

REPORT ON RABBIT CREEK SPECIAL STUDY – SUBWATERSHED 5.19

Sabine River Authority of Texas

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Prepared in Cooperation with the [Texas Commission on Environmental Quality](#)

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Rabbit Creek Subwatershed Special Study

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Rabbit Creek Subwatershed Special Study

INTRODUCTION

The Sabine River Authority (SRA) 1998 Summary Report of water quality in the Sabine River Basin reported some water quality concerns identified by the SRA systematic sub-watershed screening program. Concerns for ambient toxicity; non-support of stream standards for dissolved oxygen and fecal coliform; and possible concern for orthophosphate. The design of this study was tailored to examine these specific concerns identified by historic sampling. The Rabbit Creek watershed has a numerous oil and gas leases and associated spills of oil and/or saltwater, but parameters of concern from historical sampling in Rabbit Creek don't appear to be related to the oilfield activities. One set of samples was taken during normal flow conditions to help establish ambient conditions. A rainfall event sample was planned, but delayed due to logistics of long-term deployment of auto-samplers and the volume of water required for the different analyses desired. Manual sample collection was planned as an alternative to auto-samplers. Reduced funding forced a termination of this study before the rainfall event sampling could be completed.

Sampling for benthic macroinvertebrates and fish was completed. Sampling collections were made twice, once during early summer and again during the late summer index period. Routine field and laboratory parameters, total and dissolved metals in water, and biomonitoring and rapid bio-assessment (RBA) were collected at all sites. David Hackley, City of Kilgore; Rickey Clements, East Texas Saltwater; and Adam Whisenant, TPWD, assisted during some benthic and fish collections.

SAMPLING METHODS

The following types of samples were collected at each of the eight sites on Rabbit Creek and its tributary streams:

Ambient Sampling: Normal flow sampling included dissolved oxygen, pH, conductivity, temperature, total dissolved solids, chlorides, sulfates, nutrients, fecal coliform, total organic carbon, total and dissolved metals, metals in sediment, and stream flow.

Aquatic Life: Ambient toxicity samples were taken to clarify the source and identity of toxicity seen in previous samples. In-stream rapid biological assessments of the fish and benthic communities were also done twice at each site, once during early summer and again during the late summer index period.

Priority Pollutants: In an effort to identify the toxic element indicated by biomonitoring in historical samples, a priority pollutant scan was planned for any samples for which ambient toxicity indicated consistent lethality to laboratory organisms. No toxicity was observed and therefore priority pollutants were not analyzed for any of the samples collected during this study.

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SAMPLE LOCATIONS

Locations for sampling sites were selected to evaluate different parts of the watershed by sampling most of the major tributaries of Rabbit Creek and to monitor cumulative downstream conditions with several sites on the main-stem of Rabbit Creek.

Rabbit Creek Sampling Sites

SRA ID	Description	TNRCC #	Parameter Set
RBC03	Rabbit Creek near IH20	10371	AM, AT, PP*, RBA
PEAV42	Peavine Creek at SH42	16680	AM, AT, PP*, RBA
BHC02	Bighead Creek at FM349	14802	AM, AT, PP*, RBA
RBC12	Rabbit Creek at FM2012	16681	AM, AT, PP*, RBA
HELT163 9	Helton Creek at FM1639	16682	AM, AT, PP*, RBA
WLDS305 3	Wilds Creek at FM3053	16692	AM, AT, PP*, RBA
RB132	Rabbit Creek at CR132	16693	AM, AT, PP*, RBA
LRB132	Little Rabbit Creek at CR132	16694	AM, AT, PP*, RBA

Parameter Set Codes: AM = Ambient Sampling, AT = Ambient Toxicity, PP = Priority Pollutants, RBA = Rapid Biological Assessment.

*A priority pollutant scan was done on selected sites only if ambient toxicity indicated lethality.

The three main stem Rabbit Creek sites were at IH20, FM2012, and CR132. Five additional sites were located on tributaries of Rabbit Creek.

Rabbit Creek near IH20 is the furthestmost downstream site sampled. The IH20 site is a historical monitoring site and shows effects from most of the watershed before its confluence with the Sabine River.

Rabbit Creek at FM2012 was selected because it is upstream from Bighead and Peavine creeks and it's upstream from most of the runoff from the western side of Kilgore.

Little Rabbit Creek at CR132 is the receiving stream for Overton's wastewater treatment plant.

Rabbit Creek at CR132 is located on the upstream reach of Rabbit Creek to provide data on the upstream extremities of the Rabbit Creek.

Peavine Creek at SH42 was selected to evaluate this fairly large sub-watershed west of SH42 and paralleling IH20. No known historical data exists for this tributary stream.

