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Little Big Horn River

Water Quality Project

Report by

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&
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October 1995

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Introduction

This report summarizes the accomplishments of the Water Quality Project on the Little Big Horn River during the summer of 1995. Financial Support was provide by the Science & Technology Alliance Program. The majority of the summer was spent collecting data on the Little Big horn River, then testing the water samples for a number of different test which was done at the Little big Horn College in Crow Agency, Montana. The Project was under the supervision of Dianna Hooker an Instructor of from Little Big Horn College, and three student interns from the college, Dee Bad Bear, Rochelle Old Horn, and Arthur Fitzpatrick. The intention of this study is to preform stream quality analyses to gain an understanding of the quality of selected portions of the river, to assess any impact that the existing developments may be causing to the environment and to gather base-line data which will serve to provide information concerning the proposed development.

Citizens of the reservation have expressed a concern of the quality of the water on the reservation; surface waters, ground waters, and well waters. Little Big Horn College is the sole institution of higher education on the reservation, and is therefore a likely and appropriate institution from which to collect, examine, and record information on the waters of the Crow Reservation. With the help of other Agencies from the Crow Indian Reservation, State of Montana, and Wyoming, we were able to get this project started in the right direction.

Final Report

This report documents our progress during the summer of 1995 on the Little Big Horn River water quality project. The project got off to a rough start, but we were able to work out a lot of the problems and still accomplish some of the work we attended on doing. The Little Big Horn River is located on the Crow Indian Reservation on the southern part of Montana. The head waters begin in the Big Horn mountains of Wyoming and enter the reservation for the southern side. The river dissent through the reservation exit out on the other side of the reservation by Hardin, Montana. Hardin is located off the northern part of the reservation. The Little Big Horn River joins the Big Horn River at this point. The Little Big Horn River is a major water source for most of the communities on the reservation. The river is also irrigated for agricultural purposes. Citizens of the reservation have expressed a concern of the quality of the water. Some of the concerns were of a hydro-electric dam being built on the Dryfork creek on the Wyoming side. The Dryfork is one of the head waters that joins into the Little Big Horn River. The Sunlight ranch feed lot above Wyola, and the sewage treatment plants draining into the river at each community near the river.

We have three main objectives of this project, (1) Identify any impacts that a non-point source discharge may be having on the water quality of the river by taking measurements up and down stream of the source. (2) Measurements taken upstream of the non-point source will also serve as base-line stream quality data downstream of a pumped storage hydro-electric facility to be located on one of the headwaters of the LBHR. Such base line data will provide valuable information for the citizens of the Crow Indian Reservation, to better evaluate potential benefits and impacts from the project. (3) Conduct a stream quality study of the LBHR which will cover three aspects of the stream water quality. (I) Chemical analyses (II) Habitat Assessment (III) A stream quality indicator count and identify macro invertebrates to the family level.

During the first few days, we inventoried our equipment and discussed our plans to begin our project. Mark Weitz made an appointment with Bob Bukantis of the Montana D.H.E.S. to give us a class on collecting data and habitat assessment procedures. We then ordered more reagents and borrowed a Hach DR2000 Spectrophotometer from the B.I.A. water plant management

Department. Mr. Little Owl was kind enough to let us borrow the equipment for the duration of the summer. The second week of the project, Mark Weitz, project coordinator quit, and Dianna Hooker took over as project coordinator. Due to prior commitments, there was a gap of about two weeks before Dianna could begin. Dee J Bad Bear kept the project active by teaching himself how to operate the equipment, procuring reagents, and attending the appointments Mark had set up. Rochelle Old Horn worked on creating data forms and assisted in the sample collections.

We then went out on the river and picked out our sites that we planned on collecting water samples from. The following week we scheduled an appointment with Kurt King from the Wyoming D.E.Q. Mr. King is the Senior Water Quality person for Wyoming. Mr. King was able to pass on some very important data for our habitat assessment portion of the project. He also suggested that we put off the collection of the macro invertebrates until the later part of October. He also informed us that the Hydroelectric dam that was to be built had collapsed due to different reasons some of which he was not aware of. But to his knowledge in the department the project was canceled because of the geological reports. The area where the dam was to be built was on limestone and that the limestone was not stable enough to be built on. There was evidence of cracks in the limestone which would leak water or cause a major catastrophe if the dam was to be built on it. Mr. King also pointed out that due to the extreme amount of precipitation we were experiencing, it would not be very suitable to start collecting water samples until the river went down to below flood stage.

