

# RECENT DECLINE OF NONGAME FISHES INHABITING SMALL STREAMS IN THE GREATER ROCK RIVER BASIN

## SOUTHCENTRAL REGION WATER PROGRAM

By

David W. Marshall, Michael J. Sorge and Laura Stremick-Thompson

February 2004

### Abstract

In 1998 and 2000, we sampled small stream fish communities at 67 sites to evaluate the status of nongame fish species in the Greater Rock River Basin. Forty-five sites were located in the Lower Rock River sub-basin and twenty-two sites in the Sugar-Pecatonica River sub-basin. All of the sites were originally sampled as part of the Fish Distribution Study during the 1970's. Most of the stream sites had not been sampled since that time. Survey results indicated a decline in species richness, intolerant species and species listed as Endangered Resources. Species that were found in 1974-75 but not in 1998 and 2000 included blackchin shiner (*Notropis heterodon*), ozark minnow (*Notropis nubila*), redfin shiner (*Lythrurus umbratilis*), lake chubsucker (*Erimyzon sucetta*) and rainbow darter (*Etheostoma caeruleum*). The number of locations supporting reddsides dace (*Clinostomus elongatus*), banded killifish (*Fundulus diaphanus*) and least darter (*Etheostoma microperca*) declined as well. The reasons for these declines can encompass water quality, physical habitat degradation and competition with exotic species. However, expanding livestock operations during the 1970's and 1980's may also be a contributing factor as several of the sites showing a decline in species are small streams with documented animal waste management problems.

### Introduction

With the exception of the Fish Distribution Study (Fago, 1992), small streams that do not support significant gamefish populations in southern Wisconsin have often been neglected with respect to water quality monitoring, biological assessment and environmental protection. Due to inherent limited flow, small stream fishes are particularly vulnerable to the effects of polluted runoff, point source discharges and spills. In an effort to update the fish distribution database for some of these rarely sampled small streams, we conducted fish shocking surveys and replicated efforts of the Fish Distribution Study conducted in the 1970's. Our goal was to determine if small stream fish communities had not changed during the last 20+ years. We sampled forty-five small stream sites in the Lower Rock sub-basin in 1998 and 22 small stream sites in the Sugar-Pecatonica River sub-basin in 2000. In 1998, we attempted to sample all small stream sites previously sampled by Wisconsin Department of Natural Resources Fisheries Research Section, while selection of small stream sites in 2000 was based on the documented historical presence of rare fish or Endangered Resources (ER). Most of the sites in both basins had not been sampled since 1974 or 1975. The same electrofishing

sampling gear used in the 1970's was also used in the recent surveys but shocking distances were increased to represent at least 35 times the stream mean width. Thirty-five times the mean width for sampling distance has become standardized protocol for Wisconsin DNR baseline stream surveys.

## METHODS

All sites were sampled with gear previously used during the Fish Distribution Study including a DC towed stream shocker and battery powered pulse DC backpack shocker. Sampling distances within a site were the greater of either 100 meters or approximately 35 times the mean width of a stream. In some cases, the standardized baseline sampling distances (35X mean width) were greater than the distances sampled in the 1970's. An attempt was made to collect and identify all fish during a sampling run. Fish were generally identified in the field unless specimens were either too immature or otherwise could not be positively identified at the time. Specimens not identified in the field were preserved in 10% formalin for later examination. Assistance from Fisheries Researchers John Lyons and Don Fago assisted with identification when keying certain specimens was particularly troublesome. Paired data sets were analyzed with standard t-test and z-test.

## RESULTS

Table 1 summarizes fish community data at each small stream site sampled in the Lower Rock River sub-basin in 1975 and 1998. Of the 45 paired sites sampled in both sampling periods, 31 sites or 69%, showed a reduction in the number of native species present in 1998 compared to 1975 (Figure 2). In 1975, at least one environmentally "intolerant" (Lyons, 1992) species was sampled at 19 of 45 sites, while in 1998 we found intolerant species at only 9 of 45 sites. In 1975, a total of ten sites contained two or more intolerant species compared to only 1 site in 1998. Overall, differences were significant ( $P=0.05$ ) for both species richness and numbers of intolerant species between the two sampling periods. Species present in 1975 but absent in 1998 included the ozark minnow (State Threatened), redbfin shiner (State Special Concern), least darter (State Special Concern), lake chubsucker (State Special Concern), blackchin shiner (intolerant), and rainbow darter (intolerant). While these species were absent from recent collections, they were also quite rare and were found at only a few of the 45 sites in 1975. For instance, redbfin shiners (20 individuals) were found at only one location while only a single lake chubsucker specimen was collected. At one of two sites where the ozark minnow (12 individuals) had been found in 1975, significant animal waste management problems were identified within the small watershed encompassing Spring Creek, Rock County. Overall, 15 intolerant and rare species were found at 19 sites in 1975 compared to just 6 intolerant-rare species at 8 sites in 1998. The only rare species found in 1998 was the banded killifish, with seven individuals were collected from an unnamed stream within the Goose Lake Wildlife Area in Dane County.

