Temporal and Spatial Distribution of Cyprinid Fishes Between 1921 and 1995 in the North Canadian River Drainage, Oklahoma

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A 20-year survey (1976-1995) of fishes in the North Canadian River, (known as the Beaver River in the Oklahoma Panhandle), Lake Eufaula, and the Canadian River below Lake Eufaula produced 23 species of cyprinids. A review of 261 past and recent fish collections (1921-1995) by others revealed an additional eight species of cyprinids found in the North Canadian River drainage. The distribution and the relative abundance of these 31 cyprinids species over time is connected to changes in using land within the drainage and to the various habitat requirements of each species.

INTRODUCTION

This paper presents an annotated checklist, taken from archival records and our own samples, of the cyprinid fishes known to occur in the North Canadian River drainage (NCR) of Oklahoma. We discuss the occurrence and distribution of cyprinid fishes in relation to the possible influences of human activities in the watershed.

Little is known of the effects of urbanization and other cultural alterations of land use upon native cyprinids in large Oklahoma streams. Most cyprinids in these streams are tolerant of physiochemical stress, as are most native fishes in prairie streams. The present species have evolved in streams with stressful, physical (high water temperatures), and chemical (low dissolved oxygen and high salinity) conditions similar to those produced by urbanization (*1*). Therefore, the relative abundance of those species that are more tolerant of such conditions would be expected to remain similar over time or to increase while the relative abundances of less tolerant species would be expected to decline.

METHODS

Historical Collections (1921-1995): In Table 1, we have compiled a comprehensive list of the fish surveys recorded between 1921 and 1995. The earliest fish collections we found that were recorded from the drainage were taken by an unknown collector in 1921 from Buffalo Creek, a tributary of Gaines Creek, in Latimer and Pittsburg Counties.

In unpublished records of University of Oklahoma Museum of Natural History (OKMNH), we found two extensive fish surveys from the 1960s. In 1962, A. Houser and H. L. Lindsay of the Oklahoma Department of Wildlife Conservation (ODWC) conducted a pre-impoundment survey, which included more than 100 collections taken from the mainstem of the NCR and its tributaries in the area of the then proposed Lake Eufaula. Then, in 1963, H. L. Lindsay and M. Bates of the Oklahoma Biological Survey (OBS) made 36 collections from the Beaver River and its tributaries in the Panhandle and other areas in NW Oklahoma (Table 1). [Editor's note: This paper has an unusually large number of extensive tables; all tables are collected at the end of the text; see pp. 55- 92.]

Collections before 1975 from the central urbanized (Oklahoma City) sections of the river are rare. Since 1975, however, there have been six fish surveys in this area. In Table 1 we list 261 past fish collections (year-year) taken from the NCR drainage.

Additional records of cyprinid fishes listed in collections from reservoirs were obtained from unpublished ODWC Job Performance Reports (ODWCLS) that are on file at

the Oklahoma Fisheries Research Laboratory (OFRL) for the years 1964-1994. Most of these reports lacked voucher specimens, limiting their usefulness. However, most of the earlier collections of lake minnows were taken by ODWC field personnel, most of whom were former students, who referred most of these specimens to G. A. Moore and C. R. Riggs for identification (personal communiations with ODWC field people).

Current Collections (1976-1995): We include information on minnows from the following reservoirs: Lake Canton, Lake Fort Supply, Lake Optima, Lake Overholser, Lake Hefner, Shawnee City Lake #1, Shawnee City Lake #2, Lake McAlester, American Horse Lake, and Lake Eufaula (Table 1).

In 1976-1995 Oklahoma State Departmental of Environmental Quality (ODEQ), formerly the Oklahoma State Department of Health (OSDH), conducted surveys that included 467 collections from 60 sites on the NCR and its tributaries and reservoirs. We collected fishes at ten mainstem, long-term monitoring sites and 30 additional short-term ones from river and stream, and 21 sites in ten lakes (Table 2). A review of 261 fish collections from the drainage (1921 to 1995) found in museums at Oklahoma State University (OSUS), University of Oklahoma (OKMNH), University of Kansas (UK), University of Michigan (UMMZ), United States National Museum of National History (USNM), and University of Tulsa (UT) now OSUS, provided additional data on the past occurrence and distribution of cyprinid fishes (Table 1).

The ten, long-term sampling sites (Figure 1) were established on the mainstem of the NCR between 1976 and 1980 and were visted two or three times a year through 1995 (Table 2). Collecting locations were selected primarily on the basis of their accessibility by roads and were areas that were influenced by water quality, impoundments, wastewater discharges, and storm water runoff as nonpoint-sources (*2*).

A heavily leaded seine, 3.3×1.3 m with 3.0-mm mesh, was used in all sampling. A 200-m reach of stream was sampled during each visit. The sampling technique for all stream sites consisted of slow seining as close to shore and cover as possible. We would first establish the upstream boundary, then seine downstream 200 m, and this point became the downstream boundary.

Lake surveys consisted of shoreline seining of 100 m (10 hauls of 10 m each using a 3.3-m minnow seine) to catch smaller fish. In lakes larger cyprinids (carp) were also collected by using 330-m experimental gill nets set overnight.

In this study, we define six categories of relative abundance values calculated as the number of specimens per collection (approximately 200 m) (*2*) as follows: very abundant (VA) = over 5,000; abundant (A) = 4,999-500; common (C) = 499-100; rare (R) = 99-20; very rare (VR) = 19-1; 0 = no specimen collected; and '—' = no collection that year.

RESULTS

The 467 collections produced 532,183 fish of which 338,410 (64%) were cyprinids. In the 371 collections from the ten, long-term mainstem sites, cyprinids consist of 66% of all fish collected (Tables 3 and 4). In the collections from the tributaries 51% of the fish collected were cyprinids. In lake collections cyprinids comprised 14% of the fish (Table 3).

***Campostoma anomalum* (Rafinesque) Central stoneroller:** Stonerollers have never been common in the mainstem of the NCR. We found past records of this species from the mainstem (Table 5). We found the stoneroller to be VR (1-4) in the lower segments (E, F, and G) of the mainstem (Table 6).

In the past, stonerollers were found in some of the tributaries of the NCR east of Seminole County. The 1962 ODWC survey found stonerollers to be A (3,416) in 51 collections from 18 tributaries of the proposed Lake Eufaula (Table 5). In 1988 we found this species to be VR (1-8) from tributaries in the lower reaches of NCR (Table 6).

Past collections taken by OBS from tributaries in Beaver and Texas Counties did not contain the stoneroller. In 1988, in single collections from each of two sites on Corrumpa

Creek, we found this species to be C (224 specimens) (Table 3).

Today, stonerollers are primarily collected in the NCR or in some of the tributaries below Lake Eufaula GM10 (Table 3). This species probably has always been in the headwater tributaries of the NCR in Cimarron County, and in the tributaries of lower reaches of the river below Lake Eufaula (Table 5). This species may have disappeared from the mainstem above Lake Eufaula because of habitat limitations (Table 7). Lake Optima, and a dry section of the Beaver River west of the lake, apparently prevent downstream movement from the western tributaries, where the species is common today. The lack of gravel and rock substrata in the Beaver River and its lower tributaries may also limit stoneroller downstream movements. Lake Eufaula may be a barrier to the upstream migration of stonerollers from downstream tributaries where this species was C (134-842) (Table 5).

***Cyprinus carpio* (Linnaeus) Common carp:** Common carp likely has occurred in western Oklahoma and southwestern Kansas since its introduction to Kansas in the early 1880s (*3*). A 1962 preimpoundment survey (Lake Eufaula) produced 131 common carp from seven tributaries and six specimens from mainstem sites (Table 5).

Comman carp were C in most ODWC lake surveys between 1965 and 1994. Unpublished job reports at OFRL indicated it is C in lakes of the NCR (Table 3).

These carp were more common in the mainstem of NCR and reservoirs than in the tributaries, being present in 37% of our mainstem collections (Table 8), in all our reservoir collections, and in 63% of our lake collections (Table 3).

These carp were most numerous in the central segments of the NCR (Table 8) segments C, D, and E. Before 1992, they were R in collections from the headwaters (Ml, M2, and M3), and VR in collections from lower segments (M10) of the NCR (Table 7).

***Ctenopharyngodon idella* (Valenciennes) Grass carp:** We failed to collect any grass carp; however, it was stocked by ODWC for weed control in several small lakes including Beaver City Lake in Beaver County and Guymon City Lake in Texas County in 1983 (Table 9). Both the grass carp and the hybrid *C. idella* × *Hypophthalmichythys noblilis* were introduced into the American Horse Lake (ODWC unpublished stocking records) in Blaine County (Table 9). Throughout the drainage, the grass carp has also been stocked by landowners in many small ponds with aquatic weed problems (*4*). No grass carp have been collected from the mainstem.

***Hybognathus placitus* (Girard) Plains minnows:** The plains minnow was collected by Ortenburger in 1926, from Coldwater Creek in Texas County (Table 5). Past collections from the westernmost tributaries indicated this species was C (Table 5). Two of our collections made in 1988 from Palo Duro Creek contained 220 specimens (Table 3).

During the 1962 ODWC survey, collections from the mainstem in the area of the proposed Lake Eufaula produced 12,469 plains minnows (Table 5). In the past, this species was VA in the mainstem now inundated by Lake Eufaula (Table 10).

This species was once A in the mainstem, downstream of Lake Eufaula; preimpoundment collections found 1,580 specimens (Table 11). In 1982 we found that this species was R; we collected 21 specimens from the mainstem north of Whitefield (Site M10) (Table 10).

In 1981 we collected a single specimen from the river north of El Reno (M7). This was the last record of this species from segments D and E of this species. Downstream from Oklahoma City our last collection of this species was at Harrah (M10) in 1986 (Table 10).

The plains minnow was collected from all ten mainstem sites (Table 10), and in 117 of the collections from the mainstem. In our collections, this species was VR (ten specimens) in reservoirs and C (339 specimens in four collections) in some western tributaries (Table 3).

Today, the plains minnow is R in the

drainage. Since 1982, this species has not been found downstream of Lake Eufaula (Table 11). A notable decline in the numbers of the plains minnows occurred after 1983; three sites (M4, M8, and M9) exhibited declines (Table 10). This decline of the plains minnow may be related to construction of reservoirs and in-stream flow depletions because of deep-well irrigation. A review of collection records indicated this species has never been reported to be A in the central sections of the river upstream of Lake Overholser. This lake, which was constructed in 1919, and Canton Lake, constructed in 1948, might have restricted upstream dispersals. However, it is R within Canton Lake. In the 1962 surveys conducted by ODWC, this species was VA in the river below Oklahoma City and downstream to the mouth of the river (Table 5). Since the construction of Lake Eufaula in 1964, this minnow has almost disappeared from the river downstream of Lake Eufaula. Since 1983 it has also declined above the lake. Cross (*3*) indicated a similar change in abundance in the Cimarron and Salt Fork Rivers of the Arkansas drainages in Kansas.

It was once an A minnow but today is a VR minnow between sites Ml and M4 below Lake Optima and west of Woodward. Stream flow patterns in the Beaver River between Lake Optima and Wolf Creek are still mainly controlled by storm events and spring flows. Because Lake Optima has never released water, the river downstream still retains the natural flow patterns for a small prairie stream.

In the sections of the river with a continuous flushing action by daily discharges from the reservoir, or increases in daily discharges from sewage treatment plants, the changes in flow may contribute to the decline of the plains minnow over a long period. This herbivorous minnow feeds on diatoms, other microorganisms, and finely divided detritus that accumulates in pools and calm, shallow water or along sandbars. Increased discharges from lakes or the South Side Oklahoma City Waste Water Treatment Plant (95 million gallons/day wash away this food source). In sections of the river below these discharges, there are very few pools or calm areas for feeding. With the increases in downstream flows and unstable substrata of sand, the sand may have covered much of the organic debris and other food materials for this species. Burial of the organic debris by sand would make the food unavailable to plains minnows and would contribute to a decline in abundance.

***Macrhybopsis aestivalis* (Girard) Speckled chub:** Hubbs and Ortenburger (*5*) collected nine (OKMNH 6219) and 18 (UMMZ 80431) specimens in 1926 from Coldwater Creek, a tributary of the NCR 13 km southeast of Guymon in Texas County. Examinations of past fish collections indicate this species was R in the river west of Woodward and it is now extirpated from the river west of Woodward (Table 5).

Apparently, there has been a decline in the number and distribution of the speckled chub in the study area. The virtual absence of speckled chub, in our collections and in collections made by other workers (*6,7,10*) during the 1980s and 1990s, indicates a serious depletion. This species was collected only twice during our survey. We found record of one recent collection (1993) from the mainstem north of Whitefield (*6*). This was the site (M10) where we collected it in 1982.

The lack of suitable habitat of pea-sized gravel substrata and main channel habitat may account for the absence of this species in our tributaries and reservoirs collections.

***Platygobio gracilis* (Richardson) Flathead chub:** The flathead chub was always VR in the river. In 1988 we took three from Corrumpa Creek south of Wheeless, east of the New Mexico state line in Cimarron County. In 1977 a single specimen was collected from Fort Supply Lake by ODWCLS (Table 9). The status of this species in the river seems critical and appears limited to the westernmost sections of the mainstem above Lake Optima.

***Macrhybopsis storeriana* (Kirtland) Silver chub:** Only one record of silver chub from the NCR drainage was found. One 1962 collection took six specimens from the NCR near the mouth of the Deep Fork River. It is likely that the silver

chub has always been VR in the river. We collected twice (two to seven specimens) from Site M10 near Whitefield (Table 9). A recent survey (1993) also found this species at site M10 (*6*). The silver chub was not found in any of our tributaries or reservoirs. The silver chub now seems limited to the mainstem downstream from Lake Eufaula near Whitefield (M10).

***Notemigonus crysoleucas* (Mitchell) Golden shiner:** The first collections of golden shiners from the drainage were made by Ortenburger in 1926 from Coldwater Creek in Texas County, and in 1927 from the NCR in Hughes County (Table 5). Some time after the 1930s, this species was widely transported for bait.

Most collections of golden shiners were from the tributaries. We found records of only two collections from the mainstem (Table 5). This species was R in the river before 1975 and remains R today (Table 4). Golden shiners were present in our collections from mainstem sites M4-M10. Collections from the westernmost mainstem sites (M1, M2, and M3) failed to produce this species. and it was present in only one of our tributary collections (Table 4).

The annual lake surveys by the ODWC of Optima, Canton, Fort Supply, Hefner, Overholser, Shawnee City #1, and Eufaula Reservoirs in the 1970s and 1980s usually indicated this species was R. In our survey, golden shiners were found in five reservoirs, usually R (maximum = 34 specimens) in four collections from Lake Canton, and the species was R in tributaries (Table 5).

Bait bucket discards may account for up to 1,223 specimens found in the reservoirs. A similar probability may account for the increase in numbers at site M10 where there is more fishing than at other mainstem sites.

***Scardinius erythrophthalmus* (Linnaeus) Rudd:** On 26 June 1990, we collected two large specimens of this exotic species from the Elm Point area of Lake Eufaula, in the Gaines Creek arm of the lake (*12*). These specimens of rudd may be bait bucket discards (Table 9).

***Notropis atherinoides* (Rafinesque) Emerald shiner:** Our collections show a decline in the abundance of the emerald shiner in the three Panhandle counties. During the time we collected from the these counties, this species was not found any of our 90 collections, 79 from the mainstem and 11 from the tributaries (Table 12). The absence of emerald shiners from all 79 collections from the Beaver River in the Oklahoma Panhandle reflects a substantial change in the recent distribution of this species west of Woodward, where at one time it was VB (Table 5).

The emerald shiner exhibited a tendency toward greater abundance in downstream areas than in other areas of the NCR (Table 12). Most of the specimens (93%) were collected between sites M7 and M9. Between sites M4 and M8 this species has declined in abundance since 1980, and 7 specimens have been collected since 1986 (Table 11). This species was C during the 1962 ODWC survey of the proposed Lake Eufaula (Table 5). But recent surveys indicate that this species is very rare above Lake Eufaula. It still occurs at site M10 below the lake (*6*) (Table 12).

Past ODWC lake surveys indicate this species occurred in both Canton Lake and Lake Eufaula. A recent (1990-1992) ODWC lake survey of Lake Eufaula indicated emerald shiners were still common (Table 5). During our lake surveys (1976-1996) this species was VR in all lakes (Table 12), and appears to be on the decline. The lack of voucher specimens limits the usefulness of this ODWC data, but we have included it to make others aware of emerald shiner presence.

***Notropis bairdi* (Hubbs and Ortenburger) Red River shiner:** The Red River shiner is a recent invader of the Arkansas River basin from the Red River System (*11,12*). Our survey produced the only known record of this species in the NCR drainage (Table 9). Our specimens were deposited at OSUS, but were not cataloged into the collections; we assume they have now been lost. Recent surveys, since 1983, have failed to find the Red River shiner (*1,6,7*). This species apparently has not established

itself in the NCR.