During the next couple of week we practiced using the equipment we had, making out forms and ordering supplies. We also went out to our sites and did the habitat assessment part of our project. After the river had subsided, we were able to start collecting water samples to test for the chemical portion of the project. Water sample were collected once a week, some of the testing was done right in the field and the rest of the testing was done once we returned back to the lab at the College. Once we retrieved our samples we tested the water for the following: Temperature, Dissolved Oxygen, P.H., Milli-volts, Conductivity, Total Dissolved Solids, Total Suspended Solids, Nitrogen Ammonia, Nitrite, Nitrate, Hardness, Phosphates, Turbidity, Absorbance, %T, Acidity, and Alkalinity. After the test were complete we entered the data into our records to be filed. Any test that showed any discrepancies was either redone or a new water sample was taken. Fecal Coliform testing was done for presence or absence, not to the specific test. Problems with ordering the

right reagents and equipment forced us to use old tests and the accuracy is questionable. It was found present at all sites. We were also only able to get one Stream flow reading from the state flow meters on the river. Lori Tuck a Ground Water hydrologist from the Montana D.E.Q., said that if we write to them ahead of time that they would be able to help us get the data we need, next time.

In the next following pages you will find the following information: Team Members, Instruments used, Site description, Specific Sampling Sites, map of the Crow Indian Reservation with the site locations marked by the river, chemical data, habitat assessment study, conclusions and recommendations. Due to the time frame we were not able to get to the macro-invertebrate study portion in our project. I felt that this Project was very helpful to the team we all learned a considerable amount of information on everything that we did. We learned how to use the equipment collect data and gather information from the public to use in our project. We worked long hard hours, traveled many miles and tested a lot of water. In the end we were able to get some base-line data for next year.

Conclusion.

From our chemical testing there is evidence of some water contamination of chemical form. More testing and studying needs to be done to get a more accurate determination on the quality of the water. The collection of data to set a baseline for the Little Big Horn river needs to be continued. Ongoing development and land use practices on and near the river could effect the water quality, with the data we are collecting we will have baseline data and will be able to monitor any changes that are occurring. Although none of the test data indicates alarmingly high levels of a certain chemical, we do experience a decrease in the overall water quality as we move downstream.

Future Plans and Recommendations.

The water quality study on the Little Big Horn river should be continued and expanded. Herbicides and insecticides should be included in next year's study. There are intense days of crop dusting the surrounding sugar beet fields and we feel it would be important to monitor this event. Although we do not have exact data on what type of fecal coliform was present, we do have data on the presence or absence of it. This needs to be followed up, with more complete testing. Our plans were to carry out a macro invertebrate study this year to give us a more unique characterization of the overall water quality, but high water and time did not allow us to complete this portion of our study. We need to have this data as part of our baseline collection. The fisheries aspect of the river also provides another point of view to the overall water quality. It was proposed that we not do that study this year as we already had plenty to do without that added dimension. It is still an area of great interest.

Acknowledgements

Montana Consortium S. & T.A.
Oak Ridge National Labs
Los Alamos National Labs
Little Big Horn College

People:

Clara Beth Johnson S&TA Coordinator
Janet Cowan Los Alamos Student Coordinator
Dianna Hooker LBHC Instructor & Project Supervisor
Jeff Hooker LBHC Math & Science Dept. Head
Rich Stiff LBHC Instructor
Bob Madsen LBHC Instructor
Mark Wietz LBHC Instructor
Kurt King Wyo. D.E.Q.
Lori Tuck Mt. D.E.Q.
Bob Bukantis Mt. D.H.E.S.

Brief Overview

Little Big Horn River Water Quality Project

The Little Big Horn River Water Quality Project was initiated June 13, 1995. Due to high water flow baseline data taken June 14, 22, and July 7, 1995 are insufficient. During the weeks of July 22 & July 25, 1995 the water flow has dropped low enough for testing. Due to delays in receiving chemicals and equipment for collecting data some of the test we wanted to do had to be delayed. Data is still being collected until the later part of October 1995.