Table 2 contains fish community data for small streams sampled in the Sugar-Pecatonica River sub-basin in 1974 and 2000. Unlike the Lower Rock River sub-basin, most streams

in the Sugar-Pecatonica River sub-basin are high gradient and support a greater frequency of cool or cold water. In 2000, mottled sculpin, a cold water indicator species, were found in only 2 of the 45 Lower Rock River sub-basin sites compared to 15 of 22 Sugar-Pecatonica River sub-basin sites. The distribution of the coolwater redbase is also limited to the Sugar-Pecatonica River sub-basin of the Greater Rock River Basin.

Twenty-two small stream sites within the Sugar-Pecatonica sub-basin were sampled in year 2000. Site selection in 2000 was based on the presence of rare, threatened or endangered species previously documented during the Fish Distribution study conducted in 1974. Of the 22 paired sites sampled in both sampling periods, 15 sites, or 68%, showed a reduction in species richness (the number of native species present) in 2000 compared to 1974. The significant decline ( $P=0.05$ ) in species richness may partly reflect general shift toward less diverse cool-cold water communities in small Sugar-Pecatonica River sub-basin streams. For example, in 2000, mottled sculpin were generally found in higher numbers in small streams located in southwest Dane County and northwest Green County compared with those same sites in 1974.

At least one intolerant species was collected 22 sites in 1974 compared to 21 sites in 2000 (Figure 4). Two or more intolerant species were found at 17 sites in 1974 compared to 9 sites in 2000. The apparent decline of intolerant species numbers in 2000 largely reflected a regional decline of redbase dace, a State Special Concern species. While at least one of three species listed as State Special Concern were found at all 22 sites in 1974, we found rare species at only 6 sites in 2000. Both the least darter and redbase dace were collected in 2000 while the redbase shiner was not. However, only two redbase shiner individuals, at two sites, were collected in 1974.

**Redbase dace *Clinostomus elongatus*:– Special Concern.** Becker (1983) described the overall range of the species to be decreasing due to habitat degradation. Within the Greater Rock River Basin, distribution of the redbase dace (*Clinostomus elongatus*) was limited to the Sugar-Pecatonica sub-basin during the Fish Distribution Study and more recently. Of the 22 sites sampled in 1974, redbase dace were found at 17 sites compared to only 3 of 22 sites in 2000 (Figure 1). While surveys conducted as part of this study suggest an overall decline across the sub-basin, more extensive sampling conducted over the last decade on Deer, Syftestad, Schlapbach, and Flynn creeks indicate that the species has likely been extirpated from those streams. Redbase dace were last documented in Deer Creek, Dane County, prior to brown trout habitat restoration efforts in 1983. Two years after the habitat restoration, redbase dace appeared to have been displaced by brown trout within the system, as sexually mature brown trout were found in pools previously containing numerous redbase dace. Lyons (2000) implicated the expansion of piscivorous brown trout as a contributing factor for the decline of redbase dace in Deer Creek and other streams now managed for brown trout. However, animal waste management problems within the sub-basin have been an environmental concern, particularly as livestock operations expanded during the 1980's. During the mid-eighties, specific manure management problems were identified within small watersheds encompassing

Deer Creek and Little Sugar River, both streams that historically supported redbside dace populations.

Increased stream baseflows may be an additional factor influencing the current distribution of redbside dace in the Sugar-Pecatonica River sub-basin. Gephart (1996) demonstrated increase baseflows throughout southwest Wisconsin as a response to improved land use practices and increased springflows. Continuous temperature measurements in Deer Creek and Syftestad Creek, both in Dane County, suggest that the observed cold temperatures are currently beyond the preference range of the redbside dace, a cool water species. Becker (1983) indicated that redbside dace avoids both warm and very cold water. Very cold water temperatures have been measured in several small headwater streams that now support brook trout while piscivorous brown trout are typically found in lower stream reaches. In these systems, redbside dace populations may become extirpated due to displacement and interspecific competition.