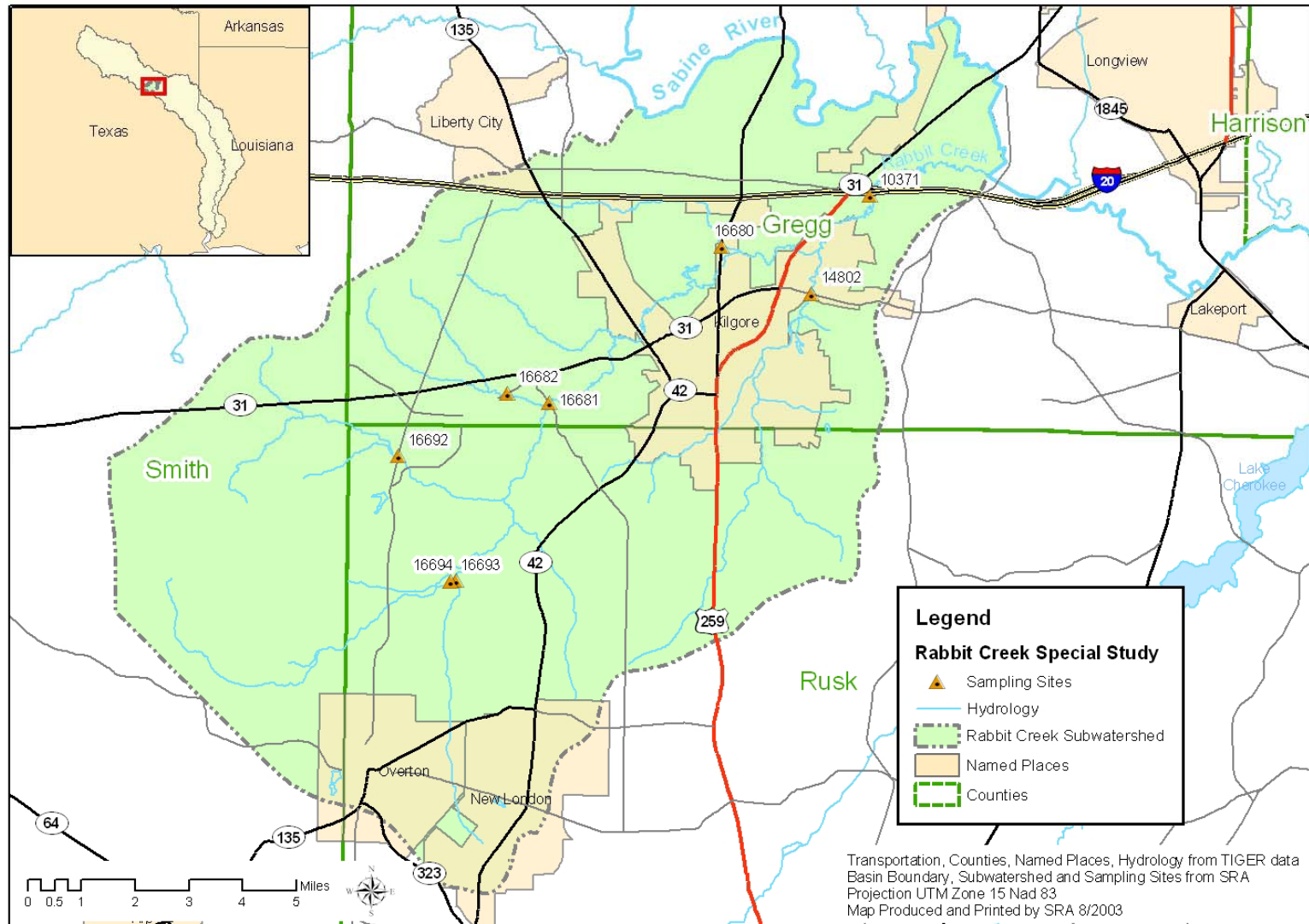
Bighead Creek at FM349 An upstream tributary, Bighead Creek, is the receiving stream for the City of Kilgore and also receives runoff from the eastern side of Kilgore. The site, BHC02, at SH349 was selected to evaluate the water quality of Bighead Creek. Some of the biological sampling for this location was done a short distance downstream from SH349 just upstream of a new loop under construction. Stream habitat here was better for benthic and fish colonization.

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Helton Creek at FM1639 has a large sub-watershed and could have significant influence on Rabbit Creek. No known historical data exist for this tributary stream. This site was used as a reference site for the area.

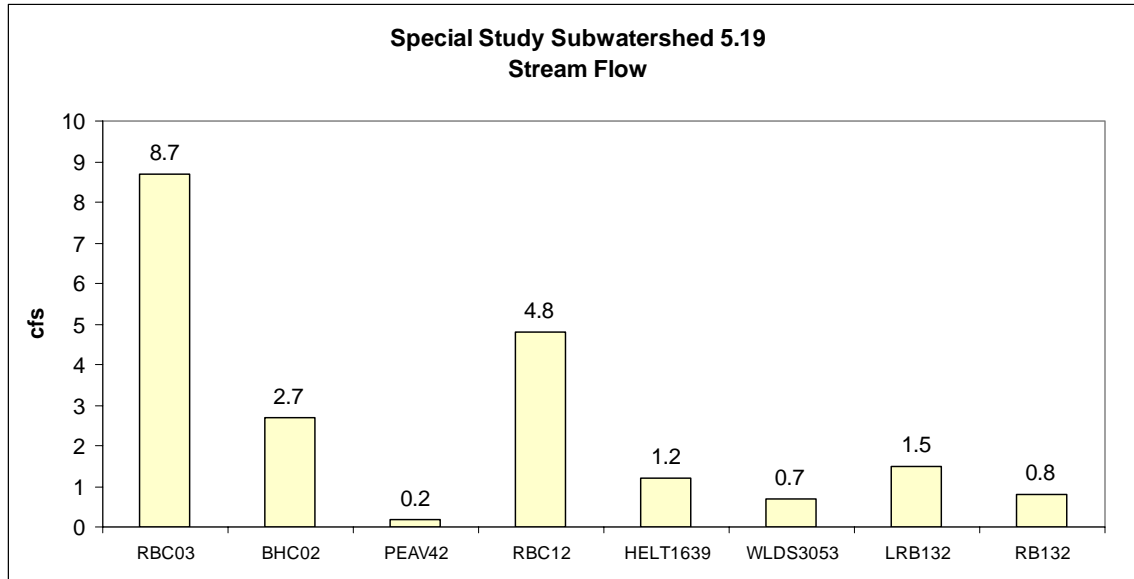
Wilds Creek at FM3053 has a relatively small watershed area with few obvious water quality impacts. The stream site appeared to be a good reference stream for the area. No known historical data exists for Wilds Creek.

Subwatershed 5.19 Rabbit Creek Special Study Site Map



STREAM FLOW DATA

The normal flow sample set was collected on 7/31/01. The most recent rain event was greater than seven days prior to this date. Flows measured at all sites ranged from 8.7 cubic feet per second (cfs) at RBC03 to less than one cfs at Little Rabbit, Wilds, and Peavine Creek.