Team Members

Dianna Hooker	LBHC Instructor/Project Supervisor
Dee Bad Bear	S&TA Student Intern
Rochelle Old Horn	S&TA Student Intern
Author Fitzpatrick	S&TA Student Intern
Rich Stiff	Mentor
Jeff Hooker	Mentor
Bob Madsen	Mentor

Instruments

Hach DR-2000 Spectrophotometer, Portable Hach 1 ISE meter Model 45400, Digital Titrator Model 16900-01, Hach Portable Turbidimeter Model 2100P, Orthophosphate Test Kit Model PO-19/PO-19A, Ammonia Combination Electrode, Gas Sensing Model 44470, Ecology combination Test Kit Model A1-36DT, Corning M90 Meter, Bell Jar Vacuum Test Kit & Membrane Filtration Technique.

Site Description

Little Big Horn River on the Crow Indian Reservation.

Specific Sample Locations

Montana-Wyoming State Line (MWL)

Located on the Montana side of the Montana Wyoming border near the Big Horn National Forest. Above Sunlight Ranch Feedlot.

Black Bridge (BB)

Located above Black Bridge river crossing near Wyola . Below the Sunlight Ranch Feedlot.

Spearsiding (SS)

Located at the Spear Siding picnic area. After the town of Wyola, and before Lodge Grass.

Benteen (Ben)

Located between the town of Lodge Grass and Crow Agency. On the property of

Bill Pease.

Black Lodge (BL)

Located off the Dunmore exit. After the town of Crow Agency, and approximately five miles before confluence with the Big Horn River. On the property of Dale Old Horn.

