INTERIM REPORT

RESULTS OF THE AQUATIC MONITORING PROGRAM IN BIG DRY CREEK, 1997

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Prepared for

THE CITIES OF BROOMFIELD,
NORTHGLENN, AND WESTMINSTER
COLORADO

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ADMIN RECORD

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1.0 INTRODUCTION

An aquatic monitoring program was initiated in 1997 in Big Dry Creek. This investigation was performed for the Cities of Broomfield, Northglenn, and Westminster to document the abundance and distribution of fish and aquatic macroinvertebrate populations at select locations in Big Dry Creek. Objectives of the monitoring program are to establish a data base that can ultimately be used to determine appropriate surface water quality standards for Segment 1 of Big Dry Creek and document the effects of potential influences in water quality on the aquatic community. Data will be used to reference any benefits resulting from recent effluent dechlorination efforts and assess the extent and potential causes of aquatic impairment in Big Dry Creek. Results of the 1997 aquatic sampling program are presented herein.

The Colorado Water Quality Control Commission held a rulemaking hearing in December 1996, concerning revisions to surface water quality classifications and standards for several segments of Big Dry Creek in the South Platte River basin including Segment 1. All parties supported adoption of standards as presented in the document prepared for this segment with the exception of the unionized ammonia standard. The Colorado Water Quality Control Division (CWQCD) proposed to adopt an unionized ammonia standard of 0.10 mg/l, based on the standard normally associated with a class 2 warm water aquatic life classification. The Colorado Division of Wildlife (CDOW) requested that the Commission adopt a more stringent unionized ammonia standard of 0.06 mg/l in Segment 1 of Big Dry Creek based on the species composition of the fish community in Big Dry Creek (Woodling, 1996). The CDOW's rationale for requesting a more restrictive unionized ammonia standard was based on the opinion that downstream decreases in fish diversity are attributable to ammonia discharges to Big Dry Creek from municipal wastewater plants and that an unionized ammonia standard of 0.10 mg/l is not protective of the johnny darter. The CDOW suggested that decreases in fish diversity may also be related to elevated chlorine levels, although they supported the proposed chlorine standard.

In preparation for the hearing, the Cities conducted a qualitative study which included an assessment of habitat and macroinvertebrates to determine the impacts of water quality on aquatic life. Although a thorough biological assessment was not performed prior to the hearing because of time constraints, study results supported the conclusion that the aquatic community of Big Dry Creek had not been adequately characterized and may be primarily limited by poor habitat quality and flow conditions rather than water quality (Conklin, 1996).

Based on the information presented in the hearing, the Colorado Water Quality Control Commission decided in favor of the 0.10 mg/l unionized ammonia standard, since there was not enough supporting evidence to warrant adopting a more stringent unionized ammonia standard at that time. Consequently, the Commission encouraged the Cities, the CDOW, and the CWQCD to work together to assess instream conditions. The 1997 monitoring program initiated by the Cities represents an essential component of the effort to establish appropriate surface water quality standards for this segment of Big Dry Creek.

2.0 METHODS

2.1 FISH POPULATIONS

Fish populations were sampled at all study locations in the fall using shoreline electroshocking equipment. One negative and five mobile positive electrodes were used at each station to maximize sampling effectiveness in study areas where relatively high conductivity values were measured. Fish were collected at all sites using multiple pass removal techniques. Fish were collected in two consecutive passes, and fish from each pass were kept separate. All fish captured were identified, counted, measured, weighed, and released to the stream.

Sampling areas selected were representative of the stream reach and were of sufficient length to include all macro-habitat types (pool-run-riffle). In most cases, natural physical barriers (very shallow flow depths over the riffle) prevented fish from moving into or out of the study site. The length of study areas ranged from approximately 70 to 140 meters (225 to 450 feet). At some stations in downstream areas, the stream was channelized and the length of the study area was 91.4 meters (300 feet) for consistency. Stream widths were measured at 15-meter intervals throughout each study section and ranged from approximately 4 to 6 meters (12 to 20 feet). Average stream width and total length were used to calculate the area sampled. Physical characteristics and sampling activities at each study site were recorded at the time of sampling.

Fish population sampling was performed by the CDOW in March 1997. Backpack and/or shoreline electroshocking equipment and two electrodes were used. One pass was made through the stream reach at most stations. Field data were obtained from the CDOW for analysis and were incorporated with the fall 1997 sampling results.

Fish population data collected in the spring and fall 1997 were analyzed and summarized. A list of species collected including mean lengths, mean weights, and relative abundance were calculated for each station and sampling occasion.

2.2 MACROINVERTEBRATES

Macroinvertebrate sampling locations corresponded with areas where fish populations were sampled. Sampling was performed according to methods outlined by Klemm et al. (1990) and the Colorado Water Quality Forum (1995). Benthic macroinvertebrates were collected from shallow riffle areas using a modified Hess sampler, equipped with 250 micron Nitex mesh. Three replicate samples were collected at random at all study locations. In addition, kick samples were collected from representative aquatic habitats (riffle, run, pool, bank) found in each study section. Kick samples were collected from a one square meter area using a kick net with a mesh size of 425 microns. The effort expended to collect the one square meter kick samples was consistent (approximately one minute per sample) to allow for comparability of data collected from representative habitats. The material that was collected was carefully removed from the samplers and placed in labeled sample containers filled with 80% ethyl alcohol (ethanol) or 10% formalin preservative in the field. Samples were transported to the laboratory for analysis. Physical characteristics at each station were recorded and photographed at the time of sampling.

Identification of aquatic macroinvertebrates and laboratory techniques were performed according to the methods outlined by Klemm et al. (1990). In the laboratory, macroinvertebrates in each sample were removed from the debris with forceps for identification. Sample processing was performed by City of Northglenn staff. Samples were then delivered to Aquatics Associates for identification and quality assurance. The debris from each sample was reexamined to ensure that no organisms were overlooked. Macroinvertebrates were identified and enumerated to the lowest taxonomic level possible with the aid of a binocular stereo dissecting microscope. In addition, a compound microscope was used to identify slide-mounted Oligochaeta, Chironomidae, and certain Baetidae. A voucher collection was prepared containing representative specimens of each taxon in vials of 80% ethanol or on permanent slide mounts with Euparal or PVA (polyvinyl alcohol) when necessary. Principal taxonomic references used in identification included Brinkhurst (1986), Burch (1972), Cook (1974), Edmunds et al. (1976), Epler (1986), Evans (1988), Gundersen (1977), Hilsenhoff and Brigham (1978), Holsinger (1972), Hungerford (1932, 1948), Jackson (1977), Kawakatsu et al. (1989), Klemm (1985), Larson (1989), Lugo-Ortiz et al. (1994), Matheson (1912), McAlpine et al. (1981), McCafferty and Waltz (1990, 1995), McCafferty et al. (1994), Merritt and Cummins (1996), Morihara and McCafferty (1979), Oliver et al. (1990), Pennak (1989), Peterson and Kondratieff (1995), Spangler (1960), Unger (1978), Westfall and May (1996), Wiederholm (1983, 1986), Wiggins (1996), and Zimmerman (1970).

Following species identification and enumeration, a species list including the number of organisms collected, total density, total number of taxa, relative abundance, and species diversity were calculated for replicate and kick samples for all study sites. Other community parameters were also calculated for both replicate and kick samples according to methods outlined for the Rapid Bioassessment Protocol III analysis (Plafkin et al., 1989). The Rapid Bioassessment Protocol III (RBP III) analysis considers several benthic community parameters and provides a standardized method for evaluating differences between study sites, seasons, and years. The metrics calculated included taxa richness, the modified Hilsenhoff Biotic Index, ratio of scrapers to filtering collector feeding groups, ratio of EPT to Chironomidae abundances, percent dominant taxon, and the EPT Index, the Community Loss Index, and ratio of the shredder feeding group to the total number of individuals collected. Tolerance values used in the Hilsenhoff Biotic Index (HBI) incorporate values presented by McGuire (1992, 1993, 1994), Bode (1988), and Winget and Mangum (1979) which are more applicable to Colorado streams. HBI values may range from 0 to 10, with values increasing as the tolerance of the benthic community increases. The EPT Index represents the number of distinct taxa within the orders Ephemeroptera, Plecoptera, and Trichoptera, and generally increases with increasing water quality. The EPT to Chironomidae abundance ratio compares the abundance of the generally tolerant Chironomidae to the more sensitive groups of Ephemeroptera, Plecoptera, and Trichoptera. RBP III scores were calculated based on these metrics.

3.0 RESULTS AND DISCUSSION

3.1 PHYSICAL CHARACTERISTICS

3.1.1 Project Study Area

The project study area in Big Dry Creek extends from approximately 1.5 miles downstream from Standley Lake to Wattenberg, upstream from the confluence with the South Platte River in Jefferson, Adams, and Weld Counties, Colorado. Seven study sites were selected by the Cities where fish and macroinvertebrates were sampled in the spring (prior to the start of the irrigation season) and fall. Aquatic life sampling locations correspond with the surface water quality monitoring program conducted by the Cities. The project study area and study sites are depicted in Figure 1. Descriptions of sampling locations are provided in Table 1.

3.1.2 General Habitat Characteristics

Three study sites are located in the transition zone in the upper portion of the project study area, upstream from municipal wastewater facilities which discharge to Big Dry Creek. Further downstream, four study sites are located in the reach downstream from the Broomfield Water Treatment Plant and the Westminster Big Dry Creek Wastewater Treatment Plant (Figure 1).

General description of sample site & stream

Big Dry Creek is characterized as a transition zone foothills-plains stream in areas upstream from wastewater treatment plants. The stream meanders through open space areas in urban Denver with grasses, willows, and some cottonwood and Russian olive trees growing along stream banks. The gradient is moderately low. Macro-habitat types at the three upper study sites included riffle, run, and pool habitat sequences. The substrate in riffle habitats was composed primarily of small cobble interspersed with gravel and sand, while sand and silt were predominant in pool and run habitats. Large cobble, small boulders, and large woody debris were occasionally present in the stream channel. Overhanging trees provided some cover and shade. Sediment deposition was evident throughout the study section at all sites, although some scouring of fine sediments was observed in riffle areas where velocities are comparatively higher. Periphytic algae growth was abundant on bottom substrates in both March and October, and was very dense in October. Beds of waterbuttercup (*Ranunculus* sp.) were also observed in riffle areas in October. Some erosion of stream banks was evident, particularly at sites BDC-1.0 and BDC-1.5B. Stream bank erosion has

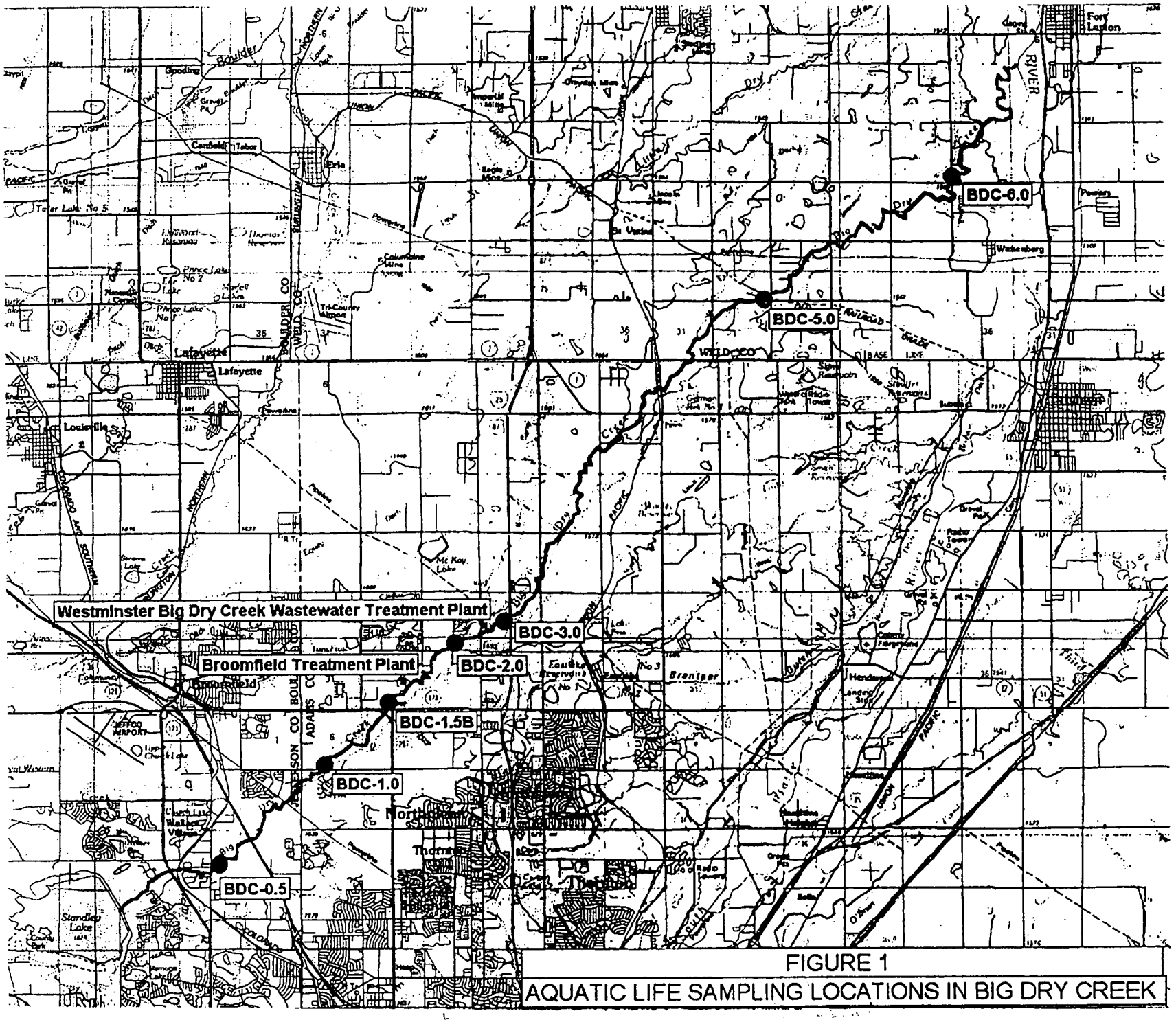


FIGURE 1

AQUATIC LIFE SAMPLING LOCATIONS IN BIG DRY CREEK

TABLE 1

AQUATIC LIFE SAMPLING LOCATIONS
IN BIG DRY CREEK IN MARCH AND OCTOBER 1997

STUDY SITE	LOCATION	STREAM TYPE
BDC-0.5	Church Ranch Open Space, downstream from Old Wadsworth Boulevard	Transitional foothills-plains
BDC-1.0	Downstream from 112th Avenue	Transitional foothills-plains
BDC-1.5 1/	Downstream from 120th Avenue	Transitional foothills-plains
BDC-2.0	Upstream from 128th Avenue, downstream from Broomfield Wastewater Treatment Plant	Plains
BDC-3.0	At Interstate 25, downstream from Westminster Big Dry Creek Wastewater Treatment Plant	Plains (channelized)
BDC-5.0 2/	Downstream from Weld County Road 4	Plains (channelized)
BDC-6.0	Near Wattenberg and Weld County Road 23, upstream from bridge on Weld County Road 8	Plains (channelized)

1/ Fish population sampling at site BDC-1.5 was performed under the 120th Avenue overpass in March 1997, in an area recently disturbed by construction of a bike path. Subsequent sampling at this site was performed further downstream from 120th Avenue (called site BDC-1.5B) in an effort to eliminate the possible influences of construction activity on the aquatic community.

2/ Macroinvertebrate sampling was not performed at site BDC-5.0 in March 1997, since the stream channel was dry as a result of irrigation diversions.

undoubtedly occurred as a result of the high stream flows and increased surface runoff during storm events. The effects of storm events were evident in October at site BDC-1.0 where branches of mature willows were laden with debris and were pushed over during periods of high stream flow. Water was clear at sites upstream from wastewater treatment plants on March and October sampling occasions.

Big Dry Creek is characterized as a plains stream in areas downstream from the Broomfield Treatment Plant near 128th Avenue. The stream flows through open agricultural areas and the gradient is lower than in upstream reaches. A few Russian olive trees and willows were present along the stream bank at site BDC-2.0 downstream from the Broomfield Treatment Plant. Otherwise, riparian vegetation was sparse or absent at downstream sites. Overhanging grasses covered the stream banks providing cover for fish and macroinvertebrates. Meandering run-pool habitat sequences were common at site BDC-2.0; although no riffle habitat was present in this study reach. The substrate was relatively homogenous and composed primarily of sand and silt. Only two small gravel areas were noted in shallow run habitats. Organic sediment deposition was evident throughout the study reach, particularly in pools and along stream margins were velocities were reduced. Some blue green and green algae were observed on the substrate in March. Water was clear downstream from Broomfield Treatment Plant during sampling in March, but was slightly turbid in October.

Further downstream, physical habitat at other sites was even less diverse than at site BDC-2.0. The stream channel was relatively uniform in depth and width, and included mostly run habitat with only a few small pools in backwater areas at sites BDC-3.0, BDC-5.0, and BDC-6.0. The substrate was small and composed primarily of fine sand and silt. Riffles consisted of two small areas of exposed gravel with some small cobble at site BDC-5.0. Only one riffle was present at both sites BDC-3.0 and BDC-6.0. Cobble which had been deposited in the stream channel during bridge and highway construction at Interstate 25 and Weld County Road 8 (near Wattenberg) created the only riffle habitat present at these sites. The cobble substrate was embedded in silt and sand which was deposited in the riffles at these sites during periods of high flow. Periphyton was growing on the cobble at sites BDC-3.0 and BDC-6.0 in October. Several small patches of *Elodea* sp. were also found along the stream margins at sites BDC-5.0 and BDC-6.0 in October.

Water was turbid at sites located downstream from the Westminster Big Dry Creek Wastewater Treatment Plant on all sampling occasions, making it impossible to see the stream bottom. Excessive turbidity is in part caused by irrigation diversions and return flows to Big Dry Creek, particularly in the downstream part of the drainage. Irrigation activities begin in areas upstream

from the Westminster treatment facility, and extend downstream to the confluence with the South Platte River. Significant fluctuations in flow occur in Big Dry Creek as a result of irrigation and agricultural activities. For example, during macroinvertebrate sampling on March 27, 1997, the stream channel was dewatered at site BDC-5.0 due to irrigation diversions in upstream areas, which precluded macroinvertebrate sampling at this site in spring. However, further downstream flows had increased three-fold (from approximately 20 cfs to 60 cfs) at site BDC-6.0 due to irrigation return flows.

Do we have any flow data from area?

Significant flow fluctuations also occurred in Big Dry Creek during storm events in the summer and early fall in 1997, according to monthly flow measurements. Although stream discharge was too high to measure at sites BDC-5.0 and BDC-6.0 on August 14, 1997, stream flows were estimated at approximately 200 cfs because of major storm events in the Colorado Front Range. These fluctuations in flow which were evidenced in 1997 caused substrates to shift within the stream channel. The cobble substrate was partially covered by deposits of sand in riffle habitats at sites BDC-3.0 and BDC-6.0 when observed in October. Fluctuating flows undoubtedly influence physical habitat conditions in Big Dry Creek, which may negatively affect macroinvertebrate productivity and natural reproduction of some fish species. Significant increases in stream flow may also displace fish in some sections of Big Dry Creek.

Stream flows are generally low in areas upstream from municipal wastewater discharges during most of the year, except during storm events and when releases occur from Standley Lake. Flows generally ranged from approximately <1 to 5 cfs at sites BDC-0.5 and BDC-1.5B, respectively in 1997. Extremely low flows may negatively affect the aquatic community in upstream areas, particularly during low base flow conditions. Flows are higher in areas downstream from wastewater facilities due to effluent discharges, resulting in less extreme low flow conditions than observed upstream from treatment plants. Although irrigation activities result in flow fluctuations and excessive turbidity in areas downstream from treatment plants, flow conditions are probably more suitable for sustaining fish populations in the downstream section of Big Dry Creek during low flow periods. Water temperatures also increase above ambient levels in the vicinity of treatment plant discharges. Water temperatures are generally lower upstream from treatment plant discharges than in downstream sections of Big Dry Creek throughout the year.

3.2 FISH POPULATIONS

Fish populations were sampled at seven study locations in Big Dry Creek during the 1997 monitoring program (Table 1 and Figure 1). Sampling was performed from March 4 through 7, in spring before the irrigation season. Fall sampling was performed from October 15 through 17, 1997. Sampling results including numbers and percent composition are presented in Tables 2 and 3 for fish species collected at each site in March and October, respectively. Relative abundance of numerically dominant native fish species collected is also presented graphically in Figures 2 and 3. Fish population raw data and summary information including numbers and percent composition, and mean lengths and weights are provided in Appendix A.

Nine of the fish species collected in Big Dry Creek in March and October are native to streams in the South Platte River Basin in Colorado (Tables 2 and 3). Native species collected included longnose dace, creek chub, fathead minnow, sand shiner, white sucker, longnose sucker, black bullhead, brook stickleback, green sunfish, and johnny darter. Other species such as mosquitofish which were occasionally abundant at some sites have been introduced to the drainage. Although more species were collected during the 1997 sampling effort, species composition was comparable to data collected by the CDOW in Big Dry Creek in October 1992 and March 1993 (Woodling, 1996). Species composition was also comparable with historical data collected by Propst (1982) from 1978 to 1980, which represents the most comprehensive past geographic record of fish distribution and abundance in streams in the South Platte River Basin, and with other distribution records for the drainage (Beckman, 1952, Nessler et al., 1997, Woodling, 1985).

