



AQUATIC ECOSYSTEM INVENTORY

Macroinvertebrate Analysis



Annual Progress Report

BUREAU OF LAND MANAGEMENT

ARIZONA STRIP DISTRICT

1987



**Forest Service
Intermountain Region**



AQUATIC ECOSYSTEM INVENTORY
Macroinvertebrate Analysis

AQUATIC ECOSYSTEM ANALYSIS FOR SELECTED STREAMS
ON THE BLM ARIZONA STRIP DISTRICT
1987

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AQUATIC ECOSYSTEM ANALYSIS
FOR SELECTED STREAMS ON THE
BLM ARIZONA STRIP DISTRICT

1987

BACKGROUND AND METHODS

In recent years land managers on many of our forests and BLM districts in the west have improved the stability and reliability of land management plans and decisions by sampling aquatic organisms which act as natural monitors of management activities within the drainages on public lands.

During short-term exposure to water of poor quality or adverse changes in habitat, organisms that cannot tolerate the stress are destroyed and the aquatic macroinvertebrate community structure changes. Since aquatic organisms respond to their total environment, they can become an effective tool for detection of environmental changes.

Our analysis of aquatic ecosystems is based upon multiple factors including:

1. Various macroinvertebrate data - Community dry-weight biomass/sample expressed in gm/m²; number of individuals per taxa (resident populations?); DAT Diversity Index, which combines a measure of dominance and number of taxa; habi5, habitat and feeding preferences of individual taxa or species; specific tolerances of taxa; community composition; and BCI (Biotic Condition Index), which indicates as a percentage how close an aquatic ecosystem is to its own potential.

2. Physical parameter data and

3. Water chemistry data

Effective use of the Biotic Condition Index (BCI) depends upon the availability of data on stream gradient, natural capability of instream substrate (may not be the composition present if man-influenced sedimentation is found at the sample station), total alkalinity, and sulfate in mg/l.

Because of the way that macroinvertebrates occupy space within a stream, it generally takes at least three samples to represent the community accurately at a given station. One sample per station costs less but has little value for aquatic habitat assessment, one never knows if such single samples represent the best, the worst or an average of possible conditions at the sampling site. Also as a side benefit, three samples per station provides a basis for various statistical analyses, if random samples are all taken from a rubble substrate in as similar habitat as possible, taking into account mainly the velocity of flow and depth in the stream. Biologists have found that compared to other sampling devices, the Winget-modified surber net yields the highest coefficient of correlation (similarity of samples).

A stream's natural potential for productivity, habitat quality and water quality can be compared to the "actual" by taking quantitative samples of aquatic macroinvertebrates. Careful analysis of macroinvertebrate communities can reveal condition and trends in aquatic ecosystems. Sampling and analysis is conducted in accordance with procedures outlined in FSH R-4 2609.23, March 1985, Fisheries Habitat Surveys Handbook.

This report is based upon 27 aquatic macroinvertebrate samples from 9 stations on 7 streams along with water chemistry and physical habitat data provided by your aquatic specialists. Streams sampled included Beaver Dam Wash, Bullrush Wash, Cottonwood Spring, Maidenhair Spring, Paria River, State Line Spring and Virgin River.

BEAVER DAM WASH

The macroinvertebrate community was dominated by those taxa tolerant to sedimentation and organic enrichment. However, there was a fairly good population of the moderately tolerant mayfly, *Cinygmula*, which indicated there was fairly good water quality and at least some fairly good instream substrate. The observed lack of shredders in the community often indicates a lack of streamside deciduous vegetation, or unfavorable instream habitat conditions for those species.

The potential for a resident trout fishery appears to be fair to poor in this stream. A dominance of sediment tolerant species and lack of clean water species, indicates there may be very little if any suitable spawning substrate available in the reach of stream sampled and the macroinvertebrate standing crop of 0.6 gm/m^2 would be limiting to the number and size of fish that could be supported in the ecosystem.

The BCI value of 75 indicating fair conditions in this aquatic ecosystem, was derived considering this to be a stream with some natural limitations. It appeared there may be opportunities for management to improve the instream habitat quality and possibly riparian habitat quality in this aquatic ecosystem.

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MACROINVERTEBRATE ANALYSIS

Prior to field season fill in Sections A and C for each stream that will be sampled and forward to:

Aquatic Ecosystem Analysis Laboratory
105 Page School
Brigham Young University
Provo, Utah 84602

A. Investigator Curtis Warrick
Forest/District BLM Arizona / Strip District
Stream BEAVER DAM WASH
State/County Arizona
Forest Service Cat. No. _____

B.