***Notropis blennius* (Girardi) River shiner:** The river shiner has been rare in past collections from the NCR and limited to the lower segments (M9-M10). We observed a similar distribution (M7-M10), and relative abundance is VR (four collections from three sites yielded 11 specimens) (Table 9). These specimens were deposited at OSUS, but they were not cataloged and may be lost. A recent collection at site M10 in 1993 found 25 specimens that were placed in the museum at OSUS (#26354) (*7*).

A review of past and recent collection records would suggest that there has been little change in distribution and abundance of the river shiner (Table 9).

***Notropis boops* (Gilbert) Bigeye shiner:** Past collection records found that the bigeye shiner was limited to the tributaries of the lower reaches of the NCR (segment F) and produced 1-64 specimens (Table 5). We found this species to be C (up to 157 specimens) and to comprise over half the fish collected from the tributaries of Gaines Creek (Table 4). We could not find any records of this shiner from the mainstem.

***Notropis buchanani* (Meek) Ghost shiner:** We found 18 records of this species from the drainage. In 1962, 2,344 specimens were collected from the tributaries of Gaines Creek and the mainstem of NCR (Table 5). We found ghost shiners to be VR (nine specimens) in the mainstem. We found ghost shiners were VR also in Lake Overholser and Lake Eufaula (Table 4).

This shiner has a spotty distribution. In the past, the largest number collected was from the large, turbid tributaries of Lake Eufaula (Gaines and Longtown Creeks). Recent collections found the ghost shiner was rare in lakes and in the NCR upstream of Lake Eufaula (Table 5).

***Luxilus cardinalis* (Fowler) Cardinal shiner:** The cardinal shiner was reported in the area of Belle Starr Landing in McIntosh County and was listed as abundant. This is the only record of this species in the drainage. Because there is no voucher specimen, this record may be a questionable one.

***Notropis emilate* (Hay) Pugnose minnow:** In 1921, the first pugnose minnow collected was from Gaines Creek, a large tributary that now empties into Lake Eufaula (OKMNH 15450). Examination of past collections showed this species was restricted to the tributaries of the NCR in Pittsburg and Latimer Counties (Table 5). In other past collections this minnow was VR to R (nine collections, 38 specimens). Today, it is still rare and limited in distribution to the same area. We collected a single specimen from Gaines Creek near the mouth of Pit Creek. This is the only recent record (since 1962) of this species from the drainage.

***Notropis girardi* (Hubbs and Ortenburger) Arkansas River shiner:** The first collection of this shiner from the NCR drainage occurred in 1926 when 215 specimens were collected from Coldwater Creek southwest of Guymon, in Texas County, by Hubbs and Ortenburger (*5*). In the past, Arkansas River shiner was common in the tributaries and mainstem west of Woodward (M1-M4) (Table 5). Past collections from the tributaries and mainstem of the lower NCR drainage (M9- M10) found this species to be A before 1965. Records of past collections of this shiner from the central segments (M4-M8) are lacking. Most sites described in the 1962 ODWC survey of the proposed Lake Eufaula are now inundated by Lake Eufaula (Table 5).

Past collections show that since 1965, this species has been on the decline. In our collections we observed that this species has disappeared from the NCR drainage (*12*) except for 1 specimen found in 1994 from the westernmost site (M1). In the 372 collections we have made since 1976, we found this shiner to be VR, occurring in 16 collections (Table 13). Recent surveys of the NCR by others failed to find this shiner (Table 5).

In the past, the Arkansas River shiner was VA in the western segments (M1-M4) and eastern segments (M9-M10) of the mainstem of the NCR river. This species has also declined from the western tributaries (Coldwater Creek) where in the past it was C. At one time it may have been found throughout

the drainage. Long-term pollution problems in central Oklahoma during the later 1920s and early 1930s (Oklahoma City oil field) may account for the decline of this species in segments M7-M9. The first recorded fish collection (OKMNH 42064 and OKMNH 22983) from the urbanized Oklahoma City segment (M7-M8) was in 1936 and reported only two species of fish. Today the Arkansas River shiner is virtually absent from the drainage (Table 5).

After it disappeared from the river, this shiner was present in several reservoirs; ODWC surveys of Lake Canton and Lake Eufaula found this species (Table 5). One collection by ODWC found this species was C (135 specimens). These specimens might have washed in from the South Canadian River (JPDEQ unpubl. data) where this species is still VA. However, collections from Lake Eufaula after 1988 did not find this species and we found none in our collections from the lake. The lack of voucher specimens would limit the usefulness of these lake records; however, it is important to let others know of the possible presence of the Arkansas River shiner.

***Cyprinella lutrensis* (Baird and Girard) Red shiner:** The first collection of the red shiner from the drainage was made by Ortenburger in 1926 from Coldwater Creek, southwest of Guymon in Texas County (OKMNH 6235). Since 1926, this shiner has occurred in varying numbers (2-5,482 specimens) at most sites and in all counties through which the river flows. It is apparent that this minnow was VA and widely distributed in the past (Table 5). Today, it is still VA, widely distributed, and fairly stable in abundance (Tables 14 and 15).

The red shiner was the most abundant species collected and composed more than 41% of the total fishes collected at seven of the mainstem sites (Table 15). This shiner had the widest distribution of all the minnows, representing 48% of the fish and occurring in 88% of the collections. It was absent in our collections from the headwaters tributaries of Gaines Creek, but it appears to be limited in distribution in the headwaters of the tributaries in eastern sections of the NCR drainage. In the present survey, this species was abundant at most mainstem sites except M10, and was present in most collections from the reservoirs and tributaries (Table 3). The red shiner seems to be sustaining itself better than most cyprinids, perhaps because of its tolerance to intermittent flow and its opportunistic feeding and reproductive behavior (*1*).

***Notropis nubilus* (Forbes) Ozark minnow:** Ozark minnow is VR. There is one record of this minnow from the drainage. In 1966 the ODWCLS of Belle Starr Landing in Lake Eufaula collected the Ozark shiner (Table 9) and it was listed as R by the collector. The lack of a voucher specimen would limit the usefulness of this record.

***Notropis ortenburgeri* (Hubbs) Kiamichi shiner:** The first known collection of the Kiamichi shiner from the drainage was in 1931 by Ortenburger. Since 1931, this species was collected only during the 1962 ODWC survey of the proposed Lake Eufaula (Table 5). We could not find any recent records of this species from the NCR drainage, and we failed to collect any Kiamanchi shiner during our survey (1976-1995).

In the past, this species was limited to the tributaries of Gaines Creek in Pittsburg and Latimer Counties and occurred in varying numbers (1-33 specimens) (Table 5). Today this species is rare in the NCR drainage and appears to be limited in distribution to the eastern tributaries in Pittsburg and Latimer Counties. The 1962 collections were the last records of this species from the NCR drainage.

***Notropis potteri* (Hubbs and Bonham) Chub shiner:** A single specimen of chub shiner was collected from Canton Lake in 1979 during the ODWCLC survey. This is the only known collection of this species in the NCR drainage and probably represents bait transport from Red River drainage. The lack of a voucher specimen would limit the usefulness of this record.

***Notropis rubellus* (Agassiz) Rosyface shiner:** The rosyface shiner is R

and has been collected only one time from the NCR drainage. In 1952, 20 specimens (USNM 00165834) were collected from a tributary of the NCR, 19.4 km north of Seminole near the Pottawatomie and Seminole County line on Oklahoma Highway 9, or RTE 99, which was known as the Arkansas Drive at that time (Table 9).

***Notropis stramineus* (Cope) Sand shiner:** In past collections sand shiner was A in the upstream sections of the mainstem of the river, but showed spotty distribution in the tributaries. Records shows that the sand shiner was absent in the headwaters tributaries of the lower NCR and the proposed Lake Eufaula (Table 5). We observed a similar trend in distribution and abundance during our study (1976-1995) (Tables 16 and 17). This species was not found downstream during the 1962 ODWC survey (OKMNH). It probably was never abundant in the lower reaches of the river (Table 5).

We found the sand shiner was abundant and widely distributed in the mainstem west of Oklahoma City (upstream of M8) (Table 16). It represented 6% of all fish and was found in 66% of the collections. This species was taken from nine of the mainstem sites (M1-M9), and was C or R, except from M10 below Lake Eufaula where it was VR (Table 16). In the past (before 1976) and during recent surveys (1976-1995), this species was not found downstream from M10 (Table 5).

We found this shiner in four tributaries (Kiowa, Palo Duro, Wolf and Longtown Creeks) (Table 3). Its abundance in these tributaries was highly variable. The largest numbers (1,022 specimens from three collections) were found in Palo Duro Creek. This species was absent from the headwaters tributaries of the NCR river and many of the smaller tributaries of the river in Latimer and Pittsburg Counties (Table 5).

In the past, this shiner was C in collections from upstream reservoirs (L1-L3). However, in downstream reservoirs (L4-L9) it was R. Two recent ODWCLC collections (1991 and 1994) from Lake Eufaula found this shiner to be C (Table 5).

While this shiner is fairly stable in abundance in the western segments of the river, during the period of our study the abundance of the sand shiner appears to be on the decline in those lower mainstem sites (M9-M10) (Table 17).

***Lythrurus umbratilis* (Girard) Redfin shiner:** The 1962 ODWC survey of the proposed Lake Eufaula found redfin shiner in 35 collections; all were collected from the tributaries in McIntosh, Okmulgee, Pittsburg, Haskell, and Latimer Counties (Table 5).

As in the past, we found the redfin shiner is VR in the mainstem. We made one collection from the mainstem (M10) and also observed it was VR (only two specimens) in our collections from the tributaries (Table 4).

***Notropis volucellus* (Cope) Mimic shiner:** In past and recent collections, mimic shiner was VR. We observed that it was limited in distribution to Lake Eufaula and its tributaries. All past and recent collections were from this area (Table 9).

We collected a single mimic shiner from the Oak Ridge area of Lake Eufaula on 14 September 1984. On 20 July 1992, we obtained another specimen from Elm Creek two miles south of Featherson in Pittsburg County. These specimens were transported to OSUS, but apparently were discarded without being cataloged. In 1988, four specimens of this shiner were collected from Lake Eufaula by ODWCLS (Table 4). Lack of voucher specimens would limit the usefulness of this collection.

One past collection of this species from the river or the tributaries was indicated on a distribution map of freshwater fishes in the United States: the exact location was difficult to determine from the atlas (*8*). However, it appears that this location may be Featherson Creek, where we collected minic shiners in 1964 (OKMNH 34089-6 specimens). Featherson Creek is a tributary of Sans Bois Creek on the Arkansas River.

***Phenacobius mirabilis* (Girardi) Suckermouth minnow:** Suckermouth minnow was first taken from the drainage in 1926 by Ortenburger from Coldwater Creek southeast of Guymon (OKMNH 9243, specimens).

Since 1926 it has been rare in collections from the tributaries and the mainstem west of Woodward (Table 5). In our collections we found this species was VR to C (up to 174 specimens) in the western segments (M1-M4) of mainstem of the Beaver River (Table 4).

Past collections from the lower tributaries of the proposed Lake Eufaula found this minnow was R (316 specimens from 24 collections). In past collections from the mainstem from three collections (18 specimens), we found it to be VR in Okfuskee, Okmulgee, and McIntosh Counties (Table 5). Downstream from Lake Eufaula, this species was more abundant in the past than it is today (Table 17). After the impoundment of Lake Eufaula, this species seems to have declined in the river immediately downstream and upstream from the lake. A decline in the numbers collected at M10 was observed after 1962. For the period 1926-1995, it appears to be fairly stable in abundance above Lake Eufaula (Table 18).

Since 1980, we have been unable to collect this minnow below the lake (M10) but collected it at sites M1-M9. During this survey it was most abundant (up to 174 specimens) in the upstream reaches of the mainstem (M2-M4) (Table 18). Other recent collections (1989 and 1992) found up to ten specimens of this species in the mainstem above the Lake Eufaula (*6,7*) (Table 5).

We found the suckermouth minnow in variable numbers (0-21 specimens) in 4 collections from the tributaries and 14 specimens in 6 collections, from Lake Canton. Between 1967 and 1983, this species was collected by the ODWCLS from Lake Canton and Lake Optima (Table 5). There are no voucher specimens for these collections, which should be viewed with limited confidence.

***Pimephales notatus* (Rafinesque) Bluntnose minnow:** The first record of the bluntnose minnow from the drainage was made in 1925 by E.B. Force (*9*), who collected 14 specimens from Okmulgee County. We found 86 past collections of this species; most came from the tributaries in the eastern sections of the drainage. Past collections from the mainstem indicate VR (two collections) (Table 5).

We collected bluntnose minnows three times from two NCR mainstem locations (M8 and M10). Six of our collections from five eastern tributary sites included this species (Table 4).

In this survey, this species clearly exhibits greater abundance in downstream areas then elsewhere in the drainage, with 99% coming from the river downstream of Lake Eufaula (M10) or from the tributaries of Lake Eufaula. Our westernmost collection was from west of Harrah (M8) in Oklahoma County. A recent collection (1989) included a single specimen from the river north of Dustin, in Okfuskee County (*7*). This minnow remains VR in the NCR mainstem, but is C in the eastern tributaries in Haskell, Pittsburg, and Latimer Counties.

We failed to find this species in our lake surveys. Past collections by the ODWCLS found two to eight specimens in the western lakes, but it was C (3-218 specimens) in Lakes Hefner and Overholser (Table 5).

***Pimephales promelas* (Rafinesque) Fathead minnow:** Fathead minnow was first collected from the mainstem near Weleetka in Hughes County in 1924 by Ortenburger (OKMNH). Since 1924, it has been found to be A up to 1,064 specimens from the mainstem and tributaries of the western segments (A, B, and C) of the NCR. Extensive collecting in the lower reaches of the NCR and tributaries found this species to be R (201 specimens from 14 collections) (Table 5). Recent collections from the central, urbanized segment of the NCR mainstem included 14-16 specimens (Table 5).

Most of the specimens (63%) we obtained came from nine mainstem sites (M1-M9). None was collected from site M10, which is downstream from Lake Eufaula. This species was in 220 (60%) of the mainstem collections and represented 3% (13,978) of the fish taken from the mainstem (Table 19).

In the tributaries, this species formed 5% (701 specimens) of the fish taken and was present in 29% of our collections. It

was found in four of the reservoirs and represented 2.1% of the fish taken. In six collections from the lakes, we found 360 specimens (Table 4).

In this survey, this most adaptable minnow exhibited greater abundance in upstream areas than in the lower reaches of the NCR (Table 19). This species represented from 2% to 11% of the fish collected at sites upstream from site M6. Downstream from site M6 the percentage varied from 0.0% to 2.0%. The largest numbers were collected at site 3 north of May in Beaver County and site 4 north of Woodward in Woodward County (Table 19).

The flushing flows from Oklahoma City South Side Waste Water Treatment Plant (WWTP) and Lake Eufaula have contributed to declines in this species at sites M8-M10 (Table 19). The largest numbers were collected in 1985 and 1986 and in 1993 and 1994 (Table 20).

***Pimephales tenellus* (Girard) Slim minnow:** A single specimen of the slim minnow was collected from Emachaya Creek west of Whitefield on Highway 9 in Haskell County by M. Curd, R. Sisk, and B. Branson in 1959 (OSUS-UPR). On 20 July 1992, we collected two specimens from Elm Creek 3 km south of Featherson in Pittsburg County. These specimens were deposited at OSUS, but were apparently discarded without being cataloged. In a 1950 ODWCLS collection from Lake Canton, we found one record of this species that was deposited at OKMNH (Table 9).

***Pimephales vigilax* (Baird and Girard) Bullhead minnow:** The first collection of bullhead minnow from the NCR drainage was by Ortenburger in 1928 from the river north of Woodward (Table 5) (OKMNH). Past collections from the Beaver River north of May (M3) downstream to Watonga (M6) produced 1-7 specimens. Other past collections (1962-1975) indicated that the bullhead minnow was more abundant (up to 142 specimens) in the lower reaches (M9-M10) of the mainstem and the lower tributaries of the NCR than in other areas of NCR (Table 20). In the past this species was VR below site M10.

The bullhead minnow was abundant and widely distributed in our survey, comprising 1% of the fish collected, and was found in 53% of the collections. This species was collected from nine of the mainstem sites with the exception of the westernmost site M1 (Table 22). The bullhead minnow was in 216 (58%) of the mainstem collections, which produced 98% of the specimens (Table 4).

We found this minnow was C in collections from reservoirs, where it occurred in 31 collections and comprised 2% of the fish. The reservoirs produced 17% of the specimens, with the largest numbers taken from Lake Canton (Table 4).

The bullhead minnow appeared to increase in abundance downstream. Numbers increased from zero specimens at the westernmost site M1 to 2,519 specimens at site M9. This omnivorous minnow was R downstream of Lake Eufaula (Site M10) (Table 21).

The number of specimens collected in 1991 and 1994 was much greater than the number collected earlier (Table 20). We have observed a substantial increase of this species since 1991 at sites M8-M9.