Raccoon Creek and the East Fork Raccoon Creek are currently the only two remaining streams in the Sugar-Pecatonica River sub-basin that support significant numbers of redbside dace. In 2000, sampling sites on both streams yielded totals of 50 and 91 individuals respectively. The corridors of both streams are buffered with extensive wetlands, and a historic wet mesic prairie is also located along one of the streams. The vegetative buffers present on both streams may be affording increased filtration and subsequent improved water quality, as the streams also support a number of species considered intolerant of environmental degradation. The intolerant list found in those streams includes American brook lamprey, redbside dace, least darter, and mottled sculpin.

**Least darters *Etheostoma microperca*: – Special Concern.** Similar to the redbside dace, least darters have been declining over their entire range (Becker, 1983). Of the 67 sites sampled within the Greater Rock River Basin, least darters were found at 7 of the 67 small stream sites sampled in 1974-75 and at 5 of the 67 sites in 1998 and 2000 (Figure 1). No specimens were found during the 1998 surveys in the Lower Rock River sub-basin. In the Sugar River sub-basin, least darters were found in the same 5 sites in 2000 as were found in 1974. These sites were located in the Norwegian Creek and Raccoon Creek watersheds.

**Banded killifish *Fundulus diaphanus*: - Special Concern.** Banded killifish distribution has been historically and continues to be limited to the Lower Rock sub-basin portion of the Greater Rock River Basin (Becker, 1983). They were collected very infrequently from small streams during the Fish Distribution Study. Banded killifish were recently added to the State Special Concern list due to the recent documented decline of the species in both lakes and streams across Wisconsin. In 1974-75, banded killifish (7 individuals total) were found at only 2 of the 67 sites sampled within the Greater Rock River Basin. In 1998, we found seven individuals at a single site within the Goose Lake Wildlife Area in eastern Dane County. They were found in a small stream located within Goose Lake State Wildlife Area (Figure 1).

Other uncommon species collected during the 1974-75 Fish Distribution surveys included: **Ozark minnow** (*Notropis nubilus*) – **State Threatened** (2 sites and 16 individuals), **Redfin shiner** (*Lythrurus umbratilis*) – **Special Concern** (3 sites and 22 individuals), **Lake chubsucker** (*Erimyzon sucetta*) – **Special Concern** (1 site and 1 individual) **blackchin shiner** (*Notropis heterodon*) – (2 sites and 37 individuals) **rainbow darter** (*Etheostoma caeruleum*) – (6 sites and 43 individuals). The above mentioned rare species were absent from surveys conducted in 1998 and 2000

Figure 1: Greater Rock Basin Rare Nongame Fishes  
Frequency of Occurrence - 67 Sites

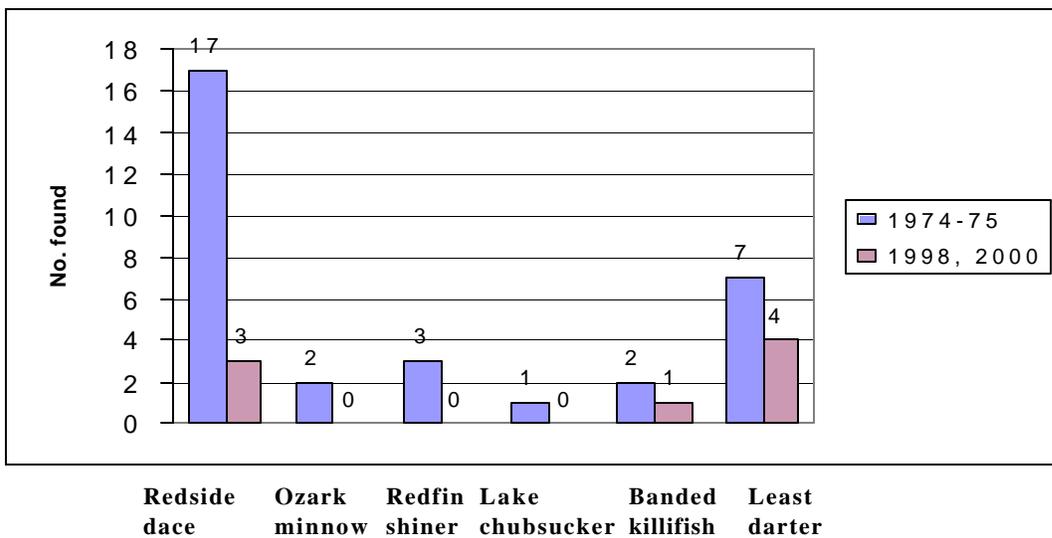


Figure 2: Greater Rock River Basin  
Percentage of Paired sites with greater native species richness