Station	Date(s)	Diversity Index DAT (mean)	Standing Crop g/m ² (mean)	Biotic Condition Index BCI 72
1	9-03-87	10.2	0.6	75

Scale:

	DAT	Standing crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	75 - 90
Fair	6 - 10	0.6 - 1.5	below 75
Poor	0 - 5	0.0 - 0.5	below 75

FS-R4-2600-15(3/85)

TOTAL SAMPLE STATISTICS

STATION: 1

BEAVER DAM, BLM ARIZONA

DATE: 09 03 87

REPL	TOTAL NO. SPECIES	MEAN /SQM	CONFIDENCE LIMITS (80 PERCENT) LL	UL	STANDARD DEVIATION	PERCENT SE OF MEAN	COEFF. OF VARIATION	DBAR	R	CTQA	CTQD
3	29	3802.	2823.	4781.	899.30	13.66	23.65	2.4993	0.4882	96.	96.

* NUMBERS DATA

SPECIES ANALYSES

STATION: 1

BEAVER DAM, BLM ARIZONA

DATE: 09 03 87

CLASS	ORDER	FAMILY	GENUS	SPECIES	MEAN NO/SQM	LOG10 NO/SQM	TOLERANCE QUOTIENT	LOG10 X TQ	MEAN WT GM/SQM
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGOMULA		215.20	2.333	30.	70.	
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	EPHEMERELLA	INERMIS	35.87	1.555	48.	75.	
INSECTA	EPHEMEROPTERA	TRICORYTHIDAE	TRICORYTHODES	MINUTUS	43.04	1.634	108.	176.	
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		154.23	2.188	72.	158.	
INSECTA	TRICHOPTERA				25.11	1.400	72.	101.	
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	HYDROPSYCHE		14.35	1.157	108.	125.	
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	CHEUMATOPSYCHE		10.76	1.032	108.	111.	
INSECTA	TRICHOPTERA	HYDROPTILIDAE	HYDROPTILA		7.17	0.856	108.	92.	
INSECTA	TRICHOPTERA	HYDROPTILIDAE	ALISOTRICHIA		10.76	1.032	108.	111.	
INSECTA	COLEOPTERA	ELMIDAE			3.59	0.555	104.	58.	
INSECTA	ODONATA	GOMPHIDAE			39.45	1.596	108.	172.	
INSECTA	LEPIDOPTERA				10.76	1.032	72.	74.	
INSECTA	ODONATA	COENAGRIONIDAE			39.45	1.596	108.	172.	
INSECTA	ODONATA	AGRIONIDAE	HETAERINA		7.17	0.856	108.	92.	
INSECTA	ODONATA	COENAGRIONIDAE	ARGIA		28.69	1.458	108.	157.	
INSECTA	DIPTERA	SIMULIIDAE			10.76	1.032	108.	111.	
INSECTA	DIPTERA	CHIRONOMIDAE			2141.24	3.331	108.	360.	
INSECTA	DIPTERA	EMPHIDAE			7.17	0.856	95.	81.	
INSECTA	DIPTERA	CERATOPOGONIDAE			10.76	1.032	108.	111.	
INSECTA	DIPTERA	PSYCHODIDAE	PERICOMA		3.59	0.555	36.	20.	
CRUSTACEA	COPEPODA				7.17	0.856	108.	92.	
CRUSTACEA	OSTRACODA				10.76	1.032	108.	111.	
GASTROPODA					555.93	2.745	108.	296.	
TURBELLARIA	TRICLADIDA	PHYSIDAE	PHYSA		68.15	1.833	108.	198.	
OLIGOCHAETA		PLANARIIDAE	PLANARIA		200.85	2.303	108.	249.	
ARACHNIDA	HYDRACARINA				60.97	1.785	98.	175.	
NEMATODA					10.76	1.032	108.	111.	
GASTROPODA					39.45	1.596	108.	172.	
HIRUDINEA					28.69	1.458	108.	157.	
				TOTALS	3801.87	3.580			0.60

BULLRUSH WASH

The macroinvertebrate community was dominated by those taxa tolerant to sedimentation. There was also an abundance of those species which compete best where there is adverse water chemistry. The observed low numbers of shredders at the Upper Station is often found where riparian habitat is in fair to poor condition and the shredders at the Lower Station are generally found where riparian habitat does not include deciduous plants or where the instream habitat is not compatible with their needs. A moderately tolerant mayfly *Ameletus* indicated there was fairly good water quality, and a mosquito larvae indicated that the sampled stream reach was less than 12 inches deep and had a low gradient. It appeared there may be some impacts from grazing activities in the area.