***Erimystax x-punctatus* (Hubbs and Crowe) Gravel chub:** We found one past record of the gravel chub from the NCR drainage. In 1962 a single specimen was collected from Gaines Creek during the ODWC survey led by Houser and Lindsay. This specimen was deposited into the University of Tulsa fish collections (TU #437) and later transferred to OSUS (Table 9).

CONCLUSIONS

In Tables 7, 11, 14, 17, and 21, we attempt to show changes in fish numbers using relative abundance based on the number of specimens per collection. Eighteen species occurred in such small numbers (fewer than 20 specimens) that we made no attempt to establish a trend for these species. These were *C. idella, E. x-punctatus, L. cardinalis, L. umbratilis, M. aestivalis, M. storeriana, N. bairdi, N. boops, N. emilate, N. nubilus, N. ortenburgeri, N. potteri, N. rubellus, N. volucellus, P. notatus, P. gracilis, P. tenellus,* and *S.*

erythrophtalmus. The remaining 13 species were evaluated for spatial or temporal trends. These species were *C. anomalum, C. carpio, C. lutrensis, H. placitus, N. crysoleucas, N. atherinoides, N. blennius, N. buchamani, N. girardi, N. stramineus, P. mirabilis, P. promelas,* and *P. vigilax.* Four species (carp, red shiner, suckermouth minnow, and golden shiner) exhibited a wide distribution in the drainage and appeared to be fairly stable in abundance.

Plains minnows exhibited an upstream distribution trend and a decline in abundance downstream below Oklahoma City. This decline may be connected to changes in flows because of the increase in discharges from Oklahoma City Southside Waste Water Treatment Plant. This increase in flows may flush out bottom microflora and organic detritus used by this species for food.

The emerald shiner showed a downstream distribution and was R. The lack of fast, deep channels, their preferred habitat, may limit this species to the lower reaches of the mainstem of the NCR.

The Arkansas River shiner and the speckled chub are two species that had almost disappeared from the NCR where in the past they were C. The lack of elevated flows during periods of reproduction may account for this decline.

Sand shiners and fathead minnows exhibited an upstream trend in distribution and abundance. Fathead minnows find large deposits of organic matter, plankton, and insect larvae in the upstream sites.

Three additional species showed trends in distribution and abundance. The bullhead minnows showed a downstream trend both in distribution and in abundance. The bigeye shiner was limited in distribution to the smaller tributaries in the lower reaches of the drainage. The central stonerollers were limited in distribution to headwater tributaries and the tributaries of Lake Eufaula. The lack of gravel and bedrock substrata may account for the absence of this grazing species in the mainstem.

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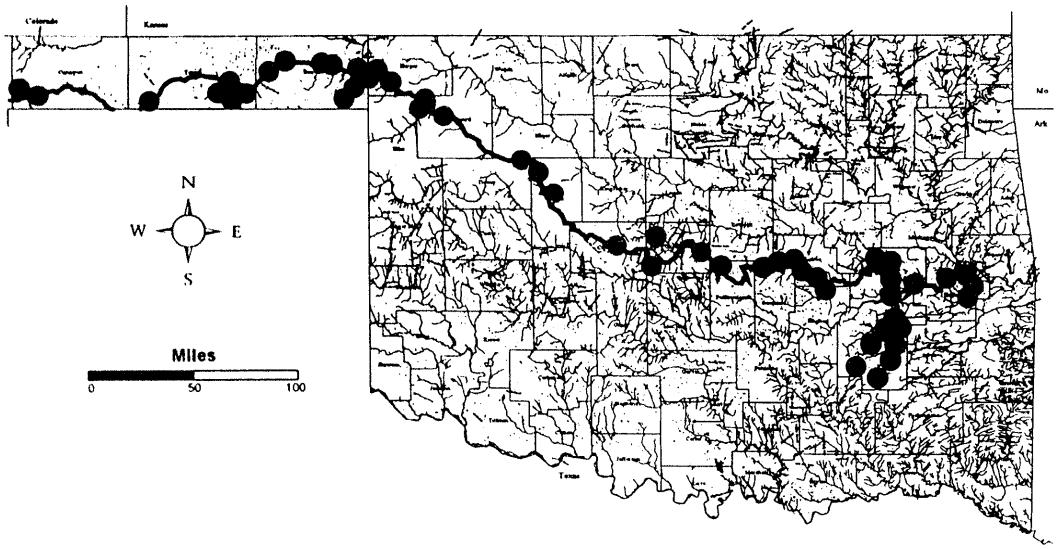

Figure 1. Map of river segments and ODEQ fish-monitoring sites on the North Canadian River, 1976–1996.

TABLE 1. Historical collections of Cyprinid fish of the North Canadian River drainage from various sources.

Year	County	Collector	Source[a]	Collector Code[b]	No.[c] Coln.	Habitat[d] T	R	L
A. NM State Line to L Optima								
1926	Texas	Hubbs, Ortenburger	(1)	ATHT	1	1	—	—
1949	Texas	A. P. Blair	(2)	ARBT	1	—	1	—
1949		Moore, Cross	UK	ARMCT	1	—	1	—
		Cross, Gordon, Moore,et al.	USNM-OSUS	ATRMT	4	2	2	—
		Unknown	TNHC	ARUT	1	—	1	—
1956	Texas	Anderson, Packard, Mader	UK	ARAPT	1	—	1	—
1957	Beaver	Carpenter, Mahmond, Deimer	OKMNH	ATCMB	1	1	—	—
1962	Texas	Metcalf	UK	ARMT	1	—	1	—
1963	Texas	Lindsay, Bates (OBS)	OKMNH	ATLBT	1	1	—	—
1979-95	Texas	Stahl	ODWCLS	ALSOT	8	—	—	8
B. L. Optima to Woodward								
1928	Woodward	Ortenburger UOBS	OKNMH	BROW	1	—	1	—
1947	Harper	Poole, Carter	OSUS-GMFN	BRPH	2	—	2	—
		Moore, Cross	OSUS	BRMCH	1	—	1	—
1949	Woodward	Moore	OSUS	BTGMW	1	1	—	—
	Cimarron	Unknown	OSUS	BTUC	1	1	—	—
1950	Woodward	Hall	ODWCLS	BLHFSW	1	—	—	1
1951	Beaver	Leonard	UK	BRLB	1	—	1	—
1953	Woodward	Riggs, Hall, Moore	OKMNH	BRTRHW	2	1	1	—
1957	Texas	Carpenter, Mahmond, Diener	OKMNH	BRTCMDT	4	2	2	—
	Harper		OKMNH	BRCMDH	1	—	1	—
	Beaver		OKMNH	BTCMB	2	2	—	—
1957	Harper	Riggs	OKMNH	BTRH	1	1	—	—
	Cimarron	Unknown	OSUS	BTUC	1	1	—	—
1960	Beaver	Patterson	UK	BRPB	1	—	1	—
1963	Texas	Lindsay, Bates (OBS)	OKMNH	BRTLBT	4	2	2	—
	Beaver		OKMNH	BTMLBB	5	3	2	—

a Where the record was found. GMFN: George Moore Field Notebooks; OBS: Oklahoma Biological Survey; OCCHD: OK City–County Health Department; ODWCLS: OK Dept. Wild. Cons. lake surveys; OKMNH: Univ. OK Museum Natural History; OSUS: OK State Univ. Zoological Museum; TNHC: Texas Univ. Natural History Collections; TU: University of Tulsa; UK: University of Kansas; USNM: United States Natural History Museum; For *numbered references* see the last section of this table.

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TABLE 1 (contd.). Historical collections of Cyprinid fish of the North Canadian River drainage from various sources.

Year	County	Collector	Source[a]	Collector Code[b]	No.[c] Coln.	Habitat[d] T	R	L
B. L. Optima to Woodward (cont.)								
1963	Beaver	Lindsay, Bates (OBS)	OKMNH	BTMLBB	9	8	1	—
	Ellis		—	BTLBE	7	7	—	—
	Harper		—	BRRLBH	7	6	1	—
	Woodward		—	BTLIBW	2	2	—	—
1972	Beaver	Cross, Collins	UK	BRCRB	1	—	1	—
1976	Woodward	Graham, Bell	TU	BRGBW	1	—	1	—
1977-86	Woodward	Stahl	ODWCLS	BLSFS	10	—	—	10
1977-95	Beaver	Stahl	ODWCLS	BLSCH	10	—	—	10
1979	Woodward	Felley, Cothran	OKMNH	BRFCW	1	—	1	—
1983	Woodward	Ok Water Res. Board	(3)	BROWRBW	2	—	2	—
1979	Woodward	Felley, Cothran	OKMNH	BRFCW	1	—	1	—
1983	Woodward	Ok Water Res. Board	(3)	BROWRBW	2	—	2	—
1986	Beaver	Norris, et al	OSUS	BRNB	1	—	1	—
1989	Texas	Larson, Echelle	(4)	BTLAET	1	1	—	—
	Beaver		—	BRLAEB	2	—	2	—
C. Woodward to L. Canton								
1989	Harper	Larson, Echelle	(5)	CTMLAEH	3	1	—	—
	Ellis		—	CTLAEE	1	1	—	—
	Woodward		—	CTLAEW	1	1	—	—
1992	Harper	Luttrell, Echelle	(4)	CTLUEH	1	1	—	—
	Texas		—	CTLUET	1	1	—	—
	Beaver		—	CRLUEB	2	—	2	—
	Harper		—	CRLUEH	2	—	2	—
	Woodward		—	CRLUEW	1	—	1	—
1993	Woodward	Luttrell, Echelle	(4)	CRLUEW	1	—	1	—

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TABLE 1 (contd.). Historical collections of Cyprinid fish of the North Canadian River drainage from various sources.

Year	County	Collector	Source[a]	Collector Code[b]	No.[c] Coln.	Habitat[d] T	R	L
C. Woodward to L. Canton (contd.)								
1949	Blaine	Cross	OSUS	CLCB	1	—	—	1
1949	Blaine	Cross, Buck	OSUS, UK	CLCBCB	1, 1	—	—	1,1
1950	Blaine	Cross, Buck	UK	CLCBCB	1	—	—	1
		Riggs, Moore	OKMNH	CRRMB	1	—	1	—
1953	Woodward	Moore	OSUS,GMFN	CRTGMW	5	3	2	—
		Riggs, Hall	OKMNH	CRCRW	1	—	1	—
1960	Blaine	Cross	UK	CLCCB	1	—	—	1
	Woodward	Riggs	OKMNH	CRTCRW	2	1	1	—
1961	Woodward	Smith, Feese	OKMNH	CRTSFW	2	1	1	—
1962	Woodward	Moore, Roberts, Sorrow	GMFN	CTRMW	1	1	—	—
		Riggs, Moore, Smith	OKMNH,GMFN	CTRRMW	5	4	1	—
1963		Moore, Jarmen, Lander	OSUS,GMFN	CTMJW	1	—	—	—
1964	Blaine	Gasaway, Gennings	ODWCLS	CLGGCB	?	—	—	?
1965	Blaine	Gasaway, Lewis	ODWCLS	CLGLCB	?	—	—	?
1965	Blaine	Gasaway, Lewis	ODWCLS	CLGLCB	?	—	—	?
1966	Blaine	Gomez, Moser	ODWCLS	CLGMCB	?	—	—	?
1967	Blaine	Bross	ODWCLS	CLBCB	?	—	—	?
1971	Blaine	White, Lewis	ODWCLS	CLWLCB	?	—	—	?
1972	Blaine		ODWCLS	CLWLCB	?	—	—	?
1974	Woodward	Miller, Pigg, OAS	OSUS	CRMPW	1	—	1	—
1976	Woodward	Lindsay	UT	CRLIW	1	—	1	—
1979	Blaine	Syahl	ODWCLS	CLSCB	?	—	—	?
	Woodward	Felley, Cothran	OKMNH	CRFCW	1	—	1	—
1980-95	Blaine	Stahl	ODWCLS	CLSB	6	—	—	6
1982	Woodward	OK. Water Res. Bd.	(3)	CROWRBW	1	—	1	—
1983	Woodward	Ok. Water Res. Bd.	(3)	CROWRBW	2	—	2	—
1989	Woodward	Larson, Echelle	(5)	CRLAEW	1	—	1	—

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TABLE 1 (contd.). Historical collections of Cyprinid fish of the North Canadian River drainage from various sources.

Year	County	Collector	Source[a]	Collector Code[b]	No.[c] Coln.	Habitat[d] T	R	L
D. L. Canton to L. Overholser								
1948	Oklahoma	Hall	ODWCLS	DLHH0	1	—	—	1
			ODWCLS	DLHO0	1	—	—	1
1952	Blaine	Smithpeter	OKMNH	DTRSB	2	—	1 1	
1953	Blaine	Moore	GMFN	DRRLSB	1	—	1	—
1958	Blaine	Riggs, Goodman	OKMNH	DRRB	2	—	2	—
1959	Canadian	Taylor	OKMNH	DTTC	1	—	1	—
1972	Blaine	Adamas	TU	DRAB	1	—	1	—
1974	Oklahoma	Summers	ODWCLS	DLSO0	1	—	—	1
1975				DLSH0	1	—	—	1
1977	Blaine	Marshall, McGovern	OCCHD	DRTMAB	4	2	1	—
1977-79		Stahl	ODWCLS	DLSCB	3	—	—	3
1978	Blaine	Pigg, Martinez	TU	DRPMB	1	—	1	—
1979	Oklahoma	Wright	ODWCLS	DLWO0	1	—	—	1
1979-82				DLWH0	4	—	—	4
1983-95	Oklahoma	Summers, Martin	ODWCLS	DLSMO0	1	—	—	1
			ODWCLS	DLSMH0	5	—	—	5
1987	Canadian	Matthews, Gelwuck	(6)	DRMAGC	1	—	1	—
1989	Canadian	Larson, Echelle	OSUS, (5)	DRLAEC	1	—	1	—
1990	Blaine	Larsen, Echelle	OSUS, (5)	DRLAEB	1	—	1	—
1992	Canadian	Lutrell, Echelle	(4)	DRLUEC	1	—	1	—
	Blaine		(4)	DRLUEB	1	—	1	—
	Oklahoma		(4)	DRLUEO	2	—	2	—
1993	Blaine	Lutrell, Echelle	OSUS, (5)	DRLUEB	1	—	1	—
E. L. Overholser to Harrah								
1936	Oklahoma	Unknown	OKMNH	ERU0	1	—	1	—
1948	Oklahoma	OU Fish and Game Survey	OKMNH	ELFGH0	1	—	—	1
				ELFGO0	1	—	—	1
1949	Oklahoma	Moore, Riggs	OKMNH	ELMRH0	1	—	—	1

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TABLE 1 (contd.). Historical collections of Cyprinid fish of the North Canadian River drainage from various sources.