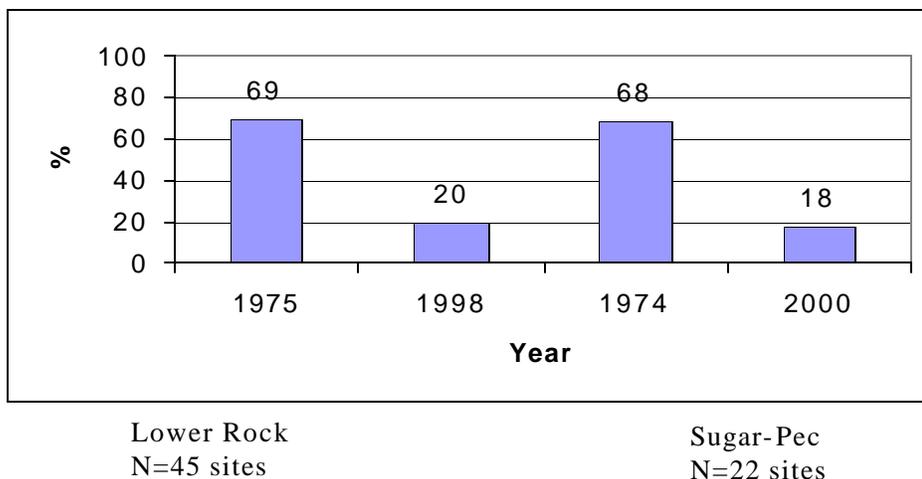
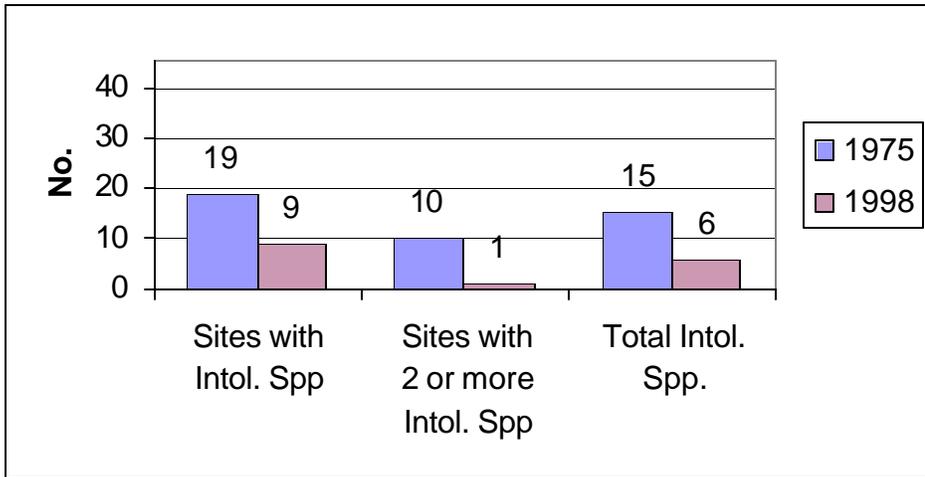


Figure 3: Lower Rock Sub-basin  
Intolerant Species Data



N=45 sites

Figure 4: Sugar-Pec Sub-basin  
Intolerant Species Data



N=22 sites

## References

- Becker, George C. 1983. Fishes of Wisconsin. The University of Wisconsin Press.
- Fago, Don 1992. Distribution and Relative Abundance of Fishes in Wisconsin. WDNR Technical Bulletin No. 175.
- Gebert, Warren A. and William R. Krug. 1996. Streamflow Trends in Wisconsin's Driftless Area. American Water Resources Association Vol. 32, No. 4.
- Lyons, John, Philip A. Cochran, Don Fago. 2000. Wisconsin Fishes 2000 Status and Distribution. UW Sea Grant Institute.
- Lyons, John and Lizhu Wang. 1996. Development and Validation of an Index of Biotic Integrity for Coldwater Streams in Wisconsin. North American Journal of Fisheries Management 16:241-256.
- Lyons, John. 1992. Using The Index of Biotic Integrity (IBI) To Measure Environmental Quality In Warmwater Streams of Wisconsin. USDA NC-149.