The potential for a resident trout fishery did not appear to be good. The dominance of sediment tolerant taxa and lack of clean water species indicated there would be very little if any suitable spawning substrate in the reach sampled, and the macroinvertebrate biomass of 0.8 and 0.6 gm/m² at Stations 1 and 2 respectively, would be limiting to the number and size of fish that could be supported. However, this type of habitat may be suitable for other kinds of fish that are better adapted to living in this type of environment. With the high conductivity of 1,700 µmhos/cm at Station 1 and 1,800 µmhos/cm at Station 2, some sensitive aquatic biota may have been limited by adverse water chemistry.

The BCI values of 64 and 65 indicated that there were stress conditions. It appeared there may be opportunities for management to improve the instream habitat quality and possibly riparian habitat quality in this aquatic ecosystem. Resident population numbers for some of the species present indicated that inspite of the impacts, this aquatic ecosystem was fairly stable.

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MACROINVERTEBRATE ANALYSIS

Prior to field season fill in Sections A and C for each stream that will be sampled and forward to:

Aquatic Ecosystem Analysis Laboratory
105 Page School
Brigham Young University
Provo, Utah 84602

A. Investigator Curtis Warrick
Forest/District BLM Arizona / Strip District
Stream BULLRUSH WASH
State/County Arizona
Forest Service Cat. No. _____

B.

Station	Date(s)	Diversity Index DAT (mean)	Standing Crop g/m ² (mean)	Biotic Condition Index BCI 60
(Upper) S-1	9-10-87	3.8	0.8	64
S-2	9-10-87	3.4	0.6	65

Scale:	DAT	Standing crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	75 - 90
Fair	6 - 10	0.6 - 1.5	below 75
Poor	0 - 5	0.0 - 0.5	below 75

FS-R4-2600-15(3/85)

TOTAL SAMPLE STATISTICS

STATION: 1

BULLRUSH WASH, BLM ARIZONA

DATE: 09 10 87

REPL	TOTAL NO. SPECIES	MEAN /SQM	CONFIDENCE LIMITS (80 PERCENT) LL	UL	STANDARD DEVIATION	PERCENT SE OF MEAN	COEFF. OF VARIATION	DBAR	R	CTQA	CTQD
3	11	32423.	23417.	41430.	8271.00	14.73	25.51	1.9966	0.4231	89.	94.

* NUMBERS DATA

SPECIES ANALYSES

STATION: 1			BULLRUSH WASH, BLM ARIZONA		DATE: 09 10 87				
CLASS	ORDER	FAMILY	GENUS	SPECIES	MEAN NO/SQM	LOG10 NO/SQM	TOLERANCE QUOTIENT	LOG10 X TQ	MEAN WT GM/SQM
INSECTA	EPHEMEROPTERA	SIPHONURIDAE	AMELETUS		200.85	2.303	48.	111.	
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		832.11	2.920	72.	210.	
INSECTA	PLECOPTERA	NEMOURIDAE	ZAPADA		128.89	1.458	16.	23.	
INSECTA	ODONATA				344.32	2.537	90.	228.	
INSECTA	ODONATA	COENAGRIONIDAE			200.85	2.303	108.	249.	
INSECTA	DIPTERA	CHIRONOMIDAE			2668.48	3.426	108.	370.	
INSECTA	DIPTERA	CERATOPOGONIDAE			1032.96	3.014	108.	326.	
INSECTA	DIPTERA	CULICIDAE	TOXORHYNCHITES		1348.59	3.130	108.	338.	
CRUSTACEA	COPEPODA				10386.99	4.016	108.	434.	
CRUSTACEA	OSTRACODA				15350.93	4.186	108.	452.	
OLIGOCHAETA					28.69	1.458	108.	157.	
TOTALS					32423.47	4.511			0.80

TOTAL SAMPLE STATISTICS

DATE: 09 10 87

BULLRUSH WASH, BLM ARIZONA

STATION: 2

REPL	TOTAL NO. SPECIES	MEAN /SQM	CONFIDENCE LIMITS (80 PERCENT) LL UL	STANDARD DEVIATION	PERCENT SE OF MEAN	COEFF. OF VARIATION	DBAR	R	CTQA	CTQD
3	9	21922.	15331. 28512.	6052.80	15.94	27.61	2.3862	0.2473	89.	92.