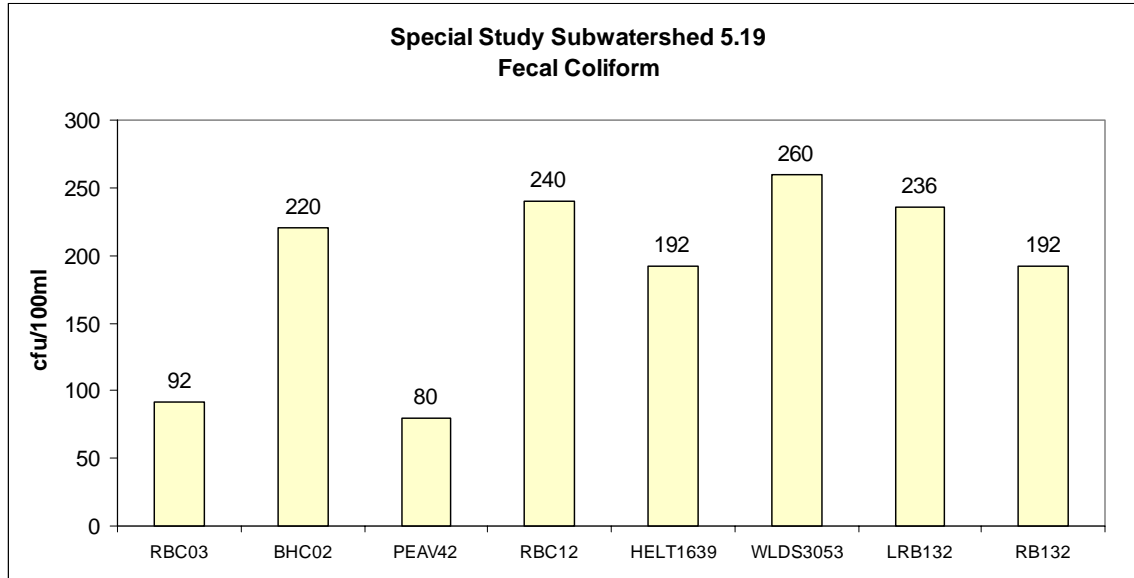
WATER QUALITY DATA

Water chemistry data results were within normal ranges for ambient surface water. Most of the sites had less than 5 cfs of flow. The furthestmost downstream site in the watershed (RBC03) had 8.7 cfs. Turbidity ranged from 38.7-57.6 NTU at five of the eight sites. Effluent receiving streams had the lowest turbidity. Bighead Creek, receiving stream for the City of Kilgore was 11.1 NTU and Little Rabbit Creek, receiving stream for the City of Overton had 19.5 NTU. Fecal coliform bacteria were below stream standards for single grab samples. Elevated bacteriological counts are often associated with turbid waters as bacteria utilize sediment particles as an attachment substrate. Laboratory equipment failure prevented the analysis of orthophosphate.

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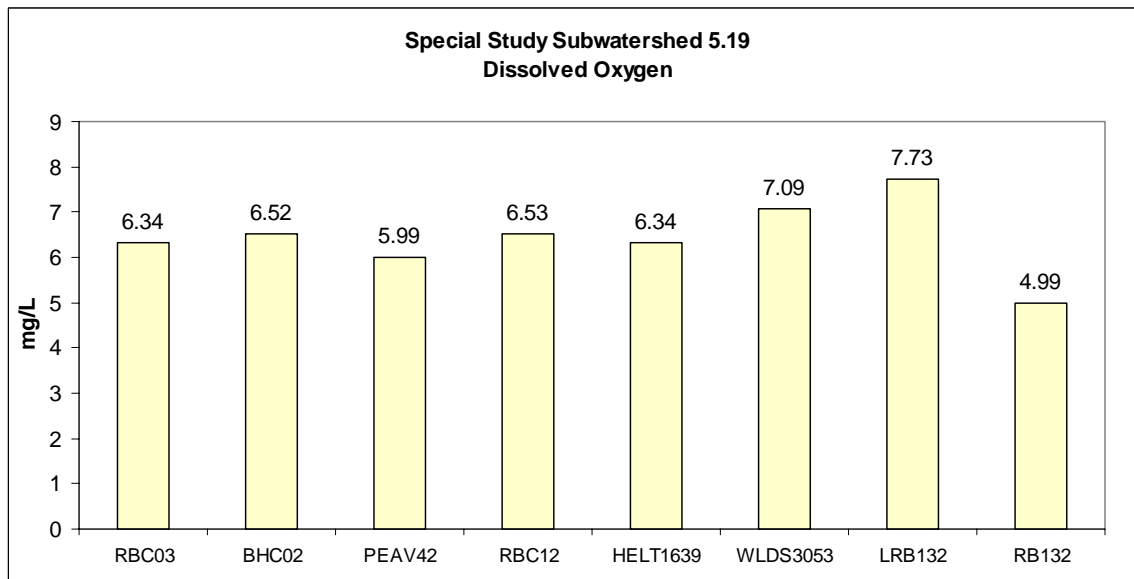
Bacteriological

Fecal coliform bacteria were elevated, but below stream standards for a single grab sample. High turbidity may have been a factor at some sites, but turbidity and bacteriological counts did not always closely correlate. Samples were collected more than seven days after the most recent rain event



