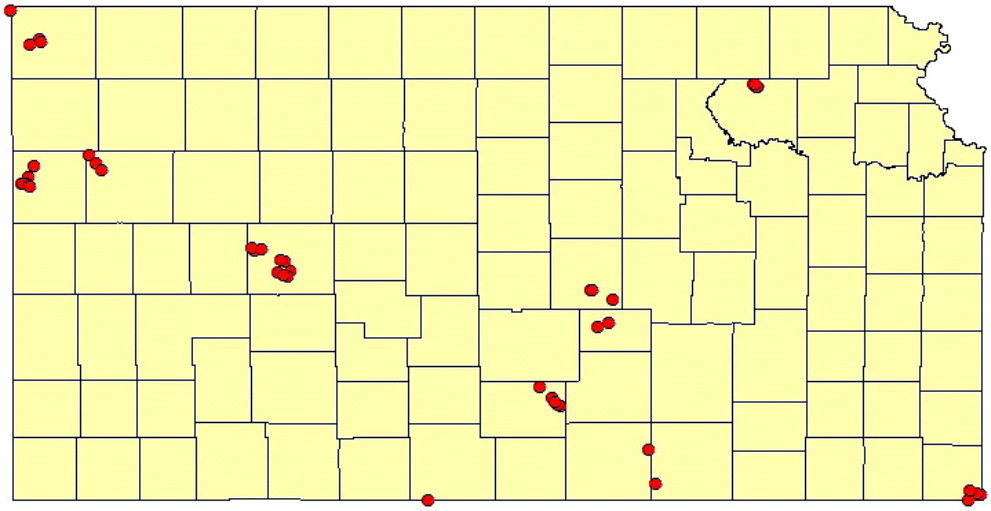
Kansas Department of Wildlife & Parks
Stream Monitoring and Assessment Program

RFM 2006 LANDOWNER SURVEY
SITE SUMMARIES

December 2007



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RFM (Rare Fish & Mussels) 2006 GENERAL PROTOCOLS

SITE SELECTION:

Site selection consisted of areas that contain or historically inhabited rare fish or mussel species. Clear Fork Creek sites in Pottawatomie county were five surveys conducted to record the affects on Topeka shiners (*Notropis topeka)* after a new bridge and stream alignment in spring of 2006. Five sites on Smoots Creek, Kingman county, were the second year of a five year study on the affects of an ammonia pipeline break in winter of 2004. The remainder of the sites were selected using aerial photos in ArcMap and finding locations that may contain the best habitat for the fish or mussel species being surveyed. After gaining landowner permission in the spring, the site would be surveyed during the summer at or close to seasonal flow. When arriving at the site the best possible habitat on the stream was selected to conduct the survey. In addition, the amount of sample site wadeable (chest waders) was also taken into consideration.

SITE SETUP:

The length of the survey site is determined by taking 10 stream widths over a 100 meter stretch and calculating the average then take that times 40. Maximum survey length is 300 meters and the minimum is 150 meters. The determined site length is divided by 10 and 11 transects are placed along the edge of the stream. A-transect is at the downstream end and K is at the upstream end. F-transect is the middle of the survey reach. Each end of the survey site has a 1-inch mesh block off net placed across the stream where applicable.

WATER CHEMISTRY:

A water sample is first collected before any disturbance occurs in the stream. Twelve water chemistry parameters are recorded at the site using a HACH spectrophotometer, digital titrator and a SensION meter.

GPS POINT:

A GPS point is recorded in decimal degrees at the F-transect on either the right or left bank. Elevation, weather, and precision error are also recorded.

FISH COMMUNITY SAMPLING:

The stream reach is usually electrofished with one pass depending on the width of the stream. Equipment used is either a back-pack unit or a tote barge electrofishing system. All available habitats are electrofished and the amount of

time electrofished is recorded. After the site is electrofished the stream is seined, usually one pass, depending on the width of the stream. The types of seines used: 15 foot straight seine with 3/16″ mesh, 18 foot bag seine with 6 foot bag made up of 1/8″ mesh and 3/16″ mesh wings, 30 foot bag seine with 6 foot bag made up of 1/8″ mesh and 3/16″ mesh wings. The proper size seine is used to best utilize for size of the stream. Riffles are often kick-seined and the amount of time seining is also recorded.

Fish collected are kept in floating cages until the fish sampling is completed. The bigger, more easily identified fish, are identified, measured according to the Gablehouse index, then released. Fish that are threatened, endangered or in need of conservation are counted and released at the site. Smaller less identifiable fish were preserved in 10% formalin and sent to University of Kansas Museum of Natural History for identification.

MACROINVERTEBRATE COMMUNITY SAMPLING:

Macroinvertebrates are collected at the nine interior transects using a 500 micron D-frame net. The collections are made in a zigzag pattern along the survey site at each transect. For example, first sample made at B-transect is on left bank then the sample at C-transect is in the middle, then D-transect sample is on right bank then back to the middle for E-transect, continuing this pattern for the rest of the interior transects. The collecting method used is placing the D-frame net on the bottom of the stream facing upstream. The substrate is then kicked or stirred up in front of the net allowing any debris and substrate to flow in the net then the net is swept over the area as it is being removed. Samples are placed in buckets keeping the pool and riffle habitats separate. After all nine collections are made; macroinvertebrates are removed from the sample media with tweezers and preserved in 50% ethyl alcohol in the appropriate habitat jar.

A HDI (Habitat Development Index) is also conducted while collecting the macroinvertebrates. This is a habitat score made up of seven metrics given to each macrohabitat type: pool, riffle, run. The HDI score is the sum of the total scores of each unique macrohabitat sampled. Twenty minutes for one individual is spent collecting macroinvertebrates at each of these macrohabitat types. All macroinvertebrates are preserved in a jar labeled HDI containing 50% ethyl alcohol. Macroinvertebrate specimens were sent to Kansas Biological Survey in Lawrence to be identified.

PHYSICAL HABITAT DATA COLLECTION:

The physical habitat assessment parameter is used to examine all the physical attributes that influence or provide sustenance to organisms within the stream. Four different components make up the physical habitat assessment,

these consists of the thalweg profile, woody debris count, stream channel/riparian cross-sections, and stream discharge.

The first component, the thalweg profile, is a longitudinal survey of the maximum stream channel depth, habitat class, and presence of fine/soft sediment at ten or 15 equally spaced intervals between each of the 11 transects.

The second component is a count of woody debris according to size and location within bankfull and above the bankfull channel. This observation is made between transects.

The third component consists of measurements of the stream channel and riparian cross-sections. The substrate and stream channel dimensions are measured by taking a wetted width measurement at each transect and dividing this measurement by four, creating five equal points across the stream. At each point, a measurement is recorded of the stream depth, substrate type, size, and embeddedness.

At each transect, boundaries are applied to the right and left bank riparian area and the stream for visual estimating of fish cover, human influences, and riparian vegetation. The boundaries at each transect are upstream five meters, downstream five meters and a visual area perpendicular to the stream a distance of ten meters. The fish cover at each transect is a visual estimate that evaluates the type and amount of cover for fish and macroinvertebrates. Human influence is a visual evaluation of the presence and proximity of a variety of human land use activities inside and outside the stream riparian area. Another visual estimate is the evaluation of the type and amount of riparian vegetation. This estimate measures the health and level of disturbance of the stream corridor.

The vegetative cover is measured at each transect with a convex spherical densiometer. Measurements are made separately in four directions at the center of the stream and one measurement at the left and right edge water facing the riparian vegetation. Seventeen intersections are observed on the densiometer and the count (0-17) is recorded. This value consists of all the intersections on the densiometer that have vegetation covering them.

Bank characteristics are measured at each transect on the right and left bank. The characteristics consist of bank angles, undercut, and the incision. The bank angle is measured by laying a clinometer on a meter stick placed perpendicular to the water's edge and measure the angle in degrees. If a bank is undercut, the horizontal distance of the undercut perpendicular to the stream is measured. Also, a measurement of the bankfull height above the present water is recorded. This is the height from baseflow of the stream to where it would flow at its stream channel capacity. The amount of channel incision (downcutting of the stream over geological time) is measured. This is the height from the water's surface to the incipient point of the flood plain. Bankfull channel width is also

measured, which is the width from the right bankfull mark to the left bankfull mark.

The third component also includes measurements of the gradient (slope) and compass bearing (sinuosity) of the stream between each transect, back sighted at each transect from B to K. The slope, recorded in percent, is measured with a field crew member reading a clinometer at eye level and standing at or near water's edge. The field crew member then back-sights to the previous transect at an individual standing at the same depth, at a point that is equal height to eye level of the person looking through the clinometer. A field crew member also records the sinuosity of the stream in the middle of each transect and measures (back-sighting), with an Azimuth compass, the bearing to the middle of the stream at the previous transect.

The fourth and final component is a measurement of stream discharge at one chosen location indicative of the natural flow of the sample reach. Discharge is measured with a Flow Mate model 2000 flow meter at 30 equal distances (points) across the stream. Width of the stream is measured in tenths of feet and then divided by 30. This will be the width of the point being measured. The width times the depth of the point being measured gives the area of the location flow is being collected. Area times the velocity recorded by the flow meter equals the discharge in cubic feet per second at this point on the stream. The 30 discharge measurements are added together for the total discharge in CFS (Cubic Feet per Second) of the stream.

SITE PHOTO:

A photograph is taken of the survey site.

DEFINITIONS

Length of Sample Site:

Average measured stream width X 40; the minimum distance of 492 feet, or the maximum distance of 984 feet.

Stream Channel Depth:

Measurements of the maximum depth of the stream channel at 100-150 equally spaced intervals along the sample reach.

Stream Width:

The maximum, minimum, and average stream widths are based upon the wetted width measurements equal-distant apart along the sample reach.

Stream Flow:

Rate at which a volume of water flows past a point over a unit of time; measured in cubic feet per second - CFS.

Water Chemistry: **

pH - A measurement of the intensity of the basic or acidic condition of the stream. The pH may range from 0 to 14, where 0 is most acidic, 14 most basic, and 7 neutral. Natural waters usually have a pH between 6.5 and 8.5. Optimum levels for fish are 6.5 to 9.0.

Alkalinity - The capacity of water to neutralize acids. Alkalinity is expressed in mg/L of equivalent calcium carbonate. Alkalinity is a measure of how much acid can be added to a liquid without causing a great change in pH. Values between 120-400 mg/L are optimum for fish, but they may tolerate a wider range.

Conductivity - A measurement that indicates the capacity of a sample of water to carry an electrical current. Conductance is measured in micro-Siemens (FS). Kansas streams usually being 300 microSiemens (low conductivity) - 2800 microSiemens (very high conductivity).

Total Dissolved Solids - A measurement of all the dissolved solids in a water sample including minerals, chlorides, phosphates, and nitrates. Calcium carbonate, or limestone, is a common dissolved solid in Kansas streams.

Nitrates - A measurement of the nitrate ion, or more often written as "nitrate-nitrogen." Although nitrate occurs naturally in water, elevated levels in groundwater usually result from human activities such as overuse of chemical fertilizers and improper disposal of human and animal wastes. These fertilizers and wastes are sources of nitrogen-containing compounds which are converted to nitrates in the soil. Nitrates are extremely soluble in water and can move easily through soil into surface and ground water. Acceptable public drinking water supply nitrate levels are <10 mg/L.

Phosphorus -A measurement of phosphorus which is usually present in natural waters as phosphate. Organic phosphate is a part of living plants and animals, their by-products, and their remains. Phosphorus sources include human and animal wastes, industrial wastes, and land and vegetation disturbances. If excessive phosphate enters the waterway, algae and aquatic plants will grow wildly, choke up the waterway, and use up large amounts of dissolved oxygen. This condition is known as eutrophication or over-fertilization of waters. This rapid growth of aquatic vegetation eventually dies and uses up dissolved oxygen as it decays. These lowered dissolved oxygen levels cause aquatic organisms to die off.

Chlorides - Ionic compounds containing the chloride ion. Although a relatively nontoxic ion, chloride can be problematic in high concentrations. The channel catfish has survived in areas with concentrations up to 8,000 mg/L.

Ammonia - A measurement of ammonia, a form of nitrogen, which is extremely soluble in water. It is formed in nature mostly by the decay of human and animal waste. Ionized and unionized ammonia occur. The unionized form is toxic to fish and other aquatic organisms. The percentage of total ammonia in the unionized form increases as pH and water temperature increase. Fish growth and survival may be reduced at levels >0.0125 mg/L, depending on pH and temperature.

Dissolved Oxygen - A measurement indicating the quantity of free-oxygen dissolved in water available for fish and other aquatic organisms. Optimum levels for fish are >5 mg/L. Oxygen present in the water is necessary for respiration in aquatic animals and in cycling of organic matter in a stream. The amount of dissolved oxygen influences the types of species found in streams. Sunlight, temperature, stream morphology, currents, and decaying organic matter can affect dissolved oxygen content.

Turbidity - A measurement used to indicate the clarity of water. Technically, turbidity is an optical property of the water based on the amount of light reflected by suspended particles. Turbidity is measured in Formazin Turbidity Units. An FTU score of 0 is equivalent to the clarity of distilled water.

Water Temperature - Water temperature can affect spawning times, dissolved oxygen, and other water chemistry variables. It also can regulate the occurrence and distribution of vegetation, fish, invertebrates, and other organisms.

Water Chemistry Continued...

Air Temperature - can affect some water chemistry parameters.

*** water chemistry results from this survey are based on a one-time sample per site. Water chemistry can vary by day, season, and year. These results are not meant to characterize an entire stream, watershed, or replace results collected by other long-term water chemistry monitoring programs.*

Fish Population Comparisons:

This is a table showing the fish identified from the survey site. The table also indicates the relative abundance (% by #.) which is what percent that species of fish makes up of the total population of the fish community sampled. Also, the percent difference of relative abundance is shown which indicates, where comparable, the difference between the abundance of a certain species found at this site from previous surveys.

The bottom of the table has an Index of Biotic Integrity (IBI) value. This index uses twelve metrics that combine many different biological factors from a fish community. Expectation criteria are developed for each of these metrics and are assigned a score of zero thru ten. After the data is compiled and summarized, a final score is calculated, thus the IBI score. The higher the IBI score, the greater the stability exhibited by the fish community. These metrics were based on weighted metrics from an IBI designed for different regions of Kansas.

- Total number of native fish species.
- Number of native family richness.
- Total number of individuals collected.
- Number of sensitive species.
- Proportion of tolerant individuals.
- Number of native benthic species
- Number of native water column species.
- Number of long-lived species
- Proportion of individuals of introduced species
- Proportion of individuals as carnivores.
- Proportion of individuals as insectivores and invertevores
- Proportion of individuals as omnivores and herbivores

IBI Value: >= 70 good
40-69.9 fair
<40 poor

Mussel Shells Collected:

This is a list of freshwater mussel shells identified from the survey site.

Macroinvertebrates (aquatic insects) Collected:

This is a list of aquatic insects collected in the sample site.

The bottom of the table has a Macroinvertebrate Biotic Index (MBI) value. Many inverts have a tolerance value associated with each family of insects. Sensitive or pollution intolerant inverts will have a low tolerance value, tolerant or pollution tolerant inverts will have a higher tolerance value. There are also values for inverts with intermediate levels of tolerance. This tolerance value is multiplied by the number of inverts with this tolerance value. All the multiplied tolerance values are added together then divided by the number of invertebrates collected.

$$MBI = (n * t)/N$$

MBI values: <= 4.5: no impact from nutrient and oxygen demanding pollutants.
4.51 – 5.39: moderate impact
>= 5.4: high impact

Species richness is lower as you go west across the state. Changes in habitat availability and permanence of water affect species distribution. IBI and MBI scores are generally lower for the western streams because of the extreme conditions of the high plains.

Physical Habitat measurements collected:

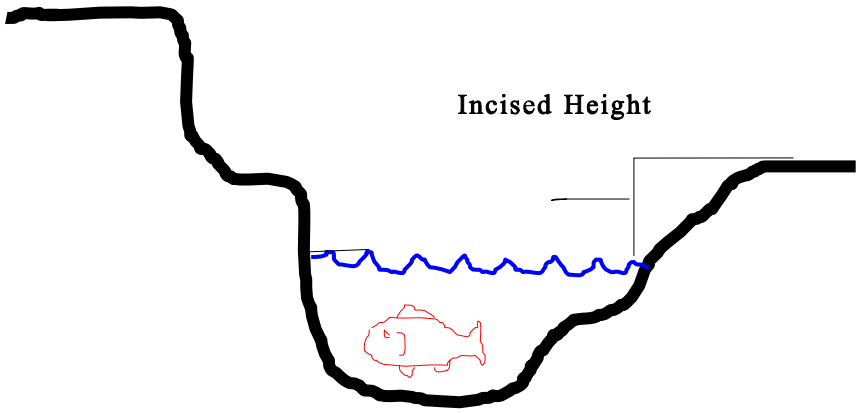
Stream Substrate - refers to particles on the stream bed, both organic (wood) and inorganic (sand). This is displayed as the percent of which substrate makes up the sample site.
Particle size:
bedrock - rocks bigger than a car
boulders - basketball to car size
cobble - tennis ball to basketball
course gravel - marble to tennis ball
fine gravel - ladybug to marble
sand - smaller than ladybug, gritty between fingers
silt - clay, muck, not gritty between fingers
other - claypan, bridge foundation, metal, tires, etc.

Bank Angle - the angle of the bank from 3.5 feet up the bank down to the waters edge measured equal-distance along the sample site. Looking downstream, the left bank is on the left side and the right bank is on the right side. Measurements were made in degrees. Any number greater than 90 (ex. 135) is considered an undercut bank.

Physical Habitat Measurements collected Continued...

Canopy (Overhead) Stream Cover - The percent of stream cover whether it is natural (trees) or artificial (bridge) that covers the stream and its banks along the sample site.

Bank (Incised) Height - downcutting of the stream over geological time, also known as the distance between the water and the point where the stream breaks over into its floodplain.



Stream Channel Type - distinguished channel habitat units (types) given to the stream.

pool - still water, low velocity, smooth glassy surface, usually deep compared to other parts of the channel. Channel types are expressed in percent makeup of sample site.

glide - water moving slowly with smooth unbroken surface.

riffle - water moving with small ripples, waves and eddies. Waves not breaking, surface tension not broken. sound: babbling, gurgling

rapid - water movement rapid and turbulent, surface with intermittent white water with breaking waves. sound: continuous rushing

cascade - water movement rapid and very turbulent over steep channel bottom. Most of water surface broken in short irregular plunges, mostly white water. sound: roaring

falls - free falling water over vertical or near vertical drop into plunge, water white over high falls. sound: splash to roar

dry channel - no water in stream channel

086-RFM-06

Rattlesnake Gulch

Wallace Co.

NE/4 of SE/4 SEC. 30, 12S, 41W

5/31/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	7 inches shallowest - 0 inches deepest - 2.1 feet		
Stream Width	21.5' Maximum	4.9' Minimum	13.1' Average
Stream Flow	0 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.8
Alkalinity	501 mg/l
Conductivity	1092 microSiemens
Total Dissolved Solids	537 mg/l
Nitrates	2.8 mg/l
Phosphorus	0.02 mg/l
Chlorides	20 mg/l
Ammonia	0 mg/l
Dissolved Oxygen	1.9 mg/l
Turbidity	24 FTU
Water Temperature	64 F
Air Temperature	68 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
NO FISH COLLECTED		
Total		

Freshwater Mussel Community

NO MUSSELS COLLECTED

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	5
Arhynchobdellida	Erpobdellidae	leech	5
Coleoptera	Curculionidae	water weevil	2
Coleoptera	Dytiscidae	predaceous diving beetle	15
Coleoptera	Haliplidae	crawling water beetle	3
Coleoptera	Hydrophilidae	water scavenger beetle	11
Decapoda	Cambaridae	crayfish	20
Diptera	Ceratopogonidae	biting midge	1
Diptera	Chironomidae	non-biting midge	10
Diptera	Sciomyzidae	marsh fly	2
Diptera	Tabanidae	horse/deer fly	1
Ephemeroptera	Baetidae	small minnow mayfly	40
Heteroptera	Belostomatidae	giant water bug	1
Heteroptera	Corixidae	water boatman	42
Heteroptera	Notonectidae	backswimmer	27
Odonata	Aeshnidae	green darner dragonfly	12
Odonata	Coenagrionidae	forktail damselfly	1
Odonata	Lestidae	marsh spreadwing damselfly	30
Odonata	Libellulidae	skimmer dragonfly	2

Macroinvertebrate Biotic Index = 5.259

BIOLOGIST NOTE:
There were a few pools at the site and we did our normal electrofishing and seining and didn't collect any fish. MBI value of 5.348 is too bad for this part of the state and the conditions of isolated pools for habitat. Many species that are tolerate is what survives in these conditions such as crayfish, water boatman, and some of the diptera order.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 33% Fine/silt - 67%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	54	10	32
	Maximum	Minimum	Average
Right Bank -	110	10	36
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

0%	0%	0%
Maximum	Minimum	Average

Left side of stream - 0%
Right side of stream - 0%
Center of stream - 0%

BANK (INCISED) HEIGHT:

2.6	1.3	2.0
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 17%
Dry Channel - 49%
Pool - 35%

087-RFM-06

Goose Creek

Wallace Co.

NW/4 of NE/4 SEC. 4, 12S, 41W

6/1/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	728 feet		
Average Stream Depth	3 feet shallowest - 0 inches deepest - 5.9 feet		
Stream Width	21.5 ' Maximum	4.9' Minimum	13.1' Average
Stream Flow	0 CFS		

2006WATER CHEMISTRY

	2006
pH	7.3
Alkalinity	207 mg/l
Conductivity	2510 microSiemens
Total Dissolved Solids	1272 mg/l
Nitrates	6.6 mg/l
Phosphorus	0.02 mg/l
Chlorides	153 mg/l
Ammonia	0.55 mg/l
Dissolved Oxygen	0.9 mg/l
Turbidity	38 FTU
Water Temperature	61 F
Air Temperature	68 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	1	0.2
green sunfish	3	0.7
northern plains killifish	408	99.0
Total	**412**	**100**

Index of Biotic Integrity = 58

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	91
Basommatophora	Physidae	pouch snail	34
Basommatophora	Planorbidae	orb snail	2
Coleoptera	Carabidae	ground beetle	1
Coleoptera	Dytiscidae	predaceous diving beetle	14
Coleoptera	Haliplidae	crawling water beetle	7
Coleoptera	Hydrophilidae	water scavenger beetle	15
Diptera	Ceratopogonidae	biting midge	1
Diptera	Chironomidae	non-biting midge	45
Diptera	Culicidae	mosquito	1
Diptera	Sciomyzidae	marsh fly	2
Diptera	Stratiomyidae	aquatic soldier fly	9
Diptera	Syrphidae	flower/hover fly	1
Diptera	Tabanidae	horse/deer fly	3
Ephemeroptera	Baetidae	small minnow mayfly	1
Heteroptera	Belostomatidae	giant water bug	1
Heteroptera	Corixidae	water boatman	1
Heteroptera	Hebridae	velvet waterbug	3
Odonata	Aeshnidae	green darner dragonfly	3
Odonata	Coenagrionidae	dancer damselfly	1
Odonata	Coenagrionidae	forktail damselfly	32
Odonata	Libellulidae	blue pirate dragonfly	2
Odonata	Libellulidae	red skimmer dragonfly	1
Odonata	Libellulidae	skimmer dragonfly	4
Tricladida	Planariidae	flatworm	6
Trombidiformes	Arrenuridae	water mite	1
Trombidiformes	Lebertiidae	water mite	1
Trombidiformes	Limnocharidae	water mite	1
Veneroida	Pisidiidae	fingernail clam	1

Macroinvertebrate Biotic Index = 6.697

BIOLOGIST NOTE:
The water chemistry values are normal for this part of the state during dry conditions. The IBI value of the fish community is not real good. This is due to only very tolerant fish species were present and there was an imbalance in the fish community with northern plains killifish making up 99% of the fish collected. This result is expected in this part of Kansas and during these existing conditions. The MBI value of 6.697 is fair for this part of the state. There seemed to be a good diversity of aquatic insects collected.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 2%
Fine/silt - 92%
Boulder - 6%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	22	2	9
	Maximum	Minimum	Average
Right Bank -	35	4	17
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

8%	0%	1%
Maximum	Minimum	Average

Left side of stream - 0%
Right side of stream - 1%
Center of stream - 2%

BANK (INCISED) HEIGHT:

5.2	2.9	3.6
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 31%
Dry Channel - 1%
Pool - 68%

088-RFM-06

Trib. Cherry Creek

Cheyenne Co.