* NUMBERS DATA

SPECIES ANALYSES

STATION: 2		BULLRUSH WASH, BLM ARIZONA		DATE: 09 10 87					
CLASS	ORDER	FAMILY	GENUS	SPECIES	MEAN NO/SQM	LOG10 NO/SQM	TOLERANCE QUOTIENT	LOG10 X TQ	MEAN WT GM/SQM
INSECTA	EPHEMEROPTERA	SIPHONURIDAE	AMELETUS	T S.O S.O S.O S.O S	373.01	2.572	48.	123.	
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		114.77	2.060	72.	148.	
INSECTA	ODONATA	COENAGRIONIDAE			459.09	2.662	108.	287.	
INSECTA	DIPTERA	CHIRONOMIDAE			5222.19	3.718	108.	402.	
INSECTA	DIPTERA	CERATOPOGONIDAE			1233.81	3.091	108.	334.	
INSECTA	DIPTERA	PSYCHODIDAE	PERICOMA	ch.	746.03	2.873	36.	103.	
INSECTA	DIPTERA	CULICIDAE	TOXORHYNCHITES	S	1463.36	3.165	108.	342.	
CRUSTACEA	COPEPODA				8349.76	3.922	108.	424.	
CRUSTACEA	OSTRACODA				3959.68	3.598	108.	389.	
TOTALS					21921.71	4.341			0.60

COTTONWOOD SPRING

The aquatic macroinvertebrate community was dominated by those taxa tolerant to sedimentation with indications of some organic nutrients. Most of the species present were found in less than resident population numbers which often indicates some instability. This may have been due in part to the scouring action of high waters from a rainstorm the night before samples were taken. Periodically this stream experiences very low flows. The observed lack of shredders in the community is generally found where riparian habitat is in poor condition or where instream habitat quality does not meet the needs of the shredders, which was probably the case in this stream.

There did not appear to be a potential for a salmonid fishery, but possibly a small minnow species could survive in this habitat. Having taken into consideration natural limitations of this habitat, the BCI value was 78 which indicates that compared to its potential, there were fairly good conditions in this aquatic ecosystem.

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MACROINVERTEBRATE ANALYSIS

Prior to field season fill in Sections A and C for each stream that will be sampled and forward to:

Aquatic Ecosystem Analysis Laboratory
105 Page School
Brigham Young University
Provo, Utah 84602

A. Investigator Curtis Warrick
Forest/District BLM Arizona / Strip District
Stream COTTONWOOD SPRING
State/County Arizona / Mohave County
Forest Service Cat. No. _____

B.

Station	Date(s)	Diversity Index DAT (mean)	Standing Crop g/m ² (mean)	Biotic Condition Index BCI 80
S-1	8-13-87	3.9	0.08	78

Scale:	DAT	Standing crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	75 - 90
Fair	6 - 10	0.6 - 1.5	below 75
Poor	0 - 5	0.0 - 0.5	below 75

FS-R4-2600-15(3/85)

TOTAL SAMPLE STATISTICS

STATION: 1	COTTONWOOD SPRING, BLM ARIZONA	DATE: 08 13 87
REPL	MEAN	CONFIDENCE LIMITS
	/SQM	(80 PERCENT)
		LL UL
3	1632.	-1030. 4294.
		STANDARD DEVIATION
		PERCENT SE OF MEAN
		COEFF. OF VARIATION
		DBAR
		R
		CTQA
		CTQD
		1.6045 0.5712 98. 103.

* NUMBERS DATA

SPECIES ANALYSES

STATION: 1			COTTONWOOD SPRING, BLM ARIZONA		DATE: 08 13 87				
CLASS	ORDER	FAMILY	GENUS	SPECIES	MEAN NO/SQM	LOG10 NO/SQM	TOLERANCE QUOTIENT	LOG10 X Tq	MEAN WT GM/SQM
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS	S, O	7.17	0.856	72.	62.	
INSECTA	COLEOPTERA	ELMIDAE		S	21.52	1.333	104.	139.	
INSECTA	ODONATA				7.17	0.856	90.	77.	
INSECTA	ODONATA	COENAGRIONIDAE	ARGIA	S	78.91	1.897	108.	205.	
INSECTA	DIPTERA	SIMULIIDAE		S	50.21	1.701	108.	184.	
INSECTA	DIPTERA	CHIRONOMIDAE		S, O	1208.71	3.082	108.	333.	
INSECTA	DIPTERA	EMPIDIDAE		S	14.35	1.157	95.	110.	
INSECTA	DIPTERA	CERATOPOGONIDAE		S	114.77	2.060	108.	222.	
INSECTA	COLEOPTERA	HALIPLIDAE		S	3.59	0.555	54.	30.	
CRUSTACEA	OSTRACODA			S	21.52	1.333	108.	144.	
GASTROPODA		PHYSIDAE	PHYSA	S	7.17	0.856	108.	92.	
OLIGOCHAETA				O, S	50.21	1.701	108.	184.	
NEMATODA				S	46.63	1.669	108.	180.	
TOTALS					1631.93	3.213			0.08

MAIDENHAIR SPRING

The aquatic macroinvertebrate community was dominated by those taxa tolerant to sedimentation and some organic nutrients were indicated. The observed lack of shredders often indicates a lack of deciduous plants in a riparian habitat. In spite of some natural limitations and low flows in this ecosystem, the macroinvertebrate community indicated there was fairly good stability in this aquatic ecosystem.

