution of fishes in South Dakota and were used to augment a statewide fisheries summary (Hoagstrom et al. unpublished). An ichthyofaunal list was developed for the first time on Lake Creek (LaCreek National Wildlife Refuge). The range was extended for the spottail shiner (Grand River, 2001), the blacknose shiner (North Fork of Yellow Bank River, 2004), and northern redbelly dace (Stink Creek, 2003). The northern redbelly dace is a relict species that has been documented in the clear, cool streams of Nebraska and North Dakota, so finding the dace in South Dakota fills the distribution gap (Morey and Berry 2005). The endangered Topeka shiner was found during several years in Turkey Ridge Creek, but the finding in the Elm River was the first record in recent history. Additionally, the EMAP data allowed detailed analysis of the habitat needs of sand shiner, green sunfish and creek chub over multiple river basins (Morey 2004).

Partitioning South Dakota into "East River" and "West River" has a basis in geography, climate and river conditions (Hogan 1995). All major rivers in South Dakota are tributaries to the Missouri River, but major river basins in the East River region lie in a north to south orientation where as those West River are oriented from west to east. Streams in the sub-humid eastern part of the state are more benign than streams in the western semi-arid region of the state.

Based on stream flow patterns, there should be more topographic complexity of the fish assemblage, higher species richness, and more specialist species East River than West River (Poff and Ward 1998, Milewski 2001). The fish assemblages may also differ from east to west because post-glacial recolonization avenues differ (Bailey and Allum 1963, Hoagstrom and Berry In press). The Missouri River may be a barrier to fish movement. The East River sand shiner is *N. s. stramineus* whereas only *N. s. missouriensis* is found West River (Bailey and Allum 1963). Hoagstrom (unpublished data) has found that the subspecies remain distinct in the Cheyenne River.

Eleven species were found only East River and seven may be termed "East River" species. Our findings for these seven species (i.e. central mudminnow,

blacknose dace, bluntnose minnow, rosyface shiner, Topeka shiner, tadpole madtom, blackside darter) agree with distributions reported by Bailey and Allums (1963). We probably did not find northern pike, bluegill, white crappie and walleye because they are rare in streams and we did not sample ponds or non-wadable rivers where these species are probably more abundant.

Thirteen species were typically West River species, particularly native species such as flathead chub, plains minnow, sturgeon chub, mountain sucker, and plains killifish. Introduced species (e.g., pumpkinseed, rock bass, golden shiner) may be present but rare in western rivers.

The EMAP data may someday be used at the regional scale to assess the quality of river ecosystems. However, some results are immediately useful in South Dakota for a better understanding of the distribution and abundance of stream fish. The East River-West River difference in fish assemblages can be added to the geologic, climate, economic, historical and cultural differences that are well known (McLaird 1989, Hogan 1995).

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**Table 1. Fish collected during the EMAP study, classification, and percent of catch in western and eastern South Dakota. dash = not found, tr = trace or < 1% of catch, N = Native, I = Introduced, R = Rare, E = Exotic.**