SE/4 of SW/4 SEC. 8, 3S, 40W

6/6/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	705 feet		
Average Stream Depth	3 feet shallowest - 4 inches deepest - 7.2 feet		
Stream Width	36.4' Maximum	8.5' Minimum	19.1' Average
Stream Flow	0.186 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.7
Alkalinity	94 mg/l
Conductivity	484 microSiemens
Total Dissolved Solids	234 mg/l
Nitrates	1.8 mg/l
Phosphorus	0.01 mg/l
Chlorides	14 mg/l
Ammonia	0.02 mg/l
Dissolved Oxygen	2.7 mg/l
Turbidity	15 FTU
Water Temperature	72 F
Air Temperature	68 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	8	1.4
bluegill	114	20.0
common carp	1	0.2
green sunfish	407	71.5
largemouth bass	39	6.9
Total	**569**	**100**

Index of Biotic Integrity = 50

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pondhorn	Yes	No	Yes

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	213
Basommatophora	Physidae	pouch snail	2
Coleoptera	Dytiscidae	predaceous diving beetle	5
Coleoptera	Haliplidae	crawling water beetle	2
Coleoptera	Hydrophilidae	water scavenger beetle	7
Decapoda	Cambaridae	crayfish	3
Diptera	Ceratopogonidae	biting midge	5
Diptera	Chironomidae	non-biting midge	68
Diptera	Simuliidae	black fly	1
Ephemeroptera	Baetidae	small minnow mayfly	3
Ephemeroptera	Caenidae	small squaregill mayfly	108
Odonata	Coenagrionidae	bluet damselfly	70
Odonata	Coenagrionidae	forktail damselfly	44
Odonata	Gomphidae	common clubtail dragonfly	2
Odonata	Lestidae	marsh spreadwing damselfly	2
Odonata	Libellulidae	blue pirate dragonfly	2
Odonata	Libellulidae	red skimmer dragonfly	1
Odonata	Libellulidae	skimmer dragonfly	7
Trichoptera	Hydropsychidae	common netspinner caddisfly	1
Tricladida	Planariidae	flatworm	3
Trombidiformes	Arrenuridae	water mite	52
Trombidiformes	Limnocharidae	water mite	1
Trombidiformes	Mideopsidae	water mite	31
Veneroida	Pisidiidae	fingernail clam	7

Macroinvertebrate Biotic Index = 5.403

BIOLOGIST NOTE:
I would have liked to seen this stream 150 years ago. This stream has all the physical characteristics of an untouched western Kansas prairie stream. The stream has deep pools and narrow shallow areas and good vegetative banks. Plus, it must have a decent spring to keep it flowing even during the drought conditions of 2006. Present day you can see the influence of man with the introduction of bluegill, largemouth bass, common carp to the stream. Bluegill and largemouth bass are native to the eastern 1/3 of Kansas and common carp are introduced to the United States. There seems to be an imbalance of green sunfish making up 70% of the fish community. Primarily, there are no “minnow-like” fish present. Therefore, the IBI value is poor for this site. The MBI value is not too bad for this part of the state. There seems to be a decent diversity of inverts present.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 9%
Fine/silt - 87%
Other - 4%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	30	5	20
	Maximum	Minimum	Average
Right Bank -	120	10	43
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

28%	0%	4%
Maximum	Minimum	Average

Left side of stream - 0%
Right side of stream - 1%
Center of stream - 2%

BANK (INCISED) HEIGHT:

4.6	2.3	3.2
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 35%
Riffle - 5%
Pool - 60%

089-RFM-06

Arikaree River

Cheyenne Co.

N/2 of S/2 SEC.8, 1 S, 42 W

06/06/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	5 inches shallowest -0 inches deepest -1.5 feet		
Stream Width	24.1' Maximum	0.0 ' Minimum	11.1' Average
Stream Flow	0.00CFS		

2006 WATER CHEMISTRY

	2006
pH	7.9
Alkalinity	517 mg/l
Conductivity	1236 microSiemens
Total Dissolved Solids	610 mg/l
Nitrates	1.6 mg/l
Phosphorus	0.24 mg/l
Chlorides	8 mg/l
Ammonia	0.52 mg/l
Dissolved Oxygen	1.3 mg/l
Turbidity	89 FTU
Water Temperature	68 F
Air Temperature	72 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
fathead minnow	499	81.3
northern plains killifish	5	0.8
red shiner	2	0.3
western mosquitofish	107	17.4
yellow bullhead	1	0.2
Total	**614**	**100**

Index of Biotic Integrity = 33

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	36
Amphipoda	Hyalellidae	scud	8
Arhynchobdellida	Erpobdellidae	leech	3
Coleoptera	Dytiscidae	predaceous diving beetle	11
Coleoptera	Haliplidae	crawling water beetle	5
Coleoptera	Hydrophilidae	water scavenger beetle	27
Collembola	Poduridae	springtail	35
Diptera	Ceratopogonidae	biting midge	8
Diptera	Chironomidae	non-biting midge	322
Diptera	Culicidae	mosquito	12
Diptera	Ephydridae	shore/brine fly	2
Diptera	Sciomyzidae	marsh fly	1
Ephemeroptera	Baetidae	small minnow mayfly	15
Heteroptera	Belostomatidae	giant water bug	7
Heteroptera	Corixidae	water boatman	5
Heteroptera	Gerridae	water strider	3
Heteroptera	Notonectidae	backswimmer	66
Odonata	Aeshnidae	blue darner dragonfly	2
Odonata	Aeshnidae	green darner dragonfly	15
Odonata	Coenagrionidae	bluet damselfly	1
Odonata	Coenagrionidae	forktail damselfly	3
Odonata	Lestidae	marsh spreadwing damselfly	1
Odonata	Lestidae	spreadwing damselfly	1
Odonata	Libellulidae	blue pirate dragonfly	5
Odonata	Libellulidae	red skimmer dragonfly	5
Odonata	Libellulidae	skimmer dragonfly	7

Macroinvertebrate Biotic Index = 9.914

BIOLOGIST NOTE:
The results we found is what was expected for this dry of a spring and summer (2006) and nothing but a few drying pools existing. The IBI and MBI values are considered poor. Many very tolerant fish and aquatic insect species is all that remains in these pools. These values would be a lot different 10 years ago when the Arikaree River flowed throughout the Kansas portion of the river.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 11% Fine/silt -89%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	40 Maximum	20 Minimum	29 Average
Right Bank -	35 Maximum	10 Minimum	23 Average

CANOPY (OVERHEAD) STREAM COVER:

94% Maximum	0% Minimum	28% Average

Left side of stream - 39%
Right side of stream -29 %
Center of stream - 16%

BANK (INCISED) HEIGHT:

2.0 Maximum	1.6 Minimum	1.9 Average

STREAM CHANNEL TYPE:

Glide - 71%
Dry - 22%
Pool - 7%

090-RFM-06

Cherry Creek

Cheyenne Co.

NW/4 of SW/4 SEC.16, 3S, 40W

06/07/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	984 feet		
Average Stream Depth	2.5 feet shallowest - 1.25 feet deepest - 4.9 feet		
Stream Width	43.9' Maximum	14.6' Minimum	31.1' Average
Stream Flow	0.00CFS		

2006 WATER CHEMISTRY

	2006
pH	7.9
Alkalinity	263 mg/l
Conductivity	701 microSiemens
Total Dissolved Solids	341 mg/l
Nitrates	1.3 mg/l
Phosphorus	0 mg/l
Chlorides	21 mg/l
Ammonia	0.08 mg/l
Dissolved Oxygen	5.2 mg/l
Turbidity	50 FTU
Water Temperature	72 F
Air Temperature	72 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	22	3.0
bluegill	20	2.7
common carp	404	54.8
fathead minnow	8	1.1
green sunfish	237	32.2
largemouth bass	21	2.8
white sucker	25	3.4
Total	**737**	**100**

Index of Biotic Integrity = 46

Freshwater Mussel Community

No Mussels Collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	4
Amphipoda	Hyalellidae	scud	56
Arhynchobdellida	Erpobdellidae	leech	2
Basommatophora	Physidae	pouch snail	9
Coleoptera	Dytiscidae	predaceous diving beetle	9
Coleoptera	Haliplidae	crawling water beetle	2
Coleoptera	Hydrophilidae	water scavenger beetle	2
Decapoda	Cambaridae	crayfish	10
Diptera	Ceratopogonidae	biting midge	1
Diptera	Chironomidae	non-biting midge	9
Ephemeroptera	Baetidae	small minnow mayfly	1
Ephemeroptera	Caenidae	small squaregill mayfly	39
Heteroptera	Gerridae	water strider	1
Odonata	Coenagrionidae	forktail damselfly	1
Odonata	Libellulidae	skimmer dragonfly	3
Rhynchobdellida	Glossiphoniidae	leech	2
Tricladida	Planariidae	flatworm	1

Macroinvertebrate Biotic Index = 5.242

BIOLOGIST NOTE:
The water chemistry values were normal for this part of the state. The turbidity value was elevated due to all the common carp present at the site muddying up the water. The IBI value of the fish community is not very good. This is mostly due to common carp makeing up over half of the fish community at this site and they are an introduced fish to the United States. In turn, this introduced fish knocks out many native fish, especially native “minnow” fish that should be found in prairie streams. This is evident with collecting only eight fathead minnows. The MBI value is not bad for this part of the state even with the results showing not a very big diversity of insects collected.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 15% Fine/silt - 85%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	68	25	46
	Maximum	Minimum	Average
Right Bank -	140	30	56
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

43%	2%	14%
Maximum	Minimum	Average

Left side of stream - 6%
Right side of stream - 34%
Center of stream - 2%

BANK (INCISED) HEIGHT:

2.9	2.0	2.4
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 54%
Riffle - 0%
Pool - 46%

091-RFM-06

Cherry Creek

Cheyenne Co.

NE/4 of SE/4 SEC. 22 , 3S, 41W

06/08/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	1.6 feet shallowest - 2 inches deepest - 3.8 feet		
Stream Width	15.6' Maximum	3.9' Minimum	8.5' Average
Stream Flow	0.044 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.4
Alkalinity	260 mg/l
Conductivity	545 microSiemens
Total Dissolved Solids	264 mg/l
Nitrates	1.6 mg/l
Phosphorus	0.11 mg/l
Chlorides	3 mg/l
Ammonia	0 mg/l
Dissolved Oxygen	0.9 mg/l
Turbidity	10 FTU
Water Temperature	70 F
Air Temperature	73 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	8	1.1
fathead minnow	689	94.0
green sunfish	36	4.9
Total	**733**	**100**

Index of Biotic Integrity = 42

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pondhorn	No	No	Yes

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	30
Amphipoda	Hyalellidae	scud	5
Arhynchobdellida	Erpobdellidae	leech	5
Basommatophora	Physidae	pouch snail	78
Basommatophora	Planorbidae	orb snail	5
Coleoptera	Curculionidae	water weevil	1
Coleoptera	Dytiscidae	predaceous diving beetle	35
Coleoptera	Haliplidae	crawling water beetle	18
Coleoptera	Hydraenidae	minute moss beetle	2
Coleoptera	Hydrophilidae	water scavenger beetle	22
Diptera	Ceratopogonidae	biting midge	6
Diptera	Chironomidae	midge	65
Diptera	Culicidae	mosquito	1
Ephemeroptera	Baetidae	small minnow mayfly	3
Heteroptera	Corixidae	water boatman	1
Heteroptera	Gerridae	water strider	8
Heteroptera	Mesoveliidae	water treader	1
Heteroptera	Veliidae	shortlegged strider	13
Odonata	Aeshnidae	green darner	1
Odonata	Coenagrionidae	narrowwinged damselfly	8
Odonata	Lestidae	marsh spreadwing damselfly	2
Odonata	Libellulidae	blue pirate dragonfly	1
Odonata	Libellulidae	skimmer dragonfly	4
Odonata	Libellulidae	whitetailed skimmer dragonfly	1
Rhynchobdellida	Glossiphoniidae	leech	8
Tricladida	Planariidae	planarian	27
Veneroida	Pisidiidae	fingernail clam	17

Macroinvertebrate Biotic Index = 8.210

BIOLOGIST NOTE:
This site is like a little oasis in northwest Kansas. Since water in streams is rare in this part of the state, aquatic organisms have to be tolerant to the conditions the stream goes through season to season. The IBI value is not considered very good. This is expected though when the stream is both dry upstream and downstream of the survey site. Although, at the time of the survey there was measurable flow present which is a good sign of a spring in this area. A very tolerant fish species, the fathead minnow, was most abundant do to the fact it can adapt well to these environmental conditions. There is a good diversity of aquatic insects at this site, yet the MBI value is not very good. Like with the fish, the community is made up mostly of tolerant insect species that can sustain life under these conditions. It is still an interesting biological site with the presence of aquatic life and stream flow in these dry conditions of northwest Kansas and Cherry Creek.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 40%
Fine/silt - 38%
Fine Gravel - 13%
Course Gravel - 4%
Boulder - 5%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	80	15	46
	Maximum	Minimum	Average
Right Bank -	70	12	39
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

76%	25%	38%
Maximum	Minimum	Average

Left side of stream - 48%
Right side of stream - 41%
Center of stream - 23%

BANK (INCISED) HEIGHT:

4.6	3.3	4.0
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 37%
Riffle - 10%
Pool - 53%

092-RFM-06

Willow Creek

Wallace Co.

SW/4 of NE/4 SEC. 12 , 13S, 42W

06/12/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	1.0 feet shallowest - 0 inches deepest - 3.4 feet		
Stream Width	68.6' Maximum	0.0' Minimum	14.8 ' Average
Stream Flow	0.00 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.5
Alkalinity	391 mg/l
Conductivity	1941 microSiemens
Total Dissolved Solids	974 mg/l
Nitrates	1.9 mg/l
Phosphorus	0.01 mg/l
Chlorides	68 mg/l
Ammonia	0.05 mg/l
Dissolved Oxygen	0.6 mg/l
Turbidity	47 FTU
Water Temperature	66 F
Air Temperature	66 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
green sunfish	2	0.6
northern plains killifish	358	99.4
Total	**360**	**100**

Index of Biotic Integrity = 58

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	71
Araneae	Lycosidae	wolf spider	1
Basommatophora	Lymnaeidae	river/pond snail	5
Basommatophora	Physidae	pouch snail	77
Basommatophora	Planorbidae	orb snail	30
Coleoptera	Chrysomelidae	aquatic leaf beetle	1
Coleoptera	Dytiscidae	predaceous diving beetle	18
Coleoptera	Haliplidae	crawling water beetle	16
Coleoptera	Hydrophilidae	water scavenger beetle	36
Diptera	Ceratopogonidae	biting midge	2
Diptera	Chironomidae	midge	40
Diptera	Culicidae	mosquito	8
Diptera	Sciomyzidae	marsh fly	4
Diptera	Tabanidae	horse/deer fly	1
Ephemeroptera	Baetidae	small minnow mayfly	9
Heteroptera	Belostomatidae	giant water bug	4
Heteroptera	Corixidae	water boatman	7
Heteroptera	Hebridae	velvet waterbug	1
Heteroptera	Notonectidae	backswimmer	3
Heteroptera	Veliidae	shortlegged strider	1
Odonata	Aeshnidae	green darner	3
Odonata	Coenagrionidae	forktail damselfly	21
Odonata	Libellulidae	blue pirate dragonfly	5
Odonata	Libellulidae	skimmer dragonfly	3
Veneroida	Pisidiidae	fingernail clam	1

Macroinvertebrate Biotic Index = 7.153

BIOLOGIST NOTE:
This is a tough stream for aquatic organisms to live in with it being nothing but drying pools. The IBI value reflects this with only two tolerant fish species collected. The MBI value does indicate that many tolerant aquatic insects are present in the pools. Although, there is still a decent family diversity of insects. The results from this survey show that only the tolerant aquatic organisms to these conditions are the ones that are going to sustain life in Willow Creek.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 40% Fine/silt - 56%
Bedrock - 4%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	80	15	46
	Maximum	Minimum	Average
Right Bank -	70	12	39
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

76%	25%	38%
Maximum	Minimum	Average

Left side of stream - 48%
Right side of stream - 41%
Center of stream - 23%

BANK (INCISED) HEIGHT:

4.6	3.3	4.0
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 58%
Dry - 19%
Pool - 23%

093-RFM-06

Willow Creek

Wallace Co.

SE/4 of NE/4 SEC. 10, 13S, 42W

06/13/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	856feet		
Average Stream Depth	1.42 feet shallowest - 0 inches deepest - 4.2 feet		
Stream Width	35.8' Maximum	0.0' Minimum	13.4' Average
Stream Flow	0.161 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.4
Alkalinity	214 mg/l
Conductivity	399 microSiemens
Total Dissolved Solids	193 mg/l
Nitrates	2.1 mg/l
Phosphorus	0.05 mg/l
Chlorides	4 mg/l
Ammonia	0.27 mg/l
Dissolved Oxygen	2.4 mg/l
Turbidity	5 FTU
Water Temperature	63 F
Air Temperature	70 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	27	11.9
central stoneroller	3	1.3
golden shiner	3	1.3
green sunfish	174	77.0
largemouth bass	15	6.6
orangespotted sunfish	2	0.9
orangethroat darter	2	0.9
Total	**226**	**100**

Index of Biotic Integrity = 67

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	10
Amphipoda	Hyalellidae	scud	74
Arhynchobdellida	Erpobdellidae	leech	2
Basommatophora	Physidae	pouch snail	20
Basommatophora	Planorbidae	orb snail	1
Coleoptera	Dytiscidae	predaceous diving beetle	43
Coleoptera	Haliplidae	crawling water beetle	5
Coleoptera	Helodidae	marsh beetle	3
Coleoptera	Hydrophilidae	water scavenger beetle	4
Diptera	Ceratopogonidae	biting midge	2
Diptera	Chironomidae	midge	191
Diptera	Culicidae	mosquito	3
Diptera	Ephydridae	shore/brine fly	1
Heteroptera	Corixidae	water boatman	3
Heteroptera	Veliidae	shortlegged strider	2
Odonata	Aeshnidae	green darner	2
Odonata	Coenagrionidae	forktail damselfly	8
Rhynchobdellida	Glossiphoniidae	leech	4
Tricladida	Planariidae	planarian	160
Veneroida	Pisidiidae	fingernail clam	21

Macroinvertebrate Biotic Index = 7.148

BIOLOGIST NOTE:
This is pretty much the headwater spring of Willow Creek and the water chemistry value indicate this. The detection of flow present in the stream and being spring water make for good water quality for this area of the state. The IBI value of 67 is fair for this part state. The introduced golden shiner and largemouth bass to western Kansas and this stream will have an impact on the fish community and the IBI value. The presence of orangethroat darters at the site is a good “maintaining” sign because we didn’t catch any anywhere else on Willow Creek, like we did in the mid 1990's. There could be an imbalance in predator fish (green sunfish), which has had an effect on the smaller minnow-like fish present, like the central stoneroller, with only three being collected. The MBI value of 7.148 is fair for this area. There is still a lot of backed up standing water which is ideal for many of the tolerant insect species found in streams.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 38% Fine/silt - 58%
Fine Gravel - 4%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	55	10	24
	Maximum	Minimum	Average
Right Bank -	75	5	27
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

96%	14%	54%
Maximum	Minimum	Average

Left side of stream - 41%
Right side of stream - 64%
Center of stream - 55%

BANK (INCISED) HEIGHT:

2.6	0.7	2.0
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 44%
Riffle - 22%
Pool - 24%
Dry - 10%

094-RFM-06

Willow Creek

Wallace Co.

SW/4 of NW/4 SEC. 11, 13S, 42W

06/14/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	2.25 feet shallowest - 1.0 inches deepest - 6.1 feet		
Stream Width	78.0' Maximum	3.3' Minimum	33.9' Average
Stream Flow	0.014 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.7
Alkalinity	186 mg/l
Conductivity	420 microSiemens
Total Dissolved Solids	203 mg/l
Nitrates	1.3 mg/l
Phosphorus	0.01 mg/l
Chlorides	1 mg/l
Ammonia	0.07 mg/l
Dissolved Oxygen	4.2 mg/l
Turbidity	10 FTU
Water Temperature	68 F
Air Temperature	72 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	22	3.0
green sunfish	577	79.3
largemouth bass	34	4.7
northern plains killifish	1	0.1
orangespotted sunfish	94	12.9
Total	**728**	**100**

Index of Biotic Integrity = 53

Freshwater Mussel Community

No mussels collected

BIOLOGIST NOTE:

There was still some stream flow detected which helped maintain decent water chemistry values. The IBI value is not good. There were a lot of predator fish (sunfish, bass) collected which can be detrimental to a prairie stream in consuming all its native "minnow-like" fish. The introduced largemouth bass to western Kansas can have this effect and the 577 green sunfish is not a normal balance of predator fish in a confined stream system like Willow Creek. The MBI value is not bad for this area of the state. There seems to be a good diversity and numbers of aquatic insects collected. Having a lot of "fish-eating" predator fish at this site probably helps the macroinvertebrate community. Mainly the orangespotted sunfish and plain killifish would eat the aquatic insects.

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	41
Amphipoda	Hyalellidae	scud	320
Arhynchobdellida	Erpobdellidae	leech	18
Basommatophora	Physidae	pouch snail	49
Basommatophora	Planorbidae	orb snail	2
Branchiobdellida	Cambarincolidae	crayfish worm	1
Coleoptera	Dytiscidae	predaceous diving beetle	7
Coleoptera	Haliplidae	crawling water beetle	1
Coleoptera	Hydraenidae	minute moss beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	13
Decapoda	Cambaridae	crayfish	1
Diptera	Ceratopogonidae	biting midge	6
Diptera	Chironomidae	midge	137
Diptera	Culicidae	mosquito	4
Diptera	Phoridae	humpbacked fly	1
Diptera	Sciomyzidae	marsh fly	1
Diptera	Simuliidae	black fly	1
Ephemeroptera	Baetidae	small minnow mayfly	43
Heteroptera	Belostomatidae	giant water bug	2
Heteroptera	Corixidae	water boatman	17
Heteroptera	Notonectidae	backswimmer	1
Odonata	Aeshnidae	green darner	2
Odonata	Coenagrionidae	bluet damselfly	4
Odonata	Coenagrionidae	forktail damselfly	5
Odonata	Coenagrionidae	narrowwinged damselfly	4
Odonata	Libellulidae	red skimmer dragonfly	3
Rhynchobdellida	Glossiphoniidae	leech	1
Trichoptera	Hydroptilidae	micro caddisfly	1
Tricladida	Planariidae	planarian	13
Trombidiformes	Arrenuridae	water mite	4
Trombidiformes	Hygrobatidae	water mite	3
Trombidiformes	Limnesiidae	water mite	4
Trombidiformes	Mideopsidae	water mite	6
Trombidiformes	Pionidae	water mite	2
Trombidiformes	Unionicolidae	water mite	4
Veneroida	Pisidiidae	fingernail clam	11

Macroinvertebrate Biotic Index = 6.257

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 24% Fine/silt - 75%
Course Gravel - 1%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	27	5	16
	Maximum	Minimum	Average
Right Bank -	2	5	11
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

17%	0%	2%
Maximum	Minimum	Average

Left side of stream - 5%
Right side of stream - 0%
Center of stream - 0%

BANK (INCISED) HEIGHT:

2.9	0.7	1.9
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 15%
Riffle - 40%
Pool - 45%

095-RFM-06

Willow Creek

Wallace Co.