Dissolved Oxygen

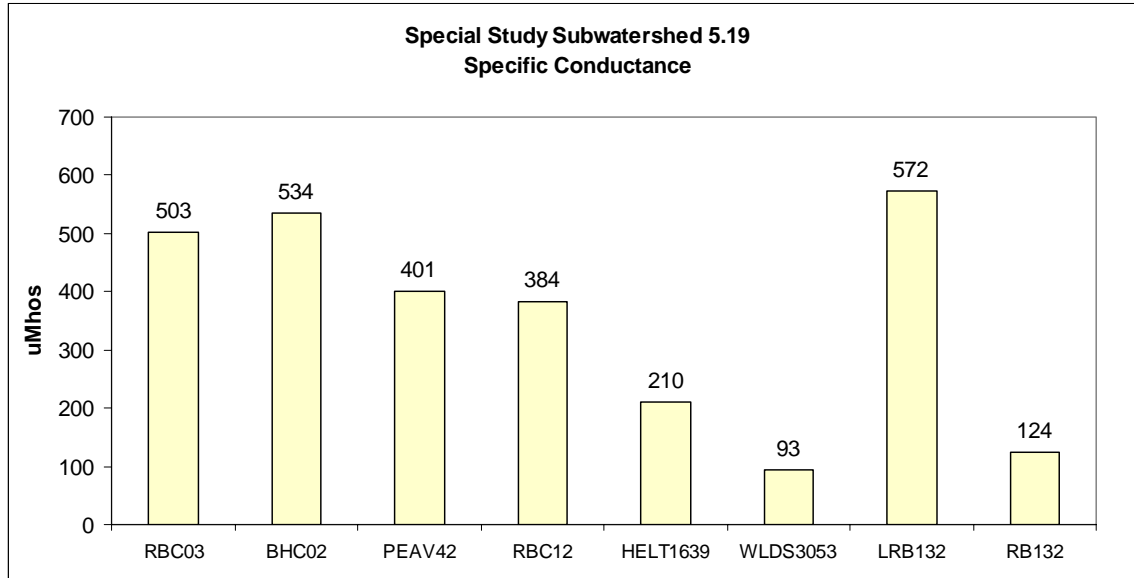
Dissolved oxygen met stream standards at all sites. The lowest dissolved oxygen (4.99 mg/l) was seen at RBC132. This site was a meter deep, 12 ft wide and had 0.8 cfs of flow when the sample was taken. Little Rabbit Creek (LRB132), the receiving stream for treated wastewater from the City of Overton, had similar depth and width, 1.5cfs of flow and had 7.73 mg/l of dissolved oxygen.



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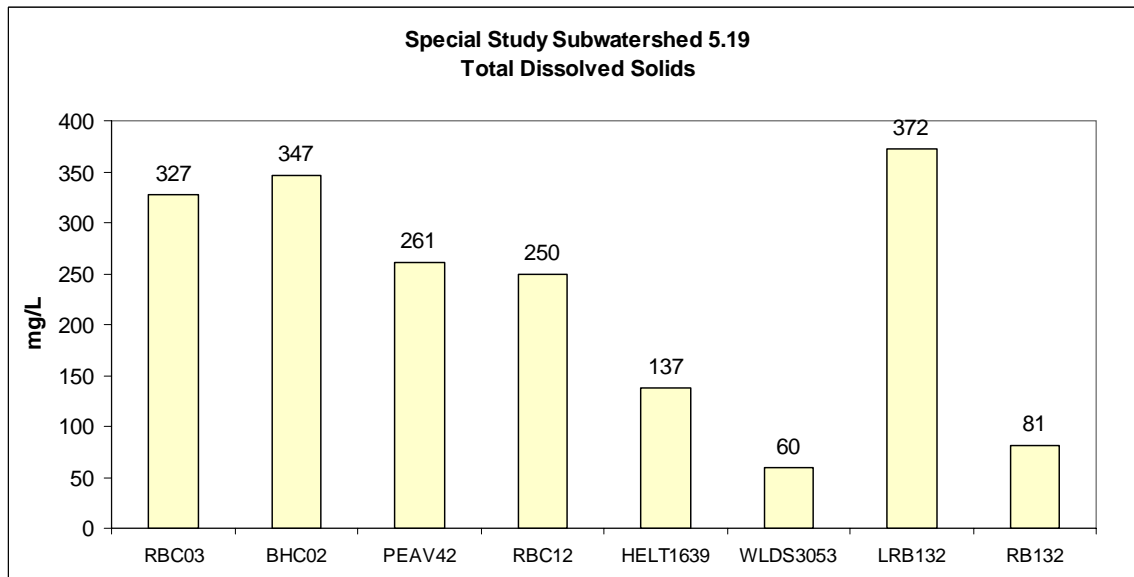
Specific Conductance

Specific conductance ranged from a low of 93 μMho at Wilds Creek to a high of 572 μMho at Little Rabbit Creek at CR132 (LRB132). Again, Rabbit and Little Rabbit Creeks at CR132 were significantly different. Generally, conductivities are 100-200 μmhos higher than typical values seen in the main stem Sabine River.



Total Dissolved Solids (TDS)

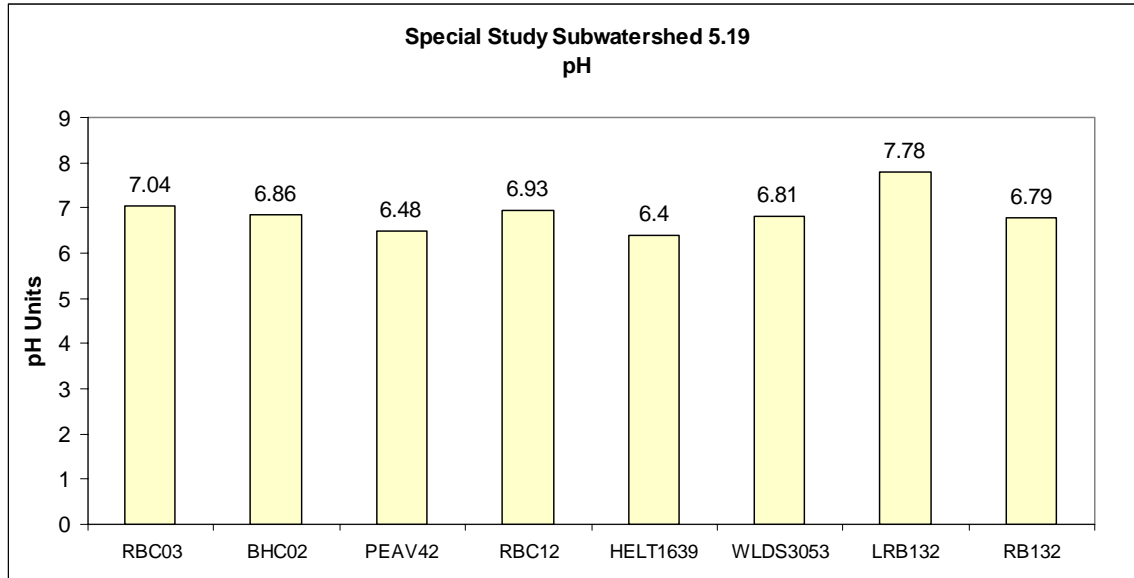
Total dissolved solids are calculated from the specific conductance values and so the same trends are followed. Stream standards have not been established for Rabbit Creek, but the standard is 400 mg/l for Segment 0505 Sabine River Above Toledo Bend Reservoir. All samples were below that value.