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E. L. Overholser to Harrah (cont.)								
1977-78	Oklahoma	Marshall, McGovern	OCCHD, (7)	ERMAO	11	—	11	—
1982	Oklahoma	U.S. Fish & Wild. Ser.	(8)	ERUSFO	4	—	4	—
1983-88	Oklahoma	Martin, Summers	ODWCLS	ELMSHO	6	—	—	6
1987	Oklahoma	Matthews, Gelwick	(6)	ETMAGO	23	10	13	—
F. Harrah to L. Eufaula								
1893	Ind. Terr.	Meeks	USNM	FTMP	1	—	1	—
1921	Latimer	Unknown	OKMNH	FTUL	1	—	1	—
1924	Hughes	Hubbs, Ortenburger	OKMNH	FRHOH	1	—	1	—
1926	Okmulgee	Force	OKMNH, (9)	FTFO	1	1	—	—
1927	Hughes	Ortenburger UOBS	OKMNH	FROH	1	—	1	—
1929	Okmulgee	Ortenburger UOBS	OKMNH	FTOO	1	1	—	—
	Pittsburg	Ortenburger UOBS	OKMNH	FTOP	1	1	—	—
1929	Okmulgee		OKMNH	FTMHO	1	1	—	—
	Pittsburg		OKMNH	FTMHP	1	1	—	—
1931	Latimer		OKMNH	FTMHL	4	4	—	—
1944	Pittsburg	Laura Hubbs	OKMNH	FTLHP	1	1	—	—
1947	Pittsburg	Moore, Irwin	OSUS, GMFN	FTMIP	1	1	—	—
1948	P'watomie	Moore, Hall	ODWCLS	FLMHS	1	—	—	1
1944	Pittsburg	Laura Hubbs	OKMNH	FTLHP	1	1	—	—
1952	Seminole	Lachner, Leapley, Schwartz	USNM	FTLLSS	1	1	—	—
						—	—	—
1959	Seminole	Riggs, Goodmen	OKMNH	FTRGS	1	1	—	—
	Hughes		OKMNH	FTRGH	1	1	—	—
	McIntosh		OKMNH	FTRGM	1	1	—	—
1961	Hughes	Riggs, Smith	OKMNH	FRRSH	1	—	1	—
	McIntosh	Riggs, Shehaden	OKMNH	FTRSM	1	?	?	—

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F. Harrah to L. Eufaula (contd.)								
1962	Okfuskee	Houser, Lindsay	OKMNH	FRHLO	2	—	2	—
	Okmulgee		OKMNH	FRTHLO	3	3	1	—
	McIntosh		OKMNH	FRTHLM	39	27	10	2
	Pittsburg		OKMNH	FTHLP	43	43	—	—
	Haskell		OKMNH	FTHLH	1	1	—	—
1962	Latimer	Houser, Lindsay	OKMNH	FTHLL	5	5	—	—
	Latimer	Seacat, Landrith	OKMNH	FTSLL	2	2	—	—
	Pittsburg	Seacat, Landrith	OKMNH	FTSLP	8	8	—	—
1963	McIntosh	Riggs, Wade, Smith	OKMNH	FRRWM	1	—	1	—
	Okmulgee		OKMNH	FRRWSO	1	—	1	—
1964	Seminole	Lindsay	TU	FTLS	1	1	—	—
1978	Hughes	Felley, Cothran	OKMNH	FRFCH	2	1	1	—
	Seminole	Felley, Cothran	OKMNH	FRFCS	1	—	1	—
	Okfuskee	Felley, Cothran	OKMNH	FRCSO	1	—	1	—
1978-96	McIntosh	Wright	ODWCLS	FLWM	9	—	—	9
1979-86	P'watomie			FLWS#1P	6	—	—	6
1979-86	P'watomie			FLWS2#2P	6	—	—	6
1987	Seminole	Matthews, Gelwick	(6)	FRMAGS	2	—	2	—
1989	Okfuskee	Larson, Echelle	(5)	FRLAEO	3	—	3	—
1989	P'watomie	Larson, Echelle	(5)	FRLAEP	1	—	1	—
1993	P'watomie	Luttrell, Echelle	(4)	FRLUEP	1	—	1	—
1993	Okmulgee	Luttrell, Echelle	(4)	FRLUEO	1	—	1	—
1993	McIntosh	Luttrell, Echelle	(4)	FRLUE2M	1	—	1	—

a Where the record was found. GMFN: George Moore Field Notebooks; OBS: Oklahoma Biological Survey; OCCHD: OK City–County Health Department; ODWCLS: OK Dept. Wild. Cons. lake surveys; OKMNH: Univ. OK Museum Natural History; OSUS: OK State Univ. Zoological Museum; TNHC: Texas Univ. Natural History Collections; TU: University of Tulsa; UK: University of Kansas; USNM: United States Natural History Museum; For *numbered references* see the last section of this table.

b Collector code: identifies who collected the specimens, etc.; see Table 5. *c* Number of collections reported. *d* L: lake; R: river; T: tributary.

TABLE 1 (contd.). Historical collections of Cyprinid fish of the North Canadian River drainage from various sources.

Year	County	Collector	Source[a]	Collector Code[b]	No.[c] Coln.	Habitat[d] T	R	L
G. L. Eufaula to Arkansas R.								
1959	McIntosh	Moore	OKMNH	GRMM	1	—	1	—
	Haskell	Curd, Sisk, Branson	OKMNH	GTCSBH	1	1	—	—
1962	McIntosh	Houser, Lindsay	OKMNH	GRHLM	1	—	1	—
	Haskell	Houser, Lindsay	OKMNH	GTRHLH	4	2	2	—
1963	Haskell	Lindsay, Bates (OBS)	OKMNH	GTLIBH	2	2	—	—
1963	Haskell	Lindsay, Bates (OBS)	OKMNH	GTLIBH	2	2	—	—
1972	Haskell	Lindsay, Maxwell	TU	GRLMH	1	—	1	—
1974	Haskell	Unknown collector	OSUS	GRUH	1	—	1	—
1993	Haskell	Luttrell, Echelle	(4)	GRLUEH	1	—	1	—

a Where the record was found. GMFN: George Moore Field Notebooks; OBS: Oklahoma Biological Survey; OCCHD: OK City-County Health Department; ODWCLS: OK Dept. Wild. Cons. lake surveys; OKMNH: Univ. OK Museum Natural History; OSUS: OK State Univ. Zoological Museum; TNHC: Texas Univ. Natural History Collections; TU: University of Tulsa; UK: University of Kansas; USNM: United States Natural History Museum; For *numbered references* see the last section of this table.

b Collector code: identifies who collected the specimens, etc.; see Table 5. *c* Number of collections reported. *d* L: lake; R: river; T: tributary.

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TABLE 2. Fish-collecting sites of the Oklahoma State Department of Health (DH) and the Oklahoma Department of Environmental Quality (EQ) 1975-1995.

Description of Location of Site							
Seg- ⇓ment	Name of Stream/Lake, Highway Map Info.[a]	Legal T R S	County	Site Code	Col- lector	Period[b]	No. Col.[c]
A. NM State Line to L. Optima							
	Corrumpa Ck State Line	02N 01E 07	Cimarron	T1	DH	88	1
	Corrumpa Ck S Wheeless	02N 01E 23	Cimarron	T2	DH	88	1
	Beaver R N Goodwell	03N 13E 22	Texas	M11	DH	90–91	2
	L. Optima (one site)	03N 18E 32	Texas	L1	DH, EQ	84–95	8
B. L. Optima to Woodward							
	Hackberry Ck SE Hardesty	01N 18E 01	Texas	T22	DH	88	1
	Beaver R S Turpin	03N 21E 06	Beaver	M1	DH, EQ	81–95	28
	Beaver R ODWC Area	04N 22E 08	Beaver	M12	DH, EQ	90–95	4
	Beaver R N Beaver	04N 24E 07	Beaver	M2	DH, EQ	81–95	26
	Beaver R E Beaver	04N 25E 27	Beaver	M13	DH	90	1
	Palo Duro Ck SE Hardesty	01N 18E 14	Texas	T3	DH	88	1
	Palo Duro Ck E Hardesty	02N 19E 21	Texas	T4	DH	89–90	2
	Kiowa Ck SW Slapout	01N 27E 12	Beaver	T5	DH	88	1
	Kiowa Ck W Slapout HW 3	02N 27E 29	Beaver	T6	DH	88	1
	Kiowa Ck N Slapout	02N 27E 11	Beaver	T7	DH	88	1
	Beaver R S Knowles	04N 27E 32	Beaver	M16	DH	90	1
	Beaver R Laverne	26N 25W 09	Harper	M14	DH	87	1
	Beaver R N May	25N 24W 23	Harper	M3	DH, EQ	81–95	28
	Ft. Supply L.(5 sites)	24N 22W 17	Woodward	L2	DH, EQ	85–90	8
	Wolf Ck E Ft Supply	24N 22W 09	Woodward	T8	DH, EQ	90–93	3
C. Woodward to L. Canton							
	NCR N Woodward	23N 16W 25	Woodward	M4	DH, EQ	78–95	47
	NCR NE Seiling	20N 16W 28	Dewey	M5	DH, EQ	85–95	22
	Canton L (four sites)	19N 18W 32	Blaine	L3	DH, EQ	80–92	13
D. L. Canton to L. Overholser							
	NCR S Watonga	16N 12W 27	Blaine	M6	DH, EQ	78–95	36
	NCR N El Reno	13N 07W 32	Canadian	M7	DH, EQ	76–95	57
	L. Overholser (one site)	12N 04W 30	Oklahoma	L4	DH, EQ	80–92	3
	L. Hefner (one site)	13N 04W 34	Oklahoma	L5	DH, DH	80–92	4
	L. Hefner Duck Pond	13N 04W 34	Oklahoma	L6	DH	80	2
E. L. Overholser to Harrah							
	NCR NW Harrah	12N 01E 22	Oklahoma	M8	DH, EQ	76–95	58
F. Harrah to L. Eufaula							
	NCR N Little on HW 56	11N 06E 27	P'watomie[d]	M15	DH	85	1
	Shawnee L. No. 2	10N 02E 14	P'watomie	L7	DH, EQ	80–94	3
	Wetlands L. Clearview	11N 11E 31	Okfuskee	L8	EQ	92–93	2
	Unnamed T	10N 10E 13	Okfuskee	T23	EQ	93	1
	Alabama Ck SW Clearview	11N 10E 36	Okfuskee	T9	EQ	93	1
	Alabama Ck SW Clearview	11N 11E 31	Okfuskee	T10	EQ	93	1
	NCR NE Wetumka	09N 10E 12	Hughes	M9	DH, EQ	78–95	40
G. L. Eufaula to Arkansas R(*continued next page*)							

a L = Lake; Ck = Creek; M = Mainstem of North Canadian River; T = Tributary.
b Century is omitted: 89 = 1989; 78–95 = 1978–1995.
c Number of collections during period.
d Pottawatomie

TABLE 2. (contd.) Fish-collecting sites of the Oklahoma State Department of Health (DH) and the Oklahoma Department of Environmental Quality (EQ) 1975-1995.

Description of Location of Site								
Seg-	Name of Stream/Lake,	Legal				Site	Col-		No.
⇓ment	Highway Map Info.[a]	T	R	S	County	Code	lector	Period[b]	Col.[c]
G. L. Eufaula to Arkansas R									
	Gaines Ck at Pit Ck	04N	17E	03	Latimer	T11	DH	85	1
	T Pit Ck W Gowen	04N	17E	03	Latimer	T12	DH	85	1
	T Pit Ck at Pit Ck	05N	17E	34	Latimer	T13	DH	85	1
	Gaines Ck below Pit Ck	05N	17E	36	Latimer	T14	DH	85	1
	Elm Ck S Featherson	07N	17E	35	Pittsburg	T15	DH, EQ	88–92	2
	Ash Ck 4 S ODWC[e]	06N	17E	13	Latimer	T16	DH	88	1
	Ash Ck 5 S ODWC[e]	06N	18E	18	Latimer	T17	DH	88	1
	Ash Ck 4.5S ODWC[e]	06N	17E	14	Latimer	T18	DH	88	2
	Ash Ck 5SE ODWC[e]	06N	17E	14	Latimer	T19	DH	88	1
	T Ash Ck 5 S ODWC[e]	06N	17E	14	Latimer	T20	DH	88	1
	Longtown Ck 5 N Quinton	08N	18E	10	Haskell	T21	DH, EQ	90–93	2
	L. Eufaula (five sites)	10N	18E	25	McIntosh	L9	DH, EQ	84–90	11
	L. McAlester (one site)	07N	14E	33	Pittsburg	L10	DH, EQ	80–89	3
	C. N Whitefield	09N	19E	12	Haskell	M10	DH, EQ	79–95	35

a L = Lake; Ck = Creek; M = Mainstem of North Canadian River; T = Tributary.

b Century is omitted: 89 = 1989; 78–95 = 1978–1995.

c Number of collections during period.

d Pottawatomie

e ODWC Collins Ranch Headquarters.

TABLE 3. Number of collections of fish, number of specimens, and number and percentage of cyprinids, collected by OSDH[a] and ODEQ[b] at indicated sites on the North Canadian River and its lakes and tributaries.

	Total	Cyprinids		Number of collections/specimens[c]						
Site	#fish	#	%	CA	CC	CL	HP	NA	NG	NS
A. NM State Line to L. Optima										
T1	468	368	79	1/218	—	—	—	—	—	—
T2	177	131	74	1/6	—	2/3054	—	—	—	—
M11	2530	2448	97	—	—	7/970	—	—	—	2/227
L1	3674	1469	40	—	6/148	—	—	1/10	—	5/20
B. Lake Optima to Woodward										
T22	533	18	07	—	1/10	1/10	—	—	—	—
M1	42385	11745	28	—	2/3	27/3636	13/254	—	7/187	26/5590
M12	14606	10290	70	—	3/73	6/4277	5/278	—	1/7	6/2865
M2	34356	16884	49	—	10/444	25/6231	18/384	—	—	25/6813
M13	906	609	67	—	1/1	1/120	—	—	—	1/472
T3	2957	2377	80	—	—	1/1610	—	—	—	1/643
T4	7052	2697	38	—	1/1	2/960	2/220	—	—	2/1294
T5	534	440	82	—	1/1	1/432	—	—	—	—
T6	263	152	58	—	1/1	1/137	—	—	—	1/6
T7	250	13	05	—	—	1/12	—	—	—	1/1
M16	397	319	80	—	—	1/105	—	—	—	1/210
M14	598	298	50	—	1/1	1/134	—	—	—	1/33
M3	38940	26002	67	—	13/92	27/15572	10/1053	—	1/1	27/4240
L2	1915	708	37	—	4/120	7/443	—	—	—	2/2
T8	1025	386	38	—	1/1	3/328	—	—	—	2/5
C. Woodward to L. Canton										
M4	68402	51402	76	—	15/127	47/33703	25/1420	7/32	5/11	47/33703
M5	12435	7782	63	—	8/452	22/5657	3/3	3/9	—	17/358
L3	16157	818	05	—	6/45	11/227	2/6	4/4	—	2/9
D. L. Canton to L. Overholser										
M6	34316	24564	72	—	21/165	36/21746	7/35	4/4	—	36/1569
M7	55737	48252	87	—	27/111	53/46216	4/25	7/45	—	47/1348
L4	1784	106	06	—	3/51	2/37	1/3	—	—	1/2
L5	1254	270	22	—	—	1/27	—	—	—	—
L6	77	58	85	—	4/63	1/116	—	—	—	1/1
E. L. Overholser to Harrah										
M8	88406	47853	54	1/1	17/69	56/44395	19/117	18/56	—	39/706
F. Harrah to L. Eufaula										
M15	54	2	04	—	—	—	—	—	—	—
L7	505	319	63	—	3/31	3/287	—	—	—	—
L8	167	0	00	—	—	—	—	—	—	—
T23	135	135	100	1/1	—	1/130	—	—	—	—
T9	48	37	74	1/23	—	1/9	—	—	—	—
T10	40	22	55	1/3	1/17	—	—	—	—	—
M9	82919	71552	86	2/2	10/10	140/64255	18/3940	31/1314	1/1	21/172

continued on next page

— No data or collection that year.

a Oklahoma State Department of Health.

b Oklahoma Department of Environmental Quality.

c CA: *Campostoma anomalum*; CC: *Cyprinus carpio*; CL: *Cyprinella lutrensis*; HP: *Hybognathus placitus*; NA: *Notropis atherinodes*; NG: *Notropis girardi*; NS: *Notropis stramineus*.

d L: Lake; M: Mainstem of river; T: Tributary.

TABLE 3. (contd.) Number of collections of fish, number of specimens, and number and percentage of cyprinids, collected by OSDH[a] and ODEQ[b] at indicated sites on the North Canadian River and its lakes and tributaries.

	Total	Cyprinids		Number of collections/specimens[c]						
Site	#fish	#	%	CA	CC	CL	HP	NA	NG	NS
G. L. Eufaula to Arkansas R.										
T11	25	14	56	—	—	1/5	—	—	—	—
T12	34	32	94	—	—	—	—	1/32	—	—
T13	20	0	00	—	—	—	—	—	—	—
T14	75	50	67	—	—	—	—	1/24	—	—
T15	73	20	27	1/8	—	—	—	—	—	—
T16	224	140	63	1/3	—	—	—	—	—	—
T17	172	43	25	1/4	—	—	—	—	—	—
T18	485	378	78	1/1	—	—	—	—	—	—
T19	44	23	52	—	—	—	—	—	—	—
T20	46	20	43	1/7	—	—	—	—	—	—
T21	88	24	27	2/13	—	—	—	—	—	1/7
L9	9176	1147	13	1/4	2/21	8/611	1/1	4/20	—	—
L10	338	155	46	—	3/310	3/114	—	—	—	—
M10	5582	828	15	3/11	5/23	20/412	1/21	11/54	—	—

Summary	N.C.[e]	No. fish	No. cyprinids	% cyprinids
Tributaries (23 sites)	29	14855	7520	51
L.-t. mainstem(10 sites)[f]	377	463478	307329	66
Mainstem(6 sites)	12	19091	13966	73
Lakes(10 lakes,21 sites)	57	34847	5050	14
Totals	475	532271	338865	64

— No data or collection that year.

a Oklahoma State Department of Health.

b Oklahoma Department of Environmental Quality.

c CA: *Campostoma anomalum*; CC: *Cyprinus carpio*; CL: *Cyprinella lutrensis*; HP: *Hybognathus placitus*; NA: *Notropis atherinodes*; NG: *Notropis girardi*; NS: *Notropis stramineus*.

d L: Lake; M: Mainstem of river; T: Tributary.

e Number of collections.

f Long-term mainstem of river.

TABLE 4. Number of collections of fish and number of specimens collected by OSDH[a] and ODEQ[b] at indicated sites on the North Canadian River and its lakes and tributaries.