List of native species

Most of the native fish species collected in Big Dry Creek including longnose dace, creek chub, white sucker, longnose sucker, and johnny darter are considered to be colder water transition zone species, which are most common in cool water transition areas with low siltation. The brook stickleback is an eastern plains warm water transition zone species, and the green sunfish is a warm water lentic species. The fathead minnow and sand shiner are big river habitat/silt tolerant species which are fairly ubiquitous throughout the South Platte River and tributaries. Species abundance and distribution is largely dependent on the different habitat preferences of the species collected, and the different habitat conditions encountered in the transition zone and plains sections of Big Dry Creek which occur upstream and downstream from municipal wastewater discharges, respectively.

Most of the native fishes collected in Big Dry Creek were classified as either abundant or common in a recent inventory of streams in the Front Range and eastern plains streams conducted by

TABLE 2

PERCENT ABUNDANCE OF FISH SPECIES AND TOTAL NUMBER COLLECTED AT STUDY SITES IN BIG DRY CREEK, MARCH 1997

	STUDY SITES						
SPECIES	BDC-0.5	BDC-1.0	BDC-1.5	BDC-2.0	BDC-3.0	BDC-5.0	BDC-6.0
Longnose dace (*Rhinichthys cataractae*)	76.7	87.9	55.9	4.8	11.4	1.1	20.5
Creek chub (*Semotilus atromaculatus*)	8.9	2.9	2.9	–	–	–	–
Fathead minnow (*Pimephales promelas*)	–	–	29.4	7.9	14.9	64.6	35.4
Sand shiner (*Notropis stramineus*)	–	0.6	–	–	7.0	25.5	32.3
Goldfish * (*Carassius auratus*)	–	–	1.5	–	–	–	–
White sucker (*Catostomus commersoni*)	1.1	4.0	–	7.9	–	–	6.3
Longnose sucker (*Catostomus catostomus*)	7.8	1.1	–	6.3	0.9	–	–
Black bullhead (*Ameiurus melas*)	–	–	–	–	–	–	0.8
Yellow bullhead * (*Ameiurus natalis*)	Not collected in March.						
Brook stickleback (*Culaea inconstans*)	–	–	–	–	–	–	0.8
Largemouth bass * (*Micropterus salmoides*)	Not collected in March.						
Green sunfish (*Lepomis cyanellus*)	–	–	10.3	69.8	64.0	8.8	3.9
Bluegill * (*Lepomis macrochirus*)	Not collected in March.						
Pumpkinseed * (*Lepomis gibbosus*)	Not collected in March.						
Yellow perch * (*Perca flavescens*)	–	0.6	–	–	–	–	–
Johnny darter (*Etheostoma nigrum*)	5.6	2.9	–	3.2	–	–	–
Mosquitofish * (*Gambusia affinis*)	–	–	–	–	1.8	–	–
TOTAL COLLECTED	180	174	68	63	114	977	127

* Fishes which have been introduced in the South Platte River drainage.

TABLE 3

PERCENT ABUNDANCE OF FISH SPECIES AND TOTAL NUMBER COLLECTED AT STUDY SITES IN BIG DRY CREEK, OCTOBER 1997

	STUDY SITES						
SPECIES	BDC-0.5	BDC-1.0	BDC-1.5B	BDC-2.0	BDC-3.0	BDC-5.0	BDC-6.0
Longnose dace (*Rhinichthys cataractae*)	73.5	63.2	45.8	8.1	38.7	0.8	25.0
Creek chub (*Semotilus atromaculatus*)	15.9	13.0	0.5	1.0	–	–	–
Fathead minnow (*Pimephales promelas*)	0.7	3.3	36.9	53.8	11.0	47.3	36.9
Sand shiner (*Notropis stramineus*)	–	0.4	2.1	–	–	43.8	9.5
Goldfish * (*Carassius auratus*)	Not collected in October.						
White sucker (*Catostomus commersoni*)	3.8	8.9	2.1	1.0	17.5	1.1	7.1
Longnose sucker (*Catostomus catostomus*)	4.1	7.3	–	–	2.6	<0.1	1.2
Black bullhead (*Ameiurus melas*)	Not collected in October.						
Yellow bullhead * (*Ameiurus natalis*)	–	0.1	–	–	–	–	–
Brook stickleback (*Culaea inconstans*)	–	–	–	–	–	<0.1	1.2
Largemouth bass * (*Micropterus salmoides*)	–	0.3	0.2	–	0.2	0.2	–
Green sunfish (*Lepomis cyanellus*)	–	1.6	7.5	18.6	24.8	3.2	16.7
Bluegill * (*Lepomis macrochirus*)	–	–	–	1.4	1.0	0.3	–
Pumpkinseed * (*Lepomis gibbosus*)	–	–	–	–	–	0.1	–
Yellow perch * (*Perca flavescens*)	Not collected in October.						
Johnny darter (*Etheostoma nigrum*)	2.3	1.9	–	–	–	–	–
Mosquitofish * (*Gambusia affinis*)	–	–	4.9	16.2	4.1	3.1	2.4
TOTAL COLLECTED	1200	699	428	210	491	2739	84

* Fishes which have been introduced in the South Platte River drainage.

FIGURE 2

RELATIVE ABUNDANCE OF NUMERICALLY DOMINANT NATIVE FISH SPECIES COLLECTED FROM BIG DRY CREEK, MARCH 1997

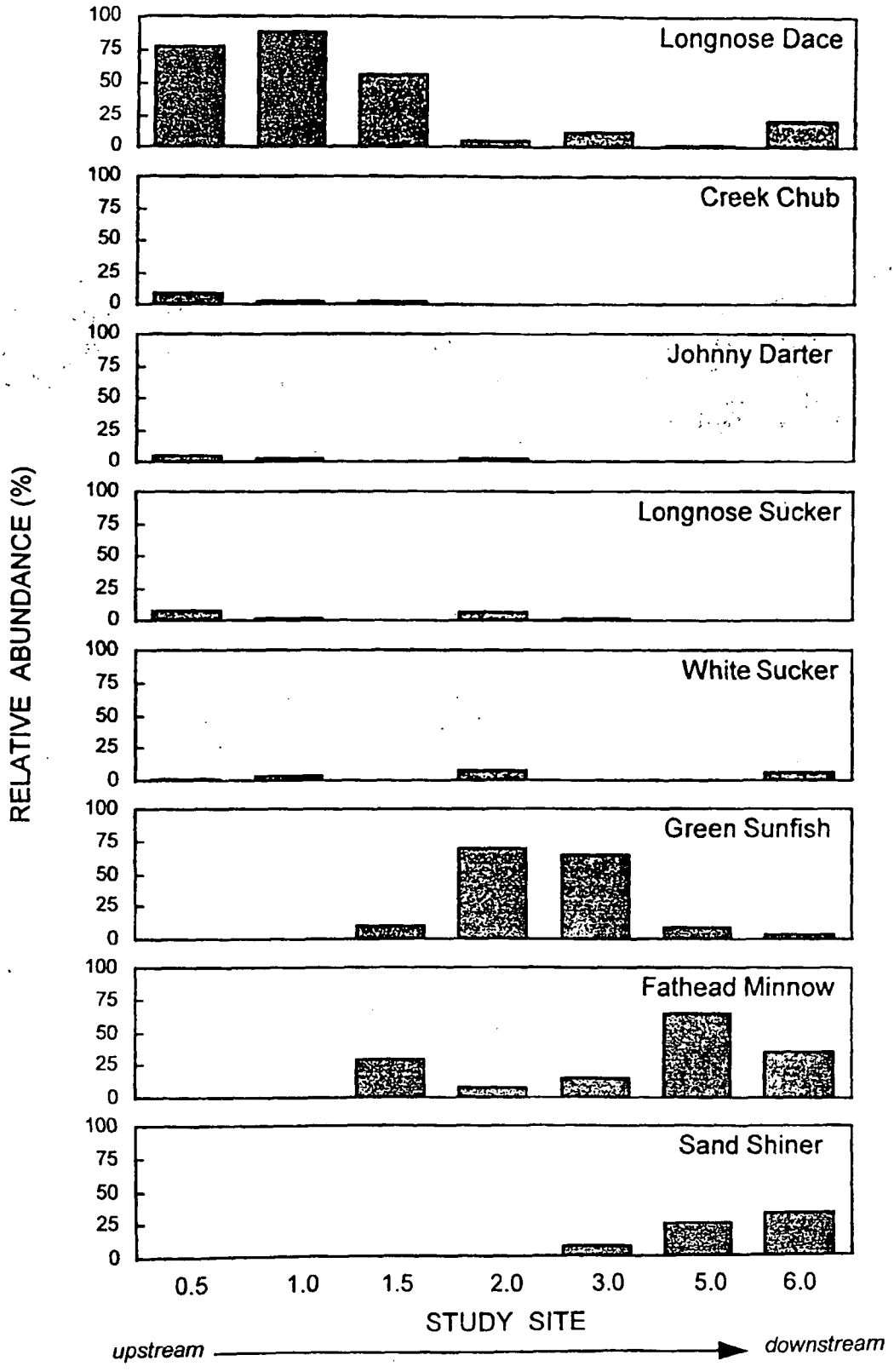
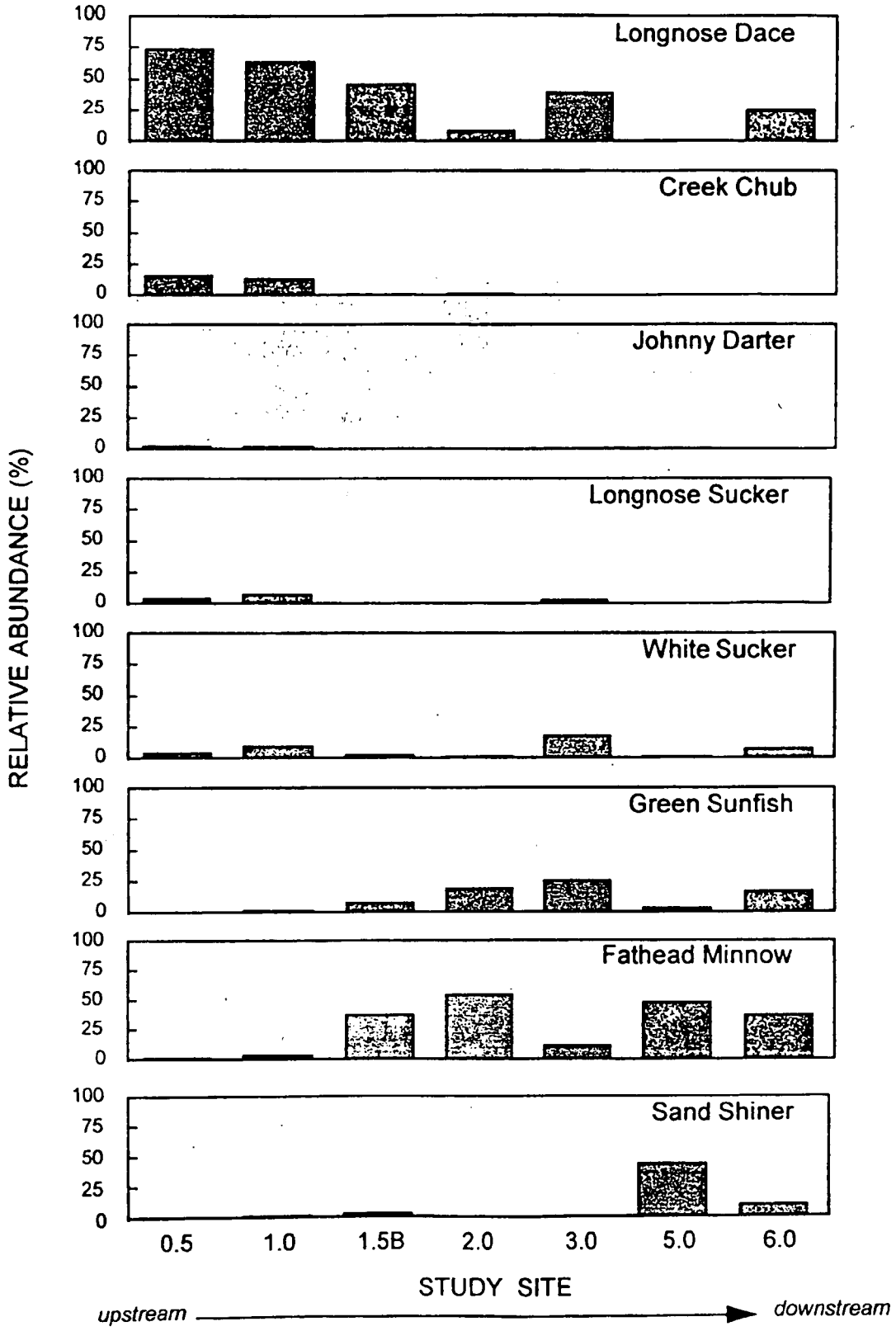


FIGURE 3

RELATIVE ABUNDANCE OF NUMERICALLY DOMINANT NATIVE FISH SPECIES COLLECTED IN BIG DRY CREEK, OCTOBER 1997



CDOW from 1992 through 1994, to evaluate the status of native fish species in the drainage (Nessler et al., 1997). The biological assessment conducted as part of this study suggested a relatively low risk of imperilment for most native species in the South Platte River Basin. The johnny darter was sampled in sufficient numbers to be categorized as common and stable in this inventory, though their distribution was the most restricted among the fish species in the common category (Nessler et al., 1997). Johnny darters were collected at the upper two study sites on Big Dry Creek in March and October 1997 (Tables 2 and 3). Two fish were also collected at site BDC-2.0 downstream from the Broomfield Treatment Plant in March.

Physical habitat requirements of the johnny darter are rather specific (Li, 1968, Propst, 1982). The johnny darter is usually found in shallow streams 6 to 18 inches deep, in slow to moderate velocity run habitat with sand and rubble substrates (Propst, 1982, Propst and Carlson, 1986). These habitat conditions are generally found in runs, shallow pools, or along stream banks of run habitats. Their restriction to these habitat areas is in part a function of their spawning and feeding requirements (Winn, 1958). Johnny darters are daytime benthic feeders and rely on sight and smell for feeding. Consequently, turbid water and silt covered substrate limits them to waters of at least moderate clarity (Winn, 1958, Kuehne and Barbour, 1983). The species was reported to be sensitive to dewatering, channelization, flow regulation, and sedimentation. However, johnny darters have been found repeatedly in silty, degraded habitats (Nessler et al., 1997).

Considering the habitat preferences of the johnny darter for rubble substrate and avoidance of stream areas which are excessively turbid, their distribution would be restricted to the upper sections of Big Dry Creek, upstream from wastewater treatment discharges where coarser substrate is most abundant. The lack of cobble substrate, increased deposition of silt and fine sand, and greater water depths in the channelized reaches undoubtedly limit this species in sections of Big Dry Creek downstream from wastewater discharges. Their distribution is further restricted by excessive turbidity which was evident at sites downstream from the Westminster treatment plant, primarily due to irrigation diversions and return flows. Stream dewatering during the irrigation season, which was observed at site BDC-5.0 in March is another obvious factor which limits distribution of this species. The CDOW requested that the CWQCC adopt a more restrictive unionized ammonia standard in the rulemaking hearing in December 1996, based on the opinion that an unionized ammonia standard of 0.10 mg/l was not protective of the johnny darter (Woodling, 1996). Although the upper reaches of Big Dry Creek provide a refugia for johnny darters in the South Platte River Basin, the absence of johnny darters at sites in the downstream reaches of Big Dry Creek is most likely due to the lack of suitable habitat rather than water quality.

3.3 MACROINVERTEBRATES

Macroinvertebrate samples were collected at seven study sites in Big Dry Creek during the 1997 monitoring program (Table 1 and Figure 1). Samples were collected on March 27 and October 8, 1997. A list of macroinvertebrate taxa collected at each site and percent abundance are presented in Tables 4 and 5 for samples collected in March and October, respectively. Community parameters including taxa richness, total density, species diversity, and modified HBI values are summarized in Table 6. Total density and number of taxa collected are presented graphically in Figure 4 for replicate and kick samples collected in March and October. Density of macroinvertebrate taxonomic groups is also presented graphically in Figures 5 and 6 for both sampling occasions. A list of macroinvertebrate species collected, relative abundance, total density, number of taxa, Rapid Bioassessment Protocol III (RBP III) metrics, and other community parameters are provided in Appendix B for both sampling occasions and all sites sampled.

The macroinvertebrate community of Big Dry Creek included a broad assemblage of aquatic organisms normally associated with transitional foothills and plains stream environments. However, Big Dry Creek has been subjected to multiple anthropogenic factors which have altered the stream environment sufficiently to exclude certain groups expected to be present. Altered water temperatures resulting from treatment plant discharges may also influence the macroinvertebrate community in downstream areas. Plecoptera (stoneflies), which require cold temperatures and well-oxygenated flowing water at all times were not present, undoubtedly because of altered flow or thermal regimes (Ward and Stanford, 1979). Other factors which potentially affect the macroinvertebrate community include urban runoff, sedimentation, agricultural activities, and diversions. Agricultural activities influence the aquatic community of Big Dry Creek in areas downstream from the Westminster Big Dry Creek Wastewater Treatment Plant to the confluence with the South Platte River. The lack of riffle habitat at site BDC-2.0 and lack of pool habitat at site BDC-6.0 also influence the macroinvertebrate community at these sites. Essentially the fauna present upstream from the Broomfield Treatment Plant was representative of a transitional foothills-plains stream, while in downstream areas the aquatic community was more representative of plains stream habitats.

The aquatic community of Big Dry Creek was represented by 18 orders of macroinvertebrates including a total of 113 taxa. Diptera (midges and flies) were predominant at all sites in March, although Oligochaeta (aquatic earthworms) were also relatively abundant at sites downstream from site BDC-1.5B (Figure 5). Diptera and Oligochaeta were also abundant at all sites in October. Ephemeroptera (mayflies) and Trichoptera (caddisflies) were commonly encountered at sites

TABLE 4

PERCENT ABUNDANCE OF MACROINVERTEBRATE SPECIES IN REPLICATE AND KICK SAMPLES COLLECTED AT STUDY SITES IN BIG DRY CREEK, MARCH 1997

TAXON	STUDY SITE BDC-0.5 Reps.	BDC-0.5 Kick	BDC-1.0 Reps.	BDC-1.0 Kick	BDC-1.5B Reps.	BDC-1.5B Kick	BDC-2.0 Reps.	BDC-2.0 Kick	BDC-3.0 Reps.	BDC-3.0 Kick	BDC-5.0 Reps.	BDC-5.0 Kick	BDC-6.0 Reps.	BDC-6.0 Kick
Turbellaria							1/				2/			3/
Dugesia sp.													<1	1
Nematoda		<1	2	<1	2	1	5	<1	16	2			2	<1
Oligochaeta														
Enchytraeidae			<1	<1	<1			<1						<1
Lumbricidae	<1	<1		<1		<1	<1	<1	<1	<1				<1
Nais spp.			1	3	1	2	23	15	15	21			4	8
Ophidonais serpentina													<1	2
Tubificidae (hair chaetae)	<1	2		<1		<1	2	1	1	3				
Tubificidae (no hair chaetae)	1	<1	<1	<1	<1	1	1	1	9	4			3	6
Hirudinea														
Erpobdellidae		<1											<1	<1
Amphipoda														
Crangonyx sp.	5	2		<1	<1	<1		<1		6				<1
Hyalella azteca		<1		<1		<1							<1	3
Isopoda														
Caecidotea sp.													<1	
Acari														
Sperchon sp.	41	1	4	1	2	<1	<1		<1	<1			1	1
Collembola		<1				<1				<1				<1
Ephemeroptera														
Baetis tricaudatus	<1	<1	2	2	4	5	<1	<1					<1	<1
Callibaetis sp.										<1				
Heptagenia sp.		<1	<1	<1	<1	<1								
Trichorythodes minutus	7	12	<1	1	<1	1								1
Odonata														
Amphiagrion abbreviatum										<1				
Argia sp.		<1												
Coenagrionidae	<1									<1				1
Enallagma sp.										<1				
Hetaerina americana										<1				<1
Ischnura sp.				<1						<1				
Ophiogomphus severus				<1		<1	<1	<1					<1	
Hemiptera														
Corisella inscripta										<1				
Hesperocorixa laevigata										<1				
Microvelia sp.				<1										
Notonecta undulata										<1				
Sigara alternata		<1		<1		<1		<1		<1				
Sigara grossolineata										<1				
Trichocorixa calva				<1										
Trichoptera														
Cheumatopsyche sp.	1	<1	1	<1	1	<1			<1	<1				
Hydropsyche sp.	3	<1	2	<1	1	<1			1	<1			<1	<1
Hydroptila sp.		<1	1	1	1	<1							<1	<1
Limnephilidae				<1										
Coleoptera														
Agabus sp.		<1						<1		<1				
Agabus semivittatus								<1						
Berosus sp.													<1	
Dubiraphia sp.				<1		<1								
Enochrus hamiltoni														<1