It appeared there may be fairly good potential for a nongame fishery, possibly small minnows.

Having taken into account natural limitations, the BCI value of 85 indicated this aquatic ecosystem was in good condition compared to its potential and would be an important source of water for various kinds of wildlife in the area.

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MACROINVERTEBRATE ANALYSIS

Prior to field season fill in Sections A and C for each stream that will be sampled and forward to:

Aquatic Ecosystem Analysis Laboratory
105 Page School
Brigham Young University
Provo, Utah 84602

A. Investigator Curtis Warrick
Forest/District BLM Arizona / Strip District
Stream MAIDENHAIR SPRING
State/County Arizona / Mohave County
Forest Service Cat. No. _____

B.

Station	Date(s)	Diversity Index DAT (mean)	Standing Crop $\frac{g}{m^2}$ (mean)	Biotic Condition Index BCI 80
S-1	8-13-87	5.7	0.2	85

Scale:

Excellent
Good
Fair
Poor

DAT
18 - 26
11 - 17
6 - 10
0 - 5

Standing crop
4.0 - 12.0
1.6 - 4.0
0.6 - 1.5
0.0 - 0.5

BCI
above 90
75 - 90
below 75
below 75

FS-R4-2600-15(3/85)

TOTAL SAMPLE STATISTICS

DATE: 08 13 87

MAIDENHAIR SPRING, BLM ARIZONA

STATION: 1

REPL	TOTAL NO. SPECIES	MEAN /SQM	CONFIDENCE LIMITS (80 PERCENT) LL	UL	STANDARD DEVIATION	PERCENT SE OF MEAN	COEFF. OF VARIATION	DBAR	R	CTQA	CTQD
3	23	4437.	992.	7881.	3163.41	41.17	71.30	2.0862	0.5462	89.	94.

* NUMBERS DATA

SPECIES ANALYSES

STATION: 1		MAIDENHAIR SPRING, BLM ARIZONA		DATE: 08 13 87					
CLASS	ORDER	FAMILY	GENUS	SPECIES	MEAN NO/SQM	LOG10 NO/SQM	TOLERANCE QUOTIENT	LOG10 X TQ	MEAN WT GM/SQM
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS	S, O	7.17	0.858	72.	62.	
INSECTA	TRICHOPTERA				14.35	1.157	72.	83.	
INSECTA	COLEOPTERA	HYDROPHILIDAE		S	7.17	0.856	72.	62.	
INSECTA	LEPIDOPTERA			S	7.17	0.858	72.	62.	
INSECTA	DIPTERA			S	39.45	1.598	108.	172.	
INSECTA	DIPTERA	TIPULIDAE	TIPULA	S	10.78	1.032	36.	37.	
INSECTA	DIPTERA	TIPULIDAE	HEXATOMA	S	28.69	1.458	36.	52.	
INSECTA	DIPTERA	SIMULIIDAE		S	14.35	1.157	108.	125.	
INSECTA	DIPTERA	CHIRONOMIDAE		S, O	2198.63	3.342	108.	361.	
INSECTA	DIPTERA	EMPIDIDAE		S, O	68.15	1.833	95.	174.	
INSECTA	DIPTERA	CERATOPOGONIDAE		S, O	17.93	1.254	108.	135.	
INSECTA	TRICHOPTERA	HYDROPTILIDAE	ALISOTRICHIA	S	39.45	1.598	108.	172.	
INSECTA	DIPTERA	TIPULIDAE	PEDICIA	S	10.76	1.032	65.	67.	
INSECTA	DIPTERA	DIXIDAE		ch.	7.17	0.858	108.	92.	
INSECTA	DIPTERA	PSYCHODIDAE	MARUINA	S, ch	17.93	1.254	36.	45.	
INSECTA	DIPTERA	EPHYDRIDAE		O	14.35	1.157	108.	125.	
INSECTA	DIPTERA	STRATIOMYIDAE		S, ch	32.28	1.509	108.	163.	
CRUSTACEA	COPEPODA			S	14.35	1.157	108.	125.	
CRUSTACEA	OSTRACODA			S	39.45	1.598	108.	172.	
GASTROPODA		PHYSIDAE	PHYSA	S	132.71	2.123	108.	229.	
OLIGOCHAETA				O, S	1509.99	3.179	108.	343.	
ARACHNIDA	HYDRACARINA			O, S, S	39.45	1.598	98.	158.	
NEMATODA				S, S	164.99	2.217	108.	239.	
TOTALS					4436.71	3.647			0.20