NW/4 of NE/4 SEC. 18, 13S, 41W

06/14/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	18 feet shallowest - 0 inches deepest - 3.2 feet		
Stream Width	34.1' Maximum	2.9' Minimum	17.8' Average
Stream Flow	0.00 CFS		

2006 WATER CHEMISTRY

	2006
pH	8.1
Alkalinity	347 mg/l
Conductivity	1388 microSiemens
Total Dissolved Solids	688 mg/l
Nitrates	1 mg/l
Phosphorus	0.03 mg/l
Chlorides	27 mg/l
Ammonia	0.03 mg/l
Dissolved Oxygen	6.9 mg/l
Turbidity	49 FTU
Water Temperature	88 F
Air Temperature	120 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	1	1.5
northern plains killifish	66	98.5
Total	**67**	**100**

Index of Biotic Integrity = 51

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pondhorn	No	No	Yes

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	1
Amphipoda	Hyalellidae	scud	104
Araneae	Lycosidae	wolf spider	1
Arhynchobdellida	Erpobdellidae	leech	1
Basommatophora	Physidae	pouch snail	208
Basommatophora	Planorbidae	orb snail	12
Coleoptera	Dytiscidae	predaceous diving beetle	12
Coleoptera	Haliplidae	crawling water beetle	32
Coleoptera	Hydrophilidae	water scavenger beetle	92
Diptera	Chironomidae	midge	40
Diptera	Culicidae	mosquito	9
Diptera	Sciomyzidae	marsh fly	1
Diptera	Tabanidae	horse/deer fly	1
Ephemeroptera	Baetidae	small minnow mayfly	17
Heteroptera	Belostomatidae	giant water bug	28
Heteroptera	Corixidae	water boatman	11
Heteroptera	Notonectidae	backswimmer	10
Odonata	Aeshnidae	green darner	13
Odonata	Coenagrionidae	forktail damselfly	92
Odonata	Coenagrionidae	narrowwinged damselfly	6
Odonata	Libellulidae	blue pirate dragonfly	23
Odonata	Libellulidae	red skimmer dragonfly	10
Odonata	Libellulidae	skimmer dragonfly	11
Odonata	Libellulidae	whitefaced skimmer dragonfly	2
Trombidiformes	Eylaidae	water mite	1
Trombidiformes	Pionidae	water mite	1

Macroinvertebrate Biotic Index = 6.904

BIOLOGIST NOTE:
The IBI and the MBI values both show the effects of a stream that is experiencing a drought trend. The fish community seems to have been hit the hardest compared to past surveys. (See back page). The only fish species left are the ones that can tolerate the existing conditions. There is still a decent diversity and high numbers of aquatic insects present. This is due to the low number fish and the good over-hanging vegetative banks.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 22%	Fine/silt - 67%
Fine Gravel - 2%	Bedrock - 9%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	25	10	19
	Maximum	Minimum	Average
Right Bank -	30	5	19
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

12%	0%	1%
Maximum	Minimum	Average

Left side of stream - 0%
Right side of stream - 4%
Center of stream - 0%

BANK (INCISED) HEIGHT:

2.3	1.6	2.0
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 41%
Riffle - 5%
Pool - 37%
Dry - 17%

Here is how the fish community has changed at this site since 1994. We used to ask the previous landowner to Wayne McKinney for permission until a closer inspection discovered that you have the property on the east side of the fence. This site is located about 75 yards east of the property line.

Date	Common Name	Number
6/7/1994	orangethroat darter	10
6/7/1994	black bullhead	18
6/7/1994	central stoneroller	83
6/7/1994	creek chub	2
6/7/1994	fathead minnow	18
6/7/1994	green sunfish	159
6/7/1994	northern plains killifish	39
6/7/1994	orangespotted sunfish	11
6/7/1994	Topeka shiner	263

Date	Common Name	Number
6/12/1995	central stoneroller	56
6/12/1995	common shiner	18
6/12/1995	creek chub	13
6/12/1995	fathead minnow	480
6/12/1995	green sunfish	175
6/12/1995	northern plains killifish	3
6/12/1995	orangespotted sunfish	129
6/12/1995	Topeka shiner	4
6/12/1995	black bullhead	23
6/12/1995	orangethroat darter	6

Date	Common Name	Number
6/13/2000	black bullhead	7
6/13/2000	central stoneroller	310
6/13/2000	bluntnose minnow	1
6/13/2000	red shiner	6
6/13/2000	orangethroat darter	5
6/13/2000	orangespotted sunfish	142
6/13/2000	northern plains killifish	12
6/13/2000	green sunfish	253
6/13/2000	fathead minnow	227
6/13/2000	creek chub	30
6/13/2000	Topeka shiner	1

Date	Common Name	Number
6/14/2006	northern plains killifish	66
6/14/2006	black bullhead	1

096-RFM-06

Willow Creek

Wallace Co.

SE/4 of NW/4 SEC. 17, 13S, 41W

06/15/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	853 feet		
Average Stream Depth	1.08 feet shallowest - 0 inches deepest - 2.8 feet		
Stream Width	37.1' Maximum	0.0' Minimum	16.7' Average
Stream Flow	0.00 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.9
Alkalinity	412 mg/l
Conductivity	2000 microSiemens
Total Dissolved Solids	1006 mg/l
Nitrates	0.7 mg/l
Phosphorus	0.01 mg/l
Chlorides	71 mg/l
Ammonia	0.17 mg/l
Dissolved Oxygen	0.2 mg/l
Turbidity	123 FTU
Water Temperature	68 F
Air Temperature	73 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
northern plains killifish	753	100.0
Total	**753**	**100**

Index of biotic integrity = 48

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	1
Amphipoda	Hyalellidae	scud	87
Arhynchobdellida	Erpobdellidae	leech	1
Basommatophora	Physidae	pouch snail	67
Basommatophora	Planorbidae	orb snail	19
Coleoptera	Dytiscidae	predaceous diving beetle	40
Coleoptera	Haliplidae	crawling water beetle	39
Coleoptera	Hydraenidae	minute moss beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	34
Coleoptera	Staphylinidae	rove beetle	1
Diptera	Ceratopogonidae	biting midge	2
Diptera	Chironomidae	midge	19
Diptera	Culicidae	mosquito	26
Diptera	Mycetophilidae	fungus gnat	1
Ephemeroptera	Baetidae	small minnow mayfly	27
Heteroptera	Belostomatidae	giant water bug	6
Heteroptera	Corixidae	water boatman	19
Heteroptera	Notonectidae	backswimmer	10
Odonata	Aeshnidae	green darner	8
Odonata	Coenagrionidae	bluet damselfly	2
Odonata	Coenagrionidae	forktail damselfly	14
Odonata	Libellulidae	blue pirate dragonfly	7
Odonata	Libellulidae	red skimmer dragonfly	1
Odonata	Libellulidae	skimmer dragonfly	6
Odonata	Libellulidae	whitetailed skimmer dragonfly	2

Macroinvertebrate biotic index = 6.527

BIOLOGIST NOTE:
This was basically just one long pool to do our survey site. The IBI value is not good but this is to be expected when you only collect one species of fish. The MBI value is okay considering the dry conditions. There is a good diversity and decent number of aquatic insect species collected. This could be due to the low number of fish not eating them.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 43% Fine/silt - 58%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	44	13	29
	Maximum	Minimum	Average
Right Bank -	32	10	19
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

0%	0%	0%
Maximum	Minimum	Average

Left side of stream - 0%
Right side of stream - 0%
Center of stream - 0%

BANK (INCISED) HEIGHT:

3.3	1.3	2.2
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 58%
Dry - 24%
Pool - 18%

097-RFM-06

North Fork Smoky Hill River

Logan Co.

SE/4 of SW/4 SEC. 8, 11S, 37W

06/19/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	617 feet		
Average Stream Depth	1.16 feet shallowest - 2 inches deepest - 2.8 feet		
Stream Width	49.7' Maximum	5.5' Minimum	20.2' Average
Stream Flow	0.141 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.8
Alkalinity	255 mg/l
Conductivity	536 microSiemens
Total Dissolved Solids	260 mg/l
Nitrates	1.6 mg/l
Phosphorus	0.01 mg/l
Chlorides	8 mg/l
Ammonia	0.06 mg/l
Dissolved Oxygen	3 mg/l
Turbidity	9 FTU
Water Temperature	75 F
Air Temperature	82 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	7	1.8
bluegill	28	7.2
common carp	205	52.4
green sunfish	106	27.1
largemouth bass	7	1.8
orangespotted sunfish	30	7.7
orangethroat darter	5	1.3
red shiner	3	0.8
Total	**391**	**100**

Index of biotic integrity = 52

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	274
Araneae	Lycosidae	wolf spider	3
Arhynchobdellida	Erpobdellidae	leech	10
Basommatophora	Physidae	pouch snail	16
Basommatophora	Planorbidae	orb snail	1
Coleoptera	Dytiscidae	predaceous diving beetle	5
Coleoptera	Hydrophilidae	water scavenger beetle	3
Diptera	Chironomidae	midge	137
Diptera	Simuliidae	black fly	4
Ephemeroptera	Baetidae	small minnow mayfly	19
Ephemeroptera	Caenidae	small squaregill mayfly	4
Heteroptera	Corixidae	water boatman	3
Heteroptera	Gerridae	water strider	2
Odonata	Aeshnidae	green darner	1
Odonata	Coenagrionidae	dancer damselfly	2
Odonata	Coenagrionidae	forktail damselfly	13
Odonata	Libellulidae	red skimmer dragonfly	1
Rhynchobdellida	Glossiphoniidae	leech	3
Tricladida	Planariidae	planarian	8
Veneroida	Pisidiidae	fingernail clam	6

Macroinvertebrate Biotic Index = 6.296

BIOLOGIST NOTE:
This is a very unimpaired area on the N.F. Smokey Hill River with its treeless grassy prairie and the narrow and wide sections of river. The only issue is the lack of present day flowing water through the area. The picture above of this site is what a western Kansas prairie stream should look like. The water chemistry values are normal for this area of the state. The IBI value of 52 is not real good but is what can be expected when there are harsh conditions (lack of water) in this area of the state. Half of the fish community is made up common carp, introduced fish to the United States is probably the most detrimental influence to this river. The presence of largemouth bass and bluegill, introduce fish to western Kansas, also has an effect on the IBI value. The presence of the orangethroat darter is a good find for this part of the state. This fish usually occupies the narrows areas (riffle areas) of the river. The MBI value is not too bad for this part of the state. The grassy over-hanging vegetation on the banks is what helps with this value.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 47% Fine/silt - 36%
Fine Gravel - 13% Course Gravel - 4%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	50	15	30
	Maximum	Minimum	Average
Right Bank -	130	10	33
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

13%	0%	2%
Maximum	Minimum	Average

Left side of stream - 7%
Right side of stream - 0%
Center of stream - 0%

BANK (INCISED) HEIGHT:

4.8	2.0	4.6
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 50%
Riffle - 6%
Pool - 44%

098-RFM-06

North Fork Smoky Hill River

Logan Co.

SW/4 of NE/4 SEC. 35, 11S, 37W

06/20/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	564 feet		
Average Stream Depth	2.9 feet shallowest - 3 inches deepest - 4.8 feet		
Stream Width	23.7' Maximum	6.8' Minimum	14.3' Average
Stream Flow	0.006 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.6
Alkalinity	292 mg/l
Conductivity	896 microSiemens
Total Dissolved Solids	439 mg/l
Nitrates	1.5 mg/l
Phosphorus	0.01 mg/l
Chlorides	69 mg/l
Ammonia	0.01 mg/l
Dissolved Oxygen	1.8 mg/l
Turbidity	7 FTU
Water Temperature	72 F
Air Temperature	79 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	9	4.3
bluegill	107	50.7
common carp	15	7.1
green sunfish	43	20.4
largemouth bass	34	16.1
orangespotted sunfish	3	1.4
Total	**211**	**100**

Index of Biotic Integrity = 51

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	14
Amphipoda	Hyalellidae	scud	411
Arhynchobdellida	Erpobdellidae	leech	1
Basommatophora	Lymnaeidae	river/pond snail	1
Basommatophora	Physidae	pouch snail	38
Coleoptera	Dytiscidae	predaceous diving beetle	2
Coleoptera	Hydrophilidae	water scavenger beetle	4
Diptera	Ceratopogonidae	biting midge	1
Diptera	Chaoboridae	phantom midge	1
Diptera	Chironomidae	midge	96
Diptera	Sciomyzidae	marsh fly	1
Diptera	Tabanidae	horse/deer fly	1
Ephemeroptera	Baetidae	small minnow mayfly	34
Ephemeroptera	Caenidae	small squaregill mayfly	102
Heteroptera	Belostomatidae	giant water bug	2
Heteroptera	Corixidae	water boatman	1
Heteroptera	Mesoveliidae	water treader	1
Heteroptera	Veliidae	shortlegged strider	4
Odonata	Aeshnidae	green darner	2
Odonata	Coenagrionidae	bluet damselfly	46
Odonata	Coenagrionidae	dancer damselfly	3
Odonata	Coenagrionidae	forktail damselfly	38
Odonata	Corduliidae	bog skimmer dragonfly	1
Odonata	Libellulidae	blue pirate dragonfly	15
Odonata	Libellulidae	raggedy skimmer dragonfly	1
Odonata	Libellulidae	skimmer dragonfly	9
Rhynchobdellida	Glossiphoniidae	leech	1
Trichoptera	Hydroptilidae	micro caddisfly	1
Trichoptera	Philopotamidae	fingernet caddisfly	52
Veneroida	Pisidiidae	fingernail clam	12

Macroinvertebrate Biotic Index = 5.244

BIOLOGIST NOTE:
This site is basically an oasis on the N.F. Smokey Hill River with much of the other parts of the NF Smoky Hill River being dry. The IBI value of 51 is not real good. This could be due to the environmental conditions (lack of water) of western Kansas and the fish community mostly made up of non-native to western Kansas fish species: bluegill, common carp, and largemouth bass. The MBI value is actually fairly good for this area of the state. The diversity of insects and the over-hanging vegetative banks helps this value. The water chemistry values are normal for this area of the state.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 91% Fine/silt - 5%
Fine Gravel - 4%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	90	10	35
	Maximum	Minimum	Average
Right Bank -	50	5	27
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

9%	0%	3%
Maximum	Minimum	Average

Left side of stream - 2%
Right side of stream - 6%
Center of stream - 0%

BANK (INCISED) HEIGHT:

2.3	1.3	1.8
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 8%
Riffle - 7%
Pool - 85%

099-RFM-06

North Fork Smoky Hill River

Logan Co.

NE/4 of NE/4 SEC. 18, 12S, 36W

06/21/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	1.4 feet shallowest - 0 inches deepest - 3.3 feet		
Stream Width	60.8' Maximum	0.0' Minimum	20.5' Average
Stream Flow	0.00 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.7
Alkalinity	239 mg/l
Conductivity	1975 microSiemens
Total Dissolved Solids	32 mg/l
Nitrates	0.01 mg/l
Phosphorus	0.01 mg/l
Chlorides	87 mg/l
Ammonia	0.04 mg/l
Dissolved Oxygen	4.7 mg/l
Turbidity	991 FTU
Water Temperature	72 F
Air Temperature	75 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
bluegill	403	70.8
channel catfish	1	0.2
common carp	36	6.3
green sunfish	27	4.7
largemouth bass	86	15.1
white crappie	16	2.8
Total	**569**	**100**

Index of Biotic Integrity = 46

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	4
Amphipoda	Hyalellidae	scud	96
Basommatophora	Lymnaeidae	river/pond snail	1
Basommatophora	Physidae	pouch snail	8
Coleoptera	Dytiscidae	predaceous diving beetle	1
Coleoptera	Elmidae	riffle beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	3
Decapoda	Cambaridae	crayfish	11
Diptera	Ceratopogonidae	biting midge	1
Diptera	Chironomidae	midge	25
Diptera	Tipulidae	crane fly	1
Ephemeroptera	Baetidae	small minnow mayfly	15
Ephemeroptera	Caenidae	small squaregill mayfly	27
Heteroptera	Belostomatidae	giant water bug	1
Odonata	Aeshnidae	green darner	2
Odonata	Coenagrionidae	bluet damselfly	40
Odonata	Coenagrionidae	dancer damselfly	1
Odonata	Coenagrionidae	forktail damselfly	18
Odonata	Gomphidae	clubtail dragonfly	6
Odonata	Libellulidae	skimmer dragonfly	5

Macroinvertebrate Biotic Index = 5.329

BIOLOGIST NOTE:
This site is basically an oasis on the N.F. Smokey Hill River with much of the other parts of the NF Smoky Hill River being dry. The IBI value for the fish community is not real good. Most of the fish community is made up of non-native fish to western Kansas: white crappie, largemouth bass, bluegill, and common carp. This fish and the lack of “minnow” species of fish is what causes the low IBI value. The MBI value of 5.329 is decent for this area of the state. This decent value is probably due to the undercut and over-hanging grassy banks which provide good habitat for the aquatic insects.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 65% Course Gravel -12%
Fine Gravel -23%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	85	10	23
	Maximum	Minimum	Average
Right Bank -	140	18	62
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

28%	0%	8%
Maximum	Minimum	Average

Left side of stream - 12%
Right side of stream - 13%
Center of stream - 1%

BANK (INCISED) HEIGHT:

2.9	0.2	2.2
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 37%
Dry - 21%
Pool - 42%

100-RFM-06

South Fork Walnut Creek

Ness Co.

NW/4 of SW/4 SEC. 17, 19S, 24W

06/22/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	4 inches shallowest - 0 inches deepest - 1.6 feet		
Stream Width	14.6' Maximum	0.0' Minimum	5.2' Average
Stream Flow	0.00 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.6
Alkalinity	259 mg/l
Conductivity	1324 microSiemens
Total Dissolved Solids	655 mg/l
Nitrates	3.4 mg/l
Phosphorus	0.03 mg/l
Chlorides	187 mg/l
Ammonia	0.11 mg/l
Dissolved Oxygen	1.6 mg/l
Turbidity	15 FTU
Water Temperature	64 F
Air Temperature	66 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	26	2.8
common carp	3	0.3
fathead minnow	16	1.7
green sunfish	305	33.1
western mosquitofish	572	62.0
Total	**922**	**100**

Index of Biotic Integrity = 75

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	7
Amphipoda	Hyalellidae	scud	50
Basommatophora	Physidae	pouch snail	60
Basommatophora	Planorbidae	orb snail	12
Coleoptera	Curculionidae	water weevil	1
Coleoptera	Dytiscidae	predaceous diving beetle	37
Coleoptera	Haliplidae	crawling water beetle	5
Coleoptera	Helodidae	marsh beetle	9
Coleoptera	Hydraenidae	minute moss beetle	3
Coleoptera	Hydrophilidae	water scavenger beetle	13
Coleoptera	Staphylinidae	rove beetle	2
Diptera	Ceratopogonidae	biting midge	2
Diptera	Chaoboridae	phantom midge	9
Diptera	Chironomidae	midge	86
Diptera	Culicidae	mosquito	3
Ephemeroptera	Baetidae	small minnow mayfly	6
Heteroptera	Corixidae	water boatman	8
Heteroptera	Gerridae	water strider	1
Heteroptera	Mesoveliidae	water treader	2
Odonata	Coenagrionidae	forktail damselfly	22
Odonata	Libellulidae	amberwing dragonfly	1
Odonata	Libellulidae	blue pirate dragonfly	2
Odonata	Libellulidae	skimmer dragonfly	1
Tricladida	Planariidae	planarian	18
Veneroida	Pisidiidae	fingernail clam	9

Macroinvertebrate Biotic Index = 7.772

BIOLOGIST NOTE:
When we conducted this survey it had been a very dry spring and early summer plus there was a big beaver dam holding back a lot of water. There was basically one major pool with what we had to survey from. The IBI value of 75 is considered fair but that is to be expected when there are conditions as when the survey was conducted. Many of the fish that were collected are considered tolerant species which means they can withstand harsh environmental conditions which is what often exists in the prairie streams of western Kansas. As you can see in the MBI value of 7.772, there is evidence of many tolerant species like the pouch snail and midges (flies that are around your face when you are along a creek) and their high number which causes the value to go up. Higher the number, the more environmental influenced the site. In this case the dry conditions.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Fine/silt -100%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	55	5	25
	Maximum	Minimum	Average
Right Bank -	115	10	48
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

100%	0%	42%
Maximum	Minimum	Average

Left side of stream - 42%
Right side of stream - 40%
Center of stream - 44%

BANK (INCISED) HEIGHT:

5.5	3.6	4.4
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 44%
Dry - 43%
Pool - 13%

101-RFM-06

Middle Fork Walnut Creek

Ness Co.

SW/4 of NE/4 SEC. 34, 17S, 26W

06/26/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	9 inches shallowest - 2inches deepest - 2.5 feet		
Stream Width	14.0' Maximum	3.6' Minimum	7.7' Average
Stream Flow	0.0189 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.4
Alkalinity	165 mg/l
Conductivity	856 microSiemens
Total Dissolved Solids	480 mg/l
Nitrates	1.3 mg/l
Phosphorus	0.02 mg/l
Chlorides	71 mg/l
Ammonia	0.06 mg/l
Dissolved Oxygen	1.6 mg/l
Turbidity	15 FTU
Water Temperature	64 F
Air Temperature	66 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
Arkansas darter	150	90.4
common carp	2	1.2
fathead minnow	2	1.2
green sunfish	6	3.6
orangespotted sunfish	1	0.6
red shiner	5	3.0
Total	**166**	**100**

Index of Biotic Integrity = 83

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
giant floater	No	Yes	No

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	7
Amphipoda	Hyalellidae	scud	217
Arhynchobdellida	Erpobdellidae	leech	19
Basommatophora	Physidae	pouch snail	36
Basommatophora	Planorbidae	orb snail	67
Coleoptera	Dytiscidae	predaceous diving beetle	9
Coleoptera	Haliplidae	crawling water beetle	3
Coleoptera	Hydrophilidae	water scavenger beetle	27
Decapoda	Cambaridae	crayfish	2
Diptera	Ceratopogonidae	biting midge	1
Diptera	Chironomidae	midge	20
Diptera	Stratiomyidae	soldier fly	5
Ephemeroptera	Baetidae	small minnow mayfly	10
Ephemeroptera	Caenidae	small squaregill mayfly	6
Heteroptera	Belostomatidae	giant water bug	20
Heteroptera	Corixidae	water boatman	4
Heteroptera	Gerridae	water strider	1
Heteroptera	Hebridae	velvet waterbug	1
Heteroptera	Mesoveliidae	water treader	1
Heteroptera	Nepidae	water scorpion	1
Heteroptera	Notonectidae	backswimmer	1
Lepidoptera	Pyralidae	snout moth	2
Odonata	Coenagrionidae	dancer damselfly	12
Odonata	Coenagrionidae	forktail damselfly	7
Odonata	Libellulidae	amberwing dragonfly	1
Odonata	Libellulidae	whitetailed skimmer dragonfly	2
Rhynchobdellida	Glossiphoniidae	leech	2
Tricladida	Planariidae	planarian	9
Trombidiformes	Arrenuridae	water mite	2
Veneroida	Pisidiidae	fingernail clam	109

Macroinvertebrate Biotic Index = 5.471

BIOLOGIST NOTE:

This is a very good site for this part of the state. The water chemistry values are pretty good. The conductivity reading is lower than other areas of Ness county, meaning there must be some decent springs in this stretch of creek. The IBI value of 85 is good, especially for this area of the state. The Arkansas darter which made up 90% of the fish community is considered a threatened species in Kansas. With our surveys we are finding that the Arkansas darter populations can be quite numerous and fairly stable, in turn, may mean it will be taken off the threatened list. This fish is usually found in south-central Kansas but there seems to be a remnant population that is doing just fine in the NF walnut watershed. The MBI value of 5.308 is also good for this area. A good diversity of aquatic insects and plenty of overhanging vegetation on the banks helps with this favorable MBI value.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 5%	Fine/silt -73%
Fine Gravel -18%	Course Gravel - 4%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	70	10	37
	Maximum	Minimum	Average
Right Bank -	65	10	36
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

88%	3%	24%
Maximum	Minimum	Average

Left side of stream - 24%
Right side of stream - 21%
Center of stream - 27%

BANK (INCISED) HEIGHT:

2.3	0.2	1.8
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 71%
Pool - 29%

102-RFM-06

South Fork Walnut Creek

Ness Co.