TABLE 4 (Continued)

TAXON	STUDY SITE BDC-0.5 Reps.	BDC-0.5 Kick	BDC-1.0 Reps.	BDC-1.0 Kick	BDC-1.5B Reps.	BDC-1.5B Kick	BDC-2.0 Reps.	BDC-2.0 Kick	BDC-3.0 Reps.	BDC-3.0 Kick	BDC-5.0 Reps.	BDC-5.0 Kick	BDC-6.0 Reps.	BDC-6.0 Kick
Coleoptera (Continued)														
Haliplus sp.				<1										
Laccophilus maculosus		<1				<1				<1				
Ochthebius sp.								<1						
Diptera														
Brillia sp.		<1	<1	2	<1	1	<1	<1	<1	<1				
Ceratopogonidae	<1	<1	<1		<1	<1	<1	<1		<1			<1	
Chaoborus sp.														<1
Chelifera sp.					<1					<1				
Chironomini		<1	6	2	2	2	9	2	1	<1			10	<1
Chironomus sp.		<1		1		<1	<1	1		1				
Conchapelopia sp.										<1				
Cricotopus sp.	27	57	62	59	54	54	55	68	34	35			76	65
Cricotopus/Orthocladius sp.		<1	1											
Cryptochironomus sp.	<1	<1		<1		<1	<1	<1		<1			<1	
Cyphomella sp.				<1		<1								
Diamesa sp.		<1	1	<1	1	<1	<1							
Dicranota sp.						<1								
Dicrotendipes sp.	<1	8	<1	<1		<1		<1						
Erioptera sp.						<1								
Eukiefferiella sp.		2	1	<1	2	1	1	<1	5	<1			<1	<1
Glyptotendipes sp.									1	<1				
Hemerodromia sp.	<1		<1	<1	<1					<1				
Heterotrissocladius sp.						<1								
Hydrobaenus sp.		2	<1	5	<1	5				<1				
Limnophora sp.	<1	<1												
Limnophyes sp.		1	<1	1		1		<1		<1				
Micropsectra sp.	<1	1		1	<1	<1		<1	1	13				<1
Microtendipes sp.		<1		<1										
Nanocladius sp.					<1			<1	<1	<1				<1
Odontomesa sp.		<1		<1		<1								
Pagastia sp.	<1	<1	<1											
Parakiefferiella sp.	1	2	1	8	<1	8	<1		<1	1			2	<1
Parametriocnemus sp.	1	1	7	4	4	4	<1	<1		<1			<1	1
Paraphaenocladius sp.		<1		<1	<1	<1								2
Paratanytarsus sp.				<1	<1									
Phaenopsectra sp.	1	2	1	5	<1	1	<1	1		<1			<1	
Polypedilum sp.			1	<1	<1	<1	<1	1	1	<1			<1	
Procladius sp.				<1						<1				
Pseudodiamesa sp.				<1										
Pseudosmittia sp.														1
Radotanypus submarginella						<1		<1						<1
Saetheria tylus							<1		<1	<1				
Simulium vittatum	<1	<1	5	1	16	7	1	1	12	1			<1	1
Stictochironomus sp.				<1		<1	<1			<1				
Tanytarsini						<1								
Tipula sp.	4	<1	<1	<1	<1	<1								
Thienemanniella sp.			<1	<1	2	1								2
Thienemannimyia group	7	1	1	1	2	2	<1	7	3	7			1	4
Tvetenia sp.		<1	<1	<1	3	1								

TABLE 4 (Concluded)

TAXON	STUDY SITE BDC-0.5 Reps.	Kick	BDC-1.0 Reps.	Kick	BDC-1.5B Reps.	Kick	BDC-2.0 Reps.	Kick	BDC-3.0 Reps.	Kick	BDC-5.0 Reps.	Kick	BDC-6.0 Reps.	Kick
Gastropoda														
Ferrissia sp.				<1					<1	<1				
Lymnaeidae		<1												
Physidae		<1		<1		<1		<1					<1	4
Bivalva														
Sphaeriidae		<1												

1/ No riffle habitat present at site BDC-2.0.
2/ No samples were collected at site BDC-5.0 in March 1997, since the stream channel was dry as a result of irrigation diversions.
3/ No pool habitat present at site BDC-6.0.

TABLE 5

PERCENT ABUNDANCE OF MACROINVERTEBRATE SPECIES IN REPLICATE AND KICK SAMPLES COLLECTED AT STUDY SITES IN BIG DRY CREEK, OCTOBER 1997

TAXON	STUDY SITE BDC-0.5 Reps.	BDC-0.5 Kick	BDC-1.0 Reps.	BDC-1.0 Kick	BDC-1.5B Reps.	BDC-1.5B Kick	BDC-2.0 Reps.	BDC-2.0 Kick	BDC-3.0 Reps.	BDC-3.0 Kick	BDC-5.0 Reps.	BDC-5.0 Kick	BDC-6.0 Reps.	BDC-6.0 Kick
Turbellaria							1/							2/
Dugesia sp.	2	<1								<1	<1	<1	5	32
Nematoda	1	<1	1	3	1	2	1	1	5	1	2	2	1	<1
Oligochaeta														
Enchytraeidae	1	<1	1	1	1	1		2	<1	<1	1			
Lumbricidae	<1	<1		<1	<1	<1		<1						
Dero sp.										11		3		
Nais spp.	1	1	8	8	4	2	2	<1	35	17	1	<1	11	1
Ophidonais serpentina											<1	9		<1
Pristina sp.	1		<1	<1	2		<1		3	<1	1			<1
Pristinella jenkinae													26	<1
Tubificidae (hair chaetae)	3	2	1	4		1		1	1	4		1	1	
Tubificidae (no hair chaetae)	4	5	1	16	1	11	6	15	7	5	2	7	5	19
Hirudinea														
Mooreobdella microstoma		<1		<1		<1		<1		<1				
Helobdella stagnalis		<1												
Amphipoda														
Crangonyx sp.	1	6		<1	<1	1		20	<1	3				
Hyalella azteca								<1			<1	2	2	7
Decapoda														
Orconectes sp.								<1						
Acari														
Sperchon sp.	9	2	1	1	<1	<1	<1		<1	<1	1	<1		
Collembola										<1		<1		
Ephemeroptera														
Acentrella insignificans	<1		12	10	10	11	7	3	1	<1	6	2	5	3
Baetidae	1	1	1		<1									
Baetis tricaudatus	23	1	20	8	15	3	1	<1	1	<1	<1		<1	<1
Callibaetis sp.								<1		1				
Fallceon quilleri			<1	<1		1			<1	<1	<1	<1		
Labiobaetis dardanus				<1		1								
Heptagenia sp.				1	<1	1		1	2	1	<1	<1	<1	
Trichorythodes minutus	19	28	2	5	1	6	<1	3	1	<1	3	4	1	7
Odonata														
Argia sp.	<1	<1			<1									
Coenagrionidae				<1						<1		<1		2
Hetaerina americana													<1	3
Ophiogomphus severus		<1		<1	<1	<1		<1	<1	<1	<1	<1	<1	<1
Hemiptera														
Microvelia sp.								<1						
Sigara alternata		1												
Sigara grossolineata		1												
Trichocorixa calva		1												
Trichoptera														
Cheumatopsyche sp.	6	1	5	2	6	4	<1	1	2	1	<1	1		
Hydropsyche sp.	10	1	7	2	7	3	<1	<1	9	3	1	<1	<1	<1
Hydroptila sp.	1	<1	4	2	5	1	<1				5	<1	6	<1
Lepidoptera														
Petrophila sp.	<1	<1	<1											
Coleoptera														
Agabus sp.		<1												
Berosus sp.											<1	<1		

TABLE 5 (Concluded)

TAXON	STUDY SITE BDC-0.5 Reps.	BDC-0.5 Kick	BDC-1.0 Reps.	BDC-1.0 Kick	BDC-1.5B Reps.	BDC-1.5B Kick	BDC-2.0 Reps.	BDC-2.0 Kick	BDC-3.0 Reps.	BDC-3.0 Kick	BDC-5.0 Reps.	BDC-5.0 Kick	BDC-6.0 Reps.	BDC-6.0 Kick
Coleoptera (Continued)														
Dubiraphia sp.			<1	1		<1		<1		<1				
Laccophilus maculosus								<1						
Paracymus sp.		<1												
Peltodytes edentulus		<1												
Tropisternus lateralis								<1						
Diptera														
Brillia sp.		<1	<1			1		<1	<1	<1				
Cardiocladius sp.			<1											
Ceratopogonidae		<1	<1	<1		<1	<1	1		<1	<1	2		
Chaoborus sp.								<1						
Chelifera sp.								<1	<1					
Chironomini			1											
Chironomus sp.				<1		1	<1	5	<1	24		37	<1	
Cladotanytarsus sp.					<1	<1	<1	<1			1	<1	1	
Corynoneura sp.	<1													
Cricotopus sp.	4	12	17	23	5	14	25	15	3	8	6	2	7	4
Cryptochironomus sp.	<1	1		1	<1	1	<1	4	<1	1	<1	1	3	8
Dicranota sp.			<1	<1										
Dicrotendipes sp.		16							<1					
Erioptera sp.											<1			
Eukiefferiella sp.			<1	1	<1	<1	1	<1	2	1	1	<1		<1
Glyptotendipes sp.									1	5		1		
Hemerodromia sp.			1	<1		<1		<1	<1	<1				
Hydrobaenus sp.				<1	1	7	1	2		<1				
Limnophora sp.	<1	<1		<1				<1			<1			<1
Micropsectra sp.	<1	<1		<1		<1		1				<1		
Nanocladius sp.									1	<1				
Parachironomus sp.										<1				
Parakiefferiella sp.		2	<1	1	<1	6	3	5		<1	<1	1	1	2
Parametriocnemus sp.	<1	<1			<1		<1	<1			<1			
Paraphaenocladius sp.	<1													
Paratanytarsus sp.				<1										
Phaenopsectra sp.				<1		<1								
Polypedilum sp.	<1	<1		1	2	1	6	2	<1	<1	3	<1	12	<1
Procladius sp.										1		1		
Pseudochironomus sp.		<1							<1					
Psychoda sp.								<1						
Rheocricotopus sp.				<1							<1			
Saetheria tylus	1	7	2	<1	4	3	8	<1		<1	35	1	<1	1
Simulium vittatum	2	<1	7	3	28	9	25	13	21	9	25	15	6	1
Stictochironomus sp.		8		<1		<1	1	1		<1		1		
Tipula sp.	<1	<1		<1		<1								
Thienemanniella sp.	1	<1	4	5	4	7	10	3	1	<1	1	<1	1	<1
Thienemannimyia group	8	2	1	<1	1	<1	2	<1	6	<1	3	4	4	2
Tvetenia sp.	<1		<1	<1	<1	<1			<1	<1				
Gastropoda														
Ferrissia sp.			<1	<1		<1		<1	<1	1				
Physidae		<1				<1			<1	<1	<1	4		7
Bivalva														
Pisidium sp.		<1												

1/ No riffle habitat present at site BDC-2.0.
2/ No pool habitat present at site BDC-6.0.

TABLE 6

TAXA RICHNESS, TOTAL MACROINVERTEBRATE DENSITY, DIVERSITY, AND COMMUNITY TOLERANCE VALUES (MODIFIED HILSENHOFF BIOTIC INDEX) AT STUDY SITES IN BIG DRY CREEK, MARCH AND OCTOBER 1997

	STUDY SITES						
PARAMETERS	BDC-0.5	BDC-1.0	BDC-1.5B	BDC-2.0	BDC-3.0	BDC-5.0	BDC-6.0
MARCH 1997							
REPLICATES							
Taxa Richness	24	32	34	24	21	2/	26
Total Density 1/	13453	46010	35280	48013	6437		10490
Diversity	2.56	2.45	2.64	2.04	2.86		1.50
Modified HBI	5.48	6.52	6.41	7.30	7.00		7.14
KICK SAMPLES							
Taxa Richness	47	54	50	31	48	2/	34
Total Density	6083	6927	4507	6749	2878		6731
Diversity	2.58	2.63	2.85	1.81	3.05		2.18
Modified HBI	6.56	6.72	6.55	7.04	6.69		7.04
OCTOBER 1997							
REPLICATES							
Taxa Richness	33	32	31	26	34	35	25
Total Density	33570	38517	49370	30783	15353	30520	14430
Diversity	3.61	3.70	3.57	3.23	3.22	3.12	3.67
Modified HBI	5.05	5.60	5.62	6.56	6.82	6.59	6.84
KICK SAMPLES							
Taxa Richness	45	45	42	45	45	37	27
Total Density	7488	11580	8561	10999	5680	2467	3761
Diversity	3.55	3.83	4.22	3.71	3.66	3.35	3.26
Modified HBI	6.01	6.61	6.36	6.45	8.30	7.90	6.47

1/ Total density is the total number of organisms collected per square meter (N/sq.m).
2/ No samples were collected at site BDC-5.0 in March 1997, since the stream channel was dry due to irrigation diversions.

FIGURE 4

MACROINVERTEBRATE DENSITY AND TOTAL NUMBER OF TAXA COLLECTED IN REPLICATE AND KICK SAMPLES IN BIG DRY CREEK IN MARCH AND OCTOBER 1997

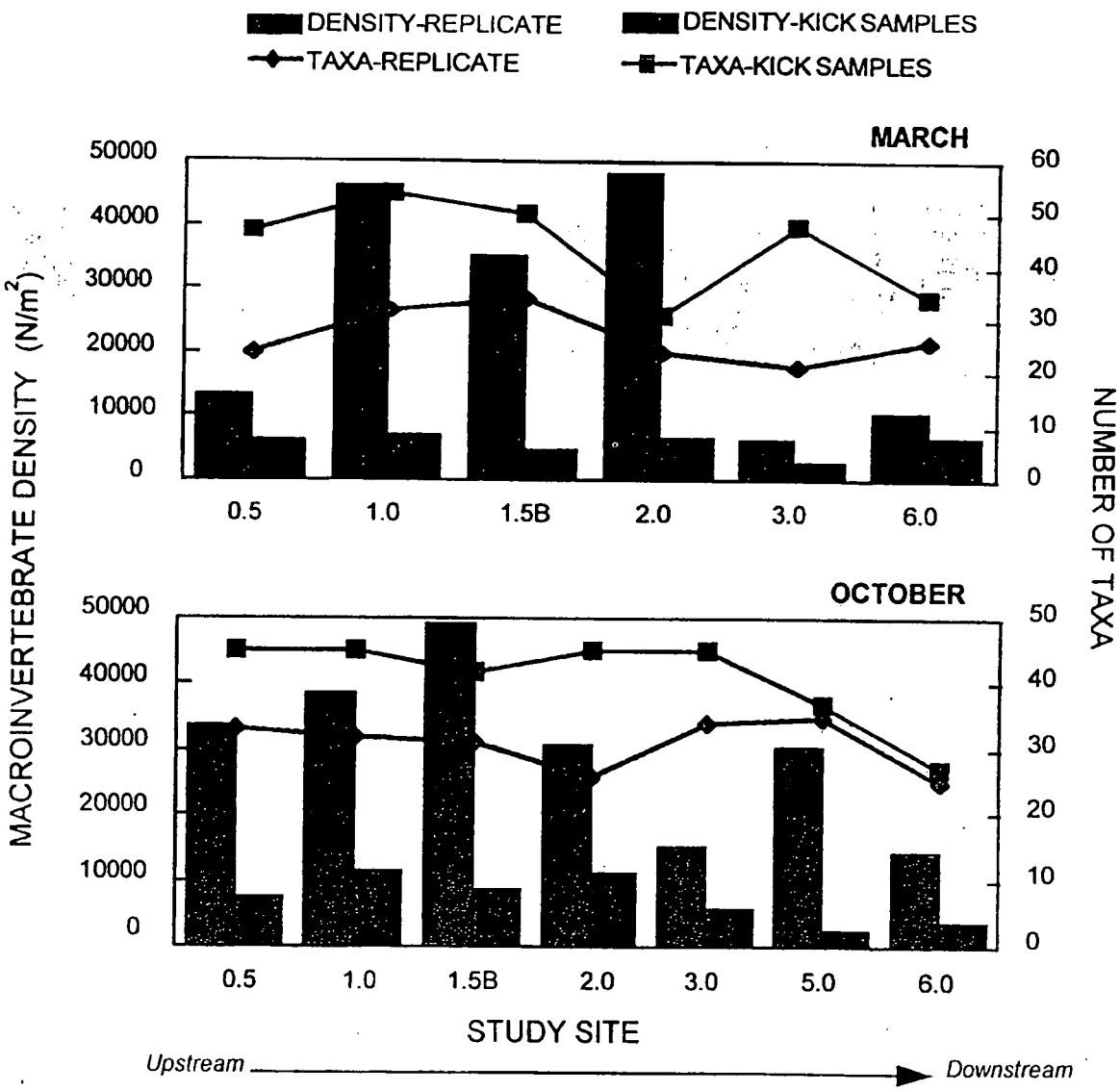


FIGURE 5

DENSITY OF MACROINVERTEBRATE TAXONOMIC GROUPS COLLECTED IN REPLICATE AND KICK SAMPLES AT STUDY SITES IN BIG DRY CREEK, MARCH 1997

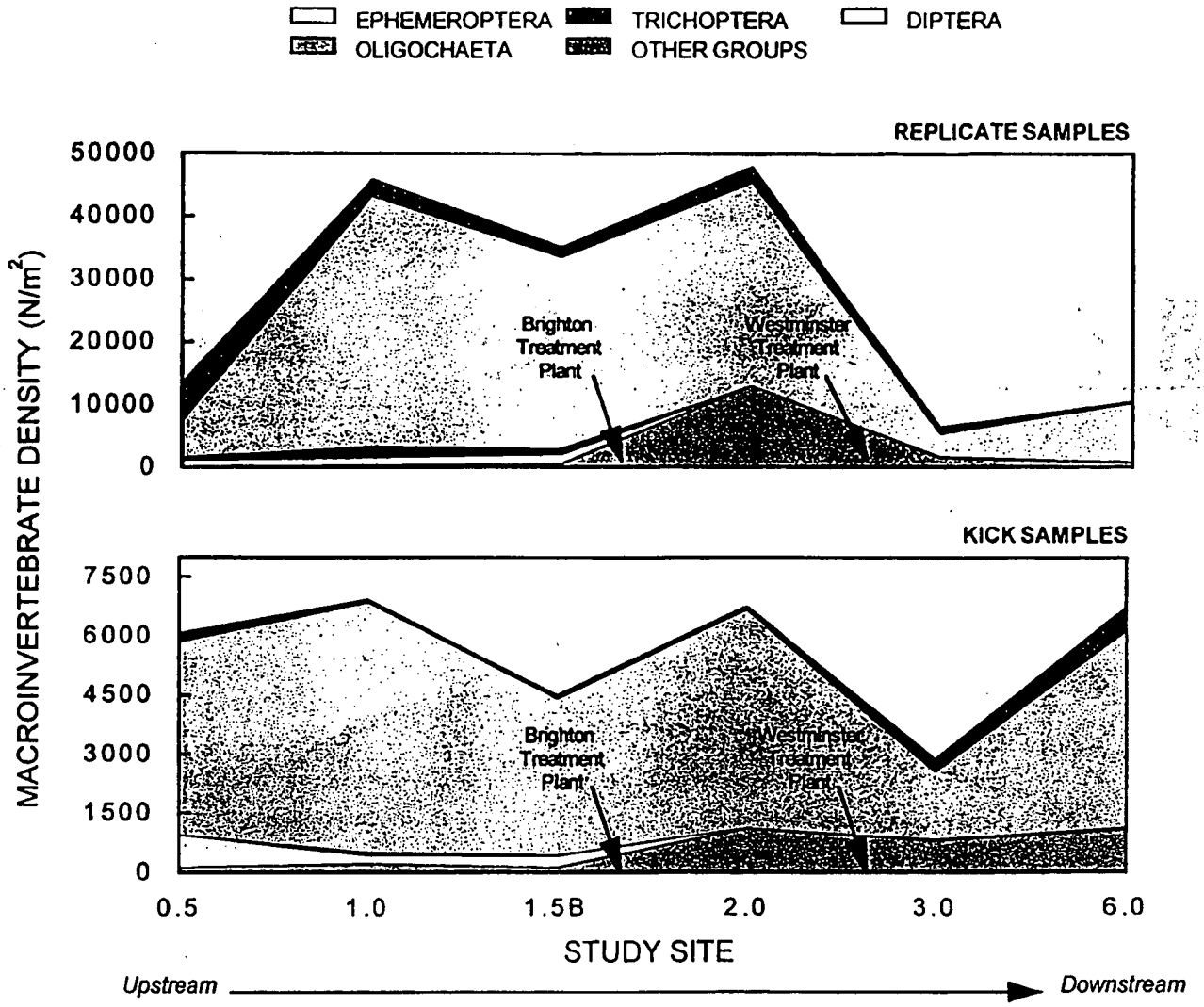
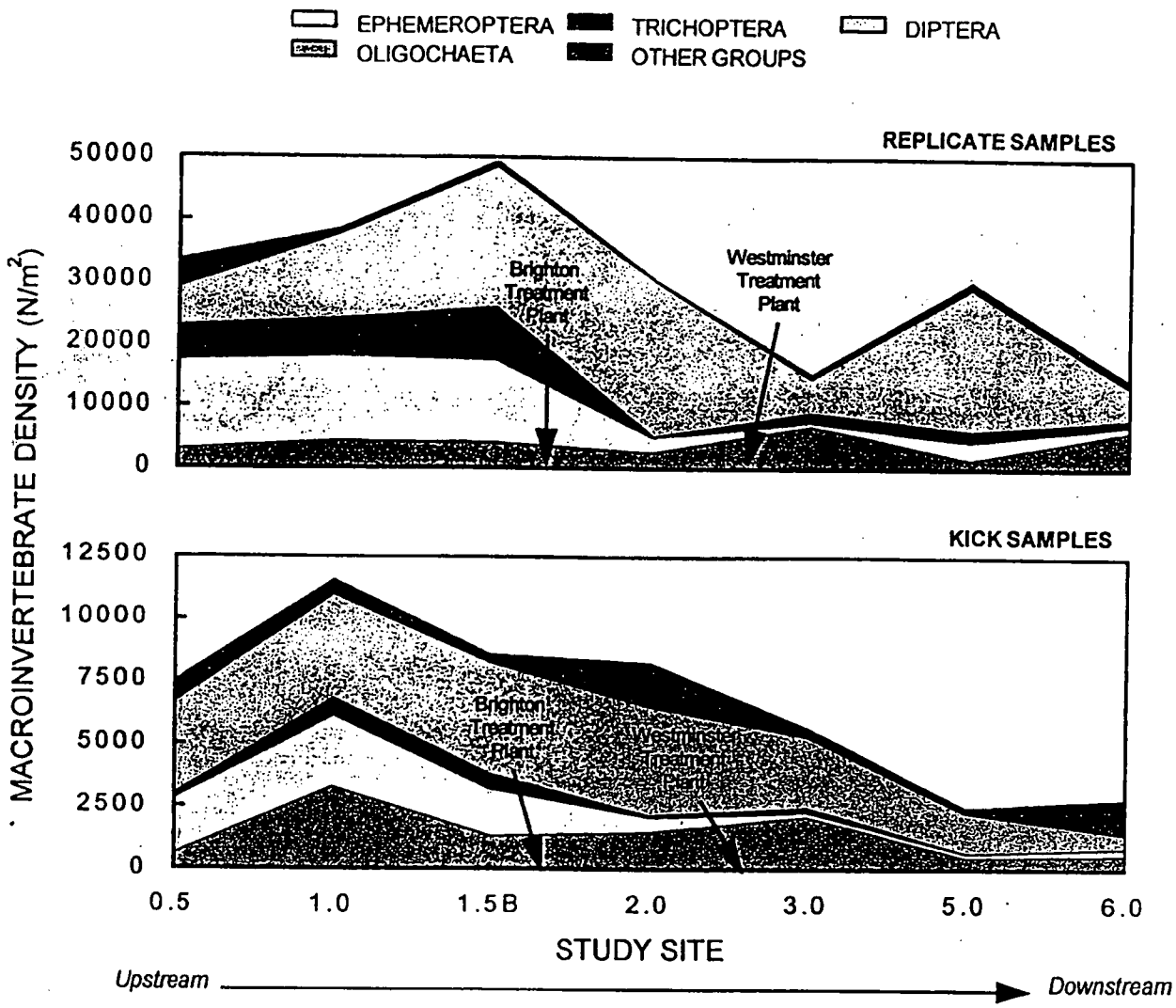