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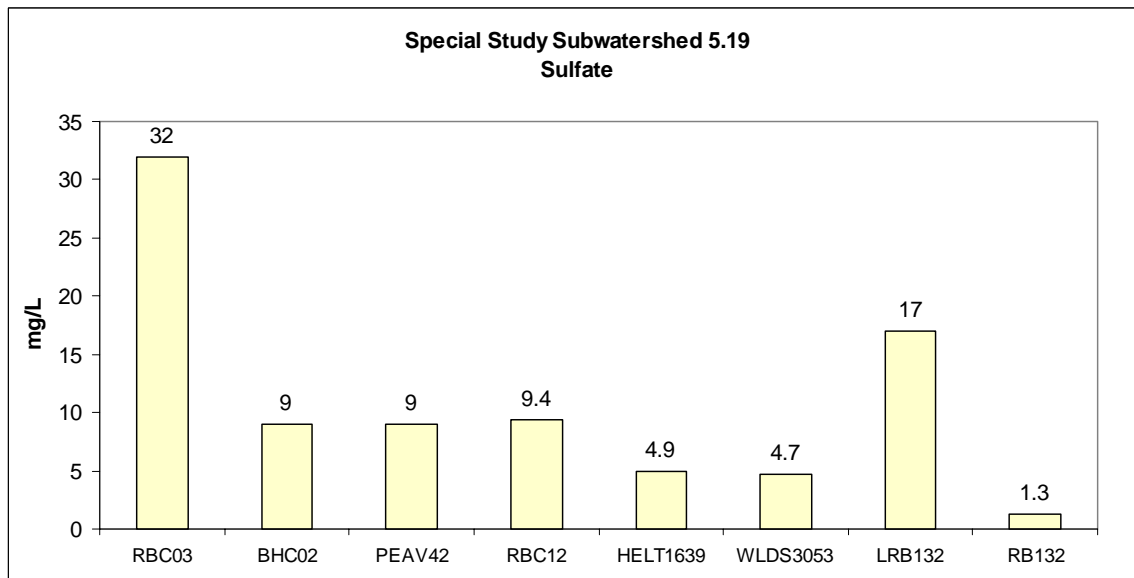
pH

The pH was within limits for stream standards for Reach 5 of the Sabine River. Samples ranged from 6.40 to 7.78.



Sulfates

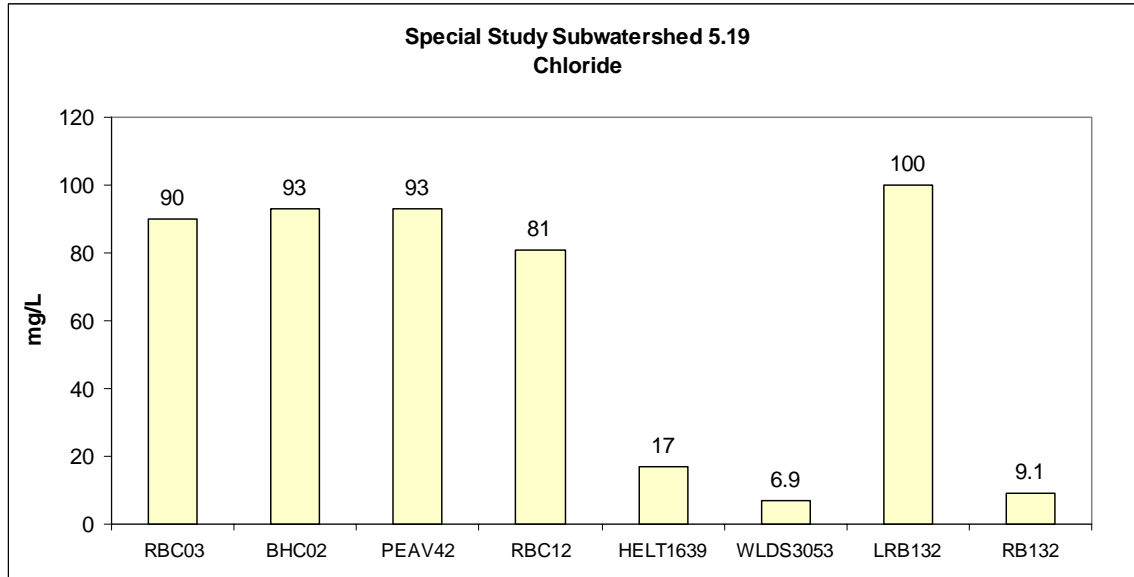
Stream standards for sulfates have not been established for Rabbit Creek so the standard for the Segment 0505 Sabine River Above Toledo Bend is used as a reference. The standard is an annual average of 75 mg/l and all sites fell below this value. The furthestmost downstream site, RBC03, had the highest level with 32.0 mg/l.



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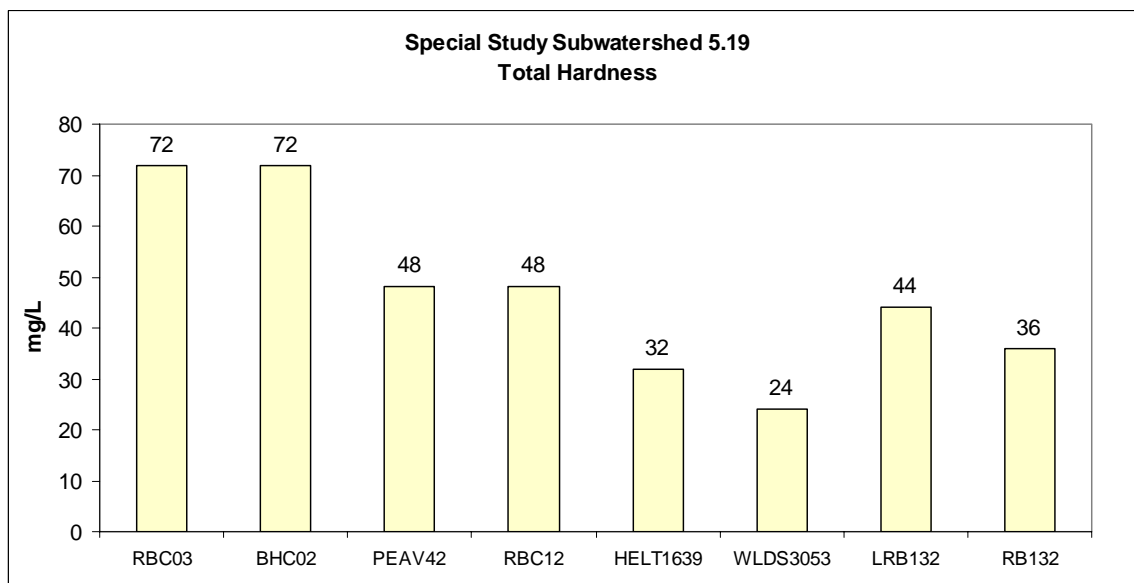
Chlorides