SW/4 of NE/4 SEC. 18, 19S, 23W

06/27/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	10 inches shallowest - 1 inch deepest - 2.7 feet		
Stream Width	29.3' Maximum	1.3' Minimum	9.9' Average
Stream Flow	0.044 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.4
Alkalinity	142mg/l
Conductivity	1686 microSiemens
Total Dissolved Solids	841 mg/l
Nitrates	0.6 mg/l
Phosphorus	0.01 mg/l
Chlorides	225 mg/l
Ammonia	0.03 mg/l
Dissolved Oxygen	4.1 mg/l
Turbidity	37 FTU
Water Temperature	63 F
Air Temperature	63 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	1	0.05
common carp	1	0.05
fathead minnow	127	6.1
green sunfish	5	0.2
largemouth bass	12	0.6
red shiner	17	0.8
western mosquitofish	1917	92.2
Total	**2080**	**100**

Index of Biotic Integrity = 56

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
giant floater	No	Yes	No

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	514
Arhynchobdellida	Erpobdellidae	leech	3
Basommatophora	Physidae	pouch snail	26
Branchiobdellida	Branchiobdellidae	crayfish worm	1
Coleoptera	Dytiscidae	predaceous diving beetle	1
Coleoptera	Haliplidae	crawling water beetle	12
Coleoptera	Hydrophilidae	water scavenger beetle	24
Decapoda	Cambaridae	crayfish	23
Diptera	Ceratopogonidae	biting midge	3
Diptera	Chironomidae	midge	33
Diptera	Stratiomyidae	soldier fly	1
Ephemeroptera	Baetidae	small minnow mayfly	24
Ephemeroptera	Caenidae	small squaregill mayfly	19
Heteroptera	Belostomatidae	giant water bug	7
Heteroptera	Corixidae	water boatman	9
Odonata	Aeshnidae	green darner	1
Odonata	Coenagrionidae	bluet damselfly	1
Odonata	Coenagrionidae	dancer damselfly	2
Odonata	Coenagrionidae	forktail damselfly	38
Odonata	Libellulidae	red skimmer dragonfly	1
Rhynchobdellida	Glossiphoniidae	leech	1
Veneroida	Pisidiidae	fingernail clam	18

Macroinvertebrate Biotic Index = 4.739

BIOLOGIST NOTE:
The SF Walnut Creek is a tough creek for fish to survive. It is usually prone to extreme environmental conditions like may western Kansas prairie streams. An IBI value of 56 is not real good value but is often the case in this part of the state. The 1,917 western mosquitofish, an introduced, tolerant fish species to Kansas, causes this site have a lower IBI value. Also, the introduction of largemouth bass in western Kansas, where they are not native, can also be detrimental to a prairie stream. This is what was expected for this S.F. Walnut creek site. The water chemistry values is what we expected for this area of the state during the drought conditions that were existing at the time of the survey. On the flip side, the MBI value is good for this area of the state.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 7%	Fine/silt - 60%
Fine Gravel -11%	Course Gravel - 15%
Cobble - 2%	Boulder - 5%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	90	5	42
	Maximum	Minimum	Average
Right Bank -	110	4	31
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

43%	0%	8%
Maximum	Minimum	Average

Left side of stream - 15%
Right side of stream - 6%
Center of stream - 1%

BANK (INCISED) HEIGHT:

4.2	2.6	3.3
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 38%
Riffle - 31%
Pool - 31%

103-RFM-06

South Fork Walnut Creek

Ness Co.

NW/4 of NW/4 SEC. 25, 19S, 24W

06/28/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	5 inches shallowest - 1 inch deepest - 0.8 feet		
Stream Width	15.6' Maximum	2.6' Minimum	10.2' Average
Stream Flow	0.040 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.4
Alkalinity	153 mg/l
Conductivity	1562 microSiemens
Total Dissolved Solids	777 mg/l
Nitrates	0.1 mg/l
Phosphorus	0 mg/l
Chlorides	233 mg/l
Ammonia	0.02 mg/l
Dissolved Oxygen	2.9 mg/l
Turbidity	69 FTU
Water Temperature	70 F
Air Temperature	79 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	1	0.04
fathead minnow	8	0.3
largemouth bass	12	0.5
orangespotted sunfish	8	0.3
western mosquitofish	2275	98.7
Total	**2304**	**100**

Index of Biotic Integrity = 55

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	3
Amphipoda	Hyalellidae	scud	162
Arhynchobdellida	Erpobdellidae	leech	7
Basommatophora	Ancylidae	limpet snail	2
Basommatophora	Physidae	pouch snail	23
Coleoptera	Dytiscidae	predaceous diving beetle	10
Coleoptera	Elmidae	riffle beetle	2
Coleoptera	Helodidae	marsh beetle	5
Coleoptera	Hydrophilidae	water scavenger beetle	5
Decapoda	Cambaridae	crayfish	4
Diptera	Ceratopogonidae	biting midge	5
Diptera	Chironomidae	midge	32
Diptera	Stratiomyidae	soldier fly	1
Diptera	Tabanidae	horse/deer fly	1
Ephemeroptera	Baetidae	small minnow mayfly	3
Ephemeroptera	Caenidae	small squaregill mayfly	11
Heteroptera	Belostomatidae	giant water bug	1
Odonata	Coenagrionidae	dancer damselfly	2
Odonata	Coenagrionidae	forktail damselfly	2
Odonata	Coenagrionidae	narrowwinged damselfly	4
Rhynchobdellida	Glossiphoniidae	leech	2
Sarcoptiformes	Hydrozetidae	water mite	5
Symphypleona	Sminthuridae	globular springtail	1
Tricladida	Planariidae	planarian	37
Veneroida	Pisidiidae	fingernail clam	494

Macroinvertebrate Biotic Index = 5.077

BIOLOGIST NOTE:
This is a nice wide open treeless prairie area on the SF Walnut Creek. This site had nice pools and narrow riffle areas (see picture). Although this is a tough area for fish to exist. The 2,274 western mosquitofish, which is an introduced fish to Kansas and is very tolerant to environmental conditions makes up most of the fish community. This is not good. Along with the largemouth bass, which is introduced in western Kansas can be detrimental to a native prairie stream fishery. The IBI value of 55 reflects this which brings the value down. The aquatic insect MBI value is not too bad for this area. All the overhanging grass on the banks and riffle areas help provide habitat for the aquatic insects which possibly helped with the decent MBI value.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 4% Fine/silt - 96%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	46	6	26
	Maximum	Minimum	Average
Right Bank -	115	5	37
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

25%	0%	3%
Maximum	Minimum	Average

Left side of stream - 7%
Right side of stream - 1%
Center of stream - 1%

BANK (INCISED) HEIGHT:

3.9	2.3	3.0
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 53%
Riffle - 47%

104-RFM-06

South Fork Walnut Creek

Ness Co.

SE/4 of SW/4 SEC. 22, 19S, 24W

06/29/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	577 feet		
Average Stream Depth	5 inches shallowest - 0 inches deepest - 1 feet		
Stream Width	17.2' Maximum	3.6' Minimum	12.9' Average
Stream Flow	0.00 CFS		

2006 WATER CHEMISTRY

	2006
pH	8.1
Alkalinity	197 mg/l
Conductivity	1738 microSiemens
Total Dissolved Solids	868 mg/l
Nitrates	1.9 mg/l
Phosphorus	0.23 mg/l
Chlorides	130 mg/l
Ammonia	0.02 mg/l
Dissolved Oxygen	2.1 mg/l
Turbidity	17 FTU
Water Temperature	64 F
Air Temperature	72 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
green sunfish	2	0.1
western mosquitofish	2695	99.9
Total	**2697**	**100**

Index of Biotic Integrity = 41

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	1
Amphipoda	Hyalellidae	scud	14
Basommatophora	Physidae	pouch snail	70
Basommatophora	Planorbidae	orb snail	21
Coleoptera	Dytiscidae	predaceous diving beetle	3
Coleoptera	Haliplidae	crawling water beetle	3
Coleoptera	Hydrophilidae	water scavenger beetle	5
Diptera	Chironomidae	midge	3
Diptera	Stratiomyidae	soldier fly	1
Ephemeroptera	Baetidae	small minnow mayfly	6
Ephemeroptera	Caenidae	small squaregill mayfly	1
Heteroptera	Mesoveliidae	water treader	1
Odonata	Coenagrionidae	narrowwinged damselfly	1
Veneroida	Pisidiidae	fingernail clam	1

Macroinvertebrate Biotic Index = 7.665

BIOLOGIST NOTE:

This area of the creek is a demanding area for aquatic organisms to live especially with the drought conditions of the 2006 summer. The creek was dry upstream of this site, in turn, meaning only fish and aquatic insects that can survive these conditions are going to exist. The IBI value is not good. With the fish community being almost 100% western mosquitofish, a non native, very tolerant to extreme conditions fish, causes the IBI value to be very low. Also the MBI value is not very good. Like the fish community, it is made up mostly of snails which are very tolerant to environmental conditions.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Fine/silt -100%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	38	4	15
	Maximum	Minimum	Average
Right Bank -	35	5	17
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

47%	6%	24%
Maximum	Minimum	Average

Left side of stream - 19%
Right side of stream - 34%
Center of stream - 9%

BANK (INCISED) HEIGHT:

3.6	2.6	3.0
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 91%
Pool - 9%

105-RFM-06
070-RFM-05

Smoots Creek

Kingman Co.

SE/4 of SW/4 SEC. 26, 28S, 5W

07/11/05

07/06/06

2006 STREAM COMPARISONS

	2005	2006
Length of Sample Site	984 feet	984 feet
Average Stream Depth	1.1 feet shallowest - 4 inches deepest - 2.1 feet	1.1 feet shallowest - 4 inches deepest - 2.8 feet
Stream Width	84.6' Maximum / 29.5' Minimum / 56.1' Average	76.1' Maximum / 28.0' Minimum / 54.5' Average
Stream Flow	27.850 CFS	3.726 CFS

2006 WATER CHEMISTRY

	2005	2006
pH	8.4	8.0
Alkalinity	217 mg/l	202 mg/l
Conductivity	670 microSiemens	718 microSiemens
Total Dissolved Solids	336 mg/l	650 mg/l
Nitrates	1.6 mg/l	2 mg/l
Phosphorus	0.06 mg/l	0.02 mg/l
Chlorides	41 mg/l	97 mg/l
Ammonia	0 mg/l	0.02 mg/l
Dissolved Oxygen	5.4 mg/l	5.4 mg/l
Turbidity	19 FTU	8 FTU
Water Temperature	75 F	70 F
Air Temperature	77 F	72 F

FISH POPULATION COMPARISONS

SPECIES	2005		2006	
	#	% BY #	#	% BY #
Arkansas darter	1	0.1	11	0.3
bigmouth buffalo	0	0.0	1	0.0
black crappie	0	0.0	1	0.0
bluegill	4	0.3	64	2.0
bluntnose minnow	19	1.2	88	2.8
brook silverside	9	0.6	0	0.0
bullhead minnow	95	6.1	674	21.2
central stoneroller	40	2.6	287	9.0
channel catfish	4	0.3	49	1.5
common carp	9	0.6	20	0.6
emerald shiner	2	0.1	0	0.0
fathead minnow	3	0.2	26	0.8
freshwater drum	3	0.2	10	0.3
gizzard shad	7	0.4	79	2.5
green sunfish	28	1.8	99	3.1
largemouth bass	8	0.5	17	0.5
longnose gar	3	0.2	0	0.0
northern plains killifish	24	1.5	47	1.5
orangespotted sunfish	3	0.2	7	0.2
orangethroat darter	5	0.3	15	0.5
quillback	0	0.0	13	0.4
red shiner	666	42.6	524	16.5
river carpsucker	1	0.1	37	1.2
sand shiner	448	28.7	658	20.7
saugeye	0	0.0	1	0.0
smallmouth buffalo	0	0.0	1	0.0
silver chub	2	0.1	0	0.0
slenderhead darter	1	0.1	0	0.0
suckermouth minnow	135	8.6	375	11.8
warmouth	0	0.0	22	0.7
western mosquitofish	41	2.6	0	0.0
white crappie	0	0.0	5	0.2
white perch	0	0.0	15	0.5
wiper	0	0.0	5	0.2
yellow bullhead	1	0.1	1	0.0
Total	**1562**	**100**	**3183**	**100**
Index of Biotic Integrity =	90		87	

Freshwater Mussel Community

No mussels collected

BIOLOGIST NOTE:

As you can see from the photos in 2006 the creek was a lot lower than in 2005. The fish community was stable with the IBI values being close. Although, most of these are prairie fish so they have adapted to these kinds of fluctuations. Very good fish diversity and numbers collected. This site on Smoots creek has a good diversity of habitat from woody debris, undercut banks, bedrock, and a nice riffle area. This diversity of habitat helps with the high diversity of fish and inverts and the number collected. The MBI values are pretty good for this area of the state. Both years are close in value which means this site on the creek is in pretty good condition.

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	6
Amphipoda	Hyalellidae	scud	42
Arhynchobdellida	Erpobdellidae	leech	3
Basommatophora	Lymnaeidae	river/pond snail	3
Basommatophora	Physidae	pouch snail	5
Coleoptera	Carabidae	ground beetle	1
Coleoptera	Curculionidae	water weevil	1
Coleoptera	Dytiscidae	predaceous diving beetle	22
Coleoptera	Elmidae	riffle beetle	15
Coleoptera	Haliplidae	crawling water beetle	9
Coleoptera	Helodidae	marsh beetle	2
Coleoptera	Hydraenidae	minute moss beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	12
Diptera	Ceratopogonidae	biting midge	10
Diptera	Chironomidae	midge	138
Diptera	Culicidae	mosquito	1
Diptera	Stratiomyidae	soldier fly	1
Diptera	Tabanidae	horse/deer fly	2
Diptera	Tipulidae	crane fly	13
Enoplida	Leptosomatidae	nematode worm	1
Ephemeroptera	Baetidae	small minnow mayfly	744
Ephemeroptera	Caenidae	small squaregill mayfly	50
Ephemeroptera	Heptageniidae	flatheaded mayfly	4
Ephemeroptera	Isonychiidae	brush legged mayfly	36
Ephemeroptera	Leptohyphidae	little stout crawler mayfly	106
Ephemeroptera	Leptophlebiidae	prong gill mayfly	1
Heteroptera	Corixidae	water boatman	3
Heteroptera	Gerridae	water strider	1
Heteroptera	Nepidae	water scorpion	2
Megaloptera	Corydalidae	dobson fly	1
Odonata	Calopterygidae	ruby spot damselfly	1
Odonata	Coenagrionidae	dancer damselfly	2
Odonata	Coenagrionidae	narrowwinged damselfly	1
Odonata	Gomphidae	common clubtail dragonfly	3
Odonata	Gomphidae	snake darner dragonfly	1
Trichoptera	Hydropsychidae	common netspinner caddisfly	22
Trichoptera	Leptoceridae	longhorned casemaker caddisfly	7
Tricladida	Planariidae	planarian	7
Trombidiformes	Hygrobatidae	water mite	1
Veneroida	Corbiculidae	Asian clam	11
Veneroida	Pisidiidae	fingernail clam	1

Macroinvertebrate Biotic Index = 2005 = 4.655
2006 = 4.807

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand -47%
Course Gravel - 2%
Fine Gravel -18%
Bedrock - 33%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	140	8	56
	Maximum	Minimum	Average
Right Bank -	140	5	53
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

81%	18%	35%
Maximum	Minimum	Average

Left side of stream - 52%
Right side of stream - 43%
Center of stream - 11%

BANK (INCISED) HEIGHT:

4.2	2.9	3.6
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 59%
Riffle - 19%
Pool - 20%
Cascade - 2%

106-RFM-06

Yellowstone Creek

Barber Co.

SE/4 of NW/4 SEC. 16, 35S, 14W

07/07/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	7 inches shallowest - 4 inches deepest - 1.6 feet		
Stream Width	17.9' Maximum	7.5' Minimum	10.9' Average
Stream Flow	1.148 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.9
Alkalinity	158 mg/l
Conductivity	3010 microSiemens
Total Dissolved Solids	1542 mg/l
Nitrates	1.4 mg/l
Phosphorus	0.01 mg/l
Chlorides	62 mg/l
Ammonia	0.04 mg/l
Dissolved Oxygen	5.3 mg/l
Turbidity	8 FTU
Water Temperature	70 F
Air Temperature	66 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
central stoneroller	7	1.0
emerald shiner	11	1.6
green sunfish	13	1.8
longear sunfish	1	0.1
northern plains killifish	160	22.6
plains minnow	2	0.3
red shiner	96	13.6
sand shiner	411	58.1
western mosquitofish	6	0.8
Total	**707**	**100**

Index of Biotic Integrity = 85

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	1
Basommatophora	Physidae	pouch snail	11
Coleoptera	Haliplidae	crawling water beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	14
Decapoda	Cambaridae	crayfish	1
Diptera	Ceratopogonidae	biting midge	3
Diptera	Chironomidae	midge	11
Diptera	Simuliidae	black fly	6
Diptera	Stratiomyidae	soldier fly	1
Ephemeroptera	Baetidae	small minnow mayfly	14
Ephemeroptera	Caenidae	small squaregill mayfly	50
Heteroptera	Corixidae	water boatman	1
Neotaenioglossa	Hydrobiidae	hydrobid snail	1
Odonata	Coenagrionidae	dancer damselfly	4
Odonata	Coenagrionidae	forktail damselfly	2
Odonata	Gomphidae	clubtail dragonfly	2
Odonata	Gomphidae	common clubtail dragonfly	1
Odonata	Gomphidae	snake darner dragonfly	3

Macroinvertebrate Biotic Index = 5.873

BIOLOGIST NOTE:
This stream was very low due to the dry conditions of that summer, although both the IBI and the MBI values are decent. Nothing out of the ordinary on any fish or aquatic insects collected. Water chemistry is adequate except for the conductivity value. This may be elevated due to the amount of minerals (hardness) in this water and with the creek being low, these minerals are more concentrated.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 22% Fine/silt - 16%
Fine Gravel - 62%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	130	2	52
	Maximum	Minimum	Average
Right Bank -	75	2	33
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

77%	13%	37%
Maximum	Minimum	Average

Left side of stream - 60%
Right side of stream - 23%
Center of stream - 28%

BANK (INCISED) HEIGHT:

6.2	2.9	4.7
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 96%
Pool - 4%

107-RFM-06
071-RFM-05

Smoots Creek

Kingman Co.

SE/4 of SE/4 SEC. 21, 28S, 5W

07/12/05

07/10/06

2006 STREAM COMPARISONS

	2005	2006
Length of Sample Site	984 feet	984 feet
Average Stream Depth	1 foot shallowest -4 inches deepest - 2.1 feet	7 inches shallowest -2 inches deepest - 1.9 feet
Stream Width	70.5' Maximum; 20.7' Minimum; 36.1' Average	37.7' Maximum; 15.6' Minimum; 27.3' Average
Stream Flow	26.150 CFS	4.488 CFS

2006 WATER CHEMISTRY

	2005	2006
pH	8.5	7.9
Alkalinity	217 mg/l	244 mg/l
Conductivity	661 microSiemens	699 microSiemens
Total Dissolved Solids	332 mg/l	340 mg/l
Nitrates	1.4 mg/l	1.5 mg/l
Phosphorus	0.08 mg/l	0.06 mg/l
Chlorides	37 mg/l	52 mg/l
Ammonia	0.02 mg/l	0.09 mg/l
Dissolved Oxygen	6.5 mg/l	4.2 mg/l
Turbidity	14FTU	10 FTU
Water Temperature	77 F	72 F
Air Temperature	81 F	73 F

FISH POPULATION COMPARISONS

SPECIES	2005		2006	
	#	% BY #	#	% BY #
Arkansas darter	131	9.1	112	3.3
black bullhead	1	0.1	0	0.0
bluegill	16	1.1	7	0.2
bluntnose minnow	2	0.1	60	1.8
brook silverside	3	0.2	0	0.0
bullhead minnow	9	0.6	40	1.2
central stoneroller	185	12.8	428	12.5
channel catfish	1	0.1	8	0.2
common carp	2	0.1	0	0.0
fathead minnow	2	0.1	0	0.0
green sunfish	77	5.3	265	7.7
largemouth bass	25	1.7	0	0.0
northern plains killifish	83	5.8	520	15.2
orangespotted sunfish	3	0.2	0	0.0
orangethroat darter	25	1.7	53	1.5
red shiner	194	13.4	387	11.3
river carpsucker	1	0.1	0	0.0
sand shiner	303	21.0	1450	42.3
silver chub	1	0.1	0	0.0
slenderhead darter	1	0.1	0	0.0
suckermouth minnow	278	19.3	44	1.3
western mosquitofish	95	6.6	51	1.5
yellow bullhead	5	0.3	1	0.0
Total	**1443**	**100**	**3426**	**100**

Index of Biotic Integrity = 92 85

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
Asian clam	No	Yes	No
pimpleback	No	Yes	Yes

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	10
Amphipoda	Hyalellidae	scud	6
Araneae	Lycosidae	wolf spider	1
Araneae	Pisauridae	fishing spider	2
Arhynchobdellida	Erpobdellidae	leech	1
Basommatophora	Lymnaeidae	river/pond snail	1
Basommatophora	Physidae	pouch snail	7
Branchiobdellida	Branchiobdellidae	crayfish worm	754
Coleoptera	Dytiscidae	predaceous diving beetle	28
Coleoptera	Elmidae	riffle beetle	3
Coleoptera	Haliplidae	crawling water beetle	20
Coleoptera	Hydrophilidae	water scavenger beetle	10
Decapoda	Cambaridae	crayfish	3
Diptera	Ceratopogonidae	biting midge	10
Diptera	Chironomidae	midge	77
Diptera	Tipulidae	crane fly	3
Ephemeroptera	Baetidae	small minnow mayfly	173
Ephemeroptera	Caenidae	small squaregill mayfly	33
Ephemeroptera	Heptageniidae	flatheaded mayfly	1
Ephemeroptera	Leptohyphidae	little stout crawler mayfly	50
Heteroptera	Belostomatidae	giant water bug	1
Heteroptera	Corixidae	water boatman	8
Heteroptera	Gerridae	water strider	1
Odonata	Calopterygidae	ruby spot damselfly	1
Odonata	Gomphidae	clubtail dragonfly	2
Odonata	Gomphidae	common clubtail dragonfly	3
Odonata	Libellulidae	skimmer dragonfly	1
Rhynchobdellida	Glossiphoniidae	leech	1
Trichoptera	Hydropsychidae	common netspinner caddisfly	3l’
Trichoptera	Hydroptilidae	micro caddisfly	3
Trichoptera	Leptoceridae	longhorned casemaker caddisfly	12
Trombidiformes	Eylaidae	water mite	1
Trombidiformes	Hygrobatidae	water mite	3
Veneroida	Corbiculidae	Asian clam	38
Veneroida	Pisidiidae	fingernail clam	3

Macroinvertebrate Biotic Index 2005 = 4.733 2006 = 8.463

BIOLOGIST NOTE: The fish IBI value dropped a little in 2006, this could be due to the dry conditions that summer, although these are still very good values. The MBI values went from excellent to very bad from 2005 to 2006. I’m speculating this is from the tolerant insect species adapting because of the drought conditions.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 44%	Fine/silt - 2%
Fine Gravel -20%	Course Gravel - 7%
Cobble - 2%	Bedrock - 25%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	120	5	37
	Maximum	Minimum	Average
Right Bank -	120	5	43
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

19%	0%	7%
Maximum	Minimum	Average

Left side of stream - 6%
Right side of stream - 13%
Center of stream - 0%

BANK (INCISED) HEIGHT:

4.9	2.9	4.0
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 54%
Riffle - 32%
Pool - 14%

108-RFM-06
072-RFM-05

Smoots Creek

Kingman Co.