FIGURE 6

DENSITY OF MACROINVERTEBRATE TAXONOMIC GROUPS COLLECTED IN REPLICATE AND KICK SAMPLES AT STUDY SITES IN BIG DRY CREEK, OCTOBER 1997



upstream from the Broomfield Treatment Plant in March, but were more abundant at all sites in October (Figure 6). Turbellaria (flatworms), Nematoda (roundworms), Amphipoda (scuds), and Acari (water mites) were also occasionally abundant at some sites. Several other groups, including Mollusca (snails and clams) and Decapoda (crayfish) were also occasionally encountered. Sub-aquatic organisms such as Collembola (springtails) were collected primarily in stream margin habitats.

Macroinvertebrate densities and number of taxa were generally high at all sites (Table 6 and Figure 4). Macroinvertebrate densities were comparatively higher in replicate samples and ranged from 6,437 to 49,370 organisms per square meter. Densities in kick samples were lower and ranged from 2,467 to 11,580 organisms per square meter. Macroinvertebrate densities in both replicate and kick samples were distinctly lower at site BDC-3.0 than at other sites in March (Figure 5). Density was also comparatively lower at site BDC-6.0 in replicate samples collected in March. Macroinvertebrate densities were generally lower in both replicate and kick samples collected at downstream sites in October 1997 (Figure 6).

Macroinvertebrate densities were consistently higher in replicate samples than in kick samples since replicates were collected from riffle habitats, which are generally more productive than other stream habitats (Hynes, 1970). Kick samples were collected from a variety of stream habitats (riffle, run, pool, and along stream banks). Consequently, number of taxa were much higher in kick samples than in replicates. Total number of taxa collected ranged from 31 to 54 in kick samples, and from 21 to 34 in replicate samples in March. Kick samples collected in October yielded 27 to 45 taxa, while only 25 to 35 taxa were collected in replicate samples (Table 6).

Species diversity values were relatively similar among sites on both sampling occasions (Table 6). However, species diversity values were comparatively lower in March largely due to the high relative abundance of *Cricotopus* sp. at all sites (Table 4). HBI values ranged from 5.05 to 8.30. These values indicate that while many tolerant species were collected, water quality in Big Dry Creek is apparently suitable to support sensitive species at all sites. Ephemeroptera and Trichoptera, many species of which are considered sensitive to water quality conditions, were abundant at several sites, particularly in October (Figures 5 and 6).

The Rapid Bioassessment Protocol III (RBP III) metrics and bioassessment scores are provided in Appendix B. The upper study site BDC-0.5 was used as a reference station to calculate RBP III metrics and scores in the analysis presented. Differences between sites were most evident in March 1997, and may be attributable to differences in stream habitat rather than water quality. The

RBP III metrics presented are intended to provide a baseline reference which will be used in future biological assessments of Big Dry Creek.

Physical habitat and fluctuating stream flows most likely limit the macroinvertebrate community in Big Dry Creek, particularly in lower gradient areas downstream from the Broomfield Treatment Plant where riffle habitats with cobble substrate are sparse and much of the streambed is channelized. The effects of sedimentation were most evident in downstream depositional areas where fine shifting substrates are predominant. Species of Ephemeroptera and Trichoptera which were collected in Big Dry Creek are most commonly associated with riffle habitats. The lack of coarse substrates for organisms associated with riffle habitats most likely restricts their abundance at sites downstream from the Broomfield Treatment Plant (Figure 1). Periodic flow fluctuations and interruptions also affect the aquatic community. For example, the stream channel was dry at site BDC-5.0 at the time of sampling on March 27, 1997. The consequences of fluctuating discharges have been well-documented (Ward and Stanford, 1979, 1983, Zimmermann and Ward, 1984). Studies conducted by Blinn et al. (1995) have shown that permanently submerged stream channels supported four-times higher macroinvertebrate mass than variable flow zones. Their research also indicated that short-term interruptions in flow (12 hours) may require more than four months for the macroinvertebrate community to recover. Considering the numerous sources of perturbations which could potentially influence Big Dry Creek, it is essential that baseline aquatic life monitoring be continued in order to elucidate the effects of treatment plant discharges.

4.0 RECOMMENDATIONS

1. Aquatic life monitoring should be continued in Big Dry Creek in 1998 to document the potential influences of treatment plant discharges. Fish and macroinvertebrate sampling methods should be consistent with the 1997 effort, with some modifications to improve cost effectiveness.

2. Macroinvertebrate sampling methods should include both replicate and kick sampling as performed in 1997. However, to reduce costs, kick samples from representative habitats may be combined to reduce the total number of samples. Sample processing time incurred by Northglenn staff could be reduced by adopting the 300-count subsampling method for picking kick samples (Plafkin et al. 1989, Klemm et al. 1990).

3. Fish sampling methods should be consistent with the fall 1997 sampling effort. High conductivities require using shoreline electrofishing equipment and a minimum field team of eight persons. Four to five positive electrodes should also be used to increase sampling effectiveness, especially if documenting the abundance and distribution of fish species such as johnny darters is a major concern.

4. Habitat measurements were collected in 1997; however, budget constraints precluded analysis and interpretation of these data. Monitoring results indicate that physical habitat is a major factor influencing the distribution and abundance of the aquatic community of Big Dry Creek. Therefore, analysis and interpretation of habitat data should be completed and presented in report form since this information is an integral part of the biological assessment.

5. The extremely low flows in the upper section of Big Dry Creek may limit the aquatic community in areas upstream from treatment plants, particularly during low flow periods. Consequently, flow should be measured at all sites as part of the surface water monitoring program.

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APPENDIX A

FISH POPULATION DATA

RELATIVE ABUNDANCE

	0.5	1.0	1.5	2.0	3.0	5.0	6.0
Longnose Dace	76.7	87.9	55.9	4.8	11.4	1.1	20.5
Creek Chub	8.9	2.9	2.9	-	-	-	-
Johnny Darter	5.6	2.9	-	3.2	-	-	-
Longnose Sucker	7.8	1.1	-	6.3	0.9	-	-
White Sucker	1.1	4.0	-	7.9	-	-	6.3
Green Sunfish	-	-	10.3	69.8	64.0	8.8	3.9
Fathead Minnow	-	-	29.4	7.9	14.9	64.6	35.4
Sand Shiner	-	0.6	-	-	7.0	25.5	32.3
Black Bullhead	-	-	-	-	-	-	0.8
Brook Stickleback	-	-	-	-	-	-	0.8
Mosquitofish	-	-	-	-	1.8	-	-
Yellow Perch	-	0.6	-	-	-	-	-
Goldfish	-	-	1.5	-	-	-	-

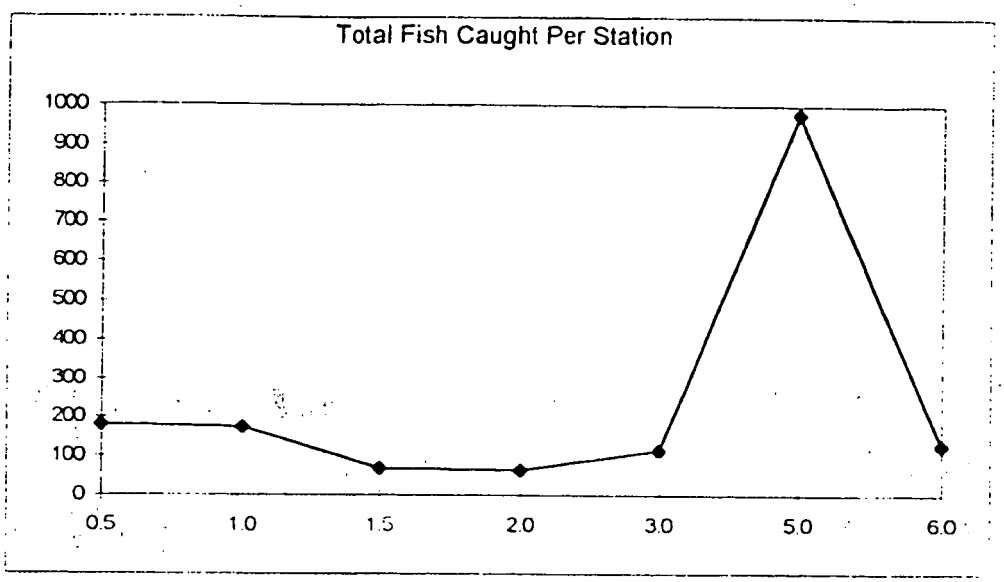
TOTAL COLLECTED

	0.5	1.0	1.5	2.0	3.0	5.0	6.0
Longnose Dace	138	153	38	3	13	11	26
Creek Chub	16	5	2	-	-	-	-
Johnny Darter	10	5	-	2	-	-	-
Longnose Sucker	14	2	-	4	1	-	-
White Sucker	2	7	-	5	-	-	8
Green Sunfish	-	-	7	44	73	86	5
Fathead Minnow	-	-	20	5	17	631	45
Sand Shiner	-	1	-	-	8	249	41
Black Bullhead	-	-	-	-	-	-	1
Brook Stickleback	-	-	-	-	-	-	1
Mosquitofish	-	-	-	-	2	-	-
Yellow Perch	-	1	-	-	-	-	-
Goldfish	-	-	1	-	-	-	-
TOTALS	180	174	68	63	114	977	128

Species	BDC-0.5 (Church Ranch, Old Wadsworth Blvd.) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)	BDC-1.0 (112th Avenue) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)	BDC-1.5 (120th Avenue) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)
Longnose dace *Rhinichthys cataractae*	138	76.7	47 (32-102)	2 (1-10)	153	87.9	46 (33-96)	2 (1-6)	38	55.9	72 (35-113)	5 (1-16)
White sucker *Catostomus commersoni*	2	1.1	154 (80-228)	58 (4-112)	7	4.0	101 (65-130)	12 (5-20)	--	--	--	--
Longnose sucker *Catostomus catostomus*	14	7.8	141 (68-265)	41 (2-164)	2	1.1	123 (121-125)	24 (20-27)	--	--	--	--
Johnny darter *Etheostoma nigrum*	10	5.6	51 (34-68)	2 (1-3)	5	2.9	63 (55-67)	2 (2-3)	--	--	--	--
Creek chub *Semotilus atromaculatus*	16	8.9	120 (46-158)	23 (2-42)	5	2.9	71 (64-82)	4 (3-4)	2	2.9	119 (117-120)	19 (18-20)
Green sunfish *Lepomis cyanellus*	--	--	--	--	--	--	--	--	7	10.3	43 (35-54)	3 (1-6)
Sand shiner *Notropis stramineus*	--	--	--	--	1	0.6	43	1	--	--	--	--
Fathead minnow *Pimephales promelas*	--	--	--	--	--	--	--	--	20	29.4	52 (27-64)	2 (1-4)
Black bullhead *Ameiurus melas*	--	--	--	--	--	--	--	--	--	--	--	--
Brook stickleback *Culaea inconstans*	--	--	--	--	--	--	--	--	--	--	--	--
Mosquitofish *Gambusia affinis*	--	--	--	--	--	--	--	--	--	--	--	--
Yellow perch *Perca flavescens*	--	--	--	--	1	0.6	104	10				
Goldfish *Carassius auratus*	--	--	--	--	--	--	--	--	1	1.5	45	2

Species	BDC-2.0 (128th Avenue) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)	BDC-3.0 (Interstate-25) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)
Longnose dace *Rhinichthys cataractae*	3	4.8	64 (38-78)	5 (2-9)	13	11 4	76 (47-102)	7 (2-14)
White sucker *Catostomus commersoni*	5	7.9	273 (205-314)	290 (122-379)	--	--	--	--
Longnose sucker *Catostomus catostomus*	4	6.3	82 (58-130)	9 (3-22)	1	0 9	125	25
Johnny darter *Etheostoma nigrum*	2	3.2	43 (40-45)	2 (1-2)	--	--	--	--
Creek chub *Semotilus atromaculatus*	--	--	--	--	--	--	--	--
Green sunfish *Lepomis cyanellus*	44	69.8	40 (28-90)	2 (1-10)	73	64.0	45 (24-72)	3 (1-8)
Sand shiner *Notropis stramineus*	--	--	--	--	8	7.0	40 (30-56)	2 (1-4)
Fathead minnow *Pimephales promelas*	5	7.9	48 (34-64)	2 (1-3)	17	14.9	49 (32-65)	3 (1-6)
Black bullhead *Ameiurus melas*	--	--	--	--	--	--	--	--
Brook stickleback *Culaea inconstans*	--	--	--	--	--	--	--	--
Mosquitofish *Gambusia affinis*	--	--	--	--	2	1.8	31 (22-40)	2 (1-2)
Yellow perch *Perca flavescens*	--	--	--	--	--	--	--	--
Goldfish *Carassius auratus*	--	--	--	--	--	--	--	--