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Sites	Date	Temp. in	D.O. %	D.O. mg/l	PH	MV	Cond. u	T.D.S. mg/l	T.S.S. g/200ml	Nitro/Ammonia	Nitrite mg/l	Nitrate mg/l	Hardness mg/l	Phosphates mg/l	Turbidity FTU's	Absorbance abs	% T	Acidity mg/l	Alkalinity mg/l	Fecal Colliform	Water flow
2	State line	06/14/95	11			7.9		210								19						Inside 3.36 outside 5.9
3	2nd on WY	06/22/95	12.3			7.07	-3	268	140	0.006												
4	Blackbrdg	06/22/95	9.3			7.47	-25	307	159	0.0075												
5	Spearsidn	06/22/95	9.6			7.57	-29	382	182	0.0176												
6	Benteen	06/22/95	9.1			7.62	-35	386	198	0.0201												
7	Blacklodge	06/22/95	9.6			7.62	-37	388	194	0.0541												
8	Dryfork Y	07/07/95	17.7	70		7.51	-37	287	146	0.0031												
9	2nd on WY	07/07/95	16.2	63		8.86	15	282	143	0.0049												
10	Blackbrdg	07/07/95	15.8	76		8.23	-71	367	186	0.0052												
11	Spearsidn	07/07/95	15.9	41		7.04	-42	406	204	0.0079												
12	Benteen	07/07/95	18.4	51	50	7.23	-17	442	223	0.0092												
13	Blacklodge	07/07/95	19	53	52	7.97	-5	445	225	0.0148												
14	MWL	07/25/95	16.5	63	61	7.35	-25	370	188	0.0113	0.02	0.006	0.02	0.56								
15	Blackbrdg	07/25/95	18.8	67	81	7.31	-24	484	244	0.0053	0.01	0.001	0.03	0.14								
16	Spearsidn	07/25/95	18.8	76	72	7.5	-28	631	319	0.0012	0	0.004	0.02	0.14								
17	Benteen	07/25/95	21.5	66	64	7.53	35	720	361	0.0017	0	0.005	0.02	0.05								
18	Blacklodge	07/25/95	23.7	64	58	7.31	-19	822	425	0.0047	0	0.005	0.02	0								
19	MWL	08/01/95	11.7	61	56	7.18	-16	533	263	0.0002	0	0.01	0.01	0					0	0		
20	Blackbrdg	08/01/95	15.7	77	88	7.18	-9	714	362	0.0003	0	0.03	0.02	0.15					0	0		
	Spearsidn	08/01/95	17.5	79	89	7.23	-23	767	383	0.0008	0	0.001	0.02	0.14					0	0		
	Benteen	08/01/95	23	61	67	6.83	11	823	414	0.002	0.02	0.002	0.03	0.23					0	0		
23	Blacklodge	08/01/95	20.3	51	55	7	-8	728	368	0.0006	0	0.001	0.01	0.13					0	0		
24	MWL	08/11/95	16.9	53	65	8.34	-90	483	267	0.0003	0	0.002	0.02	0.02					0	0		
25	Blackbrdg	08/11/95	19.1	57	66	8.51	-81	555	273	0.0004	0.05	0.005	0.03	0.12					0	0		
26	Spearsidn	08/11/95	19	66	63	8.2	-84	777	390	0.0008	0	0.003	0.01	0.11					0	0		
27	Benteen	08/11/95	21.2	83	70	8.54	-78	833	421	0.0015	0	0.002	0.03	0.17					0	0		
28	Blacklodge	08/11/95	21.9	53	43	8.19	-62	961	485	0.0027	0	0	0.02	0.1		8	0.03	93.4	0	0		
29	MWL	08/16/95	17.3	56	68	8.15	-82	495	283	0.0005	0.02	0.004	0.06	0.59	0.28	0	0.002	99.6	0	0		
30	Blackbrdg	08/16/95	20.3	62	72	8.21	-52	574	289	0.0009	0.49	0.006	0.07	0.175	0.33	1	0.007	98.3	0	0		
31	Spearsidn	08/16/95	23.7	67	61	8.1	-32	715	410	0.0015	0.001	0.005	0.06	1.81	0.01	1	0.001	99.7	0	0		
32	Benteen	08/16/95	25.3	79	63	8.04	-19	759	390	0.0026	0.01	0.007	0.03	0.39	0	2	0.003	99.2	0	0		
33	Blacklodge	08/16/95	28.5	60	51	7.69	-50	880	505	0.0037	0.19	0.005	0.04	0.2	0	1	0.001	100	0	0		
34	MWL	08/23/95	13.4	85	88	8.39	-23	584	290	0.0006	0	0.01	0.09	0.56	0.29	0	0.004	99.1	0	0		
35	Blackbrdg	08/23/95	16	92	89	7.53	-51	781	392	0.0017	0.07	0.008	0.05	0.6	0.42	22	0.02	95.4	0	0		
36	Spearsidn	08/23/95	18.1	84	77	7.55	-39	831	419	0.0022	0.04	0.013	0.01	0.4	0.92	7	0.046	89.9	0	0		
37	Benteen	08/23/95	18.6	83	70	7.7	-45	889	447	0.0023	0.02	0.01	0.02	0.7	0.92	22	0.095	80.3	0	0		
38	Blacklodge	08/23/95	24.1	84	71	8.13	-60	1035	522	0.003	0.02	0.011	0.06	0.32	0.81	18	0.07	85.1	0	0		
39	MWL	08/29/95	10.8	71	79	8.28	-73	587	294	0.0001	0.1	0.009	0.02	0.48	0.01	0	0.004	99.1	0	0		
40	Blackbrdg	08/29/95	15.3	76	73	8.23	-69	799	400	0.0003	0.05	0.009	0.04	0.76	0.01	3	0.02	95.4	0	0		
41	Spearsidn	08/29/95	18.8	80	74	8.27	-72	821	416	0.0007	0.03	0.007	0.12	0.5	0.12	7	0.046	89.9	0	0		
42	Benteen	08/29/95	22.2	79	68	8.31	-84	905	454	0.0011	0.02	0.018	0.17	0.63	0.19	22	0.095	80.3	0	0		
43	Blacklodge	08/29/95	26.6	81	89	8.59	-85	1077	543	0.0017	0.005	0.012	0.15	0.13	0.11	18	0.07	85.1	0	0		
44	MWL	09/07/95	10.3	79	76	8.82	-90	576	288	0.0011	0.01	0.007	0.05	0.36	0.001	1	0	98.9	0	0		
45	Blackbrdg	09/07/95	15.2	75	74	8.52	-78	790	390	0.0028	0.02	0.005	0.07	0.73	0.002	2	0.008	98.2	0	0		
	Spearsidn	09/07/95	16.9	70	67	8.52	-78	886	396	0.0027	0.001	0.003	0.08	0	0.08	5	0.005	98.5	0	0		
	Benteen	09/07/95	19	65	60	8.33	-71	917	457	0.0028	0.02	0.011	0.1	0.44	0.12	24	0.096	80.1	0	0		
48	Blacklodge	09/07/95	19	63	56	8.77	-87	1045	535	0.0022	0.03	0.009	0.09	0	0.07	14	0.054	88.3	0	0		
49	MWL	09/12/95	9	74	59	7.45	-64	605	225	0.0037	0.04	0.001	0.06	0.2	0.11	16	0.07	90.6	0	0		
50	Blackbrdg	09/12/95	11	80	63	8.46	-57	680	290	0.0041	0.03	0.008	0.09	0.17	0.14	22	0.09	93.4	0	0		
51	Spearsidn	09/12/95	13	72	71	8.43	-53	711	331	0.0053	0.015	0.004	0.07	0.17	0.11	25	0.13	95.3	0	0		
52	Benteen	09/12/95	14	71	62	8.42	-51	693	305	0.006	0.011	0.002	0.09	0.2	0.16	24	0.17	96.7	0	0		
53	Blacklodge	09/12/95	17	69	64	8.01	-43	701	325	0.007	0.019	0.004	0.07	0.7	0.24	26	0.27	92.1	0	0		
54	MWL	09/19/95	16	63	65	7.38	-2	657	211	0.001	0.02	0.005	0.06	0.58	0.01	38	0.05	92.5	0	0		
55	Blackbrdg	09/19/95	21	67	64	7.9	-38	689	240	0.0014	0.01	0.008	0.04	0.24	0.01	30	0.003	91.8	0	0		
56	Spearsidn	09/19/95	23	65	64	8.03	-45	673	257	0.0019	0.01	0.001	0.02	0.16	0.03	26	0.007	93.4	0	0		
57	Benteen	09/19/95	27	72	70	8.45	-37	734	310	0.0026	0.03	0.007	0.03	0.09	0.02	15	0.009	95.2	0	0		
58	Blacklodge	09/19/95	34	69	73	8.07	-21	852	347	0.0037	0.01	0.001	0.02	0.08	0.04	11	0.01	95	0	0		
59	MWL	09/26/95	11	72	76	7.57	-3	643	189	0.0011	0	0.001	0.02	0.61	0.02	29	0.02	94.2	0	0		
60	Blackbrdg	09/26/95	13	69	73	7.6	-23	692	191	0.0015	0.03	0.004	0.02	0.19	0.04	18	0.0029	96.8	0	0		
61	Spearsidn	09/26/95	16	70	72	7.77	-17	759	208	0.0018	0.01	0.005	0.07	0.17	0.02	11	0.0035	95.2	0	0		
62	Benteen	09/26/95	17	75	78	8.22	-27	810	217	0.0029	0.01	0.002	0.06	0.1	0.01	10	0.0051	96.3	0	0		
63	Blacklodge	09/26/95	21	72	69	8.13	-41	930	247	0.0031	0.07	0.002	0.08	0	0.03	11	0.0043	96	0	0		