Stream standards for chlorides have not been established for Rabbit Creek. The standard is an annual average of 175 mg/l for Segment 0505 Sabine River Above Toledo Bend. Chlorides were well under typical stream standard limits



Hardness

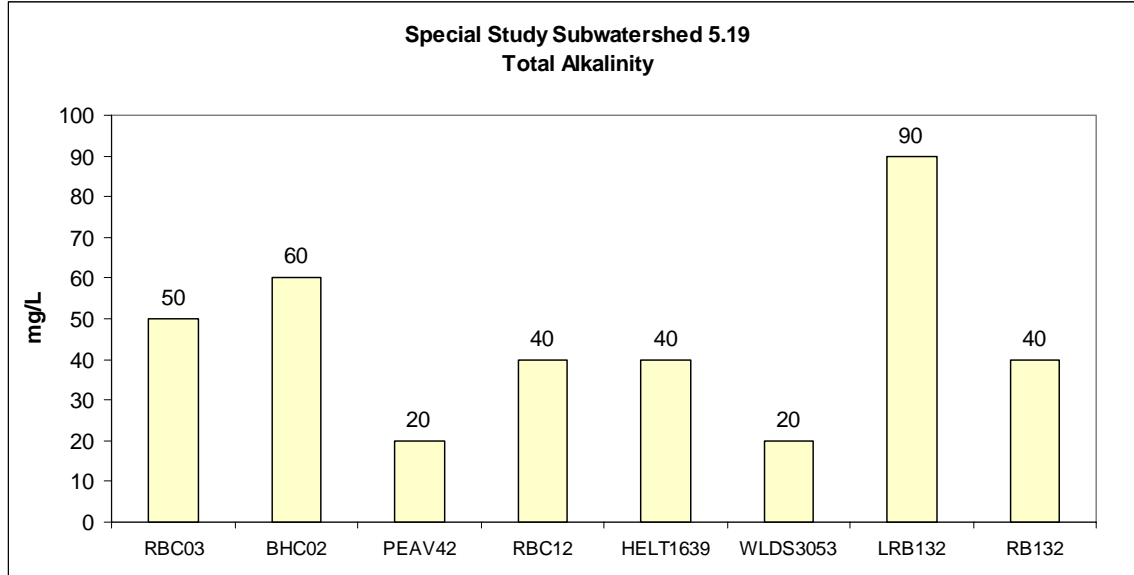
Total hardness ranged between 24 and 72 mg/l. Hardness is an important factor in calculating the toxic limits of some metals. Components of hardness are believed to compete with metals for binding sites on cell membranes. Levels of metals sampled were below levels thought to be toxic to aquatic life.



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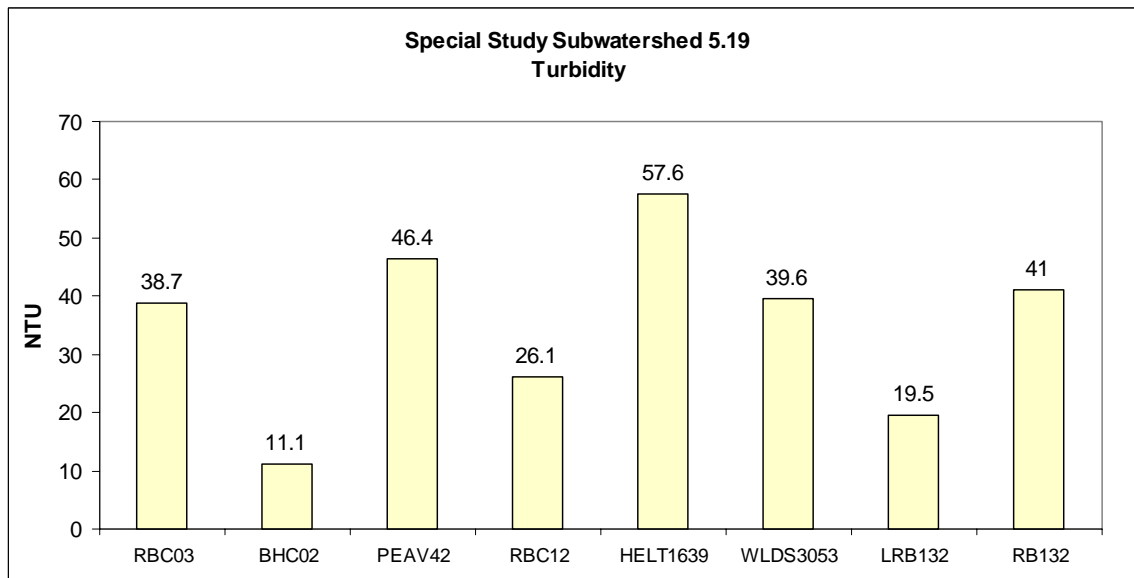
Alkalinity

Alkalinity ranged from a high of 90mg/l at LRB132 to a low of 20mg/l at two tributary stream sites. Alkalinity is considered to be representative of good pH buffering capacity. The pH of all sites was normal.



Turbidity

Turbidity ranged from 11.1NTU to 57.6NTU. These values are normal for most East Texas streams. The Rabbit Creek watershed has a lot of clay formations. Livestock have access to the stream near several sample sites.