Species	BDC-5.0 (Weld County Rd. 4) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)	BDC-6.0 (Wattenberg, Weld County Rd. 23) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)
Longnose dace *Rhinichthys cataractae*	11	1.1	54 (35-62)	1 N/A	26	20.5	81 (57-116)	9 (3-23)
White sucker *Catostomus commersoni*	--	--	--	--	8	6.3	275 (100-379)	345 (13-750)
Longnose sucker *Catostomus catostomus*	--	--	--	--	--	--	--	--
Johnny darter *Etheostoma nigrum*	--	--	--	--	--	--	--	--
Creek chub *Semotilus atromaculatus*	--	--	--	--	--	--	--	--
Green sunfish *Lepomis cyanellus*	86	8.8	42 (29-125)	2 (1-40)	5	3.9	51 (42-57)	6 (2-12)
Sand shiner *Notropis stramineus*	249	25.5	34 (27-75)	1 N/A	41	32.3	60 (52-73)	4 N/A
Fathead minnow *Pimephales promelas*	631	64.6	34 (32-77)	1 N/A	45	35.4	55 (31-74)	2 (1-9)
Black bullhead *Ameiurus melas*	--	--	--	--	1	0.8	160	52
Brook stickleback *Culaea inconstans*	--	--	--	--	1	0.8	56	5
Mosquitofish *Gambusia affinis*	--	--	--	--	--	--	--	--
Yellow perch *Perca flavescens*	--	--	--	--	--	--	--	--
Goldfish *Carassius auratus*	--	--	--	--	--	--	--	--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900
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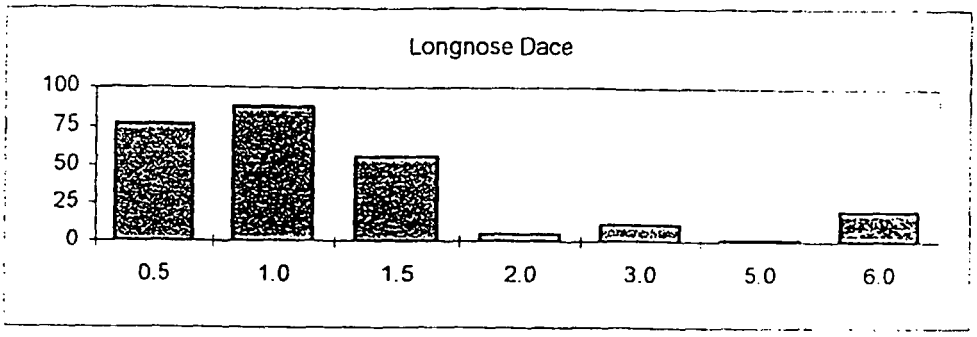
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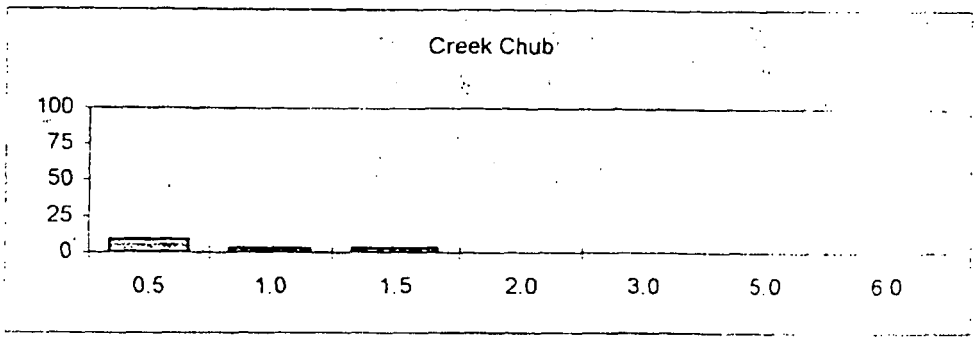
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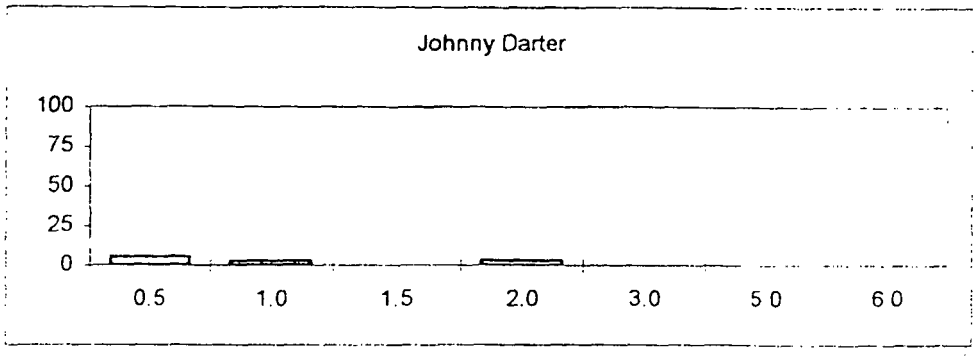
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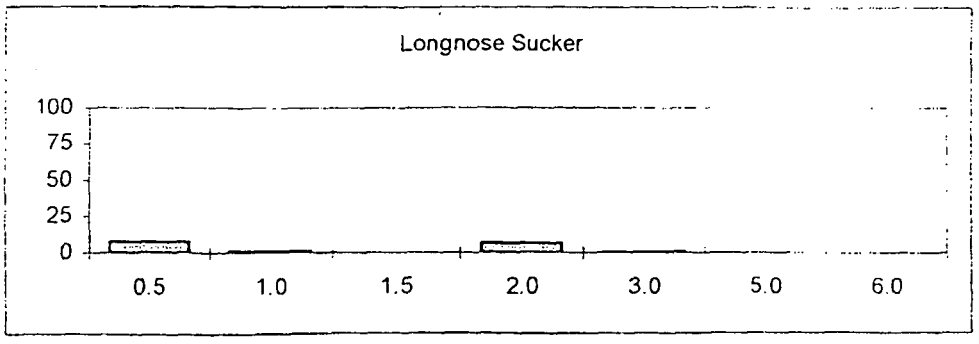
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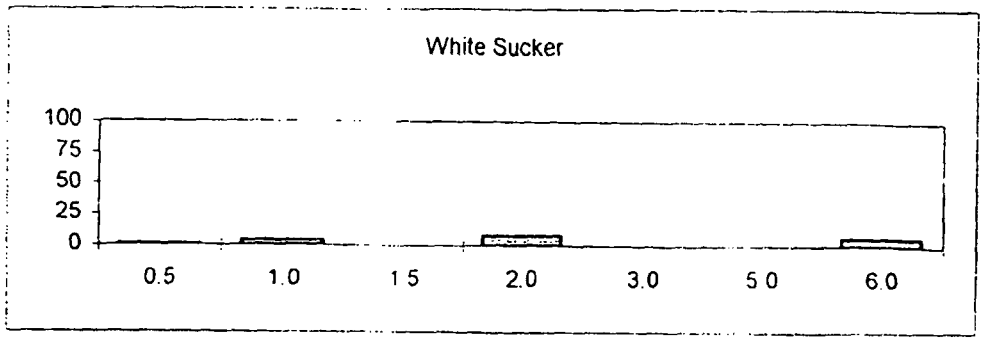
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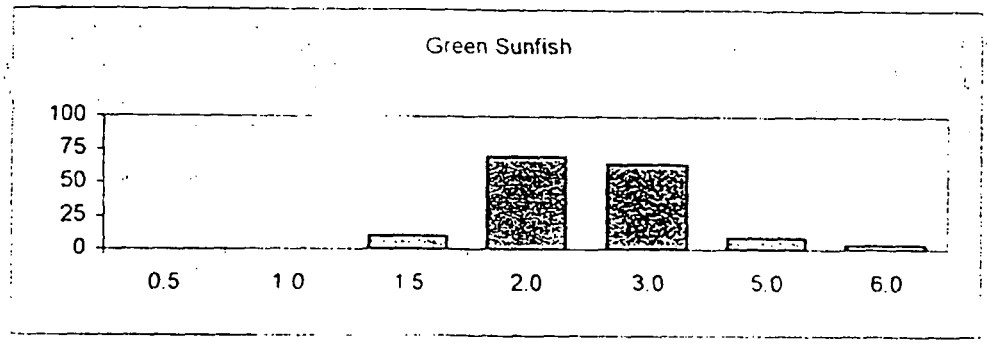
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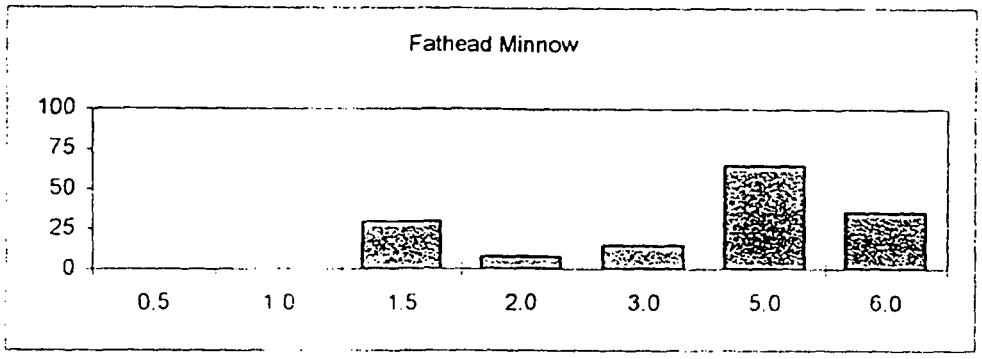
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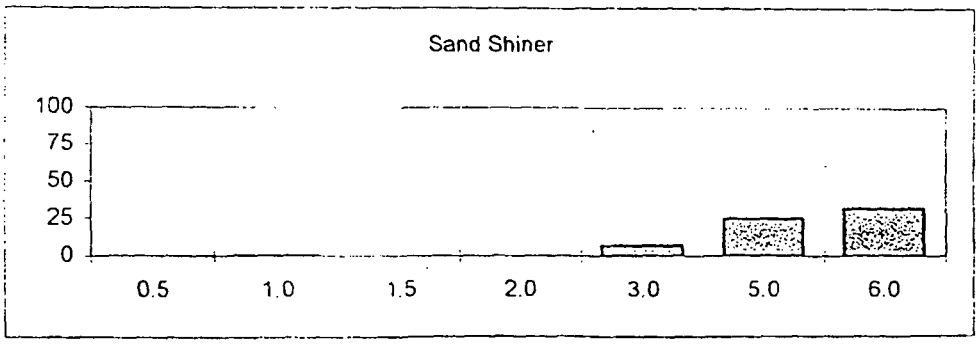
Sand Shiner
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75
50
25
0
0.5
1.0
1.5
2.0
3.0
5.0
6.0

BDC-0.5 Big Dry Creek at Church Ranch, Old Wadsworth Blvd.

Sample Date: 7 March 1997 Station Length = 96.6 m Mean Width = 3.4 m Sampling Area = 0.0324 ha

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
LGS	208	120	LND 1/	38	1	LND	77	3
LGS 1/	265	164	LND	64	3	LND	63	2
LGS	211	88	LND	42	1	LND	58	1
LGS	196	62	LND	61	2	LND	47	1
LGS	193	60	LND 1/	59	2	LND	58	2
LGS	118	10	LND	66	3	LND	58	2
LGS	91	8	LND	68	2	LND	58	2
LGS	101	10	LND 1/	67	3	LND	83	4
LGS	129	24	LND	58	2	LND	47	1
LGS	101	6	LND	38	1	LND	38	1
LGS	102	6	LND	42	1	LND	45	1
LGS	105	6	LND	39	1	LND	48	1
LGS	68	2	LND	39	1	LND	63	2
LGS	92	4	LND	39	1	LND	45	1
			LND	39	1	LND	73	3
WHS	80	4	LND 1/	48	1	LND	34	1
WHS	228	112	LND	78	3	LND	33	1
			LND 1/	79	3	LND	33	1
CRC	150	34	LND	64	3	LND	78	3
CRC	158	39	LND	58	2	LND	44	1
CRC	155	39	LND	58	2	LND	59	2
CRC	138	28	LND	43	1	LND	70	3
CRC	140	32	LND	42	1	LND 1/	42	1
CRC	118	29	LND	43	1	LND 1/	62	2
CRC	135	28	LND	62	4	LND	47	2
CRC	130	20	LND	87	8	LND	78	4
CRC 1/	46	2	LND	62	2	LND	42	1
CRC 1/	62	3	LND	37	1	LND	44	1
CRC 1/	154	42	LND	78	8	LND	32	1
CRC 1/	129	20	LND	63	3	LND	68	2
CRC	110	13	LND	63	3	LND	41	1
CRC	128	18	LND	46	2	LND	42	1
CRC	99	10	LND	38	1	LND	65	2
CRC 1/	72	6	LND	68	5	LND	54	2
			LND	78	8	LND	61	2
JOD	62	2	LND	61	3	LND	37	1
JOD	68	3	LND	47	2	LND	58	1
JOD	63	2	LND	59	2	LND	40	1
JOD	59	2	LND	60	2	LND 1/	44	1
JOD	39	1	LND	48	1	LND	39	1
JOD	34	1	LND	67	2	LND 1/	57	2
JOD	54	2	LND	38	1	LND	39	1
JOD	58	2	LND	62	2	LND	39	1
JOD	38	1	LND	57	2	LND	38	1
JOD	35	1	LND	102	10	LND 2/	32-44	46 n=46
			LND	59	2			
			LND	58	2			
			LND 1/	57	2			

1/ External parasites observed.

2/ Range of lengths and collective weights are reported for total number (n) of fish collected.

BDC-1.0 Big Dry Creek at 112th Avenue

Sample Date: 7 March 1997

Station Length = 106.1 m
Mean Width = 5.0 m

Sampling Area = 0.0529 ha

Species	Length (mm)	Weight (g)
LGS	125	27
LGS	121	20
WHS	111	20
WHS	96	10
WHS	94	5
WHS	125	20
WHS	130	17
WHS	86	8
WHS	65	5
CRC	70	4
CRC	82	4
CRC	70	4
CRC	70	4
CRC	64	3
JOD	67	2
JOD	63	2
JOD	55	2
JOD	66	3
JOD	66	3
SAH	43	1
YPE	104	10
LND	70	4
LND	60	3
LND	52	3

Species	Length (mm)	Weight (g)
LND 1/	72	
LND	81	
LND	71	
LND	72	
LND	80	
LND	60	
LND 2/	52	
LND 2/	72	44g total
LND	60	
LND	70	
LND	62	
LND	70	
LND 2/	61	
LND	58	
LND	61	
LND	73	
LND 1/	45	
LND	62	
LND	62	
LND	61	
LND	36	
LND	65	
LND	60	
LND	53	
LND	62	
LND	65	
LND	62	
LND	58	
LND	70	
LND	62	
LND	73	
LND	70	
LND	65	
LND	52	
LND	63	

Species	Length (mm)	Weight (g)
LND	62	
LND	80	
LND	65	84g total
LND	62	
LND	57	
LND	60	
LND	65	
LND	61	
LND	73	
LND	55	
LND	72	
LND	66	
LND	71	
LND	60	
LND	64	
LND	62	
LND	65	
LND	73	
LND	39	
LND	43	
LND	65	
LND 1/	96	
LND	70	
LND	55	18g total
LND	75	
LND	80	
LND	33	1
LND	35	1
LND	38	1
LND	40	1
LND	38	1
LND	39	1
LND 3/	36-41	83 n=83

1/ Weight is reported as a collective measurement.
2/ External parasites observed.
3/ Range of lengths and collective weights are reported for total number (n) of fish collected.

BDC-1.5 Big Dry Creek at 120th Avenue

Sample Date: 7 March 1997 Station Length = 106.7 m Sampling Area = 0.0476 ha
Mean Width = 4.5 m

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
FMW	51	3	LND	74	5
FMW	56	4	LND	113	16
FMW	60	3	LND	99	16
FMW	41	1	LND	75	8
FMW	27	1	LND	103	16
FMW 1/	54		LND	76	6
FMW	51		LND	80	6
FMW	60		LND	69	4
FMW	64		LND	70	4
FMW	50		LND	90	6
FMW	47	21g total	LND	75	4
FMW	62		LND	89	6
FMW	55		LND	83	4
FMW	45		LND	73	2
FMW	63		LND	75	2
FMW	45		LND	47	2
FMW	40		LND	78	6
FMW	53	2	LND	46	2
FMW	58	3	LND	71	2
FMW	55	2	LND	72	4
			LND	85	6
CRC	117	20	LND	63	3
CRC	120	18	LND	56	2
			LND	72	4
SNF	54	6	LND	70	3
SNF	45	3	LND	84	6
SNF	42	3	LND	65	4
SNF	45	3	LND	71	4
SNF	35	1	LND	72	5
SNF	43	2	LND	35	1
SNF	39	1	LND	74	4
			LND	74	5
GDF	45	2	LND	45	2
			LND	65	3
			LND	60	4
			LND	70	6
			LND	66	5
			LND	65	4

1/ Weight is reported as a collective measurement.

BDC-2.0 Big Dry Creek at 128th Avenue

Sample Date: 4 March 1997

Station Length = 163.1 m
Mean Width = 6.0 m

Sampling Area = 0.0986 ha

Species 1/	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
WHS	280	330	SNF	90	10	SNF	45	3
WHS	314	379	SNF	37	2	SNF	35	2
WHS	280	280	SNF	34	1	SNF	33	1
WHS	288	338	SNF	35	1	SNF	37	2
WHS	205	122	SNF	28	1	SNF	42	3
			SNF	46	3	SNF	56	2
LGS	130	22	SNF	43	3	SNF	42	3
LGS	80	7	SNF	43	2	SNF	40	3
LGS	60	3	SNF	37	1	SNF	40	1
LGS	58	3	SNF	40	3	SNF	38	3
			SNF	44	3	SNF	35	1
FMW	64	2	SNF	37	3	SNF	37	2
FMW	52	2	SNF	38	3	SNF	42	4
FMW	45	2	SNF	35	2	SNF	30	1
FMW	34	1	SNF	40	2	SNF	38	2
FMW	44	3	SNF	38	3	SNF	40	2
			SNF	32	1	SNF	30	1
LND	77	3	SNF	37	2	SNF	42	4
LND	78	9	SNF	36	2	SNF	34	1
LND	38	2	SNF	45	5	SNF	41	3
			SNF	47	5	SNF	30	1
JOD	45	2	SNF	42	4	SNF	31	1
JOD	40	1						

1/ External parasites observed on all fish collected, except johnny darters.

BDC-3.0 Big Dry Creek at Interstate-25

Sample Date: 4 March 1997

Station Length = 91.4 m
Mean Width = 6.6 m

Sampling Area = 0.0601 ha

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
LND	52	3	SNF	48	4	SNF 1/	46	
LND	74	5	SNF	43	4	SNF	40	
LND	80	6	SNF	46	4	SNF	40	
LND	80	7	SNF	38	2	SNF	40	
LND	68	10	SNF	52	5	SNF	47	
LND	82	8	SNF	45	1	SNF	48	21g total
LND	85	12	SNF 1/	48		SNF	38	
LND	102	14	SNF	44		SNF	50	
LND	65	3	SNF	44		SNF	38	
LND	84	5	SNF	38		SNF	37	
LND	85	10	SNF	34		SNF	31	
LND	83	12	SNF	55	25g total			
LND	47	2	SNF	49		SNF 1/	44	
			SNF	46		SNF	48	13g total
FMW	52	2	SNF	50		SNF	53	
FMW	48	2	SNF	53		SNF	44	
FMW	65	6						
FMW	57	3	SNF 1/	54		SNF 1/	40	
FMW	55	2	SNF	42		SNF	42	
FMW	60	3	SNF	60		SNF	51	
FMW	59	4	SNF	42		SNF	52	
FMW	42	1	SNF	48		SNF	58	
FMW	56	2	SNF	35		SNF	46	28g total
FMW	44	2	SNF	48	44g total	SNF	55	
FMW	45	3	SNF	49		SNF	46	
FMW	54	6	SNF	50		SNF	43	
FMW	47	4	SNF	42		SNF	31	
FMW	45	4	SNF	60		SNF	35	
FMW	32	1	SNF	30				
FMW	42	3				SNF 1/	47	
FMW	38	3	SNF	72	8	SNF	52	
			SNF 1/	58		SNF	42	
LGS	125	25	SNF	60		SNF	47	
			SNF	36		SNF	38	
MSQ	40	2	SNF	34	16g total	SNF	38	23g total
MSQ	22	1	SNF	44		SNF	46	
			SNF	33		SNF	35	
SAH	56	4	SNF	24		SNF	37	
SAH 1/	30					SNF	42	
SAH	50					SNF	64	
SAH	47							
SAH	42	11g total						
SAH	30							
SAH	36							
SAH	40							
SAH	32							

1/ Weight is reported as a collective measurement.

BDC-5.0 Big Dry Creek at Weld County Rd. 4

Sample Date: 6 March 1997

Station Length = 66.1 m
Mean Width = 7.0 m

Sampling Area = 0.0460 ha

Species	Length (mm)	Weight (g)
SAH 1/	57	
SAH	54	
SAH	49	
SAH	35	
SAH	64	
SAH	60	
SAH	73	
SAH	44	
SAH	62	
SAH	60	
SAH	58	
SAH	44	
SAH	59	
SAH	58	
SAH	75	
SAH	67	
SAH	54	
SAH	58	
SAH	38	
SAH	57	
SAH	62	
SAH	63	
SAH	60	50g total
SAH	70	
SAH	58	
SAH	74	
SAH	64	
SAH	64	
SAH	57	
SAH	60	
SAH	38	
SAH	56	
SAH	55	
SAH	63	
SAH	51	
SAH	64	
SAH	59	
SAH	61	
SAH	58	
SAH	59	
SAH	53	
SAH	64	
SAH	58	
SAH	54	
SAH	57	

Species	Length (mm)	Weight (g)
SAH 1/	57	
SAH	50	
SAH	63	
SAH	60	
SAH	61	
SAH	65	
SAH	40	20g total
SAH	50	
SAH	63	
SAH	54	
SAH	42	
SAH	62	
SAH	56	
SAH	27	
SAH	35	
SAH 2/	41-49	189 n=189
FMW 1/	48	
FMW	55	
FMW	35	
FMW	40	
FMW	41	
FMW	40	
FMW	57	
FMW	39	
FMW	32	
FMW	46	30g total
FMW	46	
FMW	51	
FMW	47	
FMW	37	
FMW	53	
FMW	43	
FMW	52	
FMW	77	
FMW	32	
FMW	69	
FMW	66	
FMW	54	
FMW 2/	40-51	571 n=571

Species	Length (mm)	Weight (g)
FMW 1/	39	
FMW	42	
FMW	42	
FMW	45	
FMW	34	
FMW	44	
FMW	43	
FMW	41	
FMW	59	
FMW	54	
FMW	43	
FMW	65	
FMW	41	
FMW	41	
FMW	40	
FMW	51	
FMW	32	40g total
FMW	36	
FMW	60	
FMW	44	
FMW	44	
FMW	42	
FMW	43	
FMW	57	
FMW	60	
FMW	48	
FMW	56	
FMW	56	
FMW	44	
FMW	69	
FMW	68	
FMW 1/	52	
FMW	47	
FMW	48	
FMW	45	10g total
FMW	42	
FMW	36	
FMW	54	

BDC-5.0 (Continued)

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
SNF	125	40	SNF	37	
SNF 1/	58		SNF	29	
SNF	60		SNF	42	
SNF	57		SNF	45	
SNF	47		SNF	31	
SNF	56		SNF	38	52g total
SNF	42		SNF	45	
SNF	45		SNF	58	
SNF	48		SNF	36	
SNF	44		SNF	35	
SNF	68		SNF	34	
SNF	44	50g total	SNF	50	
SNF	45		SNF	31	
SNF	45		SNF	41	
SNF	62		SNF	39	
SNF	46		SNF	30	
SNF	57		SNF	41	
SNF	44		SNF	42	
SNF	49		SNF	44	
SNF	63		SNF	38	
SNF	54		SNF	39	
SNF	37		SNF	42	
SNF	51		SNF	45	
			SNF 2/	30-42	26 n=26
SNF 1/	45				
SNF	65		LND 1/	56	
SNF	47		LND	57	
SNF	53		LND	51	
SNF	54		LND	54	
SNF	57		LND	62	
SNF	46		LND	57	16g total
SNF	49		LND	60	
SNF	48		LND	59	
SNF	38		LND	51	
SNF	58		LND	35	
SNF	37		LND	49	
SNF	35				
SNF	47				

1/ Weight is reported as a collective measurement.

2/ Range of lengths and collective weights are reported for total number (n) of fish collected.