	Number of collections/specimens[c]						
Site[d]	NBU	NC	NV	PM	PN	PP	PV
A. NM State Line to L. Optima							
T1	—	—	—	—	—	1/147	—
T2	—	—	—	—	—	1/125	—
M11	—	—	—	2/11	—	1/156	—
L1	—	—	—	—	—	7/330	—
B. L. Optima to Woodward							
T22	—	—	—	—	—	—	—
M1	—	—	—	10/24	—	26/2009	—
M12	—	—	—	4/21	—	4/2673	1/96
M2	1/17	—	—	19/271	—	25/2722	2/2
M13	—	—	—	—	—	1/16	—
T3	—	—	—	1/16	—	1/108	—
T4	—	—	—	1/1	—	2/221	—
T5	—	—	—	—	—	1/17	—
T6	—	—	—	—	—	1/8	—
T7	—	—	—	—	—	—	—
M16	—	—	—	1/2	—	1/2	—
M14	—	—	—	1/34	—	1/36	—
M3	—	—	—	23/230	—	27/4765	8/39
L2	—	1/1	—	—	—	2/25	5/167
T8	—	—	—	3/24	—	1/8	3/20
C. Woodward to L. Canton							
M4	—	4/4	—	37/749	—	44/4780	38/576
M5	—	1/14	—	16/140	—	20/1340	13/245
L3	—	—	—	6/14	—	2/40	12/424
D. L. Canton to L. Overholser							
M6	—	2/5	—	15/46	—	24/759	29/223
M7	—	2/2	—	19/34	—	24/151	32/318
L4	1/13	—	—	—	—	—	—
L5	—	—	—	—	—	1/31	—
L6	—	1/2	—	—	—	—	2/99
E. L. Overholser to Harrah							
M8	—	7/9	—	10/34	1/1	29/370	42/2095
M15	—	—	—	—	—	—	—
L7	—	1/1	—	—	—	—	—
L8	—	—	—	—	—	—	—
T23	—	—	—	1/4	—	—	—
T9	—	—	—	—	1/5	—	—
T10	—	—	—	—	1/2	—	—
M9	—	2/2	—	18/94	—	1/3	38/2519

continued on next page

— No data or collection that year.

a Oklahoma State Department of Health.

b Oklahoma Department of Environmental Quality.

c LU: *Lythrurus umbratilis*; NB: *Notropis boops*; NBU: *Notropis buchnani*; NC: *Notemigonus crysoleucas*; NV: *Notropis volucellus*; PM: *Phenacobius mirabilis*; PN: *Pimephales notatus*; PP: *Pimephales promelas*; PV: *Pimephales vigilax*;

d L: Lake; M: Mainstem of river; T: Tributary.

TABLE 4. (contd.) Number of collections of fish and number of specimens collected by OSDH[a] and ODEQ[b] at indicated sites on the North Canadian River and its lakes and tributaries.

Site[d]	Number of collections/specimens[c]						
	NBU	NC	NV	PM	PN	PP	PV
G. L. Eufaula to Arkansas R.							
T11	—	—	—	—	1/2	—	—
T12	—	1/32	—	—	—	—	—
T13	—	—	—	—	—	—	—
T14	—	—	—	—	—	—	—
T15	—	—	1/1	—	—	1/7	—
T16	—	—	—	—	1/15	—	—
T17	—	—	—	—	1/1	—	—
T18	—	—	—	—	1/24	—	—
T19	—	—	—	—	—	—	—
T20	—	—	—	—	1/1	—	—
T21	—	—	—	—	—	—	—
L9	2/6	—	1/1	—	—	—	10/152
L10	—	—	—	—	2/11	—	2/20
M10	2/9	8/69	1/1	—	5/15	—	13/167

— No data or collection that year.
a Oklahoma State Department of Health.
b Oklahoma Department of Environmental Quality.
c LU: *Lythrurus umbratilis*; NB: *Notropis boops*; NBU: *Notropis buchnani*; NC: *Notemigonus crysoleucas*; NV: *Notropis volucellus*; PM: *Phenacobius mirabilis*; PN: *Pimephales notatus*; PP: *Pimephales promelas*; PV: *Pimephales vigilax*;
d L: Lake; M: Mainstem of river; T: Tributary.

TABLE 4a. Number of collections of fish and number of specimens collected by OSDH[a] and ODEQ[b] at indicated sites on the North Canadian River and its lakes and tributaries. For these species there was no specimen from sites upstream from these.

Site[d]	Number of collections/specimens[c]	
	LU	NB
G. L. Eufaula to Arkansas R.		
T11	—	1/6
T12	—	—
T13	—	—
T14	—	—
T15	1/2	—
T16	—	1/121
T17	1/10	1/28
T18	—	1/156
T19	—	1/21
T20	—	1/12
T21	—	1/4
L9	—	—
L10	—	—
M10	—	—

— No data or collection that year.
a Oklahoma State Department of Health.
b Oklahoma Department of Environmental Quality.
c LU: *Lythrurus umbratilis*; NB: *Notropis boops*;
d L: Lake; M: Mainstem of river; T: Tributary.

TABLE 5. Number of specimens in historical fish collections from the North Canadian River and its lakes and tributaries.

Year	Coll. Code[b]	Number of specimens[a]																	
		CA	CC	CL	HP	LU	MA	MS	NA	NC	NB	NBU	NE	NG	NO	NS	NV	PM	PN	PP	PV
A. State line to L. Optima																					
1926	ATHT	—	—	75	160	—	27	—	++	1	—	—	—	316	—	110	—	3	—	100	—
1949	ARBT	—	—	++	++	—	++	—	—	—	—	—	—	++	—	++	—	—	—	++	—
	ARUT	—	—	—	—	—	6	—	—	—	—	—	—	7	—	-	—	—	—	-	—
	ARMCT	—	—	++	++	—	30	—	—	—	—	—	—	312	—	++	—	—	—	++	—
	ATRMT	—	—	387	137	—	12	—	3	—	—	—	—	203	—	32	—	—	—	28	—
1956	ARAPT	—	—	—	75	—	—	—	—	—	—	—	—	151	—	98	—	—	—	24	—
1957	ATCMT	—	—	33	2	—	—	—	—	—	—	—	—	—	—	2	—	—	—	-	—
1962	ARMT	—	—	—	29	—	—	—	—	—	—	—	—	50	—	-	—	—	—	35	—
1963	ATLBT	—	—	759	201	—	—	—	4	—	—	—	—	750	—	570	—	122	—	190	—
1979	ALSOT	—	26	144	—	—	—	—	—	—	—	—	—	—	—	81	—	1	—	74	—
1980	ALSOT	—	17	218	—	—	—	—	—	—	—	—	—	—	—	2	—	7	—	1	—
1981	ALSOT	—	8	772	—	—	—	—	—	—	—	—	—	—	—	73	—	—	—	4	—
1982	ALSOT	3	11	685	—	—	—	—	—	—	—	—	—	—	—	829	—	—	—	3	—
1983	ALSOT	—	30	297	—	—	—	—	—	2	—	—	—	—	—	43	—	2	—	2	—
B. L. Optima to Woodward																					
1928	BMOW	—	++	++	++	—	—	—	++	—	—	—	—	2122	—	—	—	++	—	++	++
1947	BRPH	—	—	18	129	—	57	—	—	—	—	—	—	223	—	—	—	—	—	26	—
	BRMCH	—	—	26	125	—	—	—	—	—	—	—	—	234	—	—	—	—	—	1	—
1949	BTGMW	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—
	BTUC	—	—	—	—	—	—	—	—	—	—	—	—	15	—	—	—	—	—	—	—
1950	BLHFSW	—	2	14	4	—	6	—	—	1	—	—	—	—	—	1	—	1	—	4	—
1951	BRLB	—	—	6	24	—	—	—	43	—	—	—	—	37	—	—	—	—	—	8	—
1953	BRTRHW	—	—	233	11	—	—	—	22	—	—	—	—	11	—	—	—	—	—	9	14
1957	BTCMDH	—	—	8	5	—	—	—	—	—	—	—	—	9	—	1	—	—	—	2	—
1957	BTCMDT	—	—	21	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	BTRH	—	—	16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	—
1960	BRPB	—	—	7	—	—	—	—	—	—	—	—	—	83	—	—	—	—	—	6	—
1963	BRTLBT	5	—	129	71	—	—	—	—	—	—	—	—	51	—	18	—	—	—	48	—
	BRTLBB	—	7	1786	168	—	—	—	122	24	—	—	—	255	—	232	—	15	—	436	—
1963	BTLBE	—	—	362	13	—	—	—	393	8	—	—	—	170	—	245	—	35	—	140	—

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TABLE 5. (contd.) Number of specimens in historical fish collections from the North Canadian River and its lakes and tributaries.

Year	Coll. Code[b]	Number of specimens[a]																		
		CA	CC	CL	HP	LU	MA	MS	NA	NC	NB	NBU	NE	NG	NO	NS	NV	PM	PN	PP	PV
B. L. Optima to Woodward (contd.)																					
	BRTLBH	—	—	150	129	—	—	—	75	—	—	—	—	195	—	9	—	—	—	19	—
	BTLIBW	—	—	79	—	—	—	—	7	5	—	—	—	35	—	—	—	—	—	8	2
1972	BRCRB	—	—	47	44	—	—	—	—	—	—	—	—	235	—	93	—	—	—	2	—
1976	BRGBW	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	4	—	66	—
1977	BLSFSW	—	112	56	—	—	—	—	—	1	—	—	—	1	—	8	—	—	—	1	14
	BLSCHB	—	63	129	—	—	—	—	—	1	—	—	—	—	—	3	—	—	—	—	—
1978	BLSFS	—	74	23	29	—	—	—	—	—	—	—	—	22	—	21	—	5	—	2	3
	BLSCH	—	41	37	—	—	—	—	—	—	—	—	—	—	—	4	—	—	—	—	—
1979	BLSFS	—	7	107	6	—	—	—	—	—	—	—	—	2	—	8	—	—	—	1	22
	BMFCW	—	—	72	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	BLSCH	—	104	95	—	—	—	—	—	—	—	—	—	—	—	14	—	—	—	—	—
1980	BLSFS	—	11	64	92	—	—	—	—	—	—	—	—	—	—	2	—	4	—	4	—
	BLSCHB	—	5	619	—	—	—	—	—	—	—	—	—	—	—	54	—	—	—	—	—
1981	BLSFSW	—	17	58	—	—	—	—	—	—	—	—	—	—	—	20	—	—	—	—	—
	BLSCHB	—	—	314	—	—	—	—	—	—	—	—	—	—	—	28	—	—	—	—	—
1982	BLSFSW	—	8	176	7	—	—	—	2	—	—	—	—	1	—	1	—	—	—	18	—
1982	BLSCHB	—	10	267	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	BRUW	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1983	BLSFSw	—	4	74	—	—	—	—	14	—	—	—	—	—	—	8	—	—	—	25	—
	BROWRBW	9	1359	89	—	—	—	103	—	—	—	—	16	—	739	—	8	3	313	—	
	BLSCHW	—	15	245	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—
1984	BLSCHW	—	—	319	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
	BLSFSW	—	5	176	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
1985	BLSCHB	—	—	342	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1986	BLSCHB	—	—	368	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
	BRNB	—	—	42	—	—	—	—	—	—	—	—	—	—	—	105	—	44	—	25	—
1989	BRLAE	—	2	538	24	—	—	—	—	—	—	—	—	—	—	82	—	5	—	104	—
	BTLAE2	—	—	166	—	—	—	—	—	—	—	—	—	—	—	16	—	2	—	—	11
	BMLAEE	—	7	232	54	—	—	—	—	—	—	—	—	—	—	37	—	6	—	100	—
	BRLAEW	—	—	161	10	—	—	—	—	—	—	—	—	—	—	22	—	—	—	159	—

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TABLE 5. (contd.) Number of specimens in historical fish collections from the North Canadian River and its lakes and tributaries.

Year	Coll. Code[b]	Number of specimens[a]																		
		CA	CC	CL	HP	LU	MA	MS	NA	NC	NB	NBU	NE	NG	NO	NS	NV	PM	PN	PP	PV
B. L. Optima to Woodward (contd.)																					
	BRLAEB	—	—	370	5	—	—	—	—	—	—	—	—	—	—	281	—	5	—	44	—
	BTLAET	—	1	1066	—	—	—	—	—	—	—	—	—	—	—	1343	—	15	—	552	—
	BTLAEH	—	—	43	—	—	—	—	—	—	—	—	—	—	—	110	—	10	—	6	—
1992	BRLUEH	—	—	++	++	—	—	—	—	++	—	—	—	—	—	++	—	++	—	++	—
	BRLUET	—	++	++	++	—	—	—	—	—	—	—	—	—	—	++	—	++	—	++	—
	BMLUEH	—	—	++	++	—	—	—	—	—	—	—	—	—	—	++	—	++	—	++	—
	BTLUEB	—	—	++	++	—	—	—	—	—	—	—	—	—	—	++	—	++	—	++	—
	BTLUEW	—	—	++	—	—	—	—	—	—	—	—	—	—	—	++	—	—	—	—	—
1993	BMLUEW	—	—	++	—	—	—	—	—	—	—	—	—	—	—	++	—	—	—	++	—
C. Woodward to L. Canton																					
1949	CLCB	—	++	++	++	—	—	—	—	++	—	—	—	—	—	—	—	—	—	++	2
	CLCBCB	—	—	—	—	—	—	—	++	—	—	—	—	—	—	—	—	—	—	—	++
1950	CLCBCB	—	++	++	++	—	—	—	—	++	—	—	—	—	—	—	—	—	—	++	++
1953	CRTGM	—	—	371	46	—	—	—	++	—	—	—	—	—	—	11	—	—	—	30	1
	CRCRW	—	—	—	—	—	—	—	2	++	—	—	—	—	—	++	—	++	—	—	—
	CTGMW	—	—	++	++	—	—	—	++	—	—	—	—	7	—	++	—	—	—	++	—
1960	CLCCB	—	—	66	—	—	—	—	—	—	—	—	—	—	—	71	—	1	—	72	—
	CRTCRW	—	3	37	—	—	—	—	—	—	—	—	—	—	—	57	—	—	—	41	—
1961	CRTSFW	—	—	81	—	—	—	—	—	—	—	—	—	—	—	25	—	3	—	—	—
	CRTSFW	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1962	CTRMW	—	—	27	6	—	—	—	—	—	—	—	—	—	—	44	—	—	—	13	—
	CTRMW	—	—	70	12	—	—	—	103	—	—	—	—	1	—	39	—	12	—	7	—
1963	CTMJW	—	—	++	—	—	—	—	—	—	—	—	—	++	—	++	—	++	—	++	—
1964	CLGGCB	—	1604	++	++	—	—	—	++	++	—	—	—	++	—	++	—	++	—	++	—
1965	CLGLCB	—	2267	60	45	—	—	—	31	—	—	—	—	—	—	3	—	++	—	59	—
1966	CLGMCB	—	143	597	—	—	—	—	500	—	—	—	—	—	—	1	—	++	—	1828	—
1967	CLBCB	—	1456	++	++	—	—	—	++	—	—	—	—	—	—	—	—	—	—	—	—
1971	CLWLCB	—	369	144	262	—	—	—	113	—	—	—	—	—	—	56	—	6	—	51	53
1972	CLWLCB	—	164	96	27044	—	—	—	42	—	—	—	—	—	—	37	—	29	—	99	16
1974	CRMPW	—	—	437	50	—	—	—	79	—	—	—	—	25	—	292	—	4	—	66	—

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TABLE 5. (contd.) Number of specimens in historical fish collections from the North Canadian River and its lakes and tributaries.