PARIA RIVER

Two stations were sampled on this stream, one near Wilson Spring and one near the lower boundary of the wilderness area. None of the macroinvertebrate taxa at either of the stations had resident population numbers, which indicates a great deal of instability in this ecosystem. This could in part have been due to the scouring action of a recent high flow from a storm. The community that was present was dominated by those taxa tolerant to sedimentation and organic enrichment, which often indicates impacts from livestock grazing. There was, however, a clean water caddisfly present with fair population numbers at the Upper Station which indicated fairly good water quality and at least some good instream substrate. This species was represented by just two individuals at the Lower Station which still indicated there was fairly good water quality but the habitat there was more limiting.

The 25 foot width and very shallow depth found at each of the stations is typically found where there has been a great deal of grazing impacts, where the streambanks lack the stabilizing effects of riparian habitat and are generally broken by the livestock as they go for water, which adds to the sediment in the stream. As the stream becomes wider and more shallow it becomes less capable of supporting a fishery. The observed lack of shredders in the community is generally found where riparian habitat is in poor condition or where instream habitat quality is not sufficient for their needs.

The potential for a small minnow nongame population appeared to be fair in this stream. It did not appear to be a salmonid fishery stream. The low macroinvertebrate standing crop of less than 0.1 g/m^2 may even be limiting to a minnow population.

The BCI value of 77 at the Upper Station (1) indicated that this reach of stream was in fair condition compared to its potential, and a BCI of 67 at the Lower Station (2) indicated there were stress conditions in that reach of stream. It appeared there may be opportunities for management to improve the instream habitat quality, stability, riparian habitat, and possibly water quality in this aquatic ecosystem.

USFS - INTERMOUNTAIN REGION - ANNUAL PROGRESS REPORT

MACROINVERTEBRATE ANALYSIS

Prior to field season fill in Sections A and C for each stream that will be sampled and forward to:

Aquatic Ecosystem Analysis Laboratory
105 Page School
Brigham Young University
Provo, Utah 84602

A. Investigator Curtis Warrick
Forest/District BLM Arizona / Strip District
Stream PARIA RIVER (Low Boundary)
State/County Arizona
Forest Service Cat. No. _____

B.

Station	Date(s)	Diversity Index DAT (mean)	Standing Crop g/m ² (mean)	Biotic Condition Index BCI 60
(Wil. Spr.) 1	9-25-87	3.2	0.05	77
(Low Bndry) 2	9-25-87	2.2	0.03	67

Scale:	DAT	Standing crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	75 - 90
Fair	6 - 10	0.6 - 1.5	below 75
Poor	0 - 5	0.0 - 0.5	below 75

FS-R4-2600-15(3/85)

TOTAL SAMPLE STATISTICS

DATE: 09 25 87

PARIA/WILSON SPRING, BLM ARIZONA

STATION: 1

REPL	TOTAL NO. SPECIES	MEAN /SQM	CONFIDENCE LIMITS (80 PERCENT) LL	UL	STANDARD DEVIATION	PERCENT SE OF MEAN	COEFF. OF VARIATION	DBAR	R	CTQA	CTQD
3	7	850.	443.	1257.	374.13	25.41	44.01	1.5869	0.4380	78.	78.

* NUMBERS DATA

SPECIES ANALYSES

STATION: 1		PARIA/WILSON SPRING, BLM ARIZONA		DATE: 09 25 87					
CLASS	ORDER	FAMILY	GENUS	SPECIES	MEAN NO/SQM	LOG10 NO/SQM	TOLERANCE QUOTIENT	LOG10 X Tq	MEAN WT GM/SQM
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS	5,0	534.41	2.728	72.	196.	
INSECTA	PLECOPTERA	CAPNIIDAE		5,0	3.59	0.555	32.	18.	
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE	5,0	71.73	1.858	18.	33.	
INSECTA	DIPTERA	SIMULIIDAE		5,0	53.80	1.731	108.	187.	
INSECTA	DIPTERA	CHIRONOMIDAE		5,0	172.16	2.236	108.	241.	
TURBELLARIA	TRICLADIDA	PLANARIIDAE	PLANARIA	5,0	3.59	0.555	108.	60.	
ARACHNIDA	HYDRACARINA				10.76	1.032	98.	101.	
TOTALS					850.04	2.929			0.03

TOTAL SAMPLE STATISTICS

DATE: 09 25 87

PARIA RIVER (LOWER BOUNDARY), BLM ARIZONA

STATION: 2

REPL	TOTAL NO. SPECIES	MEAN /SQM	CONFIDENCE LIMITS (80 PERCENT) LL	UL	STANDARD DEVIATION	PERCENT SE OF MEAN	COEFF. OF VARIATION	DBAR	R	CTQA	CTQD
3	11	1384.	385.	2384.	918.10	38.29	66.31	1.6714	0.5214	85.	89.