BDC-6.0 Big Dry Creek at Wattenberg, Weld County Rd. 23

Sample Dates: 5 & 6 March 1997

Station Length = 85.3 m
Mean Width = 5.1 m

Sampling Area = 0.0439 ha

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
WHS 1/	365	625	SAH	61	5	FMW 2/	63	
WHS 1/	240	100	SAH 2/	58		FMW	45	
WHS 1/	379	750	SAH	58		FMW	60	
WHS 1/	315	450	SAH	58		FMW	56	
WHS 1/	261	290	SAH	60		FMW	50	16g total
WHS 1/	260	252	SAH	55	25g total	FMW	50	
WHS 1/	100	13	SAH	57		FMW	41	
WHS 1/	280	280	SAH	53		FMW	50	
			SAH	58		FMW	41	
BBH	160	52	SAH	56				
			SAH	62		FMW	66	2
LND	105	20				FMW	42	1
LND	83	11	SAH	60	2	FMW	65	2
LND	75	12	SAH	60	2	FMW	45	1
LND	116	23	SAH	62	2	FMW	74	4
LND	89	15	SAH	59	3	FMW	57	4
LND	75	13	SAH	60	3	FMW	70	6
LND	73	14				FMW	60	3
LND	71	5	SAH 2/	66		FMW	42	1
LND	115	18	SAH	61		FMW	70	9
LND	80	8	SAH	60		FMW	55	3
LND	74	4	SAH	62		FMW	52	3
LND	62	3	SAH	60		FMW	60	2
LND	90	7	SAH	60	18g total	FMW	31	1
LND	90	6	SAH	57		FMW	65	3
LND	85	8	SAH	62				
LND	82	8	SAH	62		FMW 2/	53	
LND	61	5	SAH	57		FMW	57	
LND	72	7				FMW	56	
LND	77	8	SAH 2/	73		FMW	58	
LND	81	9	SAH	62		FMW	49	20g total
LND	82	9	SAH	64		FMW	60	
LND	75	7	SAH	63		FMW	55	
LND	57	4	SAH	62		FMW	58	
LND	66	5	SAH	64		FMW	68	
LND	82	8	SAH	58				
LND	75	6	SAH	59	89g total	FMW 2/	66	
			SAH	52		FMW	45	
SNF	57	12	SAH	54		FMW	52	
SNF	50	10	SAH	56		FMW	38	
SNF	55	3	SAH	53		FMW	73	
SNF	50	3	SAH	63		FMW	63	20g total
SNF	42	2	SAH	58		FMW	42	
			SAH	61		FMW	55	
BST	56	5				FMW	62	
			FMW	60	7	FMW	48	
						FMW	34	

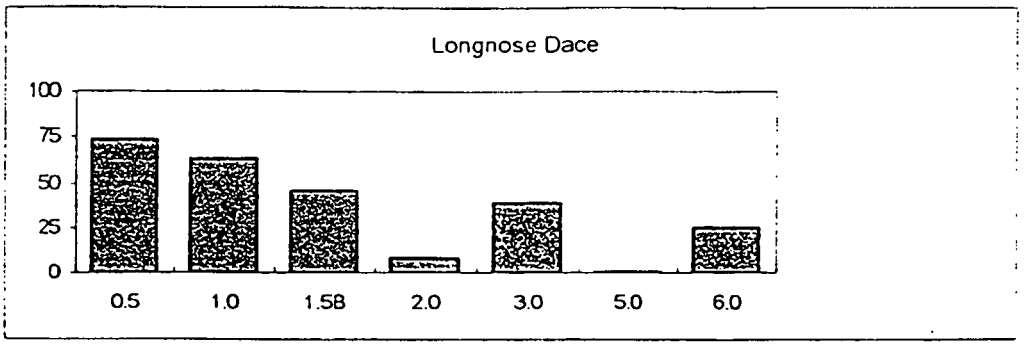
1/ Windy conditions may have affected weights.
2/ Weight is reported as a collective measurement.

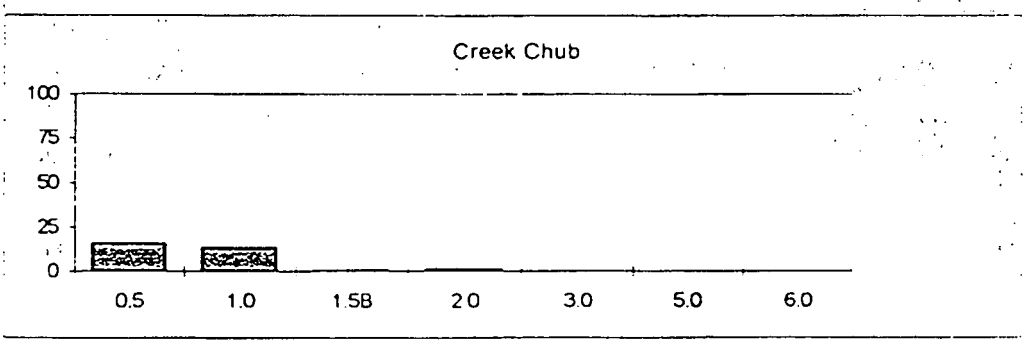
RELATIVE ABUNDANCE

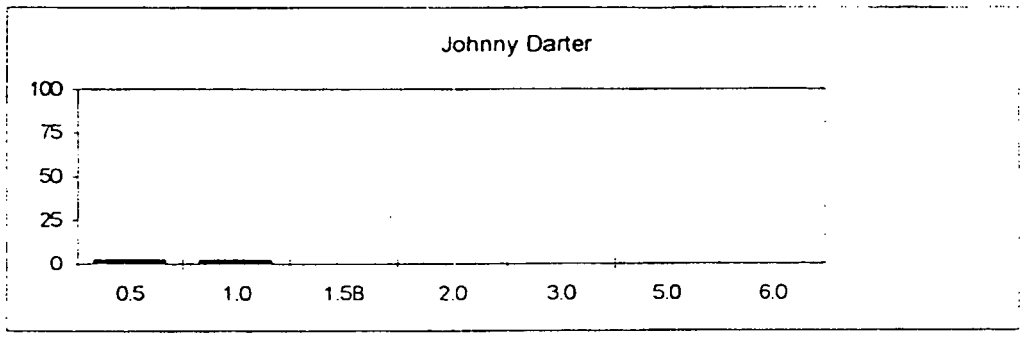
	0.5	1.0	1.5B	2.0	3.0	5.0	6.0
Longnose Dace	73.5	63.2	45.8	8.1	38.7	0.8	25.0
Creek Chub	15.6	13.0	0.5	1.0	-	-	-
Johnny Darter	2.3	1.9	-	-	-	-	-
Longnose Sucker	4.1	7.3	-	-	2.6	0.04	1.2
White Sucker	3.8	8.9	2.1	1.0	17.5	1.1	7.1
Green Sunfish	-	1.6	7.5	18.6	24.8	3.2	16.7
Fathead Minnow	0.7	3.3	36.9	53.8	11.0	47.3	36.9
Sand Shiner	-	0.4	2.1	-	-	43.8	9.5
Mosquitofish	-	-	4.9	16.2	4.1	3.1	2.4
Bluegill	-	-	-	1.4	1.0	0.3	-
Largemouth Bass	-	0.3	0.2	-	0.2	0.2	-
Brook Stickleback	-	-	-	-	-	0.04	1.2
Pumpkinseed	-	-	-	-	-	0.1	-
Yellow Bullhead	-	0.1	-	-	-	-	-

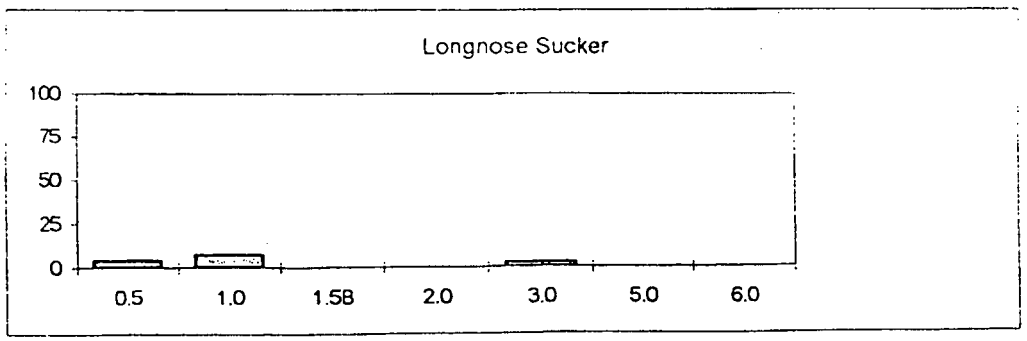
TOTAL COLLECTED

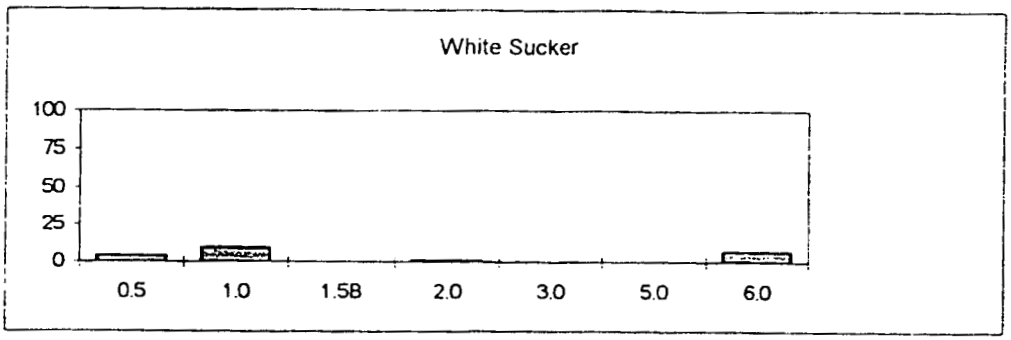
	0.5	1.0	1.5B	2.0	3.0	5.0	6.0
Longnose Dace	882	442	196	17	190	23	21
Creek Chub	187	91	2	2	-	-	-
Johnny Darter	28	13	-	-	-	-	-
Longnose Sucker	49	51	-	-	13	1	1
White Sucker	46	62	9	2	86	30	6
Green Sunfish	-	11	32	39	122	87	14
Fathead Minnow	8	23	158	113	54	1296	31
Sand Shiner	-	3	9	-	-	1200	8
Mosquitofish	-	-	21	34	20	86	2
Bluegill	-	-	-	3	5	9	-
Largemouth Bass	-	2	1	-	1	4	-
Brook Stickleback	-	-	-	-	-	1	1
Pumpkinseed	-	-	-	-	-	2	-
Yellow Bullhead	-	1	-	-	-	-	-
Totals	1200	699	428	210	491	2739	84

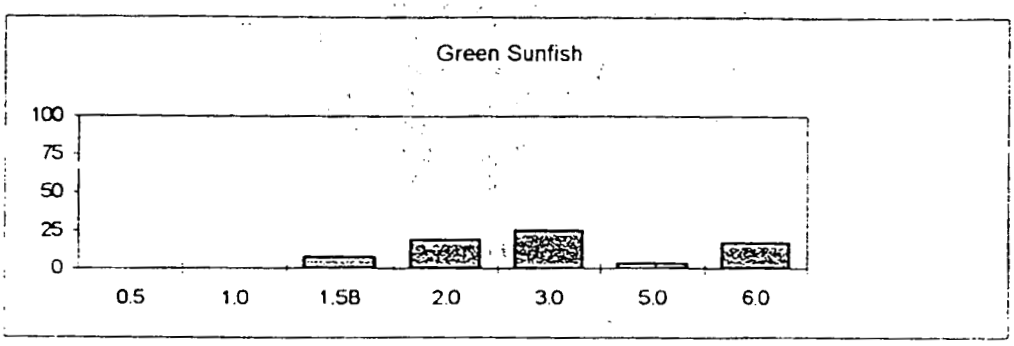

Longnose Dace
100
75
50
25
0
0.5
1.0
1.5B
2.0
3.0
5.0
6.0

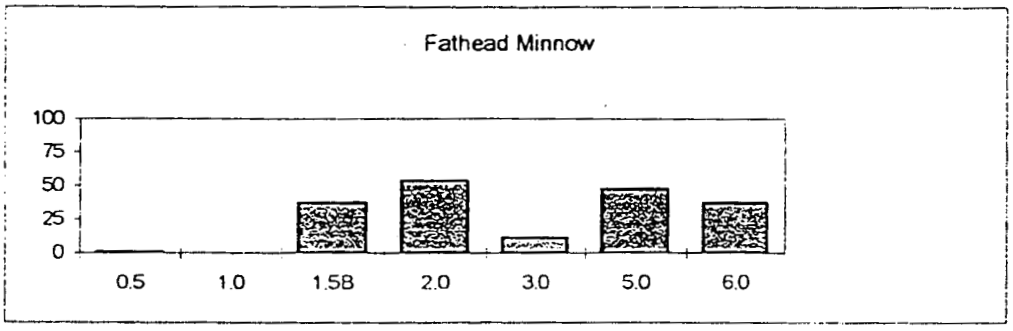

Creek Chub
100
75
50
25
0
0.5
1.0
1.5B
2.0
3.0
5.0
6.0

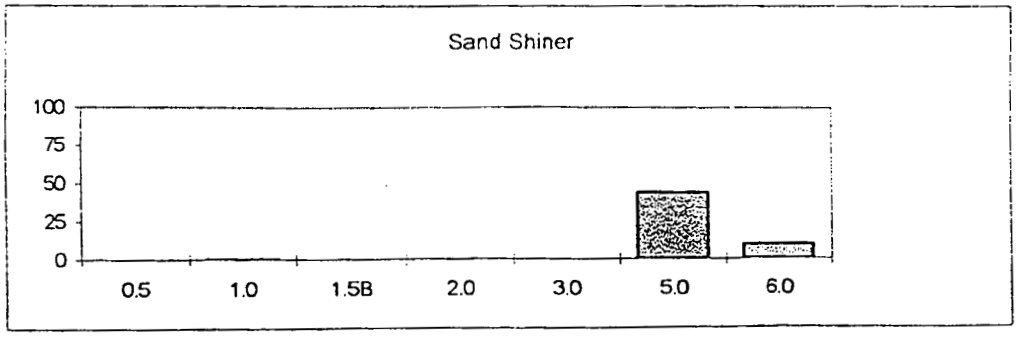

Johnny Darter
100
75
50
25
0
0.5
1.0
1.5B
2.0
3.0
5.0
6.0

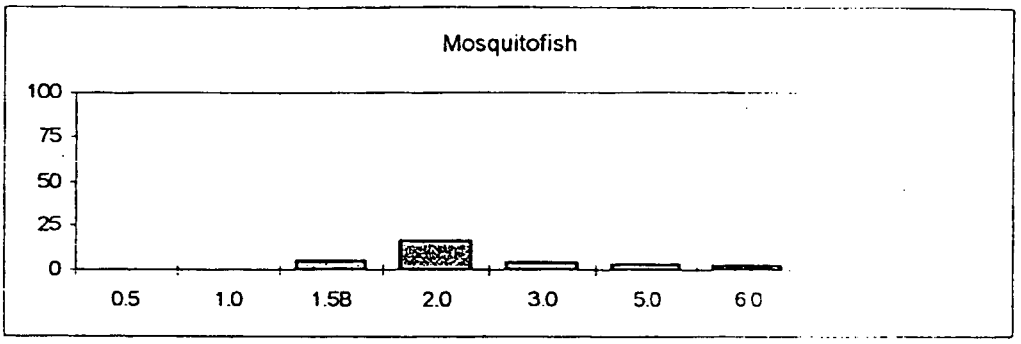

Longnose Sucker
100
75
50
25
0
0.5
1.0
1.5B
2.0
3.0
5.0
6.0

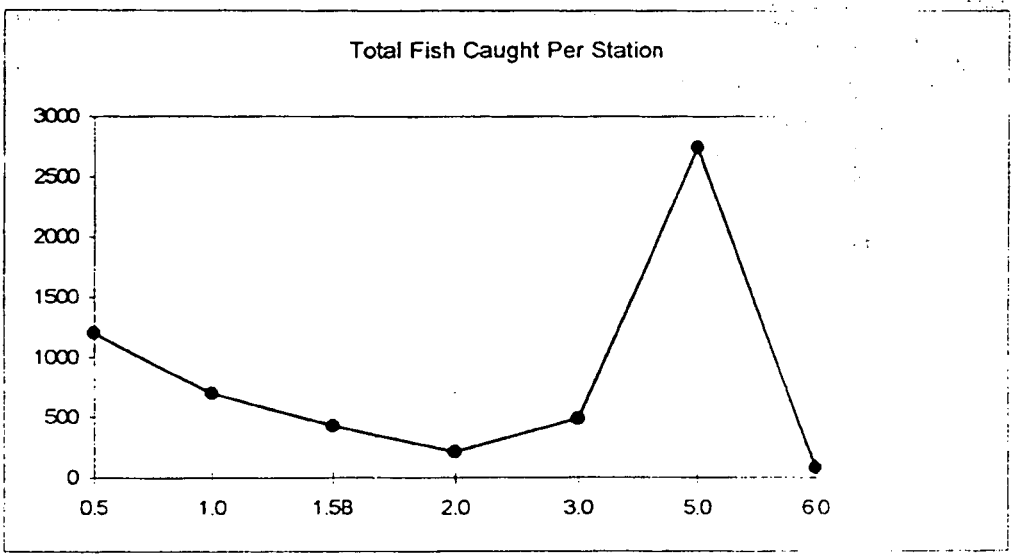

White Sucker
100
75
50
25
0
0.5
1.0
1.5B
2.0
3.0
5.0
6.0


Green Sunfish
100
75
50
25
0
0.5
1.0
1.5B
2.0
3.0
5.0
6.0


Fathead Minnow
100
75
50
25
0
0.5
1.0
1.5B
2.0
3.0
5.0
6.0


Sand Shiner
100
75
50
25
0
0.5
1.0
1.5B
2.0
3.0
5.0
6.0


Mosquitofish
100
75
50
25
0
0.5
1.0
1.5B
2.0
3.0
5.0
6 0


Total Fish Caught Per Station
3000
2500
2000
1500
1000
500
0
0.5
1.0
1.5B
2.0
3.0
5.0
6 0

Species	BDC-0.5 (Church Ranch, Old Wadsworth Blvd.) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)	BDC-1.0 (112th Avenue) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)	BDC-1.5B (120th Avenue) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)
Longnose dace *Rhinichthys cataractae*	882	73.5	52 (27-122)	2 (<1-8)	442	63.2	76 (34-104)	4 (<1-10)	196	45.8	79 (48-118)	5 (1-20)
White sucker *Catostomus commersoni*	46	3.8	115 (39-258)	24 (1-190)	62	8.9	171 (72-299)	72 (4-285)	9	2.1	165 (68-240)	66 (3-133)
Longnose sucker *Catostomus catostomus*	49	4.1	138 (85-223)	28 (5-115)	51	7.3	168 (126-227)	52 (21-110)	--	--	--	--
Johnny darter *Etheostoma nigrum*	28	2.3	61 (28-71)	2 (<1-4)	13	1.9	66 (57-77)	3 (2-4)	--	--	--	--
Creek chub *Semotilus atromaculatus*	187	15.6	62 (30-171)	6 (<1-48)	91	13.0	62 (35-187)	17 (1-63)	2	0.5	180 (176-183)	61 (56-65)
Green sunfish *Lepomis cyanellus*	--	--	--	--	11	1.6	55 (40-88)	4 (1-12)	32	7.5	50 (36-91)	3 (0.5-12)
Sand shiner *Notropis stramineus*	--	--	--	--	3	0.4	73 (69-77)	3 (2-4)	9	2.1	80 (71-89)	4 (2-6)
Fathead minnow *Pimephales promelas*	8	0.7	62 (51-67)	2 (1-3)	23	3.3	60 (44-80)	3 (1-5)	158	36.9	47 (31-75)	1 (0.25-5)
Yellow bullhead *Ameiurus natalis*	--	--	--	--	1	0.1	213	140	--	--	--	--
Brook stickleback *Culaea inconstans*	--	--	--	--	--	--	--	--	--	--	--	--
Mosquitofish *Gambusia affinis*	--	--	--	--	--	--	--	--	21	4.9	30 (22-49)	0.4 (0.1-1)
Largemouth bass *Micropterus salmoides*	--	--	--	--	2	0.3	81 (70-91)	8 (4-11)	1	0.2	111	20
Bluegill *Lepomis macrochirus*	--	--	--	--	--	--	--	--	--	--	--	--
Pumpkinseed *Lepomis gibbosus*	--	--	--	--	--	--	--	--	--	--	--	--

Species	BDC-2.0 (128th Avenue) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)	BDC-3.0 (Interstate-25) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)
Longnose dace *Rhinichthys cataractae*	17	8.1	57 (24-105)	3 (0.25-11)	190	38.7	67 (34-120)	7 (1-19)
White sucker *Catostomus commersoni*	2	1.0	69 (57-80)	5 (3-6)	86	17.5	80 (53-224)	10 (2-150)
Longnose sucker *Catostomus catostomus*	--	--	--	--	13	2.6	152 (87-250)	58 (7-185)
Johnny darter *Etheostoma nigrum*	--	--	--	--	--	--	--	--
Creek chub *Semotilus atromaculatus*	2	1.0	50 (48-52)	1 N/A	--	--	--	--
Green sunfish *Lepomis cyanellus*	39	18.6	50 (25-93)	3 (0.25-16)	122	24.8	54 (27-109)	4 (1-24)
Sand shiner *Notropis stramineus*	--	--	--	--	--	--	--	--
Fathead minnow *Pimephales promelas*	113	53.8	24 (35-68)	1 (0.25-3)	54	11.0	53 (36-74)	2 (1-4)
Yellow bullhead *Ameiurus natalis*	--	--	--	--	--	--	--	--
Brook stickleback *Culaea inconstans*	--	--	--	--	--	--	--	--
Mosquitofish *Gambusia affinis*	34	16.2	27 (22-43)	0.3 (0.1-1)	20	4.1	28 (22-47)	0.4 (0.25-1)
Largemouth bass *Micropterus salmoides*	--	--	--	--	1	0.2	102	16
Bluegill *Lepomis macrochirus*	3	1.4	44 (34-52)	2 (0.5-2)	5	1.0	51 (44-57)	2 (1-3)
Pumpkinseed *Lepomis gibbosus*	--	--	--	--	--	--	--	--

Species	BDC-5.0 (Weld County Rd. 4) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)	BDC-6.0 (Wattenberg, Weld County Rd. 23) n	Percent Composition	Mean Length (mm) (min-max)	Mean Weight (g) (min-max)
Longnose dace *Rhinichthys cataractae*	23	0.8	67 (50-89)	3 (1-7)	21	25.0	86 (61-117)	6 (2-13)
White sucker *Catostomus commersoni*	30	1.1	108 (65-152)	14 (2-27)	6	7.1	291 (87-422)	393 (7-830)
Longnose sucker *Catostomus catostomus*	1	< 0.1	121	22	1	1.2	215	100
Johnny darter *Etheostoma nigrum*	--	--	--	--	--	--	--	--
Creek chub *Semotilus atromaculatus*	--	--	--	--	--	--	--	--
Green sunfish *Lepomis cyanellus*	87	3.2	51 (35-99)	3 (1-16)	14	16.7	49 (36-82)	2 (0.5-10)
Sand shiner *Notropis stramineus*	1200	43.8	63 (32-80)	2 (0.25-4)	8	9.5	52 (34-70)	2 (0.25-3)
Fathead minnow *Pimephales promelas*	1296	47.3	61 (37-80)	2 (1-4)	31	36.9	59 (31-80)	2 (0.25-6)
Yellow bullhead *Ameiurus natalis*	--	--	--	--	--	--	--	--
Brook stickleback *Culaea inconstans*	1	< 0.1	61	1	1	1.2	64	2
Mosquitofish *Gambusia affinis*	86	3.1	38 (24-54)	1 (0.25-2)	2	2.4	24 (23-25)	0.3 N/A
Largemouth bass *Micropterus salmoides*	4	0.1	85 (64-113)	10 (4-22)	--	--	--	--
Bluegill *Lepomis macrochirus*	9	0.3	48 (43-59)	2 (1-3)	--	--	--	--
Pumpkinseed *Lepomis gibbosus*	2	0.1	71.5 (68-75)	6.5 (6-7)	--	--	--	--

BDC-0.5 Big Dry Creek at Church Ranch, Old Wadsworth Blvd.