Family Common and Scientific Name	Class	Western SD % of Catch	Eastern SD % of Catch
<b>Clupeidae</b>			
Gizzard shad, <i>Dorosoma cepedianum</i>	N	-	tr
<b>Hiodontidae</b>			
Goldeye, <i>Hiodon alosoides</i>	N	tr	-
<b>Salmonidae</b>			
Brook trout, <i>Salmo trutta</i>	I	1%	-
Brown trout, <i>Salvelinus fontinalis</i>	I	tr	tr
Rainbow trout, <i>Oncorhynchus mykiss</i>	I	tr	-
<b>Umbridae</b>			
Central mudminnow, <i>Umbra limi</i>	R	-	tr
<b>Cyprinidae</b>			
Bigmouth shiner, <i>Notropis dorsalis</i>	N	7%	5%
Blacknose dace, <i>Rhinichthys atratulus</i>	N	tr	2%
Blacknose shiner, <i>N. heterolepis</i>	R	-	tr
Bluntnose minnow, <i>Pimephales notatus</i>	N	-	tr
Brassy Minnow, <i>Hybognathus hankinsoni</i>	N	1%	1%
Central Stoneroller, <i>Campos. anomalum</i>	N	tr	2%
Common carp, <i>Cyprinus carpio</i>	E	1%	1%
Common Shiner, <i>Luxilus cornutus</i>	N	tr	13%
Creek Chub, <i>Semotilus atromaculatus</i>	N	4%	4%
Emerald shiner, <i>N. atherinoides</i>	N	tr	tr
Fathead minnow, <i>Pimephales promelas</i>	N	1tr	34%
Flathead chub, <i>Platygobio gracilis</i>	N	8%	-
Golden shiner, <i>Notemigonus crysoleucas</i>	N	tr	-
Hybognathus species	N	9%	-
Longnose dace, <i>R. cataractae</i>	N	2%	-
Northern redbelly dace, <i>Phoxinus eos</i>	R	tr	tr
Plains minnow, <i>Hybognathus placitus</i>	N	tr	-
Red shiner, <i>Cyprinella lutrensis</i>	N	6%	6%
Rosyface shiner, <i>N. rubellus</i>	N	-	tr
Sand shiner, <i>N. stramineus</i>	N	30	15%
*Spottail shiner, <i>N. hudsonius</i>	N	tr	-

<b>Cyprinidae</b>			
Sturgeon chub, <i>Macrhybopsis gelida</i>	R	tr	-
Topeka shiner, <i>N. topeka</i>	R	-	3%
<b>Catostomidae</b>			
Mountain sucker, <i>Catost. platyrhynchus</i>	N	tr	-
*Quillback, <i>Carpoides cyprinus</i>	N	tr	-
River carpsucker, <i>C. carpio</i>	N	1%	tr
Shorthead redhorse, <i>Mox. macrolepidotum</i>	N	1%	tr
White sucker, <i>Catostomus commersoni</i>	N	3%	2%
<b>Ictaluridae</b>			
Black bullhead, <i>Ameiurus melas</i>	N	3%	1%
Channel catfish, <i>Ictalurus punctatus</i>	N	2%	tr
Stonecat, <i>Noturus flavus</i>	N	1%	tr
Tadpole madtom, <i>N. gyrinus</i>	N	tr	tr
<b>Cyprinodontidae</b>			
Plains killifish, <i>Fundulus zebrinus</i>	N	1%	-
*Plains topminnow, <i>F. sciadicus</i>	N	tr	-
<b>Gasterosteidae</b>			
Brook stickleback, <i>Culaea inconstans</i>	N	-	tr
<b>Esocidae</b>			
Northern pike, <i>Esox lucius</i>	N	-	tr
<b>Centrarchidae</b>			
Black crappie, <i>Pomoxis nigromaculatus</i>	I	tr	tr
Bluegill, <i>Lepomis macrochirus</i>	I	-	tr
Green sunfish, <i>L. cyanellus</i>	N	3%	tr
Hybrid – bluegill x green sunfish	N	tr	-
Largemouth bass, <i>Micropterus salmoides</i>	I	tr	tr
Orangespotted sunfish, <i>L. humilis</i>	N	2%	3%
Pumpkinseed, <i>L. gibbosus</i>	I	tr	-
Rock bass, <i>Ambloplites rupestris</i>	I	tr	-
White crappie, <i>P. annularis</i>	I	-	tr

<b>Percidae</b>			
Blackside darter, <i>Percina maculata</i>	N	-	tr
Iowa darter, <i>Etheostoma exile</i>	N	tr	1%
Johnny darter, <i>E. nigrum</i>	I	tr	4%
Walleye, <i>Stizostedion vitreum</i>	N	-	tr
Yellow perch, <i>Perca flavescens</i>	I	tr	tr
<b>TOTAL FISH</b>		<b>14,076</b>	<b>20,273</b>
<b>TOTAL SPECIES</b>		<b>43</b>	<b>39</b>

\* Identity of these species questionable, collected in 2002 when vouchers were not taken for all sites.