SE/4 of SE/4 SEC. 6, 28S, 5W

07/11/06

2006 STREAM COMPARISONS

	2005	2006
Length of Sample Site	984 feet	732 feet
Average Stream Depth	1 foot shallowest - 6 inches deepest - 2.5 feet	6 inches shallowest - 2 inches deepest - 3.1 feet
Stream Width	78.4' Maximum 19.7' Minimum 35.7' Average	43.6' Maximum 13.7' Minimum 29.1' Average
Stream Flow	17.130 CFS	1.953 CFS

2006 WATER CHEMISTRY

	2005	2006
pH	8.5	8.0
Alkalinity	192 mg/l	184 mg/l
Conductivity	593 microSiemens	645 microSiemens
Total Dissolved Solids	296 mg/l	314 mg/l
Nitrates	1.2 mg/l	1.4 mg/l
Phosphorus	0.03 mg/l	0.05 mg/l
Chlorides	21 mg/l	36 mg/l
Ammonia	0.03 mg/l	0.04 mg/l
Dissolved Oxygen	5.5 mg/l	3.8 mg/l
Turbidity	18 FTU	9 FTU
Water Temperature	73 F	72 F
Air Temperature	81 F	75 F

FISH POPULATION COMPARISONS

SPECIES	2005		2006	
	#	% BY #	#	% BY #
Arkansas darter	24	1.2	58	2.8
bluegill	40	1.9	55	2.7
bluegill X green sunfish hybrid	0	0.0	1	0.0
bluntnose minnow	2	0.1	33	1.6
brook silverside	25	1.2	0	0.0
bullhead minnow	26	1.3	45	2.2
central stoneroller	469	22.6	258	12.6
channel catfish	2	0.1	25	1.2
common carp	20	1.0	22	1.1
fathead minnow	39	1.9	2	0.1
freshwater drum	2	0.1	2	0.1
gizzard shad	43	2.1	24	1.2
golden shiner	3	0.1	0	0.0
green sunfish	89	4.3	125	6.1
largemouth bass	40	1.9	10	0.5
longnose gar	2	0.1	0	0.0
northern plains killifish	192	9.3	240	11.7
orangespotted sunfish	5	0.2	3	0.1
orangethroat darter	13	0.6	38	1.8
quillback	3	0.1	1	0.0
red shiner	424	20.5	394	19.2
river carpsucker	0	0.0	2	0.1
sand shiner	227	11.0	488	23.7
suckermouth minnow	112	5.4	17	0.8
warmouth	0	0.0	5	0.2
western mosquitofish	243	11.7	191	9.3
white crappie	21	1.0	2	0.1
yellow bullhead	5	0.2	14	0.7
Total	**2071**	**100**	**2055**	**100**

Index of Biotic Integrity = 93 90

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pondhorn	No	Yes	No

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	54
Basommatophora	Physidae	pouch snail	19
Coleoptera	Dryopidae	longtoed water beetle	2
Coleoptera	Dytiscidae	predaceous diving beetle	6
Coleoptera	Elmidae	riffle beetle	12
Coleoptera	Haliplidae	crawling water beetle	7
Coleoptera	Helodidae	marsh beetle	8
Coleoptera	Hydrophilidae	water scavenger beetle	20
Diptera	Ceratopogonidae	biting midge	17
Diptera	Chironomidae	midge	109
Diptera	Tabanidae	horse/deer fly	2
Ephemeroptera	Baetidae	small minnow mayfly	476
Ephemeroptera	Caenidae	small squaregill mayfly	97
Ephemeroptera	Leptohyphidae	little stout crawler mayfly	51
Heteroptera	Belostomatidae	giant water bug	1
Heteroptera	Corixidae	water boatman	34
Heteroptera	Gerridae	water strider	17
Heteroptera	Nepidae	water scorpion	1
Heteroptera	Veliidae	shortlegged strider	3
Odonata	Calopterygidae	ruby spot damselfly	4
Odonata	Coenagrionidae	bluet damselfly	1
Odonata	Coenagrionidae	dancer damselfly	1
Odonata	Gomphidae	clubtail dragonfly	5
Odonata	Gomphidae	common clubtail dragonfly	1
Odonata	Gomphidae	snake darner dragonfly	3
Rhynchobdellida	Glossiphoniidae	leech	1
Trichoptera	Hydropsychidae	common netspinner caddisfly	45
Trichoptera	Hydroptilidae	micro caddisfly	3
Trichoptera	Leptoceridae	longhorned casemaker caddisfly	30
Tricladida	Planariidae	planarian	1
Trombidiformes	Hygrobatidae	water mite	1
Veneroida	Corbiculidae	Asian clam	3
Veneroida	Pisidiidae	fingernail clam	12

Macroinvertebrate Biotic Index 2005 = 5.257
2006 = 5.045

BIOLOGIST NOTE: The IBI values remained consistent even with a very dry summer in 2006. This shows an adaptive stable stream fish community. Lots of species diversity and a large number of individuals collected. The MBI scores were also consistent each year. These are not too bad of values for this part of the state. Good diversity of aquatic insect families.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 47%	Fine/silt - 7%
Fine Gravel - 20%	Cobble - 2%
Bedrock - 24%	

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	130	5	52
	Maximum	Minimum	Average
Right Bank -	124	4	32
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

70%	7%	39%
Maximum	Minimum	Average

Left side of stream - 52%
Right side of stream - 36%
Center of stream - 28%

BANK (INCISED) HEIGHT:

4.2	2.6	3.6
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 63%
Riffle - 31%
Pool - 6%

109-RFM-06
073-RFM-05

Smoots Creek

Kingman Co.

NE/4 of SE/4 SEC. 17, 28S, 5W

07/14/05

07/12/06

2006 STREAM COMPARISONS

	2005	2006
Length of Sample Site	984 feet	518 feet
Average Stream Depth	1.3 feet shallowest -7 inches deepest - 3.9 feet	8 inches shallowest -4 inches deepest -2.9 feet
Stream Width	34.4' Maximum 22.0' Minimum 27.6' Average	25.4' Maximum 9.4' Minimum 16.4' Average
Stream Flow	16.522 CFS	2.546 CFS

2006 WATER CHEMISTRY

	2005	2006
pH	8.4	8.0
Alkalinity	226 mg/l	223 mg/l
Conductivity	621 microSiemens	668 microSiemens
Total Dissolved Solids	310 mg/l	325 mg/l
Nitrates	1.4 mg/l	1.4 mg/l
Phosphorus	0.09 mg/l	0.02 mg/l
Chlorides	25 mg/l	86 mg/l
Ammonia	0.01 mg/l	0.09 mg/l
Dissolved Oxygen	5.4 mg/l	5.6 mg/l
Turbidity	16 FTU	12 FTU
Water Temperature	75 F	75 F
Air Temperature	82 F	77 F

FISH POPULATION COMPARISONS

SPECIES	2005		2006	
	#	% BY #	#	% BY #
Arkansas darter	13	1.5	30	3.0
black bullhead	1	0.1	0	0.0
bluegill	4	0.5	11	1.1
bluntnose minnow	0	0.0	2	0.2
brook silverside	6	0.7	3	0.3
bullhead minnow	25	3.0	52	5.2
central stoneroller	72	8.5	130	12.9
channel catfish	13	1.5	13	1.3
common carp	2	0.2	0	0.0
fathead minnow	77	9.1	0	0.0
flathead catfish	1	0.1	1	0.1
freshwater drum	0	0.0	1	0.1
green sunfish	64	7.6	75	7.4
largemouth bass	7	0.8	2	0.2
northern plains killifish	77	9.1	79	7.8
orangespotted sunfish	1	0.1	0	0.0
orangethroat darter	5	0.6	48	4.8
red shiner	208	24.6	281	27.9
sand shiner	180	21.3	194	19.2
suckermouth minnow	52	6.1	13	1.3
western mosquitofish	35	4.1	67	6.6
white crappie	2	0.2	0	0.0
yellow bullhead	1	0.1	6	0.6
Total	**846**	**100**	**1008**	**100**

Index of Biotic Integrity = 90 91

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
giant floater	No	Yes	No
lilliput	No	No	Yes

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	4
Basommatophora	Physidae	pouch snail	6
Coleoptera	Dryopidae	longtoed water beetle	2
Coleoptera	Dytiscidae	predaceous diving beetle	22
Coleoptera	Elmidae	riffle beetle	11
Coleoptera	Helodidae	marsh beetle	2
Decapoda	Cambaridae	crayfish	4
Diptera	Chironomidae	midge	21
Ephemeroptera	Baetidae	small minnow mayfly	23
Ephemeroptera	Caenidae	small squaregill mayfly	30
Ephemeroptera	Heptageniidae	flatheaded mayfly	3
Ephemeroptera	Isonychiidae	brush legged mayfly	14
Ephemeroptera	Leptohyphidae	little stout crawler mayfly	13
Odonata	Calopterygidae	ruby spot damselfly	2
Odonata	Coenagrionidae	dancer damselfly	1
Odonata	Gomphidae	clubtail dragonfly	5
Odonata	Gomphidae	common clubtail dragonfly	4
Odonata	Gomphidae	snake darner dragonfly	4
Trichoptera	Hydropsychidae	common netspinner caddisfly	18
Trichoptera	Leptoceridae	longhorned casemaker caddisfly	2
Veneroida	Corbiculidae	Asian clam	1
Veneroida	Pisidiidae	fingernail clam	3

Macroinvertebrate Biotic Index - 2005 = 4.383
2006 = 5.047

BIOLOGIST NOTE:
Even with a dry summer in 2006 the IBI values for the fish community remained consistent from 2005 to 2006. A value of 91 is very good and represents a diverse fish community. The 2005 MBI value of 4.383 is also very good, meaning there isn't many environmental impacts at this site. The MBI increased some in 2006. This could be due to lower water conditions and less availability to habitat such has bank vegetation. The water chemistry data indicated normal values.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 62% Fine/silt -13%
Fine Gravel - 22%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	65	2	25
	Maximum	Minimum	Average
Right Bank -	87	5	40
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

100%	30%	74%
Maximum	Minimum	Average

Left side of stream - 76%
Right side of stream - 74%
Center of stream - 73%

BANK (INCISED) HEIGHT:

5.2	4.3	3.3
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 88%
Pool - 12%

110-RFM-06
085-RFM-05

Smoots Creek

Kingman Co.

NE/4 of SE/4 SEC. 17, 27S, 6W

07/13/06

2006 STREAM COMPARISONS

	2005	2006
Length of Sample Site	928 feet	604 feet
Average Stream Depth	10 inches shallowest - 2 inches deepest - 2.2 feet	6 inches shallowest - 2 inches deepest - 1.6 feet
Stream Width	48.2' Maximum 9.8' Minimum 21.2' Average	30.9' Maximum 12.4' Minimum 21.2' Average
Stream Flow	2.025 CFS	0.458 CFS

2006 WATER CHEMISTRY

	2005	2006
pH	7.8	7.8
Alkalinity	218 mg/l	210 mg/l
Conductivity	621 microSiemens	696 microSiemens
Total Dissolved Solids	312 mg/l	339 mg/l
Nitrates	1.8 mg/l	1.2 mg/l
Phosphorus	0.03 mg/l	0.09 mg/l
Chlorides	38 mg/l	50 mg/l
Ammonia	0.05 mg/l	0 mg/l
Dissolved Oxygen	8.5 mg/l	5.2 mg/l
Turbidity	7 FTU	7 FTU
Water Temperature	55 F	75 F
Air Temperature	59 F	81 F

FISH POPULATION COMPARISONS

SPECIES	2005		2006	
	#	% BY #	#	% BY #
Arkansas darter	17	1.3	187	9.6
bluegill	1	0.1	29	1.5
bluntnose minnow	5	0.4	48	2.5
brook silverside	1	0.1	0	0.0
bullhead minnow	7	0.6	5	0.3
central stoneroller	105	8.3	77	4.0
common carp	2	0.2	0	0.0
fathead minnow	1	0.1	0	0.0
green sunfish	26	2.1	175	9.0
largemouth bass	23	1.8	8	0.4
northern plains killifish	139	11.0	735	37.8
orangespotted sunfish	1	0.1	0	0.0
orangethroat darter	4	0.3	12	0.6
red shiner	403	31.9	70	3.6
sand shiner	290	22.9	239	12.3
suckermouth minnow	94	7.4	0	0.0
western mosquitofish	140	11.1	349	17.9
yellow bullhead	5	0.4	12	0.6
Total	**1264**	**100**	**1946**	**100**

Index of Biotic Integrity = 87 86

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
lilliput	No	Yes	Yes

Macroinvertebrate Community

2006

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	3
Basommatophora	Physidae	pouch snail	8
Basommatophora	Planorbidae	orb snail	1
Coleoptera	Dryopidae	longtoed water beetle	3
Coleoptera	Dytiscidae	predaceous diving beetle	1
Coleoptera	Elmidae	riffle beetle	4
Coleoptera	Haliplidae	crawling water beetle	10
Coleoptera	Hydrophilidae	water scavenger beetle	18
Decapoda	Cambaridae	crayfish	1
Diptera	Ceratopogonidae	biting midge	7
Diptera	Chironomidae	midge	118
Ephemeroptera	Baetidae	small minnow mayfly	90
Ephemeroptera	Caenidae	small squaregill mayfly	85
Ephemeroptera	Isonychiidae	brush legged mayfly	2
Ephemeroptera	Leptohyphidae	little stout crawler mayfly	11
Heteroptera	Belostomatidae	giant water bug	1
Heteroptera	Corixidae	water boatman	4
Heteroptera	Pleidae	pigmy backswimmer	1
Odonata	Calopterygidae	ruby spot damselfly	4
Odonata	Gomphidae	clubtail dragonfly	16
Odonata	Gomphidae	common clubtail dragonfly	1
Rhynchobdellida	Glossiphoniidae	leech	1
Trichoptera	Hydropsychidae	common netspinner caddisfly	3
Trichoptera	Leptoceridae	longhorned casemaker caddisfly	7
Veneroida	Pisidiidae	fingernail clam	18

Macroinvertebrate Biotic Index - 2005 = 5.278
2006 = 6.514

BIOLOGIST NOTE: We always catch a lot a fish at this site for its size, even during a dry year like 2006. Since both IBI values are about the same each year, this shows that the fish community is very stable even during stressful environmental conditions. An increase of 17 to 187 Arkansas darters collected from year to year is a good sign. The Arkansas darter is consider a threatened fish in Kansas although its south-central populations seem quite secure. The MBI increased some in 2006. This could be due to lower water conditions and less availability to habitat such has bank vegetation. The water chemistry data indicated normal values.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 55% Fine Gravel - 45%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	120	2	36
	Maximum	Minimum	Average
Right Bank -	105	2	32
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

30%	0%	4%
Maximum	Minimum	Average

Left side of stream - 2%
Right side of stream - 7%
Center of stream - 4%

BANK (INCISED) HEIGHT:

3.6	2.6	3.3
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 92%
Pool - 8%

111-RFM-06

North Fork Walnut Creek

Ness Co.

SE/4 of NW/4 SEC. 28, 17S, 26W

07/17/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	1.25 feet shallowest - 0 inches deepest - 2.4 feet		
Stream Width	24.4' Maximum	0.0' Minimum	9.4' Average
Stream Flow	0.006 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.4
Alkalinity	180 mg/l
Conductivity	1700 microSiemens
Total Dissolved Solids	849 mg/l
Nitrates	8.3 mg/l
Phosphorus	0.03 mg/l
Chlorides	229 mg/l
Ammonia	0.08 mg/l
Dissolved Oxygen	0.4 mg/l
Turbidity	12 FTU
Water Temperature	73 F
Air Temperature	84 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
common carp	5	100.0
Total	**5**	**100**

Index of Biotic Integrity = 3

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pondhorn	No	No	Yes
giant floater	No	Yes	No

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	846
Basommatophora	Physidae	pouch snail	29
Basommatophora	Planorbidae	orb snail	11
Coleoptera	Dytiscidae	predaceous diving beetle	12
Coleoptera	Haliplidae	crawling water beetle	27
Coleoptera	Helodidae	marsh beetle	3
Coleoptera	Hydraenidae	minute moss beetle	2
Coleoptera	Hydrophilidae	water scavenger beetle	13
Diptera	Ceratopogonidae	biting midge	2
Diptera	Chironomidae	midge	52
Diptera	Culicidae	mosquito	10
Diptera	Stratiomyidae	soldier fly	1
Ephemeroptera	Baetidae	small minnow mayfly	4
Ephemeroptera	Caenidae	small squaregill mayfly	4
Heteroptera	Belostomatidae	giant water bug	17
Heteroptera	Corixidae	water boatman	12
Heteroptera	Hebridae	velvet waterbug	1
Heteroptera	Mesoveliidae	water treader	4
Heteroptera	Notonectidae	backswimmer	8
Heteroptera	Pleidae	pigmy backswimmer	59
Heteroptera	Veliidae	shortlegged strider	1
Odonata	Aeshnidae	green darner	1
Odonata	Coenagrionidae	forktail damselfly	29
Odonata	Corduliidae	greeneyed skimmer dragonfly	1
Odonata	Libellulidae	blue pirate dragonfly	10
Odonata	Libellulidae	skimmer dragonfly	2
Odonata	Libellulidae	whitetailed skimmer dragonfly	4
Rhynchobdellida	Glossiphoniidae	leech	1
Tricladida	Planariidae	planarian	2
Trombidiformes	Hydryphantidae	water mite	2
Trombidiformes	Limnesiidae	water mite	1

Macroinvertebrate Biotic Index = 4.667

BIOLOGIST NOTE:
The fish community at this site is very poor. All we collected were five common carp which is an introduced fish to the United States. There should be a balance of minnow type fish, bullheads, and sunfish. The IBI score of three indicates the stableness of the fish community. This shows that the stream goes dry often except for some remnant pools that these carp can survive in. On the flip side, the macroinvertebrate community is not bad. This is probably due to the water quality is optimal for aquatic insects and there is plenty of habitat for them to live in. Furthermore, there are no fish in the creek to feed on them.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 3%	Fine/silt - 83%
Fine Gravel -10%	Bedrock - 5%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	30	15	24
	Maximum	Minimum	Average
Right Bank -	135	8	71
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

63%	1%	17%
Maximum	Minimum	Average

Left side of stream - 13%
Right side of stream - 21%
Center of stream - 15%

BANK (INCISED) HEIGHT:

3.9	2.0	2.5
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 27%
Dry - 21%
Pool - 52%

112-RFM-06

North Fork Walnut Creek

Ness Co.

NE/4 of NW/4 SEC. 31, 17S, 25W

07/18/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	830 feet		
Average Stream Depth	9 inches shallowest - 0 inches deepest - 1.7 feet		
Stream Width	26.0' Maximum	0.0' Minimum	14.7' Average
Stream Flow	0.000 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.6
Alkalinity	140 mg/l
Conductivity	1281 microSiemens
Total Dissolved Solids	633 mg/l
Nitrates	7 mg/l
Phosphorus	0.01 mg/l
Chlorides	207 mg/l
Ammonia	0.29 mg/l
Dissolved Oxygen	0.7 mg/l
Turbidity	23 FTU
Water Temperature	75 F
Air Temperature	77 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
Arkansas darter	94	10.6
black bullhead	2	0.2
common carp	4	0.4
fathead minnow	22	2.5
green sunfish	9	1.0
northern plains killifish	755	84.7
red shiner	2	0.2
spotted bass	1	0.1
western mosquitofish	1	0.1
yellow bullhead	1	0.1
Total	**891**	**100**

Index of Biotic Integrity = 85

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
lilliput	No	No	Yes
giant floater	No	Yes	No

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	7
Amphipoda	Hyalellidae	scud	1541
Arhynchobdellida	Erpobdellidae	leech	9
Basommatophora	Physidae	pouch snail	102
Basommatophora	Planorbidae	orb snail	44
Coleoptera	Dytiscidae	predaceous diving beetle	5
Coleoptera	Haliplidae	crawling water beetle	18
Coleoptera	Helodidae	marsh beetle	1
Coleoptera	Hydraenidae	minute moss beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	17
Diptera	Ceratopogonidae	biting midge	1
Diptera	Chironomidae	midge	180
Diptera	Culicidae	mosquito	8
Ephemeroptera	Baetidae	small minnow mayfly	5
Ephemeroptera	Caenidae	small squaregill mayfly	1
Heteroptera	Belostomatidae	giant water bug	56
Heteroptera	Corixidae	water boatman	3
Heteroptera	Mesoveliidae	water treader	5
Heteroptera	Nepidae	water scorpion	2
Heteroptera	Notonectidae	backswimmer	4
Heteroptera	Pleidae	pigmy backswimmer	7
Odonata	Aeshnidae	green darner	2
Odonata	Coenagrionidae	bluet damselfly	34
Odonata	Coenagrionidae	forktail damselfly	55
Odonata	Coenagrionidae	narrowwinged damselfly	6
Odonata	Libellulidae	blue pirate dragonfly	6
Odonata	Libellulidae	skimmer dragonfly	2
Rhynchobdellida	Glossiphoniidae	leech	7
Tricladida	Planariidae	planarian	13
Trombidiformes	Arrenuridae	water mite	1
Trombidiformes	Unionicolidae	water mite	1

Macroinvertibrate Biotic Index = 5.072

BIOLOGIST NOTE:

The water chemistry at this site is normal. The chlorides are elevated but that is usually consistent in this area of the state where you have oil wells and alkaline areas along a stream. This site had a good fish community with an IBI value of 85. Helping that was the low number of non-native fish to Kansas collected. The spotted bass record is very unusual because their native range is in the eastern 1/3 of Kansas. (flint hills and east). There is an introduced population in Cedar Bluff reservoir, this would be the nearest connection. The 94 Arkansas darters collected is a positive indication of a healthy stream. The Arkansas darter is considered a threatened fish in the state of Kansas. Although, when you catch this many in a small stream it indicates the population of fish might not be in that bad of shape and eventually be taken off the threatened species list. The habitat the Arkansas darter needs are sandy streams with some vegetation on the sides and a little bit of spring water coming into the creek. The Arkansas darter is mostly found in small sandy streams of south central Kansas and a small population of them is found in extreme southeast Kansas. There seems to be a remnant population northeast of Ness City in the north fork walnut creek drainage that is doing very good. Good diversity of aquatic insects at this site.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Fine/silt - 75% Fine Gravel - 25%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	130	25	55
	Maximum	Minimum	Average
Right Bank -	75	15	38
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

33%	0%	6%
Maximum	Minimum	Average

Left side of stream - 15%
Right side of stream - 1%
Center of stream - 4%

BANK (INCISED) HEIGHT:

4.2	2.9	3.4
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 82%
Dry - 18%

113-RFM-06

North Fork Walnut Creek

Ness Co.