Sample Date: 15 October 1997 Station Length = 82.3 m Mean Width = 5.5 m Sampling Area = 0.0453 ha

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	
LGS	199	77	CRC 1/	160	38	CRC	34	<1	
LGS	127	19	CRC	142	24	CRC	44	1	
LGS	162	45	CRC	163	45	CRC	98	6	
LGS	200	76	CRC	168	43	CRC	44	1	
LGS	149	28	CRC	154	32	CRC	46	1	
LGS	113	12	CRC	110	13	CRC	42	1	
LGS	114	8	CRC	129	20	CRC	46	1	
LGS	166	41	CRC	171	48	CRC	37	<1	
LGS	184	67	CRC	162	46	CRC	37	<1	
LGS	169	47	CRC	152	32	CRC	42	1	
LGS	145	29	CRC	142	26	CRC	44	1	
LGS	143	28	CRC	153	32	CRC	64	3	
LGS	101	8	CRC	145	29	CRC 2/	35-55	24	n=28
LGS	147	31	CRC	142	48	CRC 2/	35-55	18	n=25
LGS	157	38	CRC	166	40	CRC 2/	30-45	15	n=30
LGS	130	15	CRC	134	25	CRC	160	45	
LGS	150	30	CRC	123	17	CRC	154	35	
LGS	114	13	CRC	130	20	CRC	102	9	
LGS	144	24	CRC	110	12	CRC	125	20	
LGS	142	26	CRC	75	4	CRC	117	11	
LGS	104	10	CRC	145	31	CRC	104	10	
LGS	199	58	CRC	110	12	CRC	103	10	
LGS	100	8	CRC	94	8	CRC	116	14	
LGS	135	21	CRC	123	20	CRC	109	10	
LGS	168	47	CRC	113	13	CRC	108	11	
LGS	144	25	CRC	116	15	CRC 2/	37-52	28	n=33
LGS	170	44	CRC	102	11				
LGS	105	11	CRC	100	9	LND	94	7	
LGS	110	12	CRC	118	16	LND	77	4	
LGS	123	15	CRC	95	8	LND	83	4	
LGS	112	13	CRC	92	7	LND	82	5	
LGS	101	10	CRC	82	4	LND	80	4	
LGS	99	10	CRC	100	9	LND	85	5	
LGS	120	15	CRC	49	1	LND	81	5	
LGS	85	5	CRC	44	1	LND	92	6	
LGS	121	16	CRC	45	1	LND	84	5	
LGS	100	8	CRC	37	1	LND	83	5	
LGS	107	10	CRC	37	1	LND	85	5	
LGS	96	7	CRC	41	1	LND	77	4	
LGS	123	16	CRC	41	1	LND	84	6	
LGS	94	7	CRC	42	1	LND	75	4	
LGS	223	115	CRC	44	1	LND	77	3	
LGS	165	45	CRC	41	1	LND	77	4	
LGS	165	45	CRC	39	1	LND	40	1	
LGS	151	35	CRC	45	1	LND	33	<1	
LGS	136	30	CRC	50	1	LND	46	1	
LGS	167	41	CRC	43	1	LND	35	1	
LGS	147	28	CRC	33	<1	LND	31	1	
LGS	114	13	CRC	48	1	LND	44	1	

BDC-0.5 (Continued)

Species	Length (mm)	Weight (g)		Species	Length (mm)	Weight (g)		Species	Length (mm)	Weight (g)
LND	32	<1		LND 2/	30-50	10	n=16	WHS	45	1
LND	42	1		LND 2/	60-90	160	n=59	WHS	101	9
LND	30	<1		LND 2/	73-105	80	n=11	WHS	96	7
LND	37	1		LND 2/	60-80	280	n=95	WHS	108	11
LND	30	<1		LND 2/	30-50	125	n=175	WHS	102	9
LND	35	<1		LND 2/	30-48	84	n=125	WHS	122	16
LND	27	<1								
LND	27	<1		WHS 3/	182	55		JOD	59	2
LND	30	<1		WHS	114	14		JOD	66	3
LND	31	<1		WHS	122	17		JOD	67	3
LND	53	2		WHS	101	9		JOD	66	2
LND	36	<1		WHS	100	8		JOD	52	1
LND	41	1		WHS	222	110		JOD	57	2
LND	59	2		WHS	233	130		JOD	66	3
LND	42	1		WHS	201	80		JOD	70	3
LND	41	1		WHS	183	46		JOD	68	3
LND	45	1		WHS	131	20		JOD	60	2
LND	65	3		WHS	114	13		JOD	64	3
LND	44	1		WHS	118	15		JOD	67	3
LND	37	1		WHS	176	44		JOD	59	2
LND	46	1		WHS	88	6		JOD	67	3
LND	45	1		WHS	113	13		JOD	44	1
LND	72	3		WHS	117	15		JOD	59	2
LND	78	4		WHS	112	13		JOD	71	3
LND	70	3		WHS	113	13		JOD	65	2
LND	98	8		WHS	99	8		JOD	28	<1
LND	80	5		WHS	93	8		JOD	67	3
LND	86	6		WHS	104	10		JOD	64	2
LND	74	4		WHS	110	12		JOD	60	2
LND	77	4		WHS	92	8		JOD	70	4
LND	69	3		WHS	97	9		JOD	62	3
LND	82	5		WHS	103	10		JOD	58	3
LND	70	3		WHS	86	5		JOD	53	1
LND	72	3		WHS	47	1		JOD	57	1
LND	73	4		WHS	85	6		JOD	62	3
LND	73	4		WHS	44	1				
LND	75	4		WHS	77	4		FMW	65	3
LND	71	3		WHS	44	1		FMW	67	3
LND 2/	70-79	120	n=41	WHS	55	2		FMW	57	2
LND 2/	64-122	60	n=8	WHS	39	1		FMW	66	2
LND 2/	64-50	25	n=41	WHS	258	190		FMW	64	3
LND 2/	35-55	50	n=75	WHS	138	23		FMW	51	1
LND 2/	63-85	78	n=25	WHS	95	10		FMW	64	3
LND 2/	60-85	60	n=20	WHS	190	70		FMW	60	2
LND 2/	30-47	17	n=32	WHS	89	7				
LND 2/	33-45	52	n=87	WHS	105	11				
LND 2/	30-45	7	n=12	WHS	106	10				

1/ Numerous creek chubs (~60-70%) had red spots.

2/ Range of lengths and collective weights are reported for total number (n) of fish collected.

3/ Numerous white suckers (~50-60%) had parasites and lesions.

BDC-1.0 Big Dry Creek at 112th Avenue

Sample Date: 15 October 1997 Station Length = 121.9 m Sampling Area = 0.0780 ha
Mean Width = 6.4 m

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
LGS	227	110	LGS	142	30	CRC	106	12
LGS	167	50	LGS	136	25	CRC	97	9
LGS	175	57				CRC	112	13
LGS	183	59	CRC 1/	187	63	CRC	105	11
LGS	207	94	CRC	171	51	CRC	84	5
LGS	200	76	CRC	175	55	CRC	112	14
LGS	160	42	CRC	129	22	CRC	115	14
LGS	177	60	CRC	119	19	CRC	86	6
LGS	170	57	CRC	145	33	CRC	88	8
LGS	176	57	CRC	111	14	CRC	83	7
LGS	205	88	CRC	127	22	CRC	54	2
LGS	167	52	CRC	115	16	CRC	47	1
LGS	187	62	CRC	112	12	CRC	56	[illegible]
LGS	182	63	CRC	119	18	CRC	49	[illegible]
LGS	181	59	CRC	100	9	CRC	74	4
LGS	134	27	CRC	105	12	CRC	50	1
LGS	176	59	CRC	98	9	CRC	76	5
LGS	146	32	CRC	120	20	CRC	68	3
LGS	154	35	CRC	160	41	CRC	67	3
LGS	188	70	CRC	155	33	CRC	52	2
LGS	194	70	CRC	160	39	CRC	72	4
LGS	185	61	CRC	132	24	CRC	51	1
LGS	173	55	CRC	135	25	CRC	49	1
LGS	162	39	CRC	138	26	CRC	62	3
LGS	156	48	CRC	134	22	CRC	44	1
LGS	160	42	CRC	99	9	CRC	172	48
LGS	144	30	CRC	164	41	CRC	163	40
LGS	176	61	CRC	149	33	CRC	161	46
LGS	213	110	CRC	149	31	CRC	123	19
LGS	204	84	CRC	138	27	CRC	104	13
LGS	183	53	CRC	133	23	CRC	125	19
LGS	144	27	CRC	117	15	CRC	131	24
LGS	156	41	CRC	117	15	CRC	113	14
LGS	132	33	CRC	106	12	CRC	133	24
LGS	134	28	CRC	129	20	CRC	121	20
LGS	130	23	CRC	100	11	CRC	136	25
LGS	141	27	CRC	106	12	CRC	92	8
LGS	156	39	CRC	180	56	CRC	140	26
LGS	179	62	CRC	125	19	CRC	100	10
LGS	188	61	CRC	115	15	CRC	95	8
LGS	220	100	CRC	98	10	CRC	71	4
LGS	147	32	CRC	111	14	CRC	53	1
LGS	150	35	CRC	122	17	CRC	73	4
LGS	172	48	CRC	159	42	CRC	65	3
LGS	144	33	CRC	110	14	CRC	35	1
LGS	126	21	CRC	109	11			
LGS	166	49	CRC	113	13			
LGS	152	34	CRC	127	17			
LGS	141	27	CRC	117	15			

BDC-1.0 (Continued)

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)		Species	Length (mm)	Weight (g)
LND 1/	78	3	LND	70	4		WHS 3/	223	100
LND	89	6	LND	67	3		WHS	277	215
LND	78	5	LND	80	6		WHS	255	160
LND	91	7	LND	83	5		WHS	275	190
LND	80	6	LND	62	2		WHS	207	95
LND	85	8	LND	80	5		WHS	195	81
LND	98	8	LND	82	5		WHS	156	42
LND	81	6	LND	77	4		WHS	167	45
LND	88	7	LND	73	3		WHS	180	62
LND	85	5	LND	54	2		WHS	119	16
LND	48	1	LND	75	4		WHS	167	52
LND	48	1	LND	79	3		WHS	178	55
LND	90	8	LND	68	2		WHS	201	73
LND	83	4	LND	68	4		WHS	211	100
LND	90	7	LND	74	4		WHS	282	245
LND	61	2	LND	87	6		WHS	260	190
LND	85	5	LND	87	6		WHS	219	110
LND	76	4	LND	80	5		WHS	275	220
LND	93	7	LND	81	5		WHS	159	45
LND	82	5	LND	67	2		WHS	170	55
LND	44	1	LND	73	4		WHS	265	210
LND	50	1	LND	77	3		WHS	190	75
LND	61	2	LND	77	4		WHS	184	67
LND	89	5	LND	69	3		WHS	123	22
LND	63	2	LND	69	3		WHS	159	41
LND	91	7	LND	70	3		WHS	115	16
LND	93	8	LND	61	3		WHS	265	190
LND	69	3	LND	84	5		WHS	295	275
LND	69	2	LND	104	10		WHS	299	285
LND	86	6	LND	95	9		WHS	241	150
LND	67	3	LND	45	1		WHS	181	65
LND	80	5	LND	50	3		WHS	189	69
LND	85	6	LND	101	10		WHS	237	130
LND	82	5	LND	45	1		WHS	192	77
LND	82	5	LND	69	3		WHS	185	60
LND	78	5	LND	68	3		WHS	165	49
LND	68	4	LND	46	1		WHS	157	41
LND	82	5	LND	48	1		WHS	119	19
LND	92	7	LND	55	2		WHS	105	11
LND	80	5	LND 2/	34-40	2	n=5	WHS	115	14
LND	65	3	LND 2/	48-63	13	n=10	WHS	154	37
LND	82	6	LND 2/	60-95	85	n=22	WHS	168	51
LND	78	5	LND 2/	62-90	355	n=96	WHS	142	31
LND	66	4	LND 2/	65-90	460	n=105	WHS	133	21
LND	84	5	LND 2/	65-95	495	n=119	WHS	124	19
LND	66	3					WHS	113	15

BDC-1.0 (Continued)

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
WHS	117	17	FMW	44	2
WHS	79	5	FMW	71	4
WHS	127	22	FMW	72	4
WHS	126	23	FMW	72	4
WHS	118	16	FMW	70	4
WHS	120	18	FMW	80	5
WHS	135	20	FMW	51	1
WHS	106	12	FMW	53	1
WHS	72	4	FMW	70	4
WHS	163	40	FMW	46	1
WHS	117	16	FMW	60	3
WHS	108	15	FMW	49	1
WHS	135	26	FMW	63	3
WHS	106	14	FMW	56	2
WHS	73	4	FMW	44	1
WHS	77	5	FMW	60	2
			FMW	72	5
JOD	72	4	FMW	68	4
JOD	68	4	FMW	57	2
JOD	65	3	FMW	52	2
JOD	77	4	FMW	62	2
JOD	64	3	FMW	58	3
JOD	65	3	FMW	48	1
JOD	60	2			
JOD	59	2	LMB	91	11
JOD	69	4	LMB	70	4
JOD	72	3			
JOD	62	2	SAH	77	4
JOD	57	2	SAH	74	4
JOD	71	4	SAH	69	2
SNF	88	12	YBH	213	140
SNF	58	2			
SNF	69	6			
SNF	64	5			
SNF	50	3			
SNF	47	2			
SNF	40	1			
SNF	52	3			
SNF	46	3			
SNF	52	3			
SNF	43	1			

1/ Numerous creek chubs (~80-90%) and longnose dace (<5%) had red spots

2/ Range of lengths and collective weights are reported for total number (n) of fish collected.

3/ Numerous white suckers (~90-95%) had parasites and lesions.

BDC-1.5B Big Dry Creek at 120th Avenue

Sample Date: 17 October 1997

Station Length = 76.2 m
Mean Width = 4.6 m

Sampling Area = 0.0351 ha

Species	Length (mm)	Weight (g)		Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	
LND 1/	105	11		LND	84	6	FMW 4/	53	1	
LND	118	18		LND	59	2	FMW	38	0.5	
LND	115	14		LND	106	12	FMW	58	2	
LND	110	16		LND	91	7	FMW	38	0.5	
LND	108	12		LND	81	5	FMW	51	1	
LND	110	12		LND	76	4	FMW	42	1	
LND	110	14		LND	62	2	FMW	40	0.5	
LND	106	13		LND	72	3	FMW	70	4	
LND	109	12		LND	91	7	FMW	44	1	
LND	105	10		LND	57	1	FMW	51	1	
LND	103	11		LND	88	5	FMW	48	1	
LND	94	7		LND	76	4	FMW	40	0.5	
LND	98	1		LND	87	6	FMW	42	0.5	
LND	101	10		LND	66	2	FMW	42	0.5	
LND	98	10		LND	94	8	FMW	60	2	
LND	95	9		LND	81	5	FMW	64	3	
LND	97	8		LND	64	3	FMW	52	1	
LND	94	8		LND	66	3	FMW	52	1	
LND	87	7		LND	78	4	FMW	71	4	
LND	98	10		LND	61	2	FMW	51	1	
LND	88	6		LND	56	2	FMW	47	1	
LND	93	8		LND	58	2	FMW	41	0.5	
LND	86	6		LND	87	6	FMW	75	5	
LND	92	7		LND	84	6	FMW	43	0.5	
LND	92	7		LND	54	2	FMW	66	3	
LND	86	7		LND	66	3	FMW	43	0.5	
LND	92	6		LND	78	4	FMW	40	0.5	
LND	96	8		LND	71	3	FMW	67	4	
LND	90	7		LND	60	2	FMW	61	2	
LND	91	7		LND	76	4	FMW	62	2	
LND	97	8		LND	75	3	FMW	61	2	
LND	97	9		LND	54	1	FMW	59	2	
LND	92	8		LND	80	4	FMW	61	3	
LND	96	9		LND	62	2	FMW	64	3	
LND 2/	55-95	405	n=104	LND	62	3	FMW	58	2	
LND 2/	70-85	15	n=5	LND	62	2	FMW	65	3	
LND 3/	88	7		LND	52	1	FMW 2/	35-56	108	n=106
LND	104	12		LND	83	5	FMW	50	1	
LND	63	2		LND	60	2	FMW	56	2	
LND	78	5		LND	65	3	FMW	40	0.5	
LND	105	11		LND	48	1	FMW	39	0.5	
LND	118	20		LND	60	2	FMW	50	1	
LND	95	9		LND	55	1	FMW	46	1	
LND	87	7		LND	66	2	FMW	50	1	
LND	94	8					FMW	43	1	

BDC-1.5B (Continued)

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
FMW	33	0.25	MSQ	49	1
FMW	36	0.5	MSQ	36	0.5
FMW	36	0.5	MSQ	27	0.5
FMW	46	0.25	MSQ	26	0.25
FMW	33	0.25	MSQ	42	0.75
FMW	35	0.25	MSQ 2/	26-35	4.5 n=11
FMW	31	0.5	MSQ	30	0.25
FMW	40	0.25	MSQ	25	0.25
			MSQ	24	0.25
SNF 5/	91	12	MSQ	22	0.1
SNF	57	3	MSQ	22	0.25
SNF	46	2			
SNF	52	3	SAH	88	6
SNF 3/	83	10	SAH	89	6
SNF	70	5	SAH	88	6
SNF	62	4	SAH 6/	85	5
SNF	57	3	SAH	72	3
SNF	66	5	SAH	76	3
SNF 3/	62	4	SAH	71	2
SNF	63	5	SAH	76	4
SNF 3/	49	2	SAH	71	3
SNF 3/	59	3			
SNF	51	2	WHS	219	115
SNF	40	1	WHS	199	80
SNF	36	0.5	WHS	240	133
SNF	38	1	WHS	161	42
SNF	39	1	WHS	223	115
SNF	52	2	WHS	209	95
SNF	39	1	WHS	80	5
SNF	39	1	WHS	89	8
SNF	37	0.5	WHS	68	3
SNF	38	1			
SNF	38	1	CRC	183	65
SNF	41	1	CRC	176	56
SNF	40	1			
SNF	46	2	LMB	111	20
SNF	50	2			
SNF	40	1			
SNF	42	1			
SNF 3/	45	1			
SNF	46	2			

1/ 25 (13%) longnose dace had red spots and 2 (1%) had black spots.

2/ Range of lengths and collective weights are reported for total number (n) of fish collected.

3/ Fungus was observed on the caudal and/or dorsal fin.

4/ 12 (8%) fathead minnows had subcutaneous black spots.

5/ 18 (56%) green sunfish had black spots

6/ Sand shiner with black spots.