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		CA	CC	CL	HP	LU	MA	MS	NA	NC	NB	NBU	NE	NG	NO	NS	NV	PM	PN	PP	PV
C. Woodward to L. Canton (contd.)																					
1979	CRFCW	—	—	15	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	CLSCB	—	25	88	495	—	—	—	195	—	—	—	—	7	—	43	—	—	—	—	7
1980	CLSCB	—	4	18	3	—	—	—	295	—	—	—	—	1	—	11	—	3	—	2	7
1982	CLSCB	—	3	81	—	—	—	—	67	1	—	—	—	1	—	52	—	—	—	41	5
	CMOWBW	—	++	++	++	—	—	—	++	—	—	—	—	++	—	++	—	—	—	—	—
1983	CLSCB	—	37	44	—	—	—	—	82	—	—	—	—	1	—	45	—	1	—	2	—
	CMOWRBW	—	—	848	17	—	—	—	3	—	—	—	—	—	—	172	—	6	—	1	1
1988	CLSCB	—	8	6	—	—	—	—	3	—	—	—	—	2	—	—	—	1	—	5	—
1989	CRLAEW	—	—	29	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
1993	CLSCB	—	3	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1994	CLSCB	—	2	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—
D. L. Canton to L. Overhosler																					
1948	DLHOO	—	—	++	—	—	—	—	++	—	—	—	—	—	—	—	—	—	—	—	—
	DLHHO	++	++	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	++	28	9
1952	DTRSB	—	—	66	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1958	DRRB	—	12	163	—	—	—	—	++	++	—	—	—	—	—	—	—	++	—	—	++
1959	DTTC	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	258	—
1972	DRAB	—	—	12	—	—	—	—	—	—	—	—	—	—	—	++	—	—	—	2	2
1974	DLSOO	—	C	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1975	DLSHO	—	c	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1977	DRTMAB	—	11	6090	1	—	—	—	—	—	—	—	—	—	—	548	—	—	—	41	58
	DLSHO	—	3	4	42	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
1978	DRPMB	—	—	146	—	—	—	—	—	—	—	—	—	—	—	9	—	—	—	6	8
	DLSHO	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
	DMMARO	—	—	928	—	—	—	—	—	—	—	—	—	—	—	237	—	—	—	—	—
1979	DLWHO	—	8	195	—	—	—	—	—	9	—	—	—	—	—	2	—	—	—	2	10
	DLSHO	—	—	73	1	—	—	—	—	6	—	—	—	—	—	44	—	—	—	—	—
	DLSMOO	—	5	12	—	—	—	—	—	38	—	—	—	—	—	—	—	—	—	57	15
1980	DLWHO	—	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
1981	DLSMHO	—	27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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D. L. Canton to L. Overholser (contd.)																					
1982	DLSHO	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
1983	DLSMHO	1	103	39	—	—	—	—	2	—	—	—	—	—	—	—	—	—	91	1	1
	DLSMOO	—	570	88	—	—	—	—	—	169	—	—	—	—	—	—	—	—	—	—	2
1984	DLSMHO	—	92	687	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10
1985	DLSMHO	—	5	300	—	—	—	—	5	—	—	—	—	—	—	—	—	—	—	—	109
	DLSMOO	—	1	676	—	—	—	—	1	342	—	—	—	—	—	—	—	—	18	—	—
1986	DLSMOO	—	—	—	—	—	—	—	—	20	—	—	—	—	—	—	—	—	—	—	—
1987	DLSMOO	—	—	—	—	—	—	—	—	123	—	—	—	—	—	—	—	—	—	—	—
	DRMAGC	—	1	518	—	—	—	—	—	—	—	—	—	—	—	32	—	10	—	—	4
1988	DLSMOO	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
	DLSMHO	—	2	57	—	—	—	—	—	12	—	—	—	—	—	—	—	—	—	8	—
1989	DRLAEC	—	—	73	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
	DLSMOO	—	—	—	—	—	—	—	—	410	—	—	—	—	—	—	—	—	—	—	—
1990	DRLAEC	—	1	6	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	2
1991	DLSMOO	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—
1992	DMLUEB	—	++	++	—	—	—	—	—	—	—	—	—	—	—	++	—	—	—	++	—
	DMLUEC	—	—	++	—	—	—	—	—	—	—	—	—	—	—	++	—	++	—	++	++
1993	DLSMOO	—	4	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	DLSMHO	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E. L. Overholser to Harrah																					
1936	ERUO	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1948	ELFGHO	—	—	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	26	9
	ELFGOO	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
1949	ELMRHO	++	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1976	ERMAO	—	3	1523	—	—	—	—	—	—	—	—	—	—	—	205	—	2	—	2	5
1977	ERMAO	—	19	9840	75	—	—	—	65	—	—	—	—	—	—	604	—	2	—	137	25
1978	EMMAO	—	21	2109	40	—	—	—	—	—	—	—	—	—	—	186	—	—	—	45	1
1982	EMUSFO	1	43	21269	2151	2	—	—	90	1	—	13	—	—	—	1267	—	2	1	191	17
1987	ERTMAGO	—	4	2121	11	—	—	—	9	1	—	—	—	—	—	282	—	3	—	297	48
1992	ERLUEC	—	—	++	—	—	—	—	—	—	—	—	—	—	—	++	—	++	—	++	++

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b Collector Code is given at the end of the last section of the table.

TABLE 5. (contd.) Number of specimens in historical fish collections from the North Canadian River and its lakes and tributaries.

Year	Coll. Code[b]	Number of specimens[a]																		
		CA	CC	CL	HP	LU	MA	MS	NA	NC	NB	NBU	NE	NG	NO	NS	NV	PM	PN	PP	PV
E. L. Overholser to Harrah (contd.)																					
1993	ERLUEB	—	++	++	—	—	—	—	—	—	—	—	—	—	—	++	—	—	—	++	++
	ERLUEO	—	—	++	—	—	—	—	—	—	—	—	—	—	—	++	—	++	—	++	++
F. Harrah to L. Eufaula																					
1893	FTMP	—	—	7	—	1	—	—	—	—	—	7	—	—	—	—	—	—	—	—	—
1921	FTUL	—	—	—	—	—	—	—	—	—	—	++	—	—	—	—	—	—	—	—	—
1924	FRHOH	—	—	++	—	—	—	—	—	++	—	—	—	—	—	—	—	—	—	++	—
1926	FTFO	—	—	++	—	—	—	—	—	—	—	—	—	—	—	—	—	—	++	++	—
1927	FROH	—	—	++	—	—	—	—	—	++	—	—	—	—	—	—	—	—	—	++	—
1929	FTOO	—	—	++	—	—	—	—	—	—	—	—	—	—	—	—	—	++	++	—	—
	FTOP	—	—	++	—	—	—	—	++	—	—	—	—	—	—	—	—	—	—	—	—
1931	FTMHL	—	—	—	++	—	—	—	—	—	—	—	—	—	++	—	—	—	++	++	—
1944	FTLHP	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
1947	FTMIP	—	—	—	—	—	—	—	—	2	—	—	5	—	—	—	—	—	4	—	—
1948	FLMHSP	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
1952	FTLLSS	—	1	500	8	—	—	—	—	—	—	—	1	—	—	10	—	—	—	6	—
1959	FTRGS	—	—	—	—	—	3	—	1	—	—	10	—	—	—	—	—	—	—	—	7
	FTRGH	—	—	—	—	—	—	—	—	8	—	—	—	—	—	—	—	—	—	—	—
1961	FRRSH	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—
	FTRSM	4	—	13	—	—	—	—	—	—	—	—	—	30	—	—	—	—	20	—	—
1962	FRHLO	—	—	700	4000	—	10	1	108	—	—	—	—	500	—	—	—	5	—	—	47
	FRTHLO	1	65	527	3040	4	++	—	5	19	—	—	—	—	—	—	—	14	3	5	66
	FRTHLM	883	214	3514	4272	99	64	—	3348	393	—	34	—	1301	29	33	—	123	292	176	312
1962	FTHLH	75	—	1	—	—	—	—	—	2	—	—	—	—	—	—	—	—	168	—	—
	FTHLL	609	—	—	—	19	—	—	20	9	124	—	10	525	20	—	—	—	97	—	—
	FTHLP	1589	5	879	1590	117	11	—	1283	99	3251	926	9	699	66	—	—	114	930	2	265
	FTSLP	170	—	58	—	18	—	—	913	4	—	—	2	114	10	—	—	28	141	—	25
1963	FRRWM	—	—	++	—	—	—	—	++	—	—	—	—	—	—	—	—	—	—	—	++
	FRRWO	—	++	++	—	—	—	—	++	—	—	—	—	—	—	—	—	—	—	—	++
1964	FTLS	2	—	6	—	—	—	—	—	—	—	—	—	—	—	—	—	15	7	—	—
1977	FLWSP	—	393	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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b Collector Code is given at the end of the last section of the table.

TABLE 5. (contd.) Number of specimens in historical fish collections from the North Canadian River and its lakes and tributaries.

Year	Coll. Code[b]	Number of specimens[a]																		
		CA	CC	CL	HP	LU	MA	MS	NA	NC	NB	NBU	NE	NG	NO	NS	NV	PM	PN	PP	PV
F. Harrah to L. Eufaula (contd.)																					
1978	FRTFCH	—	—	97	—	—	—	—	86	—	—	—	—	—	—	—	—	—	—	—	—
	FTFCO	—	—	39	—	—	—	—	40	—	—	—	—	—	—	—	—	—	—	—	5
	FRFCS	—	—	44	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—
	FLWEM	—	++	408	—	—	—	—	—	++	—	—	—	—	—	—	—	—	—	122	—
1979	FLWEM	++	55	2015	—	—	—	—	++	—	—	++	—	—	—	—	—	++	—	—	262
	FRCSO	—	—	103	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	FLWS2P	—	3	685	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
	FLWSP	—	3	46	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
1980	FLWEM	—	125	1477	—	—	—	—	++	++	—	++	—	—	—	++	—	—	—	—	—
1981	FLWEM	++	15	2696	—	—	—	—	++	++	—	++	—	—	—	—	—	—	—	—	892
1982	FLWSP	—	—	396	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
	FLWS2P	—	22	540	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	FLWEM	—	25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1983	FLWEM	—	43	—	—	—	—	—	—	50	—	—	—	—	—	—	—	—	—	3	1654
1985	FLWEM	—	29	1649	—	—	—	—	2011	20	—	—	1	135	—	—	—	—	—	—	647
1987	FMMAGS	—	3	1258	5	—	—	—	—	—	—	17	—	—	—	3	—	—	—	—	7
1988	FLWEM	3	23	975	—	—	—	—	—	3	—	—	4	—	—	10	—	—	1	—	—
1989	FRLAEOK	—	—	2800	—	—	—	—	13	—	—	—	1	—	—	6	—	—	—	—	—
1989	FRLAEP	—	—	80	—	—	—	—	—	—	—	—	—	—	—	115	—	—	—	—	117
1991	FLWEM	17	17	978	—	—	—	—	149	20	—	—	—	—	—	—	—	—	—	—	—
1993	FMLUEP	—	—	—	—	—	—	—	++	—	—	—	—	—	—	—	—	++	—	—	—
	FMLUEO	—	—	++	—	—	—	—	++	—	—	—	—	—	—	—	—	—	—	—	—
	FMLUEM	—	—	++	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	++	++

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b Collector Code is given at the end of the last section of the table.

TABLE 5. (contd.) Number of specimens in historical fish collections from the North Canadian River and its lakes and tributaries.

Year	Coll. Code[b]	Number of specimens[a]																			
		CA	CC	CL	HP	LU	MA	MS	NA	NC	NB	NBU	NE	NG	NO	NS	NV	PM	PN	PP	PV
G. L. Eufaula to Arkansas R.																					
1959	GRMM	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	GTCSH	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1962	GRHLM	—	—	45	744	—	11	—	59	—	—	—	—	8	—	—	—	—	—	—	—
	GTRHLH	214	—	547	1472	4	63	—	69	2	—	—	—	718	—	—	—	21	40	—	7
1963	GTLIBH	—	—	15	—	115	—	—	—	—	—	—	—	—	—	—	—	—	14	—	—
1972	GMLMH	—	—	—	—	—	—	—	2	4	1	—	—	—	—	61	—	—	—	—	—
1974	GRUH	—	—	—	—	—	5	—	—	1	—	—	—	—	—	—	—	—	—	—	—
1993	GRLUEH	—	—	++	—	—	10	++	++	—	—	—	—	—	—	++	—	—	—	—	++

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b Collector Code: 4–6 letters, e.g., GMLUEH. First letter: Segment of river A to G (headwaters to downstream). Second letter: Type of waters: T = tributary, M = mainstem, L = lake. Third letter To last letter = Collector symbol. Last letter: county: C, Cimarron; T, Texas; B, Beaver; H, Harper; W, Woodward; B, Blaine; C, Canadian; O, Oklahoma; PO, Pottawatomie; S, Seminole; Of, Okfuskee; O, Okmulgee; H, Hughes; M, McIntosh; P, Pittsburg; H, Haskell. If site is a lake: Next to last letter(s) is symbol for that lake: O, Optima; CH, Lake Chambers; FS, Fort Supply; C, Canton; AH, American Horse; O, Overholser; H, Hefner; S, Shawnee Lakes; E, Lake Eufaula.

++ Species collected but count was not given.

— Species was not collected that year.

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TABLE 6. *Campostoma anomalum*: distribution at ODEQ sites on the NCR 1976–1995. For identification of Segment and Site, see Table 2.

	Number of *C. anomalum* Collected at Site by Year														
Segment⇒	A		E	F					G						
Year	T1	T2	M8	M9	T23	T9	T10	L9	M10	T21	T20	T18	T17	T16	T15
1977	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
1978	—	—	0	—	—	—	—	—	—	—	—	—	—	—	—
1979	—	—	0	1	—	—	—	—	—	—	—	—	—	—	—
1980	—	—	0	0	—	—	—	—	0	—	—	—	—	—	—
1981	—	—	0	0	—	—	—	—	0	—	—	—	—	—	—
1982	—	—	0	0	—	—	—	—	0	—	—	—	—	—	—
1983	—	—	0	0	—	—	—	—	4	—	—	—	—	—	—
1984	—	—	0	0	—	—	—	—	0	—	—	—	—	—	—
1985	—	—	0	0	—	—	—	—	0	—	—	—	—	—	—
1986	—	—	0	0	—	—	—	—	1	—	—	—	—	—	—
1987	—	—	0	0	—	—	—	—	0	—	—	—	—	—	—
1988	218	6	0	0	—	—	—	—	0	—	7	1	4	4	0
1989	—	—	0	0	—	—	—	—	0	—	—	—	—	—	8
1990	—	—	0	1	—	—	—	21	0	8	—	—	—	—	—
1991	—	—	0	0	—	—	—	—	0	—	—	—	—	—	—
1992	—	—	0	0	—	—	—	—	0	5	—	—	—	—	—
1993	—	—	0	0	1	23	2	—	0	—	—	—	—	—	—
1994	—	—	0	0	—	—	—	—	6	—	—	—	—	—	—
1995	—	—	0	0	—	—	—	—	0	—	—	—	—	—	—
Totals[a]	218	6	1	2	1	23	2	21	11	13	7	1	4	4	8
NOC[b]	1	1	58	39	1	1	1	1	34	2	1	2	1	1	2
N(*Ca*)[c]	1	1	1	2	1	1	1	1	3	2	1	1	1	1	1

— No data or collection for the year.

a Total (sum) for each column.

b Number of collections at the site, 1977–1995.

c Number of collections which contained *C. anamalum*.

TABLE 7. Trends in relative abundance (number per collection) for *Campostoma anomalum* and *Cyprinus carpio* for years 1921–1995. Small letters indicates collections by others. Large letters indicates collections by DEQ. See footnotes for key to other abbreviations. For identification of Segment and Site, see Table 2.

Campostoma anomalum

	Relative Abundance at Site															
Segment⇒	A			B			C		D		E	F			G	
Years	T1	T2	LS3	M1	M2	M3	M4	M5	M6	M7	M8	T9	T10	M9	T16-T21	M10	FTH5
1925–1935	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1936–1945	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1946–1955	—	—	—	—	—	—	—	—	++	—	++	—	—	—	—	—	—
1956–1965	—	—	—	vr	—	—	—	—	—	—	—	vr	c	vr	c	—	a
1966–1975	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1976–1980	—	—	—	—	—	—	0	—	0	vr	VR	—	—	VR	—	0	—
1981–1985	—	—	vr	0	0	0	0	0	0	0	vr	—	—	0	—	VR	—
1986–1990	C	VR	—	0	0	0	0	0	0	0	0	—	—	0	VR	VR	—
1991–1995	—	—	—	0	0	0	0	0	0	0	0	R	VR	0	—	VR	—

Cyprinus carpio

	Relative Abundance at Site																				
Segment⇒	A		B					C					D		E		F			G	
Years	L1	ALS	M1	M2	M3	L2	BLS	M4	M5	L3	CLS	M6	M7	L4	DLS	L5	M8	M9	L7	L8	ELW	M10
1925–1935	—	—	++	—	—	—	—	vr	—	—	—	—	—	—	—	—	r	—	—	—	—	—
1936–1945	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	vr	—	—	—	—	—
1946–1955	—	—	—	—	—	vr	—	—	—	vr	—	—	++	++	—	—	—	—	—	—	—	—
1956–1965	—	—	—	—	r	—	a	—	—	vr	a	vr	—	—	—	—	—	vr	—	—	c	vr
1966–1975	—	—	—	—	r	—	—	—	—	—	a	A	—	—	—	—	—	—	—	—	—	—
1976–1980	—	r	—	—	—	c	r	VR	—	VR	r	R	VR	VR	—	VR	VR	VR	VR	—	c	VR
1981–1985	R	r	0	VR	VR	R	r	VR	0	VR	r	VR	VR	R	a	R	VR	VR	R	R	r	VR
1986–1990	R	r	VR	VR	VR	R	r	VR	VR	VR	r	VR	VR	—	r	R	VR	VR	—	R	r	VR
1991–1995	R	r	VR	R	R	—	vr	VR	C	VR	r	VR	VR	VR	r	VR	VR	VR	VR	—	vr	VR

— No data or collection that year.

++ Species was collected; number unknown.

Relative abundance is indicated by:

VA|va: over 5,000 specimens; R|r: 20–99 specimens;
A|a: 500–4,999 specimens; VR|vr: 1–19 specimens;
C|c: 100–499 specimens; 0: none collected.

TABLE 8. *Cyprinus carpio*: distribution at the ten long-term fish-collecting sites on the NCR from 1976 to 1995.