* NUMBERS DATA

SPECIES ANALYSES

STATION: 2		PARIA RIVER (LOWER BOUNDARY),		BLM ARIZONA		DATE: 09 25 87			
CLASS	ORDER	FAMILY	GENUS	SPECIES	MEAN NO/SQM	LOG10 NO/SQM	TOLERANCE QUOTIENT	LOG10 X TQ	MEAN WT GM/SQM
INSECTA	EPHEMEROPTERA	SIPHONURIDAE	AMELETUS		143.47	2.157	48.	104.	
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS	1	39.45	1.596	72.	115.	
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	HYDROPSYCHE	5, 0	10.76	1.032	108.	111.	
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE	1	7.17	0.856	18.	15.	
INSECTA	COLEOPTERA	HALIPLIDAE		5	3.59	0.555	54.	30.	
INSECTA	DIPTERA	SIMULIIDAE		0	914.60	2.961	108.	320.	
INSECTA	DIPTERA	CHIRONOMIDAE		5, 0	208.03	2.318	108.	250.	
CRUSTACEA	COPEPODA			5	7.17	0.856	108.	92.	
CRUSTACEA	OSTRACODA			5	10.76	1.032	108.	111.	
OLIGOCHAETA				0, 5	28.69	1.458	108.	157.	
ARACHNIDA	HYDRACARINA			5, 0	10.76	1.032	98.	101.	
TOTALS					1384.45	3.141			0.05

STATE LINE SPRING

None of the macroinvertebrate species in the community had resident population numbers, which generally indicates some instability. This may in part be due to very low flows which get down to 0.25 cfs or the scouring action from the heavy rain experienced the night before the samples were taken.

The community was dominated by those taxa tolerant to sedimentation and some species present prefer pools or slow moving water, particularly the mosquito larvae which indicated the water in the area sampled was no more than 12 inches deep. The shredder, a stonefly ~~Zapada~~, indicated there were some deciduous plants in the riparian habitat and also indicated fairly good water quality and at least some suitable instream substrate.

Having good water quality this ecosystem appeared to have potential for a minnow fishery, which may have been somewhat limited by a low macroinvertebrate biomass of just 0.05 gm/m². The BCI value, based upon natural limitations, was 82 which indicated this ecosystem was in good condition but could be better. It appeared there may be opportunities for management to improve the riparian habitat and possibly instream habitat quality in this aquatic ecosystem.

USFS - INTERMOUNTAIN REGION - ANNUAL PROGRESS REPORT

MACROINVERTEBRATE ANALYSIS

Prior to field season fill in Sections A and C for each stream that will be sampled and forward to:

Aquatic Ecosystem Analysis Laboratory
105 Page School
Brigham Young University
Provo, Utah 84602

A. Investigator Curtis Warrick
Forest/District BLM Arizona / Strip District
Stream STATE LINE SPRING
State/County Arizona / Mohave County
Forest Service Cat. No. _____

B.

Station	Date(s)	Diversity Index DAT (mean)	Standing Crop g/m ² (mean)	Biotic Condition Index BCI 76
<u>1</u>	<u>8-13-87</u>	<u>1.6</u>	<u>0.05</u>	<u>82</u>
_____	_____	_____	_____	_____
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_____	_____	_____	_____	_____

Scale:	DAT	Standing crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	75 - 90
Fair	6 - 10	0.6 - 1.5	below 75
Poor	0 - 5	0.0 - 0.5	below 75

FS-R4-2600-15(3/85)

TOTAL SAMPLE STATISTICS

DATE: 08 13 87

STATE LINE SPRING, BLM ARIZONA

STATION: 1

REPL	TOTAL NO. SPECIES	MEAN /SQM	CONFIDENCE LIMITS (80 PERCENT) LL	UL	STANDARD DEVIATION	PERCENT SE OF MEAN	COEFF. OF VARIATION	DBAR	R	CTQA	CTQD
3	7	151.	-27.	328.	162.83	62.41	108.09	1.6933	0.4150	84.	92.