HABITAT ANALYSIS

The habitat analysis was done by July 24, 1995, by the Dee J Bad Bear and Rochelle Old Horn, student interns and Dianna Hooker, project supervisor. The habitat assessment forms were completed individually and differences were discussed to resolve any conflicts.

Results are summarized as follows:

SITE	Riffle/Run Prevalence	Stream Reach Assessment Form
Montana/Wyoming Line	143	86%
Black Bridge	132	80%
Spear Siding	105	77%
Benteen	110	75%
Black Lodge	93	73%

Montana State forms were used to score the habitat assessment (sample form attached). The higher scores represent the best stream habitat. The stream reach assessment form scored the Little Big Horn river in the non-impaired, but threatened category near its source, diminishing to minor impairment near its convergence with the Big Horn river.

Stream _____ Site _____

Date _____ Investigator _____

Habitat Parameter	Category			
	Optimal	Sub-Optimal	Marginal	Poor
1A. Riffle Development SCORE ()	Well-developed riffle; riffle as wide as stream and extends two times width of stream. 9-10	Riffle as wide as stream but length less than two times width. 6-8	Reduced riffle area that is not as wide as stream and its length less than two times width. 3-5	Riffles virtually non-existent 0-2
1B. Benthic Substrate SCORE ()	Diverse Substrate dominated by cobble. 9-10	Substrate diverse, with abundant cobble but bedrock, boulder; Fine gravel, or sand prevalent. 6-8	Substrate dominated by bedrock, boulders, fine gravel, sand or silt, cobble present. 3-5	Monotonous fine gravel, sand, silt, or bedrock substrate. 0-2
2. Embeddedness SCORE ()	Gravel, cobble, or boulder particles are between 0-25% surrounded by fine sediment (particles less than 6.35mm [.25"]) 16-20	Gravel, cobble, or boulder particles are between 25-50% surrounded by fine sediment. 11-15	Gravel, cobble, or boulder particles are between 50-75% surrounded by fine sediment. 6-10	Gravel, cobble, or boulder particles are over 75% surrounded by fine sediment. 0-5
3. Channel Alteration (channelization, straightening, dredging, other alterations) SCORE ()	Channel alterations absent or minimal; stream pattern apparently in natural state. 16-20	Some channelization present, usually in areas of crossings, etc, evidence of past alterations (before past 20 yr) may be present, but more recent channel alteration is not present. 11-15	New embankments present on both banks; and 40 to 80% of the stream reach channelized and disrupted. 6-10	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. 0-5
4. Sediment Deposition SCORE ()	Little or no enlargement of bars and less than 5% of the bottom affected by sediment deposition. 16-20	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools. 11-15	Moderate deposition of new gravel, coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition in pools prevalent. 6-10	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. 0-5