	Number of *C. carpio* collected at Site M#										Total	No.
Year	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	*C.ca.*[a]	Cln.[b]
1976	—	—	—	—	—	—	1	0	—	—	1	2
1977	—	—	—	—	—	—	2	4	—	—	6	6
1978	—	—	—	1	—	0	5	0	0	—	6	8
1979	—	—	—	9	—	0	2	1	1	0	13	15
1980	—	—	—	2	—	101	24	4	0	3	134	18
1981	0	0	0	33	—	14	4	14	3	7	75	19
1982	0	0	0	7	—	13	16	16	10	0	62	19
1983	0	1	5	19	—	3	3	3	10	0	44	21
1984	0	0	0	0	—	2	19	7	1	0	29	21
1985	0	4	3	6	0	5	0	0	0	0	18	23
1986	0	0	0	0	0	4	1	0	1	0	6	20
1987	0	2	0	0	1	0	2	2	0	0	7	20
1988	1	1	0	0	0	0	0	3	0	0	5	22
1989	0	0	5	3	2	0	3	2	0	0	15	28
1990	0	0	1	0	0	2	3	2	0	12	20	23
1991	0	0	18	0	1	7	1	8	0	0	35	24
1992	0	0	16	0	12	7	21	0	14	1	71	24
1993	2	1	23	10	435	4	3	1	0	0	479	21
1994	0	413	14	1	0	1	0	0	0	0	429	23
1995	0	22	7	36	1	2	1	2	0	0	71	20
Totals[c]	3	444	92	127	452	165	111	69	40	23	1526	377
NOC[d]	28	26	28	47	22	36	57	58	40	35		377
N(*Cc*)[e]	2	10	13	15	8	21	27	17	10	5		128

— No data or collection that year.

a Total number of *C. carpio* collected for the year.

b Total number of collections for the year.

c Total (sum) for each column.

d Number of collections at the site, 1976–95.

e Number of collections which contained *C. carpio*.

TABLE 9. Rare historical cyprinids collections from museum records (MR), unpublished field notes (UPFN), unpublished stocking records(USR), unpublished Oklahoma Department of Wildlife Conservation (ODWC-LS), and other studies (OS) for mainstem (M), tributary (T), and lake (L) sites on the North Canadian River (NCR), Oklahoma.

Year	County	Collector or survey	Location	Sources	No. Coll.	No. Fish
Ctenopharyngodon idella						
A. NM State Line to L. Optima						
1983	Texas	ODWC	Guymon City Lake	USR		
B. L. Optima to Woodward						
1981	Beaver	ODWC	Beaver City Lake	USR		
1984	Beaver	ODWC	Beaver City Lake	USR		
1985	Beaver	ODWC	Beaver City Lake	USR		
D. L. Canton to L. Overholser						
1980	Blaine	ODWC	American Horse L.	USR		
1981	Blaine	ODWC	American Horse L.	USR		
Platygobio gracilis						
B. L. Optima to Woodward						
1978	Woodward	ODWCLS	Lake Fort Supply	ODWC	1	1
1988	Cimarron	DEQ(P & G)[a]	Corrumpa Creek	ODEQ	1	3
Notropis bairdi						
B. L. Optima to Woodward						
1983	Beaver	DEQ(P & G)	NCR , Turpin	ODEQ	1	28
D. L. Canton to L. Overhosler						
1976	Canadian	DEQ(P & G)	NCR, El Reno	ODEQ	1	1
Macrhybopsis storeriana						
F. Harrah to Lake Eufaula						
1962	McIntosh	ODWC(H & L)[a]	Proposed L. Eufaula	OKMNH	1	9
1985	Haskell	DEQ(P & G)	CR Whitefield	ODEQ	1	2
1988	Haskell	DEQ(P & G)	CR Whitefield	ODEQ	1	7
1993	Haskell	L & E[a]	CR Whitefield	[b]	1	1
Scardinius erythrophthalmus						
F. Harrah to Lake Eufaula						
1990	Pittsburg	DEQ(P & G)	L. Eufaula	OSUS 23186	1	2
Notropis blennius						
D. L. Canton to Lake Overholser						
1977	Canadian	ODEQ(P & G)	NCR El Reno (M7)	ODEQ	1	1
F. Harrah to L. Eufaula						
1962	McIntosh	ODWCLS(H & L)	Deep Fork R mouth	OKMNH	2	5
1979	Hughes	ODEQ(P & G)	NCR Wetumka (M9)	ODEQ	1	3
G. L. Eufaula to Arkansas R.						
1990	Haskell	ODEQ(P & G)	CR Whitefield (M10)	ODEQ	2	7
1993	Haskell	L & E	CR Whitefield	OSUS	1	25
1994	Haskell	ODEQ(P & G)	CR Whitefield (M10)	ODEQ	1	1
Notropis nubilus						
F. Harrah to L. Eufaula						
1967	McIntosh	ODWCLS Wright	L. Eufaula	ODWCLS	1	r
Notropis rubellus						
F. Harrah to L. Eufaula						
1952	Seminole	Lachner, et al.	Tri. NCR	USNM	1	20

continued on next page.

a P & G: Pigg, Gibbs; L & E: Luttrell, Echelle; H & L: Houser, Lindsay; C & B: Cross, Buck.

b Luttrell, G.R., Echelle, A.A., and Zale, A.V., *Status of the Speckled Chub in the Arkansas River Basin.* Oklahoma City, OK. Oklahoma Dept. Wildlife Conserv. Final Project Report. Project No. E-8 Job No. 3 (1993).

TABLE 9. (contd.) Rare historical cyprinids collections from museum records (MR), unpublished field notes (UPFN), unpublished stocking records(USR), unpublished Oklahoma Department of Wildlife Conservation (ODWC-LS), and other studies (OS) for mainstem (M), tributary (T), and lake (L) sites on the North Canadian River (NCR), Oklahoma.

Year	County	Collector or survey	Location	Sources	No. Coll.	No. Fish
Notropis volucellus						
F. Harrah to L. Eufaula						
1984	Pittsburg	ODEQ(P & G)	L. Eufaula	ODEQ	1	1
1988	McIntosh	ODWCLS Wright	L. Eufaula	ODWCLS	1	4
1992	Pittsburg	ODEQ(P & G)	Elm CR	ODEQ	1	1
Pimephales tenellus						
C. Woodward to Lake Canton						
1950	Blaine	ODWCLS(C & B)[a]	L. Canton	ODWCLS	?	?
Erimystax x-punctatus						
G. Harrah to L.Eufaula						
1962	Pittsburg	ODWC(H & L)	Gaines CR	TU	1	1

a P & G: Pigg, Gibbs; L & E: Luttrell, Echelle; H & L: Houser, Lindsay; C & B: Cross, Buck.

TABLE 10. *Hybognathus placitus*: distribution at the ten long-term fish-collecting sites on the NCR 1976-1995.

	Number of *H. placitus* collected at Site M#										Total	No.
Year	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	*H.pl.*[a]	Cln[b]
1976	—	—	—	—	—	—	20	2	—	—	22	2
1977	—	—	—	—	—	—	0	11	—	—	11	6
1978	—	—	—	118	—	1	2	13	3	—	137	8
1979	—	—	—	27	—	8	2	15	2139	0	2191	15
1980	—	—	—	1085	—	1	0	20	637	0	1743	18
1981	0	0	0	17	—	0	1	9	9	0	36	19
1982	23	5	7	71	—	0	0	0	137	21	264	19
1983	138	130	787	75	—	0	0	17	970	0	2117	21
1984	0	3	6	0	—	0	0	3	1	0	13	21
1985	0	22	2	9	1	3	0	9	2	0	48	23
1986	1	1	5	0	0	0	0	18	39	0	64	20
1987	12	15	124	8	1	0	0	0	0	0	160	20
1988	32	25	2	0	0	0	0	0	0	0	59	22
1989	15	3	115	1	0	0	0	0	0	0	134	28
1990	19	13	0	0	0	0	0	0	0	0	32	23
1991	13	8	15	0	0	0	0	0	0	0	36	24
1992	0	16	0	6	1	22	0	0	0	0	45	24
1993	1	89	0	0	0	0	0	0	2	0	92	21
1994	0	54	0	2	0	0	0	0	0	0	56	23
1995	0	0	0	1	0	0	0	0	0	0	1	20
Total[c]	254	384	1063	1420	3	35	25	117	3939	21	7261	377
NOC[d]	28	26	28	47	22	36	57	58	40	35		377
N(*Hp*)[e]	13	18	10	25	3	7	4	19	17	1		

—: No collections were made that year or data not available.

a Total number of *H. placitus* collected for the year.

b Total number of collections for the year.

c Total (sum) for each column.

d Number of collections at the site, 1976–95.

e Number of collections which contained *H. placitus*.

TABLE 11. Trends in relative abundance (numbers per collections) for *Hybognathus placitus* and *Notropis atherinoides* for 1926–1995. Small letters indicates collections by others. Large letters indicates collections by DEQ. See footnotes for key to other abbreviations. For identification of Segment and Site, see Table 2.

	Relative Abundance at Site																
Segment⇒	A	B							C			D		E	F		G
Years	ATHB	T4	M12	M1	M13	M2	M3	L2	M4	M5	L3	M6	M7	M8	M9	L9	M10
Hybognathus placitus																	
1925–1935	c	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	++
1936–1945	++	—	—	—	—	—	—	—	r	—	—	—	—	—	—	—	—
1946–1955	r	—	c	r	—	r	r	—	r	vr	r	—	—	—	—	—	—
1956–1965	c	c	—	r	—	r	r	—	—	—	a	—	—	—	a	a	va
1966–1975	—	—	—	—	—	—	—	c	—	—	va	—	—	—	vr	—	—
1976–1980	—	—	—	—	—	—	—	—	C	—	c	VR	VR	R	C	—	0
1981–1985	—	—	—	R	—	R	C	0	R	VR	R	VR	VR	VR	C	VR	VR
1986–1990	0	C	C	VR	0	VR	R	0	VR	VR	VR	0	0	VR	0	0	0
1991–1995	—	—	R	VR	—	VR	VR	0	VR	VR	VR	VR	0	0	VR	0	0
Notropis atherinoides																	
1925–1935	++	—	—	—	—	++	—	—	—	—	—	—	—	—	vr	—	—
1936–1945	vr	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1946–1955	—	—	—	—	—	r	—	—	vr	++	—	++	—	—	vr	—	—
1956–1965	++	—	—	r	—	r	r	—	r	r	c	++	—	—	c	va	r
1966–1975	—	—	—	—	—	—	—	—	—	c	c	—	—	—	—	r	—
1976–1980	—	—	—	—	—	—	—	—	R	—	a	0	VR	VR	C	a	VR
1981–1985	—	—	—	0	—	0	0	—	VR	VR	VRa	VR	VR	VR	R	VA	VR
1986–1990	—	—	—	0	—	0	0	—	VR	VR	VR	VR	VR	VR	R	VR	VR
1991–1995	—	—	—	0	—	0	0	—	0	0	—	0	0	VR	C	c	VR

— No data or collection that year.

++ Species was collected; number unknown.

Relative abundance is indicated by:

VA|va: over 5,000 specimens; R|r: 20–99 specimens;
A|a: 500–4,999 specimens; VR|vr: 1–19 specimens;
C|c: 100–499 specimens; 0: none collected.

TABLE 12. *Notropis atherinoides*: distribution the ten long-term fish-collecting sites on the NCR 1976-1995.

	Number of *N. atherinoides* collected at Site M#										Total
Year	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	*N.at.*[a]
1976	—	—	—	—	—	—	29	22	—	—	51
1977	—	—	—	—	—	—	8	1	—	—	9
1978	—	—	—	16	—	0	0	2	24	—	42
1979	—	—	—	7	—	0	1	0	17	2	27
1980	—	—	—	6	—	0	4	1	392	0	403
1981	0	0	0	0	—	1	1	1	6	0	9
1982	0	0	0	1	—	0	0	3	12	30	46
1983	0	0	0	1	—	1	0	4	115	1	122
1984	0	0	0	0	—	1	1	7	76	0	85
1985	0	0	0	0	7	0	0	0	159	0	166
1986	0	0	0	0	1	1	0	1	7	2	12
1987	0	0	0	0	1	0	0	1	10	0	12
1988	0	0	0	0	0	0	1	1	28	3	33
1989	0	0	0	1	0	0	0	0	61	0	62
1990	0	0	0	0	0	0	0	5	7	1	13
1991	0	0	0	0	0	0	0	5	127	2	134
1992	0	0	0	0	0	0	0	2	138	0	140
1993	0	0	0	0	0	0	0	0	56	0	56
1994	0	0	0	0	0	0	0	0	22	5	27
1995	0	0	0	0	0	0	0	0	2	8	10
Totals[b]	0	0	0	32	9	4	45	56	1259	54	1459
NOC[c]	28	26	28	47	22	36	57	58	40	35	377
N(*Na*)[d]	0	0	0	7	3	4	7	18	30	11	80

—: No collections were made that year or data not available.

a Total number of *N. atherinoides* collected for the year.

b Total (sum) for each column.

c Number of collections at the site, 1976–95.

d Number of collections which contained *N. atherinoides*.

TABLE 13. The Arkansas River shiner (*Notropis girardi*): distribution for the ten long-term fish-collecting sites on the NCR 1976–1995.

	1975–1979			1980–1984			1985–1995			Last
Site	NS[a]	NC[b]	TC[c]	NS	NC	TC	NS	NC	TC	collection
Turpin	0	0	0	178	3	[6]	12	5	21	1994
Beaver	0	0	0	0	0	[6]	0	0	[19]	1963
May	0	0	0	1	1	[6]	0	0	21	1982
Woodward	0	0	3	11	5	14	0	0	30	1982
Seiling	0	0	0	0	0	0	0	0	22	—
Watonga	0	0	3	0	0	10	0	0	23	—
El Reno	0	0	8	0	0	16	0	0	33	—
Harrah	0	0	10	0	0	16	0	0	32	—
Wetumka	1	1	3	0	0	13	0	0	23	1979
Whitefield	0	0	3	0	0	11	0	0	20	—
Totals	1	1	30	190	9	98	12	5	244	

20-year Summary: 203 *N. girardi* collected in 16 of 377 total collections.

a NS: Number of specimens of *Notropis girardi* collected.
b NC: Number of collections containing this species.
c TC = Total number of collections during period.
[6] Site was dry at time of visit.

TABLE 14. Trends in relative abundance (numbers per collections) for *Notropis girardi* and *Cyprinella lutrensis* for years 1926–1995. Small letters indicate collections by others. Large letters indicate collections by ODEQ. See footnotes for key to other abbreviations. For identification of Segment and Site, see Table 2.

Notropis girardi

	Relative Abundance at Site																
Segment⇒	A		B				C				D	E	F			G	
Year	T	M	M1	M2	M3	M4	M5	L3	M6	T	M7	M8	M9	L9	T	M10	T
1925-1935	c	—	va	—	va	—	—	—	—	—	—	—	—	—	—	—	—
1936-1945	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1946-1955	c	c	r	r	c	r	vr	—	—	—	—	—	—	—	—	—	—
1956-1965	r	c	r	c	c	r	r	vr	—	vr	—	c	a	—	a	a	c
1966-1975	—	—	0	r	0	0	0	—	0	—	0	0	vr	0	—	0	—
1976-1980	—	—	0	0	0	0	0	vr	0	—	0	0	0	0	—	0	—
1981-1985	—	0	R	0	VR	VR	0	vr	0	—	0	0	0	0a	—	0	—
1986-1990	0	0	R	0	0	0	0	vr	0	—	0	0	0	c	0	0	0
1991-1995	—	0	VR	0	0	0	0	0	0	—	0	0	0	0	0	0	0

Cyprinella lutrensis

	Relative Abundance at Site																						
Segment⇒	A		B						C						D	E			F		G		
Years	M11	T1-2	L1	T3-7	M12	M1	M2	M3	L2	T8	M4	M5	L3	M6	M7	L4	L5	M8	L7	M9	L9	T	M10
1925-1935	—	c	—	—	—	—	—	++	—	—	—	—	—	—	—	—	—	—	—	++	—	++	—
1936-1945	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1946-1955	a	a	—	r	—	vr	vr	c	—	—	c	c	c	r	—	++	vr	—	—	a	—	—	—
1956-1965	a	a	—	a	—	c	c	c	—	c	r	—	c	c	c	—	—	—	—	a	a	c	c
1966-1975	—	—	—	—	—	—	—	r	—	—	c	—	c	—	—	—	—	—	—	—	a	—	—
1976-1980	—	—	a	—	—	—	—	—	c	—	A	—	c	A	A	r	vr	A	c	A	C	r	R
1981-1985	—	—	Ca	—	—	C	C	A	C	—	A	C	c	A	A	vaR	r	A	C	A	C	—	R
1986-1990	A	0	C	A	A	C	C	C	C	C	A	C	R	A	A	rR	c	A	C	A	C	0	R
1991-1995	A	—	VR	C	C	C	A	A	C	C	A	C	R	A	A	R	C	A	C	VA	C	0	VR

— No data or collection that year.

++ Species was collected; number unknown.