Table 1: Lower Rock River sub-basin survey results

1975			1998			
WBIC - stream	# sp.	Intol sp	ER sp	# sp	Intol sp	ER sp
8001 - Frogpond	9			8		
8029 - Lil Door	5			5		
8103 - Mud Cr.	13	M31, M32, S01	S01	10		
8103 - Mud Cr.	10			9		
8039 - Murphys	7			8		
8066 - Token Cr.	4			6	Z01	
8066 - Token Cr.	6	Z01		4		
8080 - Saunders	17			13		
8080 - Saunders	17			14		
8055 - Six Mile	14			10		
8055 - Six Mile	9			9		
8038 - Swan Cr.	2			5		
8101 - ditch	9	M31, M32		12	M32, S01, X09	S01
8133 - Allen Cr.	19	X07 X11	X11	16		
8133 - Allen Cr.	12	X11	X11	5		
8129 - unnamed	16			2		
8095 - unnamed	19	N12,S01, X09	N12, S01	7	X09	
8129 - unnamed	11			4		
7958 - Bass Cr.	14	N13, X14		8	N13, W11	
7958 - Bass Cr.	20	M39, N13, W11, X14	M39	12	N13	
7958 - Bass Cr.	12	N13, Z01		10		
7970 - Blackhawk	4			2		
7893 - Dry Cr.	11			12		
7893 - Dry Cr.	13			14		
7965 - Fisher	10			3		
7988 - Gibbs Cr.	7			3		
7964 - Markham	16	N13		13	W11	
7964 - Markham	11			8		
7977 - Marsh Cr.	14	A05, N13		9	N13	
7977 - Marsh Cr.	16	N13, W11, X09		13	M32, N13	
7977 - Marsh Cr.	10			10		
8126 - Otter Cr.	8	X11	X11	10		
8126 - Otter Cr.	12			12		
7905 - Spring Br.	5			11		
7905 - Spring Br.	6			2		
7913 - Spring Brook Creek	17	M34, M35, X07	M34	8		
7963 - Stevens	12	N13		11		
7963 - Stevens	15	N13		11		
7916 - unnamed	10			6		
7912 - unnamed	20	M34, M35	M34	5		
7911 - unnamed	11			4		
7908 - unnamed	13	X07		11		
7894 - unnamed	13	Z01		7		
7923 - unnamed	11			11		
7979 - ditch	8			10		

Table 2: Sugar-Pecatonica River sub-basin survey results

WBIC - stream	1974			2000		
	# sp	Intol sp	ER sp	# sp	Intol sp	ER sp
8869 - Deer	6	M09, Z01	M09	3	I22, Z01	
8864 - Flynn	9	M09, Z01	M09	5	A05, I22, Z01	
8801 - Lit Sugar	5	M09, Z01	M09	2	Z01	
8863 - Milum	19	M09	M09	4	Z01	
8885 - Schlapbach	7	M09, Z01	M09	2	Z01	
8854 - Story	18	A05, I22, M09, N13, X07, X09, Z01	M09	10	A05, I22, Z01	
9082 - Syftestad	13	M09, Z01	M09	1	Z01	
8861 - W Br Sugar	11	M09, Z01	M09	3	Z01	
8819 - Hefty Cr	10	M09, Z01	M09	6	M09, Z01	M09
8819 - Hefty Cr	5	M09, Z01	M09	3	Z01	
8822 - Ctr Hefty	6	M09	M09	2		
8801 - Lit Sugar	7	M09, Z01	M09	8	Z01	
8787 - Norwegian	19	X11	X11	25	W04, W11, X11	X11
8856 - Ross Crossing	17	M39, W11, X09	M39	17	W11	
8830 - Spring Val	8	M09, Z01	M09	3	Z01	
8854 - Story	25	A05, M09, N13, W11, X07, X09, X14	M09	8	I22, N13, Z01	
8774 - Sylvester	18	M39, N13, W04, W11, X07, X09, X14	M39	20	N13, W11, X14	
8827 - Ward	8	M09, Z01	M09	2	Z01	
8788 - unnamed	12	X11	X11	12	X11	X11
8787 - Norwegian	14	X11	X11	14	X11	X11
8741 - Raccoon	16	M09, X11, Z01	M09, X11	16	A05, M09, X11	M09, X11
8741 - Raccoon	14	A05, M09, X11	M09, X11	19	A05, M09, X11, Z01	M09, X11

Key to intolerant and ER species in Tables 1 and 2: A05-American brook lamprey, I22-brook trout, M09-redside dace, M31-blackchin shiner, M32- blacknose shiner, M34-ozark minnow, M35-rosyface shiner, M39-redfin shiner, N12-lake chubsucker, N13-Northern hogsucker, S01-banded killifish, W04-rock bass, W11-smallmouth bass, X07-rainbow darter, X09-Iowa darter, X14-banded darter, Z01-mottled sculpin