NW/4 of NW/4 SEC. 26, 18S, 24W

07/19/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	6 inches shallowest - 2 inches deepest - 1.3 feet		
Stream Width	25.0' Maximum	4.2' Minimum	11.7' Average
Stream Flow	0.029 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.8
Alkalinity	215 mg/l
Conductivity	1097 microSiemens
Total Dissolved Solids	540 mg/l
Nitrates	0.7 mg/l
Phosphorus	0.03 mg/l
Chlorides	134 mg/l
Ammonia	0.03 mg/l
Dissolved Oxygen	1.8 mg/l
Turbidity	21 FTU
Water Temperature	73 F
Air Temperature	79 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
Arkansas darter	1457	34.5
black bullhead	6	0.1
bluegill	1	0.0
fathead minnow	6	0.1
green sunfish	23	0.5
largemouth bass	2	0.0
longear sunfish	1	0.0
northern plains killifish	7	0.2
orangespotted sunfish	1	0.0
red shiner	10	0.2
western mosquitofish	2710	64.1
yellow bullhead	5	0.1
Total	**4229**	**100**

Index of Biotic Integrity = 89

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
giant floater	No	Yes	No

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	23
Amphipoda	Hyalellidae	scud	333
Arhynchobdellida	Erpobdellidae	leech	17
Basommatophora	Physidae	pouch snail	30
Basommatophora	Planorbidae	orb snail	72
Coleoptera	Dytiscidae	predaceous diving beetle	1
Coleoptera	Haliplidae	crawling water beetle	16
Coleoptera	Hydrophilidae	water scavenger beetle	18
Decapoda	Cambaridae	crayfish	8
Diptera	Ceratopogonidae	biting midge	2
Diptera	Chironomidae	midge	9
Ephemeroptera	Baetidae	small minnow mayfly	74
Ephemeroptera	Caenidae	small squaregill mayfly	21
Heteroptera	Belostomatidae	giant water bug	19
Heteroptera	Corixidae	water boatman	67
Odonata	Coenagrionidae	dancer damselfly	3
Odonata	Coenagrionidae	forktail damselfly	36
Odonata	Coenagrionidae	narrowwinged damselfly	1
Odonata	Libellulidae	whitetailed skimmer dragonfly	14
Rhynchobdellida	Glossiphoniidae	leech	1
Tricladida	Planariidae	planarian	12
Veneroida	Pisidiidae	fingernail clam	1

Macroinvertebrate Biotic Index = 4.917

BIOLOGIST NOTE:
The water chemistry at this site is normal. The chlorides are elevated but that is usually consistent in this area of the state where you have oil wells. An IBI value of 89 for the fish community is real good for this area of the state. The 2,710 western mosquitofish which is a non-native introduce fish to the state makes up a lot of the fish community. On the flip side, there were 1,457 Arkansas darters collected. The Arkansas darter is considered a threatened fish in the state of Kansas. Although, when you catch over a thousand of these fish in a small stream it indicates the population of the fish might not be in that bad of shape and eventually be taken off the threatened species list. The three things the Arkansas darter like are sandy streams with some vegetation on the sides and a little bit of spring water coming into the creek. The Arkansas darter is mostly found in small sandy streams of south central Kansas and a small population of them is found in extreme southeast Kansas. There seems to be a remnant population northeast of Ness City in the north fork walnut creek drainage that is doing very good. The macroinvertebrate community for this site is not bad with a MBI value of 4.917. This means the stream is in relatively good condition.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 13%
Fine Gravel - 11%
Fine/silt -76%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	42 Maximum	10 Minimum	26 Average
Right Bank -	55 Maximum	7 Minimum	28 Average

CANOPY (OVERHEAD) STREAM COVER:

16% Maximum	0% Minimum	6% Average

Left side of stream - 11%
Right side of stream - 5%
Center of stream - 0%

BANK (INCISED) HEIGHT:

4.6 Maximum	1.6 Minimum	2.8 Average

STREAM CHANNEL TYPE:

Glide - 92%
Pool - 8%

114-RFM-06

North Fork Walnut Creek

Ness Co.

SW/4 of NE/4 SEC. 21, 18S, 24W

07/20/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	984 feet		
Average Stream Depth	1.5 feet shallowest - 10 inches deepest - 2.2 feet		
Stream Width	36.7' Maximum	22.8' Minimum	28.3' Average
Stream Flow	0.190 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.5
Alkalinity	172 mg/l
Conductivity	1141 microSiemens
Total Dissolved Solids	562 mg/l
Nitrates	3.6 mg/l
Phosphorus	0.03 mg/l
Chlorides	180 mg/l
Ammonia	0.08 mg/l
Dissolved Oxygen	2.5 mg/l
Turbidity	70 FTU
Water Temperature	79 F
Air Temperature	81 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	10	1.1
channel catfish	23	2.4
common carp	29	3.1
green sunfish	132	14.1
largemouth bass	78	8.3
orangespotted sunfish	113	12.0
red shiner	28	3.0
western mosquitofish	270	28.8
white crappie	250	26.6
yellow bullhead	6	0.6
Total	**939**	**100**

Index of Biotic Integrity = 69

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	6
Amphipoda	Hyalellidae	scud	35
Araneae	Pisauridae	fishing spider	1
Coleoptera	Dytiscidae	predaceous diving beetle	1
Coleoptera	Elmidae	riffle beetle	4
Coleoptera	Gyrinidae	whirligig beetle	1
Coleoptera	Haliplidae	crawling water beetle	2
Coleoptera	Helodidae	marsh beetle	13
Diptera	Chironomidae	midge	21
Diptera	Tabanidae	horse/deer fly	1
Ephemeroptera	Caenidae	small squaregill mayfly	16
Heteroptera	Corixidae	water boatman	13
Heteroptera	Gerridae	water strider	1
Heteroptera	Nepidae	water scorpion	1
Odonata	Coenagrionidae	bluet damselfly	10
Odonata	Coenagrionidae	forktail damselfly	8
Odonata	Gomphidae	clubtail dragonfly	1
Odonata	Libellulidae	skimmer dragonfly	1
Trichoptera	Hydroptilidae	micro caddisfly	1
Trombidiformes	Arrenuridae	water mite	2
Trombidiformes	Unionicolidae	water mite	1
Veneroida	Pisidiidae	fingernail clam	2

Macroinvertebrate Biotic Index = 5.885

BIOLOGIST NOTES:

The water chemistry results were normal for this area of the state. The IBI value for the fish community is somewhat low. This is probably due to most of the fish community is made up of bigger long-lived fish and not as many minnow species of fish. The high abundance of non-native fish to this area such at the largemouth bass, western mosquitofish, and the common carp also bring down the score. Two-hundred and fifty white crappie is not normal for a prairie stream and probably got there from the overflow of a watershed pond within the drainage.

The MBI value of 5.296 is not bad for this area of the state. I was surprised at this since the whole site was basically one long pool (see picture) and not a variety of physical stream habitats. Although, as you see from the picture, there was plenty of overhanging vegetation and undercut banks which aquatic insects will utilize.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 38%
Fine/silt - 53%
Fine Gravel - 9%

BANK ANGLE (in degrees): (Looking Downstream)
number greater that 90 is an undercut bank

Left Bank -	150	20	115
	Maximum	Minimum	Average
Right Bank -	140	55	113
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

81%	15%	37%
Maximum	Minimum	Average

Left side of stream - 51%
Right side of stream - 47%
Center of stream - 13%

BANK (INCISED) HEIGHT:

4.9	2.6	3.8
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 44%
Pool - 56%

115-RFM-06

West Emma Creek

McPherson Co.

SW/4 of SW/4 SEC. 9, 21S, 1W

07/24/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	932 feet		
Average Stream Depth	2.0 feet shallowest - 10 inches deepest - 4.3 feet		
Stream Width	40.3' Maximum	24.7' Minimum	31.1' Average
Stream Flow	0.162 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.9
Alkalinity	210 mg/l
Conductivity	584 microSiemens
Total Dissolved Solids	283 mg/l
Nitrates	1.9 mg/l
Phosphorus	0.44 mg/l
Chlorides	63 mg/l
Ammonia	0.18 mg/l
Dissolved Oxygen	2.7 mg/l
Turbidity	70 FTU
Water Temperature	73 F
Air Temperature	75 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	2	0.3
bullhead minnow	4	0.5
channel catfish	7	0.9
common carp	65	8.6
fathead minnow	23	3.0
gizzard shad	13	1.7
green sunfish	73	9.6
largemouth bass	30	4.0
longear sunfish	200	26.4
orangespotted sunfish	5	0.7
red shiner	286	37.8
sand shiner	2	0.3
suckermouth minnow	1	0.1
western mosquitofish	37	4.9
white crappie	6	0.8
yellow bullhead	3	0.4
Total	**757**	**100**

Index of Biotic Integrity = 86

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pimpleback	No	No	Yes

Macroinvertebrate Community

Order	Family	Common Name	Number
Amphipoda	Hyalellidae	scud	33
Basommatophora	Physidae	pouch snail	6
Coleoptera	Dryopidae	longtoed water beetle	2
Coleoptera	Dytiscidae	predaceous diving beetle	1
Coleoptera	Elmidae	riffle beetle	21
Coleoptera	Haliplidae	crawling water beetle	2
Coleoptera	Helodidae	marsh beetle	11
Coleoptera	Hydrophilidae	water scavenger beetle	7
Diptera	Ceratopogonidae	biting midge	18
Diptera	Chaoboridae	phantom midge	6
Diptera	Chironomidae	midge	21
Diptera	Stratiomyidae	soldier fly	2
Ephemeroptera	Baetidae	small minnow mayfly	1
Ephemeroptera	Caenidae	small squaregill mayfly	20
Ephemeroptera	Heptageniidae	flatheaded mayfly	2
Heteroptera	Corixidae	water boatman	35
Heteroptera	Gerridae	water strider	10
Heteroptera	Mesoveliidae	water treader	1
Heteroptera	Veliidae	shortlegged strider	1
Lepidoptera	Pyralidae	snout moth	1
Megaloptera	Sialidae	alderfly	1
Odonata	Coenagrionidae	bluet damselfly	5
Odonata	Coenagrionidae	dancer damselfly	10
Odonata	Coenagrionidae	forktail damselfly	2
Odonata	Gomphidae	common clubtail dragonfly	2
Odonata	Libellulidae	amberwing dragonfly	1
Rhynchobdellida	Glossiphoniidae	leech	2
Tricladida	Planariidae	planarian	2

Macroinvertebrate Biotic Index = 6.337

BIOLOGIST NOTES:

The worst thing about this site was the low water bridge crossing at the lower end of the site backs up the stream like a dam and creates a pond effect. In turn, you lose any glide or riffle habitat and makes just one big pool. No matter what kind of WRAPS project you do at this site it won't have any affect until a proper bridge crossing is installed.

This site has a good IBI value of 86 and a nice diversity of fish species. The number of longear sunfish is a surprise. You don't find very many of that species in this area of the state. The macroinvertebrate community has a good diversity of family groups. The MBI value of 6.035 isn't too bad especially for this area of the state and also the site having a big pool affect.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 53%	Fine/silt - 22%
Course Gravel - 9%	Boulders - 4%
Bedrock - 7%	Wood - 5%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	170	15	95
	Maximum	Minimum	Average
Right Bank -	165	15	75
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

99%	37%	67%
Maximum	Minimum	Average

Left side of stream - 76%
Right side of stream - 76%
Center of stream - 47%

BANK (INCISED) HEIGHT:

4.2	2.9	3.7
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 57%
Pool - 43%

116-RFM-06

Turkey Creek

McPherson Co.

SW/4 of SW/4 SEC. 24, 20S, 3W

07/25/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	2 inches shallowest - 0 inches deepest - 1.2 feet		
Stream Width	23.1' Maximum	0' Minimum	5.5' Average
Stream Flow	0.00 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.2
Alkalinity	96 mg/l
Conductivity	231 microSiemens
Total Dissolved Solids	102 mg/l
Nitrates	13.3 mg/l
Phosphorus	0.4 mg/l
Chlorides	62 mg/l
Ammonia	0.55 mg/l
Dissolved Oxygen	2.2 mg/l
Turbidity	252 FTU
Water Temperature	73 F
Air Temperature	77 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
common carp	3	9.1
green sunfish	7	21.2
western mosquitofish	23	69.7
Total	**33**	**100**

Index of Biotic Integrity = 43

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	2
Coleoptera	Dytiscidae	predaceous diving beetle	46
Coleoptera	Haliplidae	crawling water beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	5
Diptera	Chaoboridae	phantom midge	137
Diptera	Chironomidae	midge	47
Diptera	Culicidae	mosquito	18
Heteroptera	Belostomatidae	giant water bug	3
Heteroptera	Corixidae	water boatman	119
Heteroptera	Gerridae	water strider	5
Odonata	Libellulidae	skimmer dragonfly	1
Odonata	Libellulidae	whitetailed skimmer dragonfly	1

Macroinvertebrate Biotic Index = 10.176

BIOLOGIST NOTE:
Hard to say anything about this site because all we had to survey from was one pool area within the survey site. The fish community is very poor with a IBI value of 43. The fish community consisting of 78% non native introduced fish species and only three species present. The macroinvertebrate community is really bad with mostly tolerant species collected. This is what usually happens if a stream goes dry annually.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Fine/silt -100%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	15	5	10
	Maximum	Minimum	Average
Right Bank -	10	2	8
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

100%	49%	29%
Maximum	Minimum	Average

Left side of stream - 28%
Right side of stream - 32%
Center of stream - 26%

BANK (INCISED) HEIGHT:

3.6	2.3	3.2
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 36%
Dry - 40%
Pool - 4%

117-RFM-06

Running Turkey Creek

McPherson Co.

SE/4 of SE/4 SEC. 24, 20S, 3W

07/25/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	3 inches shallowest - 0.0 inches deepest - 1.1 feet		
Stream Width	16.9' Maximum	0.0' Minimum	4.8' Average
Stream Flow	0.00 CFS		

2006 WATER CHEMISTRY

	2006
pH	8.3
Alkalinity	156 mg/l
Conductivity	1293 microSiemens
Total Dissolved Solids	639 mg/l
Nitrates	4.8 mg/l
Phosphorus	0.07 mg/l
Chlorides	337 mg/l
Ammonia	0.13 mg/l
Dissolved Oxygen	5.5 mg/l
Turbidity	140 FTU
Water Temperature	79 F
Air Temperature	90 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	3	0.3
common carp	1	0.1
fathead minnow	107	11.3
green sunfish	69	7.3
northern plains killifish	3	0.3
orangespotted sunfish	3	0.3
red shiner	72	7.6
sand shiner	32	3.4
western mosquitofish	540	56.8
yellow bullhead	120	12.6
Total	**950**	**100**

Index of Biotic Integrity = 81

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pondhorn	No	Yes	No

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	13
Amphipoda	Hyalellidae	scud	9
Basommatophora	Physidae	pouch snail	43
Basommatophora	Planorbidae	orb snail	1
Coleoptera	Curculionidae	water weevil	1
Coleoptera	Dytiscidae	predaceous diving beetle	9
Coleoptera	Haliplidae	crawling water beetle	1
Coleoptera	Helodidae	marsh beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	2
Diptera	Ceratopogonidae	biting midge	2
Diptera	Chironomidae	midge	34
Heteroptera	Belostomatidae	giant water bug	1
Heteroptera	Corixidae	water boatman	193
Heteroptera	Gerridae	water strider	2
Megaloptera	Sialidae	alderfly	22
Odonata	Libellulidae	amberwing dragonfly	1

Macroinvertebrate Biotic Index = 8.080

BIOLOGIST NOTE:
The fish community is not bad with an IBI value of 81 especially under the dry conditions that existed at the time of the survey. 540 western mosquitofish, a tolerant non-native fish, made up about 50% of the fish community which hurt the IBI value the most. There wasn't a lot of diversity in the macroinvertebrate community and a score of 8.080 indicates some imperil. Although, there wasn't nothing but pools left at the time of the survey, so only the tolerant aquatic insect species are going to be present. For example the 193 water boatman collected. The high chlorides (salts) and conductivity values are due to the concentrated conditions of just pools and not a flowing stream. Also, there is usually higher chloride values in this area.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 7%
Fine/silt - 87%
Wood - 6%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	35	5	14
	Maximum	Minimum	Average
Right Bank -	30	7	21
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

100%	6%	42%
Maximum	Minimum	Average

Left side of stream - 41%
Right side of stream - 44%
Center of stream - 41%

BANK (INCISED) HEIGHT:

8.5	3.9	6.6
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide -41 %
Dry - 44%
Pool - 15%

118-RFM-06

West Emma Creek

Harvey Co.

SW/4 of SE/4 SEC. 31, 22S, 1W

07/26/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	869 feet		
Average Stream Depth	1.66 feet shallowest - 2 inches deepest - 4.1 feet		
Stream Width	56.6' Maximum	5.2' Minimum	27.1' Average
Stream Flow	0.047 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.8
Alkalinity	273 mg/l
Conductivity	686 microSiemens
Total Dissolved Solids	334mg/l
Nitrates	1.1 mg/l
Phosphorus	0.42 mg/l
Chlorides	30 mg/l
Ammonia	0.43 mg/l
Dissolved Oxygen	2.3 mg/l
Turbidity	44 FTU
Water Temperature	79 F
Air Temperature	86 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black buffalo	1	0.1
black bullhead	4	0.3
black crappie	1	0.1
bluegill	8	0.5
bluntnose minnow	56	3.7
channel catfish	33	2.2
common carp	74	4.9
fathead minnow	28	1.8
flathead catfish	1	0.1
freshwater drum	1	0.1
gizzard shad	2	0.1
goldfish	4	0.3
green sunfish	194	12.7
largemouth bass	22	1.4
longear sunfish	114	7.5
orangespotted sunfish	7	0.5
red shiner	592	38.9
river carpsucker	7	0.5
sand shiner	31	2.0
western mosquitofish	308	20.2
white crappie	26	1.7
yellow bullhead	9	0.6
Total	**1523**	**100**

Index of Biotic Integrity = 87

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pink papershell	No	Yes	No
giant floater	Yes	Yes	No
mapleleaf	Yes	Yes	No

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	11
Amphipoda	Hyalellidae	scud	70
Araneae	Pisauridae	fishing spider	1
Basommatophora	Physidae	pouch snail	10
Branchiobdellida	Branchiobdellidae	crayfish worm	1
Coleoptera	Dytiscidae	predaceous diving beetle	2
Coleoptera	Elmidae	riffle beetle	10
Coleoptera	Haliplidae	crawling water beetle	1
Coleoptera	Helodidae	marsh beetle	7
Coleoptera	Hydrophilidae	water scavenger beetle	4
Collembola	Entomobryidae	springtail	2
Decapoda	Cambaridae	crayfish	2
Diptera	Ceratopogonidae	biting midge	11
Diptera	Chironomidae	midge	70
Ephemeroptera	Baetidae	small minnow mayfly	4
Ephemeroptera	Caenidae	small squaregill mayfly	12
Ephemeroptera	Ephemeridae	common burrower mayfly	1
Ephemeroptera	Heptageniidae	flatheaded mayfly	4
Heteroptera	Corixidae	water boatman	91
Heteroptera	Gerridae	water strider	1
Heteroptera	Nepidae	water scorpion	1
Megaloptera	Sialidae	alderfly	5
Odonata	Coenagrionidae	bluet damselfly	1
Odonata	Coenagrionidae	dancer damselfly	7
Odonata	Libellulidae	whitetailed skimmer dragonfly	4
Trombidiformes	Unionicolidae	water mite	1
Veneroida	Pisidiidae	fingernail clam	3

Macroinvertebrate Biotic Index = 6.923

BIOLOGIST NOTE: This was the best site of the five sites surveyed as part of the Little Arkansas River WRAPS project. Although, it also had the most flowing water available. This is actually a pretty good site for this area of the state. A good diversity of fish species and also a IBI value of 87 is a good indicator of stream condition. Also a good diversity of macroinvertebrates and a MBI value of 6.312 is not too bad for this area of the state. The few live and recent mussels that we collected also shows that there hasn't been any lethal levels of pollutants flow down this stream for awhile.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 64% Fine/silt - 35%
Wood -1%

BANK ANGLE (in degrees): (Looking Downstream)
number greater that 90 is an undercut bank

Left Bank -	75	5	45
	Maximum	Minimum	Average
Right Bank -	175	8	54
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

100%	27%	64%
Maximum	Minimum	Average

Left side of stream - 51%
Right side of stream - 90%
Center of stream - 52%

BANK (INCISED) HEIGHT:

5.5	2.9	4.3
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 66%
Pool - 34%

119-RFM-06

Black Kettle Creek

Harvey Co.

NW/4 of NW/4 SEC. 9, 23S, 2W

07/27/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	2 inches shallowest - 0 inches deepest - 0.5 feet		
Stream Width	11.4' Maximum	0.0' Minimum	4.5' Average
Stream Flow	0.000 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.2
Alkalinity	104 mg/l
Conductivity	283 microSiemens
Total Dissolved Solids	136 mg/l
Nitrates	28.1mg/l
Phosphorus	0.12 mg/l
Chlorides	41 mg/l
Ammonia	0.37 mg/l
Dissolved Oxygen	2.4 mg/l
Turbidity	326 FTU
Water Temperature	75 F
Air Temperature	75 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
common carp	771	82.3
golden shiner	7	0.7
green sunfish	143	15.3
orangespotted sunfish	1	0.1
western mosquitofish	15	1.6
Total	**937**	**100**

Index of Biotic Integrity = 40

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
Arhynchobdellida	Erpobdellidae	leech	14
Basommatophora	Physidae	pouch snail	2
Basommatophora	Planorbidae	orb snail	4
Coleoptera	Carabidae	ground beetle	4
Coleoptera	Dytiscidae	predaceous diving beetle	50
Coleoptera	Haliplidae	crawling water beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	7
Diptera	Chironomidae	midge	5
Heteroptera	Belostomatidae	giant water bug	1
Heteroptera	Corixidae	water boatman	40
Heteroptera	Gerridae	water strider	2
Heteroptera	Mesoveliidae	water treader	1
Heteroptera	Notonectidae	backswimmer	42
Odonata	Libellulidae	whitetailed skimmer dragonfly	1
Veneroida	Pisidiidae	fingernail clam	10

Macroinvertebrate Biotic Index = 7.776

BIOLOGIST NOTE: First of all you need to consider this was a very dry summer. The fish community was very poor with 85% of its fish community made up of non native fish species. A MBI value of 7.776 indicates a poor aquatic insect community impacted by environmental conditions. Furthermore, most of the insects were collected from pools that hadn't dried up so the only insects left were the tolerant species that can withstand these conditions.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Fine/silt - 100%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	12	4	6
	Maximum	Minimum	Average
Right Bank -	15	3	6
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

100%	6%	25%
Maximum	Minimum	Average

Left side of stream - 24%
Right side of stream - 31%
Center of stream - 20%

BANK (INCISED) HEIGHT:

4.6	2.6	3.7
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 75%
Dry - 25%

120-RFM-06
077-RFM-05
041-RFM-04

Clear Fork Creek

Pottawatomie Co.

NW/4 of NW/4 SEC. 20, 6S,10E

07/31/06

2006 STREAM COMPARISONS

	2004	2005	2006
Length of Sample Site	492 feet	515 feet	515 feet
Average Stream Depth	7 inches shallowest - 1 inch deepest - 4.6 feet	1.2 feet shallowest - 1 inch deepest - 5.0 feet	9 inches shallowest - 0 inches deepest - 3.9 feet
Stream Width	15.0' Maximum 6.8' Minimum 10.7' Average	17.7' Maximum 5.9' Minimum 10.8' Average	20.8' Maximum 0.0' Minimum 6.3' Average
Stream Flow	0.000 CFS	0.000 CFS	0.000 CFS

2006 WATER CHEMISTRY

	2004	2005	2006
pH	7.7	7.8	7.6
Alkalinity	264 mg/l	233 mg/l	231 mg/l
Conductivity	715 microSiemens	642 microSiemens	639 microSiemens
Total Dissolved Solids	349 mg/l	~~23.6 mg/l~~	311 mg/l
Nitrates	0.7 mg/l	1.1 mg/l	6.1 mg/l
Phosphorus	0.02 mg/l	0.01 mg/l	0.07 mg/l
Chlorides	1 mg/l	22 mg/l	73 mg/l
Ammonia	0.02 mg/l	0.07 mg/l	0.21 mg/l
Dissolved Oxygen	3.4 mg/l	4.2 mg/l	0.8 mg/l
Turbidity	17 FTU	8 FTU	137 FTU
Water Temperature	68 F	75 F	75 F
Air Temperature	71 F	79 F	86 F

FISH POPULATION COMPARISONS

SPECIES	2004		2005		2006	
	#	% BY #	#	% BY #	#	% BY #
black bullhead	3	0.4	2	0.5	15	1.3
bluntnose minnow	33	4.2	27	7.3	123	10.6
central stoneroller	294	37.4	73	19.8	184	15.8
common shiner	22	2.8	11	3.0	69	5.9
creek chub	90	11.5	25	6.8	279	23.9
fathead minnow	161	20.5	34	9.2	206	17.7
green sunfish	61	7.8	74	20.1	161	13.8
johnny darter	18	2.3	3	0.8	1	0.1
orangethroat darter	36	4.6	72	19.6	8	0.7
red shiner	48	6.1	26	7.1	82	7.0
southern redbelly dace	0	0.0	0	0.0	1	0.1
white sucker	12	1.5	5	1.4	21	1.8
yellow bullhead	8	1.0	16	4.3	15	1.3
Total	**786**	**100**	**368**	**100**	**1165**	**100**
Index of Biotic Integrity =	86		86		97	

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pondmussel	No	Yes	No
lilliput	Yes	No	No

Macroinvertebrate Community

2006

Order	Family	Common Name	Number
		leech	18
Amphipoda	Hyalellidae	scud	31
Arhynchobdellida	Erpobdellidae	leech	2
Basommatophora	Physidae	pouch snail	47
Basommatophora	Planorbidae	orb snail	4
Coleoptera	Dytiscidae	predaceous diving beetle	4
Coleoptera	Elmidae	riffle beetle	4
Coleoptera	Haliplidae	crawling water beetle	5
Coleoptera	Hydrophilidae	water scavenger beetle	4
Decapoda	Cambaridae	crayfish	3
Diptera	Ceratopogonidae	biting midge	3
Diptera	Chaoboridae	phantom midge	2
Diptera	Chironomidae	midge	184
Ephemeroptera	Baetidae	small minnow mayfly	2
Ephemeroptera	Caenidae	small squaregill mayfly	8
Heteroptera	Belostomatidae	giant water bug	1
Heteroptera	Corixidae	water boatman	2
Megaloptera	Sialidae	alderfly	3
Odonata	Coenagrionidae	bluet damselfly	2
Odonata	Coenagrionidae	dancer damselfly	1
Odonata	Coenagrionidae	forktail damselfly	6
Odonata	Gomphidae	snake darner dragonfly	1
Odonata	Gomphidae	spinylegged clubtail dragonfly	6
Odonata	Libellulidae	amberwing dragonfly	1
Odonata	Libellulidae	blue pirate dragonfly	3
Odonata	Libellulidae	skimmer dragonfly	4
Odonata	Libellulidae	whitetailed skimmer dragonfly	11
Rhynchobdellida	Glossiphoniidae	leech	1
Tricladida	Planariidae	planarian	2
Trombidiformes	Unionicolidae	water mite	1
Veneroida	Pisidiidae	fingernail clam	14

Macroinvertebrate Biotic Index = 2004 = 6.242
2005 = 6.372
2006 = 8.701

BIOLOGIST NOTE: The fish community is staying rather consistent. An IBI value of 97 indicates a good stream fish community. This is the first year collecting a southern redbelly dace this high in the watershed so that shows some fish movement even during a dry year. The MBI value of 8.373 is not very good. This could be due to the dry stream conditions and only the tolerant insects could sustain. Since there was no flowing water at this time, a dissolved oxygen level of 0.8 mg/l can also influence the aquatic insect community.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Cobble - 27%
Fine/silt -23%
Fine Gravel -7%
Course Gravel - 37%
Boulder - 7%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	40	5	23
	Maximum	Minimum	Average
Right Bank -	85	10	36
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

99%	0%	41%
Maximum	Minimum	Average

Left side of stream - 37%
Right side of stream - 40%
Center of stream - 45%

BANK (INCISED) HEIGHT:

5.9	3.9	4.8
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 18%
Dry - 51%
Pool - 31%

121-RFM-06

Clear Fork Creek

Pottawatomie Co.