Habitat Parameter	Category			
	Optimal	Sub-Optimal	Marginal	Poor
5. Channel Flow Status	Water fills baseflow channel; minimal amount of channel substrate exposed.	Water fills > 75% of the baseflow channel; < 25% channel substrate exposed.	Water fills 25-75% of the baseflow channel; riffle substrates mostly exposed.	Very little water in channel, and mostly present as standing pools.
SCORE ()	16-20	11-15	6-10	0-5
6. Bank Stability (Score each bank) Note: determine left or right side while facing downstream.	Banks stable; no evidence of erosion or bank failure; little apparent potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; moderate frequency and size of erosional areas; up to 60% of banks in reach have erosion; high erosion potential during high flow.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of banks have erosion scars on side-slopes.
SCORE () (left) SCORE () (right)	9-10	6-8	3-5	0-2
7. Bank Vegetation Protection	Over 90% of the streambank surfaces covered by native vegetation; human or animal caused vegetative disruption minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation; human or animal caused disruption evident, but not affecting full plant growth potential to any great extent; more than one-half of potential plant height evident.	50-70% of the streambank surfaces covered in vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of potential plant height remaining.	Less than 50% of the streambank surfaces covered by vegetation; extensive disruption of vegetation; vegetation removed to 2 inches or less.
SCORE () (left) SCORE () (right)	9-10	6-8	3-5	0-2
8. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone > 18 meters.	Width of riparian zone 12-18 meters.	Width of riparian zone 6-12 meters.	Width of riparian zone < 6 meters.
SCORE () (left) SCORE () (right)	9-10	6-8	3-5	0-2

TOTAL SCORE ()

MOD 10/14/94

STREAM REACH ASSESSMENT FORM

River Basin (see reference on page 1) _____ Stream Name _____
 Recorder's Name _____ Date _____ County _____
 Reach Number (assigned by surveyor, number consecutively from mouth) _____
 Reach Length in miles (est. if necessary) _____
 Legal Description [Sec., Town., Range] - (Downstream end) _____ (Upstream end) _____
 Narrative Description _____
 Quad Sheet Name(s) - optional _____

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Answer all questions, unless you are unable to determine (N/R), or it is not applicable (N/A).

(Please check the one description that best fits each category)

Predominant vegetation and landscape characteristics in the watershed beyond the immediate riparian zone

- _____ -Perennial vegetation (pasture, rangeland, woodland, etc.), flat to rolling landscape
- _____ -Perennial vegetation, rolling to steep landscape
- _____ -Mixed perennial vegetation and annual crops, flat to rolling landscape
- _____ -Cropland, rolling to steep landscape

Meanders

- _____ -Slight Meandering - Relatively straight channel with only occasional curves. Travel length is basically the same as the straight line distance.
- _____ -Moderate meandering - Easy, gradual bends in the channel path
- _____ -Extreme meandering - Travel length of flow is greater than twice the straight line distance

Flood Flow Width

- _____ -Floods are confined in narrow canyon with width less than twice that of channel
- _____ -Floods confined to a flow width of 2-3 times the width of the channel
- _____ -Floods are unconfined and spill out onto flat valley bottom

Gradient

- _____ -Steep - Continuous rapids
- _____ -Moderate - Alternating rapids, riffles and smooth surfaced reaches
- _____ -Gradual - Smooth surfaced reaches with occasional riffles
- _____ -Flat - Very rare disruptions in smooth flat surface of stream

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(Please enter a number within the range of the category that best fits)

1. Average width of riparian zone

- 16-20 _____ - (> 90 ft wide)
- 11-15 _____