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Dissolved Metals in Water Data

Results from samples for dissolved metals in water are not within ranges thought to cause chronic or acute toxicity.

Metal (µg/l)	RBC 03	BHC 02	PEAV 42	RBC 12	HELT 1639	WLDS 3053	LRB 132	RB132
Arsenic	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Barium	302	119	446	302	272	164	351	198
Cadmium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Copper	< 2	5	< 2	< 2	< 2	< 2	< 2	< 2
Lead	< 2	< 2	< 2	< 2	< 2	< 2	NM	<2
Nickel	5.6	6.4	3.6	1.9	1	<15	3	1
Silver	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Zinc	10	36	3	4	4	<2	2	<2
Mercury (sediment)	NM	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	NM	<0.2
Selenium	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3

Ambient Toxicity Data

Ambient toxicity samples taken during past years (1995 and 1996) indicated some possible toxicity at Rabbit Creek at IH20 (RBC03), the furthest downstream publicly accessible site. Samples taken during this study did not identify any toxicity at that site. There has been no toxicity observed in present or historical samples to *Pimephales*.

Site	TNRCC#	Date Tested	<i>Ceriodaphnia dubia</i>	<i>Pimephales promelas</i>
Historical Data Review				
RBC03	10371	2/14/1995	Sublethality	No toxicity
RBC03	10371	5/16/1995	No toxicity	No toxicity
RBC03	10371	8/1/1995	Lethality	No toxicity
RBC03	10371	11/7/1995	Sublethality	No toxicity
RBC03	10371	1/17/1996	No toxicity	No toxicity
RBC03	10371	4/29/1996	Lethality	No toxicity
RBC03	10371	5/7/1996	Sublethality	Not Tested
RBC03	10371	7/30/1996	No toxicity	No toxicity

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Site	TNRCC#	Date Tested	<i>Ceriodaphnia dubia</i>	<i>Pimephales promelas</i>
RBC03	10371	10/17/96	No toxicity	No toxicity
Normal Flow Sample Event				
RBC03	10371	07/31/02	No toxicity	No toxicity
BHC02	14802	07/31/02	No toxicity	No toxicity
PEAV42	16680	07/31/02	No toxicity	No toxicity
RBC12	16681	07/31/02	No toxicity	No toxicity
HELT1639	16682	07/31/02	No toxicity	No toxicity
WLDS3053	16692	07/31/02	No toxicity	No toxicity
LRB132	16694	07/31/02	No toxicity	No toxicity
RB132	16693	07/31/02	No toxicity	No toxicity

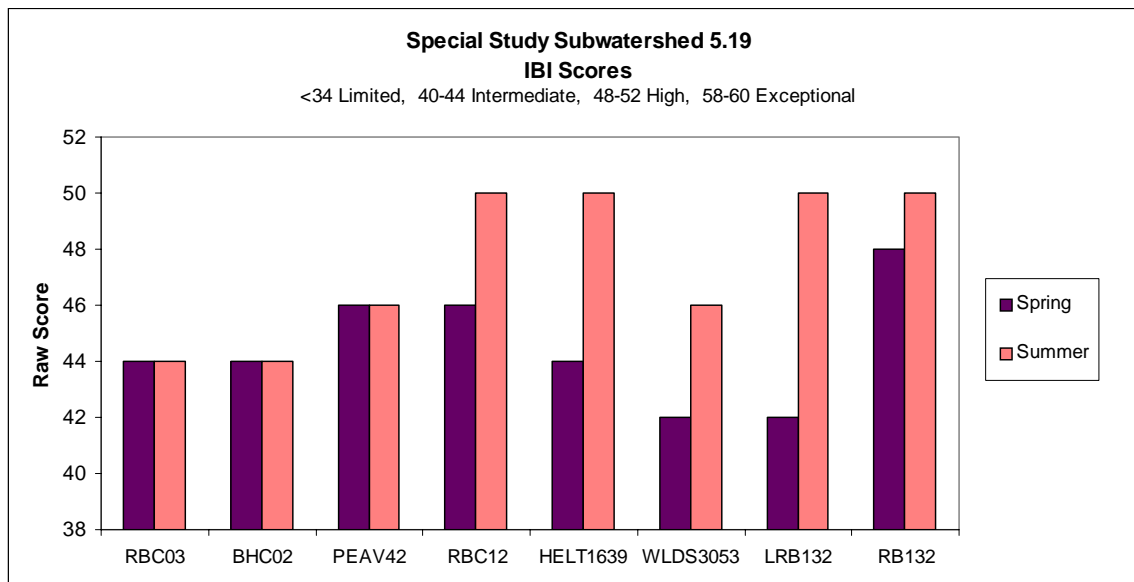
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Fish and Benthic Macroinvertebrate Data

Fish and benthic macroinvertebrates (aquatic, bottom-dwelling, insects and other invertebrates) were collected twice at each site, once in early summer and again in the late summer index period. The index of biological integrity (IBI) and the USEPA Rapid Bioassessment (RBA) Protocol II were applied to assess the health of each population. The IBI was used to analyze fish data and assign an aquatic life use for each site.

Index of Biological Integrity (IBI)