SW/4 of SW/4 SEC. 17, 6S, 10E

08/01/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	515 feet		
Average Stream Depth	9 inches shallowest - 0 inches deepest - 3.9 feet		
Stream Width	20.8' Maximum	0.0' Minimum	6.3' Average
Stream Flow	0.024 CFS		

2006 WATER CHEMISTRY

	2006
pH	8.1
Alkalinity	233 mg/l
Conductivity	551 microSiemens
Total Dissolved Solids	267 mg/l
Nitrates	6.6 mg/l
Phosphorus	0.01 mg/l
Chlorides	33 mg/l
Ammonia	0.13 mg/l
Dissolved Oxygen	4 mg/l
Turbidity	116 FTU
Water Temperature	81 F
Air Temperature	91 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black bullhead	6	0.4
bluntnose minnow	289	17.0
central stoneroller	229	13.4
common shiner	103	6.0
creek chub	189	11.1
fathead minnow	525	30.8
green sunfish	66	3.9
johnny darter	28	1.6
orangespotted sunfish	25	1.5
orangethroat darter	49	2.9
red shiner	140	8.2
white sucker	42	2.5
yellow bullhead	12	0.7
Total	**1703**	**100**

Index of Biotic Integrity = 88

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	1
Amphipoda	Hyalellidae	scud	2
Arhynchobdellida	Erpobdellidae	leech	1
Basommatophora	Physidae	pouch snail	49
Basommatophora	Planorbidae	orb snail	3
Coleoptera	Dytiscidae	predaceous diving beetle	2
Coleoptera	Haliplidae	crawling water beetle	80
Coleoptera	Hydrophilidae	water scavenger beetle	5
Decapoda	Cambaridae	crayfish	4
Diptera	Chironomidae	midge	12
Diptera	Tabanidae	horse/deer fly	1
Ephemeroptera	Caenidae	small squaregill mayfly	1
Heteroptera	Corixidae	water boatman	10
Megaloptera	Sialidae	alderfly	3
Odonata	Coenagrionidae	bluet damselfly	2
Odonata	Coenagrionidae	forktail damselfly	2
Odonata	Libellulidae	skimmer dragonfly	2
Odonata	Libellulidae	whitetailed skimmer dragonfly	1
Veneroida	Pisidiidae	fingernail clam	24

Macroinvertebrate Biotic Index = 7.570

BIOLOGIST NOTE:
Since this stretch of stream was created in 2006, we didn't know what to expect for aquatic life. The fish community adjusted well and with an IBI value of 88, is a good indicator. Along with the macroinvertebrate community, there are a few riffle species not present thus a MBI value of 7.570 indicates there is somewhat of an impact on the aquatic insect community. Should be interesting to see how organisms adapt after a year. This site was the only site out of five on Clear Fork creek that had flowing water at the time of the surveys.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Cobble - 30% Fine/silt - 48%
Fine Gravel - 6% Course Gravel - 8%
Other - 8%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	65	5	22
	Maximum	Minimum	Average
Right Bank -	45	3	23
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

75%	0%	26%
Maximum	Minimum	Average

Left side of stream - 24%
Right side of stream - 28%
Center of stream - 25%

BANK (INCISED) HEIGHT:

4.9	3.9	4.5
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 71%
Dry - 19%
Pool - 11%

122-RFM-06
075-RFM-05
039-RFM-04

Clear Fork Creek

Pottawatomie Co.

SE/4 of SE/4 SEC. 18, 6S, 10E

8/1/05

8/1/06

2006 STREAM COMPARISONS

	2004	2005	2006
Length of Sample Site	556 feet	525 feet	525 feet
Average Stream Depth	11 inches shallowest - 1 inches deepest - 2.2 feet	11 inches shallowest - 0 inches deepest - 2.8 feet	5 inches shallowest - 0 inches deepest - 1.8 feet
Stream Width	20.0' Maximum 2.6' Minimum 12.1' Average	20.0' Maximum 2.6' Minimum 12.1' Average	14.0' Maximum 0.0' Minimum 4.6' Average
Stream Flow	0.000 CFS	0.000 CFS	0.000 CFS

2006 WATER CHEMISTRY

	2004	2005	2006
pH	7.9	7.9	7.8
Alkalinity	287 mg/l	259 mg/l	310 mg/l
Conductivity	690 microSiemens	629 microSiemens	775 microSiemens
Total Dissolved Solids	336 mg/l	316 mg/l	378 mg/l
Nitrates	0.4 mg/l	1.0 mg/l	2.5 mg/l
Phosphorus	0.04 mg/l	0.03 mg/l	0.06 mg/l
Chlorides	3 mg/l	18 mg/l	34 mg/l
Ammonia	0.05 mg/l	0.06 mg/l	0.55 mg/l
Dissolved Oxygen	3.3 mg/l	4.4 mg/l	1.6 mg/l
Turbidity	44 FTU	10 FTU	195 FTU
Water Temperature	75 F	73 F	86 F
Air Temperature	86 F	81 F	102 F

FISH POPULATION COMPARISONS

SPECIES	2004		2005		2006	
	#	% BY #	#	% BY #	#	% BY #
black bullhead	3	0.5	2	0.3	24	2.4
bluntnose minnow	34	5.9	52	8.0	214	21.8
carmine shiner	0	0.0	38	5.8	0	0.0
central stoneroller	108	18.8	159	24.4	56	5.7
common shiner	29	5.1	14	2.1	88	9.0
creek chub	56	9.8	74	11.4	101	10.3
fathead minnow	200	34.9	63	9.7	248	25.3
green sunfish	47	8.2	46	7.1	92	9.4
johnny darter	24	4.2	5	0.8	14	1.4
orangethroat darter	12	2.1	138	21.2	47	4.8
red shiner	36	6.3	43	6.6	39	4.0
white sucker	21	3.7	5	0.8	25	2.5
yellow bullhead	3	0.5	13	2.0	33	3.4
Total	**573**	**100**	**652**	**100**	**981**	**100**

Index of Biotic Integrity = 78 93 89

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pondmussel	Yes	No	No

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	2
Basommatophora	Physidae	pouch snail	10
Basommatophora	Planorbidae	orb snail	7
Coleoptera	Dytiscidae	predaceous diving beetle	25
Coleoptera	Haliplidae	crawling water beetle	53
Coleoptera	Hydrophilidae	water scavenger beetle	1
Decapoda	Cambaridae	crayfish	2
Diptera	Chironomidae	midge	21
Diptera	Tabanidae	horse/deer fly	1
Heteroptera	Corixidae	water boatman	47
Odonata	Coenagrionidae	bluet damselfly	1
Odonata	Coenagrionidae	forktail damselfly	1
Odonata	Libellulidae	skimmer dragonfly	1
Rhynchobdellida	Glossiphoniidae	leech	2

Macroinvertebrate Biotic Index = 2006 = 9.130
2005 = 5.762
2004 = 6.640

BIOLOGIST NOTE:
The fish community has remained consistent and a score of 89 is not too bad. The aquatic insect community in 2006 was very small especially with all the habitat at this site. The MBI value of 9.103 value is not good. This could be due to the small number of insects collected and the very low water conditions.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Cobble -20%	Fine/silt -16%
Fine Gravel -20%	Course Gravel - 28%
Boulder - 8%	Wood - 8%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	50	18	31
	Maximum	Minimum	Average
Right Bank -	75	10	48
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

100%	26%	35%
Maximum	Minimum	Average

Left side of stream - 32%
Right side of stream - 41%
Center of stream - 33%

BANK (INCISED) HEIGHT:

4.9	3.6	4.1
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 51%
Dry - 34%
Pool - 15%

123-RFM-06
076-RFM-05

Clear Fork Creek

Pottawatomie Co.

SE/4 of SE/4 SEC. 12, 6S, 9E

8/02/05

08/02/06

2006 STREAM COMPARISONS

	2005	2006
Length of Sample Site	716 feet	715 feet
Average Stream Depth	9 inches shallowest - 2 inches deepest - 1.7 feet	6 inches shallowest - 0 inches deepest - 1.3 feet
Stream Width	28.9' Maximum 3.6' Minimum 15.0' Average	27.0' Maximum 0.0' Minimum 11.4' Average
Stream Flow	0.000 CFS	0.000 CFS

2006 WATER CHEMISTRY

	2005	2006
pH	7.9	8.1
Alkalinity	226 mg/l	210 mg/l
Conductivity	646 microSiemens	618 microSiemens
Total Dissolved Solids	323 mg/l	300 mg/l
Nitrates	3.2 mg/l	0.6 mg/l
Phosphorus	0.02 mg/l	0.04 mg/l
Chlorides	12 mg/l	40 mg/l
Ammonia	0.08 mg/l	0.17 mg/l
Dissolved Oxygen	4.5 mg/l	4.4 mg/l
Turbidity	17 FTU	50 FTU
Water Temperature	73 F	79 F
Air Temperature	77 F	82 F

FISH POPULATION COMPARISONS

SPECIES	2005		2006	
	#	% BY #	#	% BY #
black bullhead	7	0.3	1	0.04
bluegill	1	0.0	0	0.0
bluntnose minnow	42	2.1	738	26.1
carmine shiner	4	0.2	0	0.0
central stoneroller	1267	62.6	894	31.6
common shiner	76	3.8	105	3.7
creek chub	57	2.8	266	9.4
fathead minnow	26	1.3	249	8.8
green sunfish	26	1.3	62	2.2
johnny darter	71	3.5	17	0.6
orangespotted sunfish	24	1.2	9	0.3
orangethroat darter	103	5.1	50	1.8
red shiner	11	0.5	102	3.6
southern redbelly dace	142	7.0	158	5.6
Topeka shiner	133	6.6	117	4.1
white sucker	21	1.0	16	0.6
yellow bullhead	12	0.6	44	1.6
Total	**2023**	**100**	**2828**	**100**

Index of Biotic Integrity = 95 95

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pondmussel	No	Yes	No

Macroinvertebrate Community

2006

Order	Family	Common Name	Number
		leech	6
Basommatophora	Physidae	pouch snail	31
Basommatophora	Planorbidae	orb snail	4
Branchiobdellida	Branchiobdellidae	crayfish worm	30
Coleoptera	Dytiscidae	predaceous diving beetle	1
Coleoptera	Elmidae	riffle beetle	4
Coleoptera	Haliplidae	crawling water beetle	4
Coleoptera	Helodidae	marsh beetle	2
Coleoptera	Hydrophilidae	water scavenger beetle	1
Decapoda	Cambaridae	crayfish	14
Diptera	Ceratopogonidae	biting midge	2
Diptera	Chaoboridae	phantom midge	1
Diptera	Chironomidae	midge	8
Diptera	Stratiomyidae	soldier fly	1
Ephemeroptera	Caenidae	small squaregill mayfly	8
Ephemeroptera	Heptageniidae	flatheaded mayfly	9
Heteroptera	Corixidae	water boatman	3
Heteroptera	Gerridae	water strider	6
Heteroptera	Nepidae	water scorpion	1
Megaloptera	Sialidae	alderfly	2
Odonata	Gomphidae	spinylegged clubtail dragonfly	2
Rhynchobdellida	Glossiphoniidae	leech	1
Unionoida	Unionidae	pond mussel	1
Veneroida	Pisidiidae	fingernail clam	8

Macroinvertebrate Biotic Index - 2006 = 7.547
2005 = 5.661

BIOLOGIST NOTE:
Water chemistry conditions seem fairly normal for this time of year. The fish community is maintaining consistency each year with IBI values the same both years. This site is where we collect the most Topeka shiners out all five sites conducted on Clear Fork Creek. This is also the farthest downstream stream site of all five surveys. The MBI value in 2005 was real good but in 2006 it goes to 7.547. The higher the value the more impacted the aquatic insect community. The 2006 value may be due to the very low flow and drought conditions this time of year.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Fine Gravel - 2%
Course Gravel - 36%
Cobble - 36%
Boulder - 4%
Bedrock - 22%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	45	5	19
	Maximum	Minimum	Average
Right Bank -	67	8	32
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

100%	0%	71%
Maximum	Minimum	Average

Left side of stream - 71%
Right side of stream - 78%
Center of stream - 64%

BANK (INCISED) HEIGHT:

7.8	3.9	5.3
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 88%
Dry - 11%
Pool - 1%

124-RFM-06
078-RFM-05
040-RFM-04

Clear Fork Creek

Pottawatomie Co.

NW/4 of NW/4 SEC. 18, 6S, 10E

8/04/05

8/03/06

2006 STREAM COMPARISONS

	2004	2005	2006
Length of Sample Site	492 feet	531 feet	531 feet
Average Stream Depth	6 inches shallowest - 0 inches deepest - 3.8 feet	1 foot shallowest - 0 inches deepest - 4.4 feet	5 inches shallowest - 0 inches deepest - 2.8 feet
Stream Width	22.1' Maximum 3.9' Minimum 10.9' Average	20.7' Maximum 0.0' Minimum 13.7' Average	10.1' Maximum 0.0' Minimum 2.3' Average
Stream Flow	0.000 CFS	0.000 CFS	0.000 CFS

2006 WATER CHEMISTRY

	2004	2005	2006
pH	7.7	7.6	7.4
Alkalinity	181 mg/l	300 mg/l	63 mg/l
Conductivity	609 microSiemens	712 microSiemens	448 microSiemens
Total Dissolved Solids	297 mg/l	355 mg/l	216 mg/l
Nitrates	3.6 mg/l	2.3 mg/l	2.3 mg/l
Phosphorus	0.04 mg/l	0.02 mg/l	0.04 mg/l
Chlorides	4 mg/l	6 mg/l	62 mg/l
Ammonia	0.07 mg/l	0.09 mg/l	0.25 mg/l
Dissolved Oxygen	1.5 mg/l	4.3 mg/l	1.1 mg/l
Turbidity	18 FTU	22 FTU	255 FTU
Water Temperature	77 F	73 F	73 F
Air Temperature	73F	77F	77F

FISH POPULATION COMPARISONS						
	2004		2005		2006	
SPECIES	#	% BY #	#	% BY #	#	% BY #
black bullhead	3	0.6	2	0.1	21	1.2
bluegill X green sunfish hybrid	1	0.2	0	0.0	0	0.0
bluntnose minnow	3	0.6	33	2.3	81	4.6
central stoneroller	206	43.3	280	19.5	160	9.1
common shiner	31	6.5	777	54.0	26	1.5
creek chub	67	14.1	86	6.0	113	6.4
fathead minnow	46	9.7	46	3.2	1058	59.9
green sunfish	17	3.6	23	1.6	94	5.3
johnny darter	15	3.2	26	1.8	3	0.2
largemouth bass	1	0.2	2	0.1	3	0.2
orangethroat darter	34	7.1	100	6.9	21	1.2
red shiner	19	4.0	23	1.6	84	4.8
southern redbelly dace	0	0.0	18	1.3	13	0.7
Topeka shiner	3	0.6	19	1.3	12	0.7
white sucker	26	5.5	4	0.3	49	2.8
yellow bullhead	4	0.8	0	0.0	29	1.6
Total	**476**	**100**	**1439**	**100**	**1767**	**100**

Index of Biotic Integrity = 98 86 87

Freshwater Mussel Community

No Mussels Collected

Macroinvertebrate Community

2006

Order	Family	Common Name	Number
		leech	2
Arhynchobdellida	Erpobdellidae	leech	1
Basommatophora	Physidae	pouch snail	34
Basommatophora	Planorbidae	orb snail	2
Coleoptera	Dytiscidae	predaceous diving beetle	13
Coleoptera	Elmidae	riffle beetle	1
Coleoptera	Haliplidae	crawling water beetle	7
Coleoptera	Hydrophilidae	water scavenger beetle	5
Decapoda	Cambaridae	crayfish	1
Diptera	Chaoboridae	phantom midge	2
Diptera	Chironomidae	midge	35
Diptera	Culicidae	mosquito	1
Diptera	Tabanidae	horse/deer fly	1
Ephemeroptera	Caenidae	small squaregill mayfly	2
Ephemeroptera	Ephemeridae	common burrower mayfly	1
Ephemeroptera	Heptageniidae	flatheaded mayfly	7
Heteroptera	Corixidae	water boatman	137
Megaloptera	Sialidae	alderfly	1
Odonata	Gomphidae	spinylegged clubtail dragonfly	2
Odonata	Libellulidae	skimmer dragonfly	1
Odonata	Libellulidae	whitetailed skimmer dragonfly	4
Rhynchobdellida	Glossiphoniidae	leech	3
Tricladida	Planariidae	planarian	2
Veneroida	Pisidiidae	fingernail clam	7

Macroinvertebrate Biotic Index - 2006 = 8.379
2005 = 7.317
2004 = 6.641

BIOLOGIST NOTE:
Maintained a consistent fish diversity over the past three years. The higher IBI value in 2004 may be due to the low number of fish collected that year. The aquatic insect community is diverse but the MBI value seems to be dropping each year. The 2006 MBI value of 8.379 could partially be due to the very low water conditions and only the insects that can tolerate, no flow, low water conditions will inhabit the area. Water chemistry looks normal, the high 255 turbidity reading was probably due to the dry conditions and fish muddying up the pool the water sample was collected.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Course Gravel - 30%
Fine Gravel -20%
Fine/silt - 45%
Cobble - 5%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	30 Maximum	5 Minimum	18 Average
Right Bank -	25 Maximum	9 Minimum	14 Average

CANOPY (OVERHEAD) STREAM COVER:

93% Maximum	74% Minimum	29% Average

Left side of stream - 21%
Right side of stream - 33%
Center of stream - 33%

BANK (INCISED) HEIGHT:

5.2 Maximum	2.6 Minimum	4.3 Average

STREAM CHANNEL TYPE:

Glide - 40%
Dry - 53%
Pool - 7%

125-RFM-06

Shoal Creek

Cherokee Co.

SE/4 of SE/4 SEC. 36, 34S, 25E

08/07/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	984 feet		
Average Stream Depth	2.58 feet shallowest - 9 inches deepest - 6.4 feet		
Stream Width	135.9' Maximum	34.8' Minimum	54.7' Average
Stream Flow	51.353 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.7
Alkalinity	133 mg/l
Conductivity	405 microSiemens
Total Dissolved Solids	196 mg/l
Nitrates	3.3 mg/l
Phosphorus	0.32 mg/l
Chlorides	29 mg/l
Ammonia	0.14 mg/l
Dissolved Oxygen	3.3 mg/l
Turbidity	6 FTU
Water Temperature	84 F
Air Temperature	91 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
banded darter	21	1.3
banded sculpin	1	0.1
black buffalo	28	1.7
black crappie	1	0.1
blackstripe topminnow	8	0.5
bluegill	55	3.3
bluntface shiner	12	0.7
brook silverside	8	0.5
cardinal shiner	362	21.9
carmine shiner	240	14.5
central stoneroller	253	15.3
channel catfish	17	1.0
channel darter	4	0.2
flathead catfish	2	0.1
freshwater drum	4	0.2
gizzard shad	19	1.1
golden redhorse	150	9.1
gravel chub	46	2.8
green sunfish	5	0.3
greenside darter	9	0.5
longear sunfish	60	3.6
mimic shiner	4	0.2
northern hogsucker	38	2.3
orangethroat darter	21	1.3
ozark logperch	43	2.6
ozark minnow	39	2.4
pealip redhorse	5	0.3
redspot chub	1	0.1
river redhorse	36	2.2
rock bass	15	0.9
slender madtom	7	0.4
smallmouth bass	19	1.1
speckled darter	3	0.2
spotted bass	20	1.2
spotted sucker	4	0.2
walleye	1	0.1
warmouth	16	1.0
western mosquitofish	77	4.7
Total	**1654**	**100**

Index of Biotic Integrity = 106

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
plain pocketbook	No	No	Yes
fragile papershell	No	Yes	No

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	9
Amphipoda	Hyalellidae	scud	7
Arhynchobdellida	Erpobdellidae	leech	7
Basommatophora	Ancylidae	limpet snail	5
Basommatophora	Planorbidae	orb snail	2
Branchiobdellida	Branchiobdellidae	crayfish worm	11
Coleoptera	Elmidae	riffle beetle	124
Coleoptera	Psephenidae	water penny	7
Decapoda	Cambaridae	crayfish	2
Diptera	Ceratopogonidae	biting midge	1
Diptera	Chironomidae	midge	103
Diptera	Simuliidae	black fly	1
Ephemeroptera	Baetidae	small minnow mayfly	6
Ephemeroptera	Caenidae	small squaregill mayfly	10
Ephemeroptera	Ephemeridae	common burrower mayfly	1
Ephemeroptera	Heptageniidae	flatheaded mayfly	18
Ephemeroptera	Leptohyphidae	little stout crawler mayfly	32
Heteroptera	Corixidae	water boatman	2
Heteroptera	Gerridae	water strider	1
Megaloptera	Corydalidae	dobson fly	1
Neotaenioglossa	Pleuroceridae	rock/horn snail	55
Odonata	Coenagrionidae	bluet damselfly	25
Odonata	Coenagrionidae	dancer damselfly	22
Odonata	Gomphidae	snake darner dragonfly	1
Rhynchobdellida	Glossiphoniidae	leech	1
Trichoptera	Helicopsychidae	snailcase maker caddisfly	1
Trichoptera	Hydropsychidae	common netspinner caddisfly	17
Trichoptera	Hydroptilidae	micro caddisfly	5
Trichoptera	Leptoceridae	longhorned casemaker caddisfly	1
Tricladida	Planariidae	planarian	17
Trombidiformes	Lebertiidae	water mite	5
Veneroida	Corbiculidae	Asian clam	19

Macroinvertebrate Biotic Index = 5.975

BIOLOGIST NOTE: This was one of the most diverse sites I have ever surveyed. The fish community was very diverse with many sensitive fish species being collected. Sesitive to water quality conditions. The IBI value of 106 is very good for a creek this size. The aquatic insect community was very diverse. A MBI value of 5.975 is not good for this area. The nitrogen and dissolved oxygen levels are the only concern in the water chemistry values. This could be due to the low flow conditions this time of year. A couple of mussels species collected is a postive indicator since this site is below the Joplin water treatment facitly. The physical habitat of this site was very diverse for both fish and aquatic insects.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 2%
Course Gravel - 71%
Fine Gravel -16%
Cobble - 7%
Wood - 4%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	110	2	30
	Maximum	Minimum	Average
Right Bank -	65	5	26
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

73%	6%	37%
Maximum	Minimum	Average

Left side of stream - 43%
Right side of stream - 46%
Center of stream - 21%

BANK (INCISED) HEIGHT:

5.9	3.3	4.3
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 30%
Riffle - 13%
Pool - 55%
Rapid - 2%

126-RFM-06

Shoal Creek

Cherokee Co.