BDC-2.0 Big Dry Creek at 128th Avenue

Sample Date: 17 October 1997

Station Length = 137.2 m
Mean Width = 5.8 m

Sampling Area = 0.0796 ha

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
FMW 1/	49	1	FMW	43	0.5	SNF	35	0.5
FMW	56	2	FMW	53	1	SNF	45	1
FMW	38	0.25	FMW	62	2	SNF	44	1
FMW	56	2	FMW	40	0.5	SNF	32	0.5
FMW	51	1	FMW	54	1	SNF	38	1
FMW	57	2	FMW	54	1	SNF	39	1
FMW	47	0.5	FMW	46	0.5			
FMW	46	1	FMW	45	0.5	LND 4/	105	11
FMW	52	1	FMW	55	1	LND	95	8
FMW	36	0.5	FMW	36	0.5	LND	84	5
FMW	50	1				LND	90	7
FMW	52	1	SNF 3/	86	12	LND	54	1
FMW	60	2	SNF	79	9	LND	24	0.25
FMW	50	1	SNF	76	8	LND	26	0.25
FMW	43	0.5	SNF	82	6	LND	29	0.25
FMW	45	0.5	SNF	72	8	LND	28	0.25
FMW	37	0.25	SNF	64	4	LND	86	7
FMW	45	0.5	SNF	48	2	LND	92	8
FMW	60	2	SNF	38	1	LND	90	8
FMW	60	2	SNF	43	1	LND	37	0.5
FMW	45	0.5	SNF	40	1	LND	30	0.25
FMW	51	1	SNF	37	0.5	LND	34	0.5
FMW	59	2	SNF	33	0.5	LND	33	0.25
FMW	60	2	SNF	42	1	LND	27	0.25
FMW	50	1	SNF	39	1			
FMW	44	1	SNF	35	0.5			
FMW 2/	35-65	65 n=60	SNF	37	0.5			
FMW	68	3	SNF	37	0.5			
FMW	49	1	SNF	30	0.25			
FMW	48	0 5	SNF	33	0.5			
FMW	55	1	SNF	25	0.25			
FMW	59	2	SNF	40	1			
FMW	47	0.5	SNF	93	16			
FMW	60	2	SNF	82	11			
FMW	48	1	SNF	82	9			
FMW	47	1	SNF	90	14			
FMW	54	1	SNF	48	2			
FMW	53	1	SNF	40	1			
FMW	49	1	SNF	36	0.5			
FMW	54	2	SNF	46	1			
FMW	64	3	SNF	37	1			
FMW	39	0.5	SNF	44	1			
FMW	47	1	SNF	51	3			
FMW	45	0.5	SNF	39	1			

BDC-2.0 (Continued)

Species	Length (mm)	Weight (g)	
MSQ 2/	22-28	5	n=20
MSQ	34	0.25	
MSQ	31	0.25	
MSQ	43	1	
MSQ	43	0.5	
MSQ	35	0.5	
MSQ	35	0.25	
MSQ	25	0.25	
MSQ	25	0.25	
MSQ	31	0.25	
MSQ	28	0.25	
MSQ	24	0.25	
MSQ	22	0.25	
MSQ	23	0.1	
MSQ	22	0.2	
CRC 5/	52	1	
CRC 5/	48	1	
BGL 6/	52	2	
BGL	46	2	
BGL	34	0.5	
WHS	80	6	
WHS	57	3	

1/ 31 (27%) fathead minnows had subcutaneous black spots and 9 (8%) had red spots
2/ Range of lengths and collective weights are reported for total number (n) of fish collected
3/ 12 (31%) green sunfish had black spots
4/ 7 (41%) longnose dace had red spots
5/ Creek chub with red spots.
6/ Bluegill with subcutaneous black spots

BDC-3.0 Big Dry Creek at Interstate-25

Sample Date: 16 October 1997

Station Length = 91.4 m
Mean Width = 6.1 m

Sampling Area = 0.0558 ha

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
LND 1/	116	17	LND	94	11	LND	98	11
LND	102	12	LND	83	6	LND	92	10
LND	85	7	LND	95	10	LND	72	4
LND	102	12	LND	92	9	LND	91	8
LND	92	9	LND	91	8	LND	82	5
LND	105	11	LND	68	4	LND	69	3
LND	86	7	LND	92	8	LND	87	8
LND	100	9	LND	115	19	LND	60	2
LND	88	9	LND	100	12	LND	87	6
LND	83	6	LND	102	11	LND	62	3
LND	87	8	LND	95	8	LND	64	3
LND	97	11	LND	91	8	LND	67	3
LND	89	8	LND	81	5	LND	43	1
LND	118	15	LND	117	14	LND	45	1
LND	80	5	LND	65	3	LND	68	2
LND	100	12	LND	94	9	LND	57	2
LND	98	12	LND	93	10	LND	66	3
LND	96	10	LND	92	8	LND	62	2
LND	86	6	LND	94	8	LND	65	3
LND	93	8	LND	79	5	LND	63	3
LND	120	18	LND	98	11	LND	70	3
LND	101	11	LND	91	8	LND	66	3
LND	102	12	LND	78	5	LND	71	4
LND	85	6	LND	66	3	LND	79	5
LND	94	8	LND	92	9	LND	93	7
LND	99	11	LND	89	7	LND	73	4
LND	93	10	LND	91	8	LND	102	10
LND	101	10	LND	92	8	LND	82	6
LND	102	12	LND	64	3	LND	81	5
LND	93	9	LND	96	11	LND	46	1
LND	95	10	LND	85	8	LND	65	3
LND	65	3	LND	100	10	LND	98	9
LND	97	10	LND	84	6	LND	102	11
LND	105	12	LND	66	3	LND	84	6
LND	83	6	LND	92	9	LND	99	10
LND	86	6	LND	93	9	LND	103	8
LND	83	5	LND	97	10	LND	93	8
LND	93	8	LND	67	3	LND	60	2
LND	99	10	LND	71	4	LND	87	7
LND	106	12	LND	102	12	LND	89	8
LND	95	9	LND	97	10	LND	95	10
LND	94	8	LND	62	3	LND	99	8
LND	95	9	LND	97	9	LND	64	2
LND	95	8	LND	70	2	LND	82	5
LND	97	11	LND	62	2	LND	44	1
LND	85	4	LND	86	7	LND	73	3
LND	93	9	LND	78	5	LND	62	2
LND	66	3	LND	88	7	LND	69	3
LND	101	11	LND	62	3	LND	34	1

BDC-3.0 (Continued)

Species	Length (mm)	Weight (g)		Species	Length (mm)	Weight (g)		Species	Length (mm)	Weight (g)	
LND	66	2		WHS	64	3		SNF	50	2	
LND	56	2		WHS	62	3		SNF	27	1	
LND	47	1		WHS	72	3		SNF	46	1	
LND	68	3		WHS	62	3		SNF	30	1	
LND	63	2		WHS	65	3		SNF	92	19	
LND 2/	85-105	180	n=38	WHS	67	4		SNF	36	1	
				WHS	80	5		SNF	66	5	
WHS 3/	224	128		WHS	74	4		SNF	37	1	
WHS	170	70		WHS	66	3		SNF	52	3	
WHS	187	80		WHS	62	2		SNF	41	2	
WHS	224	150		WHS	68	3		SNF	90	13	
WHS	121	22		WHS	61	2		SNF	85	9	
WHS	96	10		WHS	62	3		SNF	85	13	
WHS	81	7		WHS	60	2		SNF	81	10	
WHS	80	7		WHS	185	69		SNF	77	8	
WHS	89	9		WHS	100	13		SNF	81	9	
WHS	67	4		WHS	73	4		SNF	71	6	
WHS	66	3		WHS	96	11		SNF	76	8	
WHS	71	5		WHS	104	14		SNF	78	9	
WHS	92	10		WHS	91	9		SNF	70	6	
WHS	56	3		WHS	66	3		SNF	71	7	
WHS	57	2		WHS	62	3		SNF	71	6	
WHS	56	2		WHS	61	3		SNF	66	5	
WHS	89	8		WHS	60	2		SNF	63	5	
WHS	99	9		WHS	58	2		SNF	55	2	
WHS	101	13		WHS 2/	53-85	48	n=11	SNF	55	[illegible]	
WHS	99	12		WHS 2/	55-69	28	n=11	SNF	52	2	
WHS	85	7						SNF	51	2	
WHS	88	5		SNF 4/	109	24		SNF	52	2	
WHS	79	6		SNF	39	1		SNF	80	9	
WHS	91	8		SNF	102	20		SNF	47	2	
WHS	60	2		SNF	41	1		SNF	33	1	
WHS	75	4		SNF	39	1		SNF	47	2	
WHS	73	4		SNF	52	2		SNF	47	2	
WHS	66	3		SNF	55	3		SNF	52	2	
WHS	61	3		SNF	40	1		SNF	37	1	
WHS	72	5		SNF	37	1		SNF	107	24	
WHS	77	5		SNF	75	7		SNF	96	18	
WHS	63	3		SNF	45	2		SNF	76	8	
WHS	62	3		SNF	100	18		SNF	78	7	
WHS	72	3		SNF	31	1		SNF	81	10	
WHS	73	4		SNF	45	1		SNF	77	7	
WHS	76	4		SNF	97	16		SNF 2/	55-73	44	n=10
WHS	79	5		SNF	59	4		SNF 2/	35-53	35	n=23
WHS	66	3		SNF	47	1		SNF 2/	28-53	41	n=29
WHS	70	4		SNF	92	15					

BDC-3.0 (Continued)

Species	Length (mm)	Weight (g)		Species	Length (mm)	Weight (g)
FMW 5/	66	3		MSQ	47	1
FMW	46	1		MSQ	26	0.25
FMW	47	1		MSQ	25	0.25
FMW	58	2		MSQ	26	0.25
FMW	43	1		MSQ	27	0.25
FMW	44	1		MSQ	22	0.25
FMW	68	4		MSQ	27	0.5
FMW	50	1		MSQ	32	0.5
FMW	43	1		MSQ	26	0.25
FMW	54	2		MSQ	28	0.5
FMW	41	1		MSQ	28	0.5
FMW	43	1		MSQ	25	0.25
FMW	53	2		MSQ	29	0.5
FMW	60	2		MSQ	27	0.25
FMW	52	1		MSQ	25	0.25
FMW	50	1		MSQ	29	0.5
FMW	47	1		MSQ	23	0.25
FMW	48	1		MSQ	27	0.25
FMW	53	1		MSQ	24	0.25
FMW	42	1		MSQ	28	0.25
FMW	50	1				
FMW	64	3		LGS	222	118
FMW	74	4		LGS	224	130
FMW	54	2		LGS	174	53
FMW	60	2		LGS	134	31
FMW	53	1		LGS	87	7
FMW	36	1		LGS	90	8
FMW	44	1		LGS	212	110
FMW	43	1		LGS	114	18
FMW	54	2		LGS	108	14
FMW	60	2		LGS	105	15
FMW	48	1		LGS	87	7
FMW	45	1		LGS	250	185
FMW	43	1		LGS	167	60
FMW	46	1				
FMW	68	3		BGL	55	3
FMW	59	2		BGL	44	1
FMW	73	4		BGL	57	3
FMW	50	1		BGL	55	3
FMW	42	1		BGL	45	2
FMW 2/	43-70	30	n=14			
				LMB	102	16

1/ 94 (50%) longnose dace had red spots.

2/ Range of lengths and collective weights are reported for total number (n) of fish collected.

3/ 9 (10%) white suckers had red spots.

4/ 35 (29%) green sunfish had black spots

5/ Black external parasite present on the bottom of the snout.

BDC-5.0 Big Dry Creek at Weld County Road 4

Sample Date: 16 October 1997 Station Length = 68.6 m Sampling Area = 0.0274 ha
Mean Width = 4.0 m

Species	Length (mm)	Weight (g)		Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	
SAH 1/	55-75	410	n=150	SAH	67	3	SAH 1/	40-73	475	n=196
SAH 1/	55-75	412	n=161	SAH	70	3	SAH	32	0.5	
SAH	56	1		SAH	62	2				
SAH	52	1		SAH	65	3	FMW 1/	50-80	490	n=179
SAH	53	1		SAH	72	3	FMW 1/	50-75	500	n=185
SAH	44	0.5		SAH	62	2	FMW 1/	50-75	386	n=151
SAH	41	0.5		SAH	74	3	FMW 1/	37-57	112	n=94
SAH	45	0.5		SAH	68	2	FMW 1/	50-80	470	n=165
SAH	42	0.25		SAH	69	2	FMW 1/	50-80	130	n=50
SAH	50	1		SAH	68	2	FMW 1/	45-52	15	n=15
SAH	41	0.5		SAH	66	3	FMW 1/	55-75	34	n=19
SAH	54	1		SAH	68	3	FMW 2/	67	3	
SAH	44	0.5		SAH	70	3	FMW	63	3	
SAH	45	0.5		SAH	65	2	FMW	62	3	
SAH	39	0.5		SAH	72	3	FMW	43	1	
SAH	46	0.5		SAH	66	2	FMW	60	2	
SAH	42	0.5		SAH	46	1	FMW	62	4	
SAH	45	0.5		SAH	62	2	FMW	65	3	
SAH	44	0.5		SAH	62	3	FMW	58	2	
SAH	39	0.25		SAH	73	4	FMW	52	1	
SAH	42	0.5		SAH	60	3	FMW	62	3	
SAH	42	0.5		SAH	46	1	FMW	56	2	
SAH	45	0.5		SAH	66	2	FMW	55	1	
SAH	45	0.5		SAH	55	1	FMW	53	1	
SAH	44	0.5		SAH	57	1	FMW	52	1	
SAH	38	0.25		SAH	72	3	FMW	57	2	
SAH	48	0.5		SAH	71	3	FMW	56	2	
SAH	45	0.5		SAH	63	2	FMW	52	2	
SAH	46	0.5		SAH	66	3	FMW	58	2	
SAH	49	1		SAH	65	3	FMW	59	2	
SAH 1/	55-75	485	n=180	SAH	71	4	FMW	50	1	
SAH 1/	55-75	237	n=91	SAH	69	3	FMW	61	3	
SAH 1/	40-55	25	n=35	SAH	73	3	FMW	61	2	
SAH	46	0.5		SAH	73	3	FMW	50	2	
SAH 1/	55-70	102	n=42	SAH	67	2	FMW	61	3	
SAH 1/	60-80	350	n=145	SAH	65	2	FMW	65	3	
SAH 1/	60-75	280	n=109	SAH	66	2	FMW	49	1	
SAH	44	1		SAH	63	2	FMW	65	3	
SAH	44	1		SAH	40	1	FMW	54	2	
SAH	60	3		SAH	65	2	FMW	63	3	
SAH	42	1		SAH	63	2	FMW	50	1	
SAH	37	0.5		SAH	72	4	FMW	65	3	
SAH	67	3		SAH	65	2	FMW	66	3	
SAH	68	3		SAH	67	3	FMW	47	1	
SAH	70	3		SAH	67	3	FMW	63	2	
SAH	38	0.5		SAH	67	3	FMW	59	2	
SAH	67	3		SAH	66	2	FMW	59	2	
SAH	67	2		SAH	65	2	FMW	58	2	
SAH	58	2		SAH	67	3	FMW	63	2	

BDC-5.0 (Continued)

Species	Length (mm)	Weight (g)		Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	
FMW	44	1		SNF	44	1	LND	89	5	
FMW	56	1		SNF	44	1	LND	63	2	
FMW	70	4		SNF	49	2	LND	62	2	
FMW 1/	45-78	280	n=128	SNF	50	2	LND	67	3	
FMW 1/	50-65	135.0	n=64	SNF	41	1	LND	84	5	
FMW 1/	47-62	170	n=84	SNF	44	1	LND	68	3	
FMW 1/	45-74	235	n=103	SNF	42	1				
FMW 1/	45-65	34	n=16	SNF	44	1				
FMW	45	1		SNF	44	1	MSQ 1/	25-52	38	n=50
FMW	47	1		SNF	51	2	MSQ	42	1	
				SNF	40	1	MSQ	37	0.5	
SNF 3/	82	9		SNF	51	2	MSQ	38	0.5	
SNF	99	16		SNF	71	5	MSQ	38	0.5	
SNF	96	14		SNF	43	1	MSQ	48	1	
SNF	88	11		SNF	43	1	MSQ	54	2	
SNF	81	9		SNF	45	2	MSQ	33	0.5	
SNF	73	6		SNF	48	2	MSQ	38	0.5	
SNF	72	6		SNF	51	2	MSQ	28	0.25	
SNF	62	5		SNF	44	1	MSQ	40	0.5	
SNF	63	4		SNF	45	1	MSQ	42	0.5	
SNF	73	6		SNF	37	1	MSQ	38	0.5	
SNF	65	4		SNF	37	1	MSQ	29	0.25	
SNF	64	3		SNF	39	1	MSQ	40	0.5	
SNF	56	3		SNF	51	2	MSQ	38	0.5	
SNF	60	3		SNF	35	1	MSQ	31	0.25	
SNF	56	3		SNF	41	1	MSQ	40	0.5	
SNF	57	3		SNF	44	1	MSQ	42	1	
SNF	50	2		SNF	40	1	MSQ	38	0.5	
SNF	52	2					MSQ	32	0.25	
SNF	49	2		LND 4/	80	5	MSQ	24	0.25	
SNF 1/	35-54	35	n=21	LND	62	2	MSQ	31	0.25	
SNF 1/	39-49	5	n=5	LND	87	7	MSQ	40	0.5	
SNF	44	1		LND	51	1	MSQ	33	0.25	
SNF	48	2		LND	67	3	MSQ	36	0.25	
SNF	47	2		LND	65	2	MSQ	29	0.25	
SNF	57	3		LND	67	3	MSQ	35	0.25	
SNF	80	8		LND	50	1	MSQ	30	0.25	
SNF	50	2		LND	79	5	MSQ	44	1	
SNF	60	3		LND	57	1	MSQ	41	0.5	
SNF	41	1		LND	67	3	MSQ	40	0.5	
SNF	38	1		LND	65	2	MSQ	36	0.5	
SNF	52	2		LND	63	2	MSQ	42	1	
SNF	38	1		LND	67	2	MSQ	43	0.5	
SNF	43	1		LND	62	1	MSQ	43	0.5	
SNF	42	1		LND	68	3	MSQ	37	0.5	
SNF	62	3		LND	53	1				

BDC-5.0 (Continued)

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
WHS	129	27	LMB	94	10
WHS	124	21	LMB	113	22
WHS	120	22	LMB	67	4
WHS	122	20	LMB	64	4
WHS	96	10			
WHS	123	20	PKS	75	7
WHS	127	19	PKS	68	6
WHS	131	24			
WHS	121	20	LGS	121	22
WHS	131	25			
WHS	97	10	BST	61	1
WHS	103	11			
WHS	152	16			
WHS	121	19			
WHS	89	8			
WHS	103	10			
WHS	113	15			
WHS	130	27			
WHS	105	12			
WHS	92	8			
WHS	84	6			
WHS	103	12			
WHS	85	6			
WHS	102	10			
WHS	77	5			
WHS	80	5			
WHS	78	5			
WHS	65	2			
WHS	126	24			
WHS	105	12			
BGL	59	3			
BGL	49	2			
BGL	45	2			
BGL	45	1			
BGL	52	2			
BGL	44	1			
BGL	48	2			
BGL	43	1			
BGL	44	1			

1/ Range of lengths and collective weights are reported for total number (n) of fish collected.

2/ 2 (<1%) fathead minnows had red spots.

3/ 17 (20%) green sunfish had black spots.

4/ 10 (43%) longnose dace had red spots..

BDC-6.0 Big Dry Creek at Wattenberg, Weld County Road 23

Sample Date: 17 October 1997

Station Length = 91.4 m
Mean Width = 5.5 m

Sampling Area = 0.0503 ha

Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)	Species	Length (mm)	Weight (g)
FMW	78	6	LND	69	2	LGS	215	100
FMW	79	6	LND	76	4			
FMW	74	5	LND	66	2	BKS	64	2
FMW	67	3	LND	67	3			
FMW	63	2	LND	93	8			
FMW	73	2	LND	97	10			
FMW	60	2	LND	85	6			
FMW	60	2	LND	85	5			
FMW	74	4	LND	61	2			
FMW	66	3						
FMW	58	2	SNF 2/	58	2			
FMW	55	1	SNF	49	1			
FMW	50	1	SNF	43	1			
FMW	60	2	SNF	43	1			
FMW	60	2	SNF	36	0.5			
FMW	61	2	SNF	82	10			
FMW	48	1	SNF	56	3			
FMW	56	3	SNF	47	2			
FMW	50	1	SNF	52	2			
FMW	47	1	SNF	52	2			
FMW	44	0.5	SNF	43	1			
FMW	40	0.5	SNF	44	1			
FMW	39	0.5	SNF	37	0.5			
FMW	40	0.5	SNF	38	1			
FMW	77	5						
FMW	80	6	WHS	422	830			
FMW	64	3	WHS	336	480			
FMW	71	4	WHS	298	315			
FMW	56	2	WHS	239	145			
FMW	50	1	WHS	87	7			
FMW	31	0.25	WHS	365	580			
LND 1/	96	9	SAH	36	0.25			
LND	95	9	SAH	63	3			
LND	117	13	SAH	70	3			
LND	95	7	SAH	68	3			
LND	97	8	SAH	38	0.5			
LND	100	10	SAH	37	0.25			
LND	78	5	SAH	34	0.25			
LND	111	12	SAH	67	3			
LND	84	5						
LND	81	6	MSQ	25	0.25			
LND	70	3	MSQ	23	0.25			
LND	81	4						

1/ 10 (48%) longnose dace had red spots.
2/ 2 (14%) green sunfish had black spots