Relative abundance is indicated by:

VA|va: over 5,000 specimens; R|r: 20–99 specimens;
A|a: 500–4,999 specimens; VR|vr: 1–19 specimens;
C|c: 100–499 specimens; 0: none collected.

TABLE 15. Red shiner (*Cyprinellus lutrensis*): distribution at the ten long-term fish-collecting sites on the NCR 1976-1995.

Year	Number of Red Shiner collected at Site M#										Total
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	*C.lu.*[a]
1976	—	—	—	—	—	—	767	202	—	—	969
1977	—	—	—	—	—	—	2071	1064	—	—	3135
1978	—	—	—	—	—	997	5660	580	1805	—	9506
1979	—	—	—	1539	—	1681	1795	222	4293	0	9530
1980	—	—	—	486	—	505	1341	1332	4482	27	8173
1981	0[b]	0[b]	0[b]	3412	—	2374	5488	2430	8413	1	22118
1982	59	22	229	1256	—	1825	1879	3878	1410	0	10558
1983	438	992	1471	2874	—	808	1752	4182	5230	23	17770
1984	23	176	2077	3827	—	2491	3065	1669	4448	1	17777
1985	180	361	807	2877	624	1021	3944	2333	2083	88	14318
1986	484	70	812	1582	232	436	726	4463	3707	149	12661
1987	280	483	965	1612	301	1055	444	2331	2538	0	10009
1988	329	768	433	292	106	461	2731	525	2489	77	8211
1989	379	211	432	267	113	916	2867	800	1949	3	7937
1990	593	418	1347	643	257	615	1444	2048	2194	3	9562
1991	248	313	3158	5903	1221	3102	2992	7271	5032	1	29241
1992	119	140	696	2759	1099	1288	1753	2854	4733	6	15447
1993	209	581	1166	1475	401	400	1330	355	2675	0	8592
1994	105	685	1225	1849	264	365	2496	2153	7542	33	16717
1995	170	850	754	586	1039	655	1674	3672	1226	0	10626
Sum[c]	3616	6070	15572	33703	5657	20995	46219	44364	66249	412	215412
NOC[d]	28	26	28	47	22	36	57	58	40	35	377
N[e]	27	25	27	47	22	36	53	56	36	20	349
%[f]	9	18	40	49	42	63	83	50	75	9	—

— No collections were made at that site in that year.

a Total number of *C. lutrensis* collected for the year.

b Site was dry that year.

c Total (sum) for each column.

d Number of collections at the site, 1976–95.

e Number of collections which contained *C. lutrensis.*

f Percent, by number, of *C. lutrensis* in collected fishes.

TABLE 16. *Notropis stramineus*: distribution at the ten long-term fish-collecting sites on the NCR 1976-1995.

	Number of *N. stramineus* collected at Site M#										Total	No.
Year	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	*N.st.*[a]	Cln[b]
1976	—	—	—	—	—	—	5	9	—	—	14	2
1977	—	—	—	—	—	—	27	18	—	—	45	6
1978	—	—	—	57	—	72	210	144	16	—	499	8
1979	—	—	—	32	—	45	30	1	15	0	123	15
1980	—	—	—	41	—	12	59	14	1	0	127	18
1981	0	0	0	649	—	103	84	0	68	0	904	19
1982	108	44	38	166	—	51	140	59	3	0	609	19
1983	712	1173	343	455	—	31	79	25	9	0	2827	21
1984	144	54	699	3074	—	248	96	129	9	0	4453	21
1985	631	941	535	631	143	432	328	158	0	0	3799	23
1986	422	202	190	332	17	128	21	22	1	0	1335	20
1987	117	166	216	123	8	49	6	1	2	0	688	20
1988	333	119	105	8	4	8	4	20	0	0	601	22
1989	122	77	272	36	0	16	15	61	6	0	605	28
1990	1353	495	143	106	6	16	8	3	5	0	2135	23
1991	578	799	642	827	0	56	12	11	25	0	2950	24
1992	176	852	189	1062	68	100	151	16	1	0	2615	24
1993	290	570	562	686	39	76	8	0	0	0	2231	21
1994	379	1117	954	1751	45	71	58	6	10	0	4391	23
1995	140	278	754	295	28	11	7	3	0	0	1516	20
Totals[c]	5505	6887	5642	10331	358	1525	1348	700	171	0	32467	377
NOC[d]	28	26	28	47	22	36	57	58	40	35		377
N(*Ns*)[e]	26	21	27	47	17	36	47	34	20	0		275

— No collections were made that year.

a Total number of *N. stramineus* collected for the year.

b Total number of collections for the year.

c Total (sum) for each column.

d Number of collections at the site.

e Number of collections which contained *N. stramineus*.

TABLE 17. Trends in relative abundance (numbers per collections) for *Notropis stramineus* and *Phenacobius mirabilis* years 1926–1995. Small letters indicate collections by others. Large letters indicate collections by ODEQ. See footnotes for key to other abbreviations. For identification of Segment and Site, see Table 2.

	Relative Abundance at Site																							
Segment⇒	A							B						C				D		E		F		G
Years	M11	T	L1	M1	M12	M2	T2-3	T4-7	M16	M14	M3	L2	M4	M5	L3	M6	M7	L4	L5	M8	M9	L9	T	M10
Notropis stramineus																								
1925–1935	—	—	c	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1936–1945	vr	r	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1946–1955	—	—	—	—	—	—	—	—	—	—	—	vr	r	—	—	—	—	—	—	—	—	—	vr	—
1956–1965	c	c	r	vr	—	vr	c	c	—	—	vr	—	r	—	r	—	—	—	—	—	—	0	r	—
1966–1975	—	—	r	—	—	—	—	—	—	—	—	vr	c	c	r	—	++	—	—	—	—	r	—	r
1976–1980	—	—	c	vr	—	—	—	—	—	—	—	vr	R	—	r	Rc	c	—	r	Rc	VR	++	—	0
1981–1985	—	—	cR	C	—	A	—	—	—	—	C	vr	A	R	r	C	C	—	—	Rc	R	0	—	0
1986–1990	C	0	R	C	C	C	A	VR	—	—	C	VR	C	VR	VR	R	VR	VR	VR	Rc	VR	0c	0	0
1991–1995	C	—	R	C	C	A	A	—	—	—	C	VR	A	R	VR	R	R	VR	VR	VR	VR	0c	0	0
Phenacobius mirabilis																								
1925–1935	vr	—	—	—	—	++	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	++	—
1936–1945	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1946–1955	—	—	—	—	—	—	—	—	—	—	—	vr	++	—	—	—	—	—	—	—	—	—	—	—
1956–1965	c	—	—	—	vr	r	—	—	—	—	—	—	vr	—	vr	++	—	—	—	—	vr	—	r	—
1966–1975	—	—	—	—	—	—	—	—	—	—	—	—	—	—	vr	—	—	—	—	—	—	—	—	—
1976–1980	—	—	vr	—	—	—	—	—	vr	—	—	vr	VR	—	vr	0	VR	—	—	vr0	VR	vr	—	0
1981–1985	—	—	vr	VR	—	R	—	—	—	—	R	0	R	R	VR	VR	VR	—	—	VR	VR	0	—	0
1986–1990	VR	—	0	VR	VR	VR	—	—	VR	R	VR	0	VR	VR	VR	VR	VR	—	—	VR	VR	0	0	0
1991–1995	VR	—	0	VR	VR	VR	—	—	—	—	VR	0	R	VR	VR	VR	VR	—	—	VR	VR	0	0	0

— No data or collection that year.

++ Species was collected; number unknown.

Relative abundance is indicated by:

VA|va: over 5,000 specimens; R|r: 20–99 specimens;
A|a: 500–4,999 specimens; VR|vr: 1–19 specimens;
C|c: 100–499 specimens; 0: none collected.

TABLE 18. *Phenacobius mirabilis*: distribution at the ten long-term fish-collecting sites on the NCR 1976-1995.

	Number of *P. mirabilis* collected at Site M#										Total	No.
Year	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	*P.mi.*[a]	Cln.[b]
1976	—	—	—	—	—	—	0	0	—	—	0	2
1977	—	—	—	—	—	—	1	0	—	—	1	6
1978	—	—	—	8	—	0	1	0	1	—	10	8
1979	—	—	—	7	—	0	0	0	3	0	10	15
1980	—	—	—	4	—	0	0	0	0	0	4	18
1981	0	0	0	81	—	2	1	0	2	0	86	19
1982	0	0	16	32	—	1	1	1	3	0	54	19
1983	2	2	17	30	—	0	1	0	33	0	85	21
1984	0	0	17	174	—	3	0	1	0	0	195	21
1985	1	119	52	74	48	3	2	0	0	0	299	23
1986	2	9	14	22	2	2	2	11	5	0	69	20
1987	4	4	4	6	1	1	1	0	1	0	22	20
1988	0	5	5	1	9	0	0	11	2	0	33	22
1989	0	2	2	6	0	1	0	7	0	0	18	28
1990	4	9	22	8	7	3	0	0	5	0	58	23
1991	3	7	5	31	1	6	2	1	4	0	60	24
1992	0	9	3	144	7	16	12	0	16	0	207	24
1993	0	45	27	47	11	5	4	1	14	0	154	21
1994	5	26	18	61	48	3	3	1	1	0	166	23
1995	3	34	28	13	6	0	3	0	0	0	87	20
Totals[c]	24	271	230	749	140	46	34	34	90	0	1618	377
NOC[d]	28	26	28	47	22	36	57	58	40	35		377
N(*Pm*)[e]	10	19	23	37	16	14	19	10	17	0		165

— No data or collection that year.

a Total number of *P. mirabilis* collected for the year.

b Total number of collections for the year.

c Total (sum) for each column.

d Number of collections at the site, 1976–95.

e Number of collections which contained *P. mirabilis*.

TABLE 19. Fathead minnow (*Pimephales promelas*) at the ten long-term fish-collecting sites on the NCR 1976-1995.

	Number of *P. promelas* collected at Site M#										Total	No.
Year	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	*P.pr.*[a]	Cln.[b]
1976	—	—	—	—	—	—	0	0	—	—	0	2
1977	—	—	—	—	—	—	5	11	—	—	16	6
1978	—	—	—	59	—	16	5	4	0	—	84	8
1979	—	—	—	32	—	381	6	0	0	0	419	15
1980	—	—	—	17	—	1	4	2	0	0	24	18
1981	0	0	0	521	—	56	1	3	0	0	581	19
1982	19	44	109	137	—	0	2	5	3	0	319	19
1983	116	128	454	679	—	19	2	13	0	0	1411	21
1984	11	1	477	404	—	8	7	70	0	0	978	21
1985	334	335	1475	268	349	92	32	34	0	0	2919	23
1986	628	38	110	132	16	6	3	189	0	0	1122	20
1987	195	426	65	118	4	0	0	1	0	0	809	20
1988	34	83	101	18	33	0	0	1	0	0	270	22
1989	42	46	126	26	3	0	0	6	0	0	249	28
1990	141	106	73	8	20	4	23	1	0	0	376	23
1991	127	262	523	293	87	45	8	10	0	0	1355	24
1992	15	399	199	407	310	92	25	1	0	0	1448	24
1993	126	213	710	290	194	13	26	6	0	0	1578	21
1994	147	444	263	1201	271	10	23	13	0	0	2372	23
1995	74	197	80	161	53	10	2	0	0	0	577	20
Totals[c]	2009	2722	4765	4771	1340	753	174	370	3	0	13978	377
NOC[d]	28	26	28	47	22	36	57	58	40	35		377
N(*Pp*)[e]	26	25	27	44	20	24	24	29	1	0		220

— No data or collection that year.

a Total number of *P. promelas* collected for the year.

b Total number of collections for the year.

c Total (sum) for each column.

d Number of collections at the site, 1976–95.

e Number of collections which contained *P. promelas*.

TABLE 20. *Pimephales vigilax*: distribution at the ten long-term fish collection sites on the NCR 1976–1995.

	Number of *P. vigilax* collected at Site M#										Total	No.
Year	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	*P.vi.*[a]	Cln[b]
1976	—	—	—	—	—	—	0	0	—	—	0	2
1977	—	—	—	—	—	—	41	1	—	—	42	6
1978	—	—	—	6	—	21	5	7	3	—	42	8
1979	—	—	—	5	—	4	0	8	10	0	27	15
1980	—	—	—	6	—	5	0	16	20	1	48	18
1981	0	0	0	10	—	14	7	6	29	16	82	19
1982	0	0	0	12	—	0	10	9	21	1	53	19
1983	0	0	23	73	—	5	1	21	67	15	205	21
1984	0	0	3	53	—	24	1	4	267	0	352	21
1985	0	0	5	3	0	12	19	44	20	39	142	23
1986	0	1	0	16	1	1	7	173	57	11	267	20
1987	0	1	0	4	0	5	3	44	143	0	200	20
1988	0	0	0	22	0	10	7	3	132	1	175	22
1989	0	0	0	4	3	14	12	23	95	0	151	28
1990	0	0	4	36	9	17	39	50	91	0	246	23
1991	0	0	0	167	169	24	27	430	412	0	1229	24
1992	0	0	1	32	7	16	39	74	139	2	310	24
1993	0	0	1	26	40	3	14	114	190	1	389	21
1994	0	0	2	95	15	6	78	365	766	80	1407	23
1995	0	0	0	0	3	34	8	683	57	0	785	20
Totals[c]	0	2	39	570	247	215	318	2075	2519	167	6152	377
NOC[d]	28	26	28	47	22	36	57	58	40	35		377
N(*Pv*)[e]	0	2	8	38	14	29	32	42	38	13		216

— No data or collection that year.

a Total number of *P. mirabilis* collected for the year.

b Total number of collections for the year.

c Total (sum) for each column.

d Number of collections at the site, 1976–95.

e Number of collections which contained *P. mirabilis*.

TABLE 21. Trends in relative abundance (numbers per collections) for *Pimephales vigilax* and *Pimephales promelas* for years 1926–1995. Small letters indicate collections by others. Large letters indicate collections by ODEQ. See footnote for key to other abbreviations. For identification of Segment and Site, see Table 2.

Pimephales vigilax

	Relative Abundance at Site																
Segment⇒	B					C			D				E	F			G
Years	M1	M2	M3	L2	T8	M4	M5	L3	M6	M7	L4	L5	M8	L7	M9	L9	M10
1925–1935	—	—	++	—	—	—	vr	—	—	—	—	—	—	—	—	—	—
1936–1945	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1946–1955	—	—	vr	—	vr	vr	vr	—	—	—	—	vr	vr	vr	c	—	—
1956–1965	—	—	—	—	vr	—	—	a	—	++	—	—	—	—	c	c	vr
1966–1975	—	—	—	—	—	—	—	r	—	vr	—	vr	vr	—	—	c	—
1976–1980	—	—	—	c	—	VR	—	c	VR	VR	vr	vr	VR	—	VR	a	VR
1981–1985	0	0	VR	c	—	R	0	C	VR	VR	vr	0c	VR	0	R	a	VR
1986–1990	0	VR	VR	C	VR	VR	VR	C	VR	VR	R	0	R	0	C	R	VR
1991–1995	0	0	VR	C	CR	VR	R	C	VR	R	R	0	A	0	C	C	VR

Pimephales promelas

	Relative Abundance at Site																						
Segment⇒	A							B						C		D		E		F		G	
Years	T1	T2	M11	L1	M1	M12	M2	M13	T5	T3	M3	L2	M4	M5	L3	M6	M7	L4	M8	L5	M9	L9	M10	
1925–1935	c	—	—	—	r	—	r	—	—	—	—	—	—	—	—	—	—	—	—	—	++	—	—	
1936–1945	—	—	—	—	—	—	—	—	—	—	—	—	++	—	++	—	—	—	—	—	—	—	—	
1946–1955	—	—	r	—	vr	vr	—	—	vr	—	—	vr	r	—	—	—	r	—	—	r	—	—	—	
1956–1965	—	—	r	—	vr	c	c	c	vr	vr	vr	—	vr	r	va	—	c	—	—	—	r	—	r	
1966–1975	—	—	—	r	vr	—	—	—	—	—	—	vr	—	—	r	—	r	—	—	—	—	—	—	
1976–1980	—	—	—	c	—	—	—	c	—	—	C	vr	VR	VR	vr	0	0r	r	r0	—	—	c	—	
1981–1985	—	—	—	c	C	—	C	—	—	—	A	r	C	C	VR	R	VR	—	R	—	VR	vr	0	
1986–1990	C	C	R	C	C	R	C	VR	VR	C	C	R	R	VR	VR	VR	VR	—	R	—	0	—	0	
1991–1993	—	—	R	C	C	A	C	—	—	—	C	R	C	C	VR	VR	R	—	VR	—	0	—	0	

— No data or collection that year.
++ Species was collected; number unknown.
Relative abundance is indicated by:
VA|va: over 5,000 specimens; R|r: 20–99 specimens;
A|a: 500–4,999 specimens; VR|vr: 1–19 specimens;
C|c: 100–499 specimens; 0: none collected.