NW/4 of NW/4 SEC. 35, 34S, 24E

08/08/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	984 feet		
Average Stream Depth	1.92 feet shallowest - 10 inches deepest - 3.5 feet		
Stream Width	95.6' Maximum	40.0' Minimum	64.9' Average
Stream Flow	53.537 CFS		

2006 WATER CHEMISTRY

	2006
pH	8.1
Alkalinity	162 mg/l
Conductivity	403 microSiemens
Total Dissolved Solids	194 mg/l
Nitrates	3.4 mg/l
Phosphorus	0.36 mg/l
Chlorides	19 mg/l
Ammonia	0.06 mg/l
Dissolved Oxygen	3.3 mg/l
Turbidity	6 FTU
Water Temperature	82 F
Air Temperature	84 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
banded darter	12	0.6
black buffalo	10	0.5
black bullhead	1	0.1
bluegill	33	1.7
bluntface shiner	10	0.5
bluntnose minnow	16	0.8
brook silverside	9	0.5
cardinal shiner	1027	53.4
carmine shiner	366	19.0
central stoneroller	66	3.4
channel catfish	19	1.0
channel darter	2	0.1
flathead catfish	3	0.2
freshwater drum	4	0.2
gizzard shad	7	0.4
golden redhorse	94	4.9
gravel chub	5	0.3
green sunfish	4	0.2
greenside darter	18	0.9
largemouth bass	5	0.3
longear sunfish	51	2.7
mimic shiner	3	0.2
northern hogsucker	43	2.2
orangethroat darter	11	0.6
ozark logperch	9	0.5
ozark minnow	8	0.4
pealip redhorse	9	0.5
red shiner	5	0.3
redear sunfish	1	0.1
redfin shiner	1	0.1
river redhorse	8	0.4
rock bass	7	0.4
smallmouth bass	16	0.8
spotfin shiner	8	0.4
spotted bass	19	1.0
spotted sucker	5	0.3
warmouth	9	0.5
Total	**1924**	**100**

Index of Biotic Integrity = 104

Freshwater Mussel Community

No mussels collected

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	16
Amphipoda	Hyalellidae	scud	5
Arhynchobdellida	Erpobdellidae	leech	1
Basommatophora	Ancylidae	limpet snail	1
Coleoptera	Elmidae	riffle beetle	30
Coleoptera	Haliplidae	crawling water beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	4
Coleoptera	Psephenidae	water penny	3
Decapoda	Cambaridae	crayfish	4
Diptera	Chironomidae	midge	61
Diptera	Simuliidae	black fly	2
Ephemeroptera	Baetidae	small minnow mayfly	5
Ephemeroptera	Baetiscidae	armored mayfly	1
Ephemeroptera	Caenidae	small squaregill mayfly	12
Ephemeroptera	Heptageniidae	flatheaded mayfly	6
Ephemeroptera	Isonychiidae	brush legged mayfly	6
Ephemeroptera	Leptohyphidae	little stout crawler mayfly	33
Lepidoptera	Pyralidae	snout moth	2
Neotaenioglossa	Hydrobiidae	hydrobid snail	2
Neotaenioglossa	Pleuroceridae	rock/horn snail	100
Odonata	Aeshnidae	darner dragonfly	1
Odonata	Coenagrionidae	bluet damselfly	3
Odonata	Coenagrionidae	dancer damselfly	18
Odonata	Corduliidae	belted skimmer dragonfly	1
Trichoptera	Helicopsychidae	snailcase maker caddisfly	1
Trichoptera	Hydropsychidae	common netspinner caddisfly	14
Trichoptera	Hydroptilidae	micro caddisfly	3
Tricladida	Planariidae	planarian	4
Trombidiformes	Lebertiidae	water mite	2
Veneroida	Corbiculidae	Asian clam	21

Macroinvertebrate Biotic Index = 6.0111

BIOLOGIST NOTE:

The fish community was very diverse with a IBI value of 104 which is a very good score. This is usually expected for Shoal Creek. Many fish species that are sensitive to water quality conditions were collected. No mussels were collected and this is often the case in a public area and below the Joplin water treatment facility. The MBI value for the aquatic insects was 6.0111 is of concern. I would think there would be a better IBI value for this area of the state. There doesn't seem to be a water quality issue looking at the water chemistry values. A low dissolved oxygen reading could be due to the extreme low flow conditions and the dissolved oxygen reading was taken early in the morning.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Fine Gravel - 9%
Course Gravel - 53%
Cobble - 22%
Bedrock - 15%
Wood - 1%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	40	5	18
	Maximum	Minimum	Average
Right Bank -	35	2	12
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

70%	0%	39%
Maximum	Minimum	Average

Left side of stream - 36%
Right side of stream - 50%
Center of stream - 30%

BANK (INCISED) HEIGHT:

7.5	2.9	4.3
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 53%
Riffle - 22%
Pool - 25%

127-RFM-06

Spring River

Cherokee Co.

NE/4 of NW/4 SEC. 18, 35S, 25E

08/09/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	984 feet		
Average Stream Depth	1.83 feet shallowest - 10 inches deepest - 2.5 feet		
Stream Width	160.9' Maximum	71.5' Minimum	108.5' Average
Stream Flow	93.270 CFS		

2006 WATER CHEMISTRY

	2006
pH	8.6
Alkalinity	1.57 mg/l
Conductivity	446 microSiemens
Total Dissolved Solids	215 mg/l
Nitrates	1.1 mg/l
Phosphorus	0.2 mg/l
Chlorides	44 mg/l
Ammonia	0.11 mg/l
Dissolved Oxygen	2.9 mg/l
Turbidity	13 FTU
Water Temperature	84 F
Air Temperature	82 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
banded darter	19	1.0
black buffalo	95	5.0
blackstripe topminnow	26	1.4
bluegill	29	1.5
bluntface shiner	45	2.4
bluntnose minnow	40	2.1
brook silverside	265	13.9
bullhead minnow	2	0.1
cardinal shiner	6	0.3
carmine shiner	167	8.7
central stoneroller	46	2.4
channel catfish	695	36.3
flathead catfish	9	0.5
freshwater drum	38	2.0
gizzard shad	1	0.1
golden redhose	1	0.1
gravel chub	11	0.6
green sunfish	1	0.1
greenside darter	1	0.1
largemouth bass	11	0.6
longear sunfish	31	1.6
longnose gar	23	1.2
Neosho madtom	1	0.1
northern hogsucker	9	0.5
ozark logperch	8	0.4
pealip redhose	70	3.7
red shiner	168	8.8
redear sunfish	1	0.1
river carpsucker	1	0.1
river darter	10	0.5
river redhorse	2	0.1
shortnose gar	4	0.2
slenderhead darter	4	0.2
smallmouth bass	32	1.7
smallmouth buffalo	19	1.0
spotted bass	14	0.7
stonecat	1	0.1
western mosquitofish	5	0.3
white bass	2	0.1
Total	**1913**	**100**

Index of Biotic Integrity = 100

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
Asian clam	No	Yes	No
pink papershell	No	No	Yes
yellow sandshell	No	No	Yes
fawnsfoot	No	Yes	No
threehorn wartyback	Yes	No	Yes
black sandshell	No	No	Yes
pimpleback	No	No	Yes
pistolgrip	Yes	No	Yes
plain pocketbook	Yes	Yes	Yes
bleufer	Yes	Yes	Yes
mapleleaf	No	No	Yes
threeridge	No	No	Yes
Neosho mucket	No	Yes	Yes
pondmussel	No	No	Yes
round pigtoe	No	No	Yes
monkeyface	No	No	Yes
fragile papershell	Yes	Yes	Yes
Ouachita kidneyshell	No	No	Yes

BIOLOGIST NOTE:
The fish community is very diverse. For this size of river we had a very good collection of fish numbers and species. The IBI value of 100 is also very good for this size of river. It definitely helped conducting this survey when the river level was at its lowest. As always, on the Spring River, there is a very good assortment of freshwater mussels present with many specimens being live or recent. The aquatic insect community had a MBI value of 6.584 which is often the case for a river this size and for site this far down in its drainage. The physical area of this site was scenic with the big “island” gravel bar, rock bluffs and the pools and riffle areas in the river. Its was one of my favorite areas to survey this summer.

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	18
Arhynchobdellida	Erpobdellidae	leech	1
Coleoptera	Elmidae	riffle beetle	73
Diptera	Chironomidae	midge	136
Diptera	Simuliidae	black fly	6
Ephemeroptera	Baetidae	small minnow mayfly	11
Ephemeroptera	Caenidae	small squaregill mayfly	50
Ephemeroptera	Heptageniidae	flatheaded mayfly	1
Ephemeroptera	Leptohyphidae	little stout crawler mayfly	42
Heteroptera	Corixidae	water boatman	1
Heteroptera	Gerridae	water strider	6
Heteroptera	Mesoveliidae	water treader	4
Heteroptera	Nepidae	water scorpion	1
Heteroptera	Veliidae	shortlegged strider	4
Odonata	Calopterygidae	ruby spot damselfly	4
Odonata	Coenagrionidae	dancer damselfly	5
Odonata	Corduliidae	river skimmer dragonfly	2
Odonata	Gomphidae	common clubtail dragonfly	4
Odonata	Gomphidae	snake darner dragonfly	2
Rhynchobdellida	Glossiphoniidae	leech	2
Trichoptera	Hydropsychidae	common netspinner caddisfly	84
Trichoptera	Hydroptilidae	micro caddisfly	1
Trichoptera	Polycentropodidae	trumpet net caddisfly	2
Veneroida	Corbiculidae	Asian clam	2

Macroinvertebrate Biotic Index = 6.284

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Course Gravel - 64%	Fine/silt - 5%
Fine Gravel - 15%	Cobble - 4%
Bedrock - 9%	Wood - 3%

BANK ANGLE (in degrees): (Looking Downstream)
number greater that 90 is an undercut bank

Left Bank -	115	9	30
	Maximum	Minimum	Average
Right Bank -	10	1	6
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

38%	13%	23%
Maximum	Minimum	Average

Left side of stream - 66%
Right side of stream - 0%
Center of stream - 5%

BANK (INCISED) HEIGHT:

6.8	3.9	6.6
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 53%
Riffle - 19%
Pool - 28%

128-RFM-06

Shoal Creek

Cheokee Co.

SE/4 of NE/4 SEC. 30, 34S, 25E

08/10/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	984 feet		
Average Stream Depth	1.5 feet shallowest - 9 inches deepest - 2.3 feet		
Stream Width	104.7' Maximum	46.5' Minimum	71.1' Average
Stream Flow	0.831 CFS		

2006 WATER CHEMISTRY

	2006
pH	8.0
Alkalinity	130 mg/l
Conductivity	393 microSiemens
Total Dissolved Solids	190 mg/l
Nitrates	1.1 mg/l
Phosphorus	0.3 mg/l
Chlorides	30 mg/l
Ammonia	0.2 mg/l
Dissolved Oxygen	2.7 mg/l
Turbidity	17 FTU
Water Temperature	84 F
Air Temperature	86 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black buffalo	95	8.3
bluegill	163	14.2
bluntface shiner	6	0.5
bluntnose minnow	339	29.5
brook silverside	135	11.8
bullhead minnow	42	3.7
cardinal siner	1	0.1
carmine shiner	14	1.2
channel catfish	6	0.5
common carp	1	0.1
flathead catfish	2	0.2
freshwater drum	4	0.3
gizzard shad	123	10.7
golden redhorse	1	0.1
gravel chub	1	0.1
green sunfish	6	0.5
largemouth bass	32	2.8
longear sunfish	19	1.7
longnose gar	8	0.7
mimic shiner	3	0.3
orangespotted sunfish	45	3.9
ozark logperch	7	0.6
pealip redhorse	1	0.1
red shiner	15	1.3
redfin shiner	9	0.8
smallmouth bass	9	0.8
smallmouth buffalo	13	1.1
spotted bass	10	0.9
spotted gar	10	0.9
western mosquitofish	27	2.4
white crappie	1	0.1
Total	**1148**	**100**

Index of Biotic Integrity = 100

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
paper pondshell	No	Yes	No
giant floater	No	Yes	No
plain pocketbook	Yes	Yes	No
bleufer	Yes	Yes	No
mapleleaf	No	Yes	No
pondmussel	No	Yes	No
Yellow sandshell	No	Yes	No
fragile papershell	No	Yes	No

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	23
Basommatophora	Physidae	pouch snail	2
Branchiobdellida	Branchiobdellidae	crayfish worm	1
Coleoptera	Elmidae	riffle beetle	1
Coleoptera	Haliplidae	crawling water beetle	5
Coleoptera	Hydrophilidae	water scavenger beetle	16
Diptera	Ceratopogonidae	biting midge	3
Diptera	Chironomidae	midge	210
Diptera	Stratiomyidae	soldier fly	1
Ephemeroptera	Baetidae	small minnow mayfly	1
Ephemeroptera	Caenidae	small squaregill mayfly	39
Heteroptera	Belostomatidae	giant water bug	2
Heteroptera	Corixidae	water boatman	17
Odonata	Coenagrionidae	dancer damselfly	1
Odonata	Gomphidae	clubtail dragonfly	2
Odonata	Libellulidae	amberwing dragonfly	3
Odonata	Libellulidae	skimmer dragonfly	15
Rhynchobdellida	Glossiphoniidae	leech	4
Trichoptera	Hydropsychidae	common netspinner caddisfly	4
Trichoptera	Hydroptilidae	micro caddisfly	4
Tricladida	Planariidae	planarian	1
Veneroida	Corbiculidae	Asian clam	3

Macroinvertebrate Biotic Index = 9.344

BIOLOGIST NOTE:
The fish community is very diverse which is usually what you find below a dam. The IBI value of 100 is a good score representing a healthy fish community structure. Having many live and recent mussel species indicates decent water quality. Although, the MBI values for the aquatic insect community is 9.344 indicates poor conditions for aquatics insects in this stream. There were 210 chironomids/midges (the gnats that are flying around your face when you are along the banks of the stream) collected, this will cause a score to go higher because they are a very tolerant insect. We also need to remember that stream flow conditions were very low so this could possibly impact the aquatic insect community.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Course Grave - 49%	Fine/silt - 22%
Fine Gravel -2%	Cobble - 16%
Boulder - 7%	Wood - 4%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	15	3	6
	Maximum	Minimum	Average
Right Bank -	25	2	13
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

48%	16%	34%
Maximum	Minimum	Average

Left side of stream - 41%
Right side of stream - 53%
Center of stream - 7%

BANK (INCISED) HEIGHT:

7.8	4.2	5.7
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 91%
Pool - 9%

129-RFM-06

Spring Creek

Cowley Co.

SW/4 of SW/4 SEC. 16, 34S, 3E

08/14/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	492 feet		
Average Stream Depth	11 inches shallowest - 2 inches deepest - 2.2 feet		
Stream Width	31.5' Maximum	5.9' Minimum	12.3' Average
Stream Flow	1.055 CFS		

2006 WATER CHEMISTRY

	2006
pH	7.7
Alkalinity	273 mg/l
Conductivity	232 microSiemens
Total Dissolved Solids	1171 mg/l
Nitrates	5.1 mg/l
Phosphorus	0.04 mg/l
Chlorides	194 mg/l
Ammonia	0.02 mg/l
Dissolved Oxygen	7.3 mg/l
Turbidity	16 FTU
Water Temperature	66 F
Air Temperature	77 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
Arkansas darter	19	6.6
black bullhead	1	0.4
central stoneroller	15	5.2
fathead minnow	44	15.4
green sunfish	51	17.8
longear sunfish	1	0.4
orangespotted sunfish	35	12.2
orangethroat darter	3	1.0
red shiner	3	1.0
western mosquitofish	114	39.9
Total	**286**	**100**

Index of Biotic Index = 89

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
pondhorn	No	No	Yes

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	11
Amphipoda	Hyalellidae	scud	132
Basommatophora	Physidae	pouch snail	10
Basommatophora	Planorbidae	orb snail	2
Coleoptera	Dytiscidae	predaceous diving beetle	59
Coleoptera	Elmidae	riffle beetle	2
Coleoptera	Haliplidae	crawling water beetle	15
Coleoptera	Helodidae	marsh beetle	1
Coleoptera	Hydrophilidae	water scavenger beetle	10
Decapoda	Cambaridae	crayfish	4
Diptera	Ceratopogonidae	biting midge	6
Diptera	Chironomidae	midge	66
Diptera	Empididae	dance fly	1
Ephemeroptera	Baetidae	small minnow mayfly	3
Ephemeroptera	Caenidae	small squaregill mayfly	2
Ephemeroptera	Ephemeridae	common burrower mayfly	6
Heteroptera	Corixidae	water boatman	15
Megaloptera	Sialidae	alderfly	72
Odonata	Calopterygidae	bandwing damselfly	1
Odonata	Coenagrionidae	bluet damselfly	1
Odonata	Coenagrionidae	dancer damselfly	5
Odonata	Coenagrionidae	forktail damselfly	3
Odonata	Libellulidae	skimmer dragonfly	1
Odonata	Libellulidae	whitetailed skimmer dragonfly	2
Rhynchobdellida	Glossiphoniidae	leech	2
Trichoptera	Hydropsychidae	common netspinner caddisfly	8
Veneroida	Pisidiidae	fingernail clam	26

Macroinvertabrate Biotic Index = 5.653

BIOLOGIST NOTE:
This is a nice stream. The IBI value of 89 is very good for this stream in this part fo the state. The Arkansas darter was collected which is considered a threatened fish in Kansas. Since this is a sensitive fish species, this means that the stream is considered to be in good condition. The Arkansas darter likes spring fed streams with sand and vegetative banks, this stream had all that. Although the picture above doesn't indicate this kind of habitat. This is one of the most southeastern collection records of the Arkansas darter west of the Arkansas River. Though they are considered threatened, our surveys have shown their numbers to be quite plentiful. The MBI value of 5.653 indicates the condition and water quality of the stream is marginal. The invert community had a good diversity of non-tolerate to pollution species which helps the MBI value.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Course Gravel - 49%	Fine/silt -22%
Fine Gravel -2%	Cobble - 16%
Boulder - 7%	Wood - 4%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	71	8	40
	Maximum	Minimum	Average
Right Bank -	75	9	44
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

99%	49%	80%
Maximum	Minimum	Average

Left side of stream - 83%
Right side of stream - 84%
Center of stream - 74%

BANK (INCISED) HEIGHT:

4.6	2.3	3.3
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 74%
Riffle - 7%
Pool - 19%

130-RFM-06

Arkansas River

Sumner Co.

NW/4 of NE/4 SEC. 36, 31S, 2E

08/15/06

2006 STREAM COMPARISONS

	2006		
Length of Sample Site	984 feet		
Average Stream Depth	1.75 feet shallowest - 12 inches deepest - 3.1 feet		
Stream Width	286.0' Maximum	175.5' Minimum	235.2' Average
Stream Flow	649.150 CFS		

2006 WATER CHEMISTRY

	2006
pH	8.0
Alkalinity	105 mg/l
Conductivity	744 microSiemens
Total Dissolved Solids	636 mg/l
Nitrates	1.5 mg/l
Phosphorus	0.31 mg/l
Chlorides	133 mg/l
Ammonia	0.07 mg/l
Dissolved Oxygen	4.6 mg/l
Turbidity	34 FTU
Water Temperature	73 F
Air Temperature	72 F

FISH POPULATION COMPARISONS

SPECIES	2006	
	#	% BY #
black buffalo	1	0.04
bluegill	6	0.2
bullhead minnow	171	6.4
channel catfish	35	1.3
common carp	3	0.1
emerald shiner	716	26.7
flathead catfish	10	0.4
freshwater drum	105	3.9
gizzard shad	28	1.0
green sunfish	1	0.04
inland silverside	94	3.5
largemouth bass	2	0.1
longear sunfish	1	0.04
longnose gar	26	1.0
northern plains killifish	5	0.2
orangespotted sunfish	31	1.2
pealip redhorse	1	0.04
quillback	3	0.1
red shiner	804	30.0
river carpsucker	267	10.0
sand shiner	167	6.2
shortnose gar	2	0.1
silver chub	6	0.2
smallmouth buffalo	11	0.4
suckermouth minnow	41	1.5
western mosquitofish	31	1.2
white bass	99	3.7
white crappie	2	0.1
wiper	8	0.3
Total	**2677**	**100**

Index of Biotic Integrity = 86

Freshwater Mussel Community

Common Name	Live	Recent	Weathered
mapleleaf	No	No	Yes
pondhorn	No	No	Yes
Asian clam	No	No	No
pink papershell	No	No	Yes
fragile papershell	No	No	Yes

Macroinvertebrate Community

Order	Family	Common Name	Number
		leech	13
Amphipoda	Hyalellidae	scud	6
Coleoptera	Hydrophilidae	water scavenger beetle	4
Coleoptera	Staphylinidae	rove beetle	1
Collembola	Entomobryidae	springtail	9
Diptera	Chironomidae	midge	94
Diptera	Dolichopodidae	longlegged fly	2
Diptera	Tipulidae	crane fly	57
Ephemeroptera	Baetidae	small minnow mayfly	11
Ephemeroptera	Isonychiidae	brush legged mayfly	2
Ephemeroptera	Leptohyphidae	little stout crawler mayfly	1
Ephemeroptera	Oligoneuriidae	unnamed mayfly	1
Heteroptera	Corixidae	water boatman	2
Odonata	Coenagrionidae	dancer damselfly	8
Odonata	Corduliidae	twilight skimmer dragonfly	3
Odonata	Gomphidae	clubtail dragonfly	1
Odonata	Gomphidae	common clubtail dragonfly	1
Odonata	Gomphidae	snake darner dragonfly	1
Trichoptera	Hydropsychidae	common netspinner caddisfly	2

Macroinvertebrate Biotic Index = 7.589

BIOLOGIST NOTE:
The conditions at the river were unseasonably different than usual. While we were surveying this site the river had risen to it highest flow all summer. So the velocity of the water was higher than normal and the water was more turbid than normal which could effect sampling efforts.

Although we did manage to collect a good species list of fish, mussels, and inverts. The IBI value of 86 is pretty good for the conditions we encountered and for a river this size. The MBI value of 7.589 is not the best although you need to consider the rising then falling river can effect the invert community. Also there were a lot of chironomids (midges), the bugs you slap around your face when you are along the river banks, which is a very tolerant insect to environmental impacts which caused the higher score to the MBI value.

Since we surveyed this site in 2000, physically, the river had seemed to progressed wider and shallower. We didn't have the deep channel along the east bank like in 2000.

2006 PHYSICAL HABITAT MEASUREMENTS

STREAM SUBSTRATE:

Sand - 76% Fine/silt - 2%
Fine Gravel - 22%

BANK ANGLE (in degrees): (Looking Downstream)

number greater that 90 is an undercut bank

Left Bank -	65	5	26
	Maximum	Minimum	Average
Right Bank -	5	1	3
	Maximum	Minimum	Average

CANOPY (OVERHEAD) STREAM COVER:

17%	0%	7%
Maximum	Minimum	Average

Left side of stream - 22%
Right side of stream - 0%
Center of stream - 0%

BANK (INCISED) HEIGHT:

10.4	8.8	9.3
Maximum	Minimum	Average

STREAM CHANNEL TYPE:

Glide - 97%
Pool - 3%