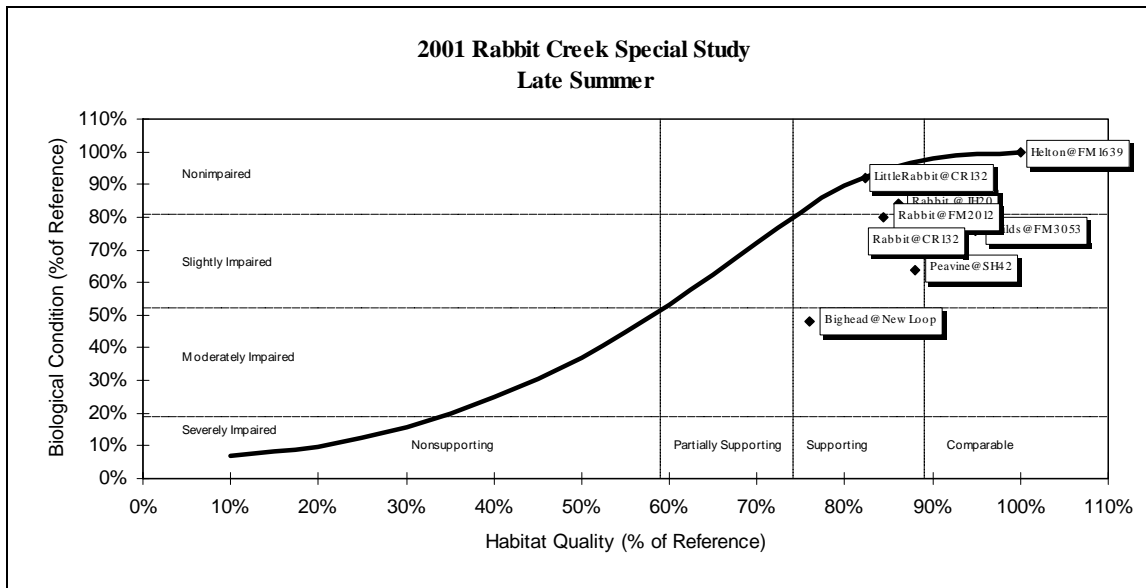
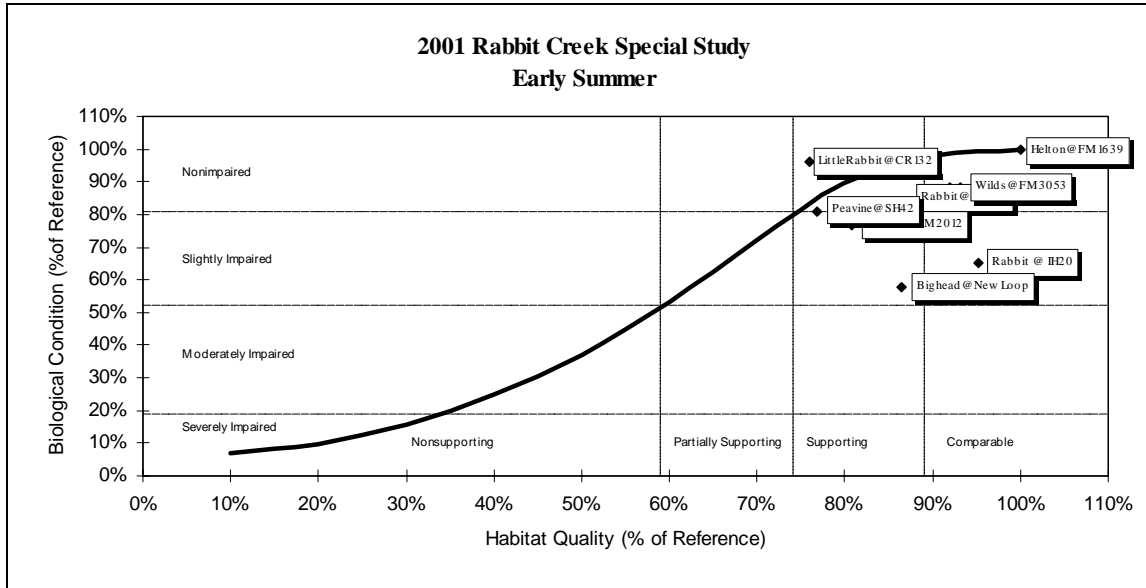
All of the sampled streams scored "Intermediate" to "High" using the IBI. Wilds and Little Rabbit Creek scored "Intermediate" during the spring sample but scored higher during the summer sample. When the two scores were different, the summer score was better. These scores are typical for most Upper Sabine Basin streams sampled by SRA.



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Rapid Bioassessment (RBA)

The RBA is used to evaluate the benthic macroinvertebrate community and stream habitat and compare study sites against a relatively non-impacted reference site. It was determined that Helton Creek at FM1639 (HELT1639) was most suitable for a reference stream.



Sites that fall near the curve have benthic community characteristics that are expected in the habitat that was available for colonization. Sites that fall significantly below the curve have a benthic community that was not as species rich and/or there were fewer intolerant organisms as would be expected in the habitat seen. In the early summer sample, Rabbit Creek at IH20 and Bighead Creek at the new loop scored slightly impaired. The rest of the early summer sites produced benthic communities expected in the respective habitats. Late summer samples showed more stress to the benthic population, with the site on Bighead Creek still showing some impairment and a few of the other sites straying a little farther below the sigmoid curve. The primary reason Bighead Creek scored lower was due to its benthic population being skewed

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towards dipterans (midges). The site also had lower species evenness and high representation of stress-tolerant species. Benthic scoring tends to separate sites more than using fish and the IBI, but both types of biological sampling indicate that, while there are some signs of stress, these sites are quite similar to other streams that have been evaluated in the Upper Basin.

SUMMARY AND RECOMMENDATIONS

The primary parameters of concern from previous data evaluations were non-support of stream standards for dissolved oxygen and fecal coliform, and concerns for ambient toxicity. Historical data were collected from Rabbit Creek near IH20 and from one site on Bighead Creek. For this study, eight sites on Rabbit Creek and several significant tributary streams were evaluated. Water quality data from a normal flow sample set indicated no significant water quality concerns at that time. Standing alone, one set of water samples is very inconclusive. On the assumption that historical concerns were caused by non-point inflows, it was hoped that a rain event sample set might indicate some regions or parameters that were contributing to the concerns observed at the downstream site on Rabbit Creek near IH20. Biological sampling was finished prior to sampling a rain event and indicated fish and benthic communities typical for the region. The biological results indicate water quality sufficient to support a healthy variety of fish and invertebrates that have been sustained over a period of time to allow for full life cycles. Earlier physical and chemical sampling at Rabbit Creek at IH20 indicated some concerns, however it appears at this time to be indicative of conditions that are typical of East Texas streams; relatively sluggish streams with high natural organic loading, warm waters, high turbidity and high associated bacteriological presence. The most downstream site on Rabbit Creek had non-typical habitat due to addition of cobble to the streambed for stream stabilization at the interstate highway right-of-way. In this “enhanced” habitat, four different darter species were collected. Darters are quite common but it is unusual to collect that many darter species from one site.