* NUMBERS DATA

SPECIES ANALYSES

STATION: 1		STATE LINE SPRING, BLM ARIZONA		DATE: 08 13 87						
CLASS	ORDER	FAMILY	GENUS	SPECIES	MEAN NO/SQM	LOG10 NO/SQM	TOLERANCE QUOTIENT	LOG10 X TQ	MEAN WT GM/SQM	
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		5.0	0.555	72.	40.		
INSECTA	PLECOPTERA	NEMOURIDAE	ZAPADA		<u>3.59</u>	0.555	16.	9.		
INSECTA	COLEOPTERA	ELMIDAE			14.35	1.157	104.	120.		
INSECTA	COLEOPTERA	DYTISCIDAE	CYBISTRINAE	MEGADYTES	5	10.76	72.	74.		
INSECTA	DIPTERA	CHIRONOMIDAE			5.0	2.002	108.	216.		
INSECTA	DIPTERA	TABANIDAE	TABANUS		5	0.555	108.	60.		
INSECTA	DIPTERA	CULICIDAE	DEINOCERITES		5	1.157	108.	125.		
			TOTALS		150.64	2.178			0.05	

VIRGIN RIVER

The aquatic macroinvertebrate community was dominated by those taxa tolerant to sedimentation and organic enrichment. There were however some clean water and moderately tolerant species present in limited numbers which indicated there was fairly good water quality in this aquatic ecosystem. The observed number of shredders is generally found where riparian habitat has few deciduous plants. The community composition and diversity indicated there was fairly good stability in the reach of stream sampled.

It did not appear that this stream would provide a good habitat for a salmonid fishery but it could possibly provide habitat for a minnow species. The conductivity of 2,800 $\mu\text{mhos/cm}$ indicates there may be adverse chemistry for many of the aquatic biota in this ecosystem, which may be part of the reason why clean water and moderately tolerant species were so limited. The scouring action of the recent thundershower could have added to the factors limiting the clean water and moderately tolerant taxa.

The BCI value of 79 indicated that this reach of stream was in fairly good condition but could be better. It appeared there may be opportunities for management to improve the instream habitat quality and possibly water quality in this aquatic ecosystem.

MACROINVERTEBRATE ANALYSIS

Aquatic Ecosystem Analysis Laboratory
105 Page School
Brigham Young University
Provo, Utah 84602

[illegible]

FS-R4-2600-15(3/85)

TOTAL SAMPLE STATISTICS

DATE: 09 03 87

VIRGIN RIVER, BLM ARIZONA

STATION: 1

REPL	TOTAL NO. SPECIES	MEAN /SQM	CONFIDENCE LIMITS (80 PERCENT) LL	UL	STANDARD DEVIATION	PERCENT SE OF MEAN	COEFF. OF VARIATION	DBAR	R	CTQA	CTQD
3	20	1316.	-13.	2646.	1220.88	53.55	92.75	3.0602	0.2951	82.	91.

* NUMBERS DATA

SPECIES ANALYSES

STATION: 1		VIRGIN RIVER, BLM ARIZONA		DATE: 09 03 87					
CLASS	ORDER	FAMILY	GENUS	SPECIES	MEAN NO/SQM	LOG10 NO/SQM	TOLERANCE QUOTIENT	LOG10 X TQ	MEAN WT GM/SQM
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGOMULA		7.17	0.856	30.	26.	
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	EPHEMERELLA	INERMIS	3.59	0.555	48.	27.	
INSECTA	EPHEMEROPTERA	TRICORYTHIDAE	TRICORYTHODES	MINUTUS	312.04	2.494	108.	269.	
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		154.23	2.188	72.	158.	
INSECTA	PLECOPTERA	NEMOURIDAE	ZAPADA		7.17	0.856	16.	14.	
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	HYDROPSYCHE		28.69	1.458	108.	157.	
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE		3.59	0.555	18.	10.	
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA		3.59	0.555	108.	60.	
INSECTA	TRICHOPTERA	HYDROPTILIDAE	HYDROPTILA		132.71	2.123	104.	221.	
INSECTA	COLEOPTERA	ELMIDAE			28.69	1.458	90.	131.	
INSECTA	ODONATA	GOMPHIDAE			25.11	1.400	108.	151.	
INSECTA	ODONATA	COENAGRIONIDAE			7.17	0.856	108.	92.	
INSECTA	LEPIDOPTERA				3.59	0.555	72.	40.	
INSECTA	DIPTERA	SIMULIIDAE			179.33	2.254	108.	243.	
INSECTA	DIPTERA	CHIRONOMIDAE			104.01	2.017	108.	218.	
INSECTA	DIPTERA	CERATOPOGONIDAE			7.17	0.856	108.	92.	
CRUSTACEA	OSTRACODA				3.59	0.555	108.	60.	
OLIGOCHAETA					10.76	1.032	108.	111.	
ARACHNIDA	HYDRACARINA				290.52	2.463	98.	241.	
TOTALS					1316.31	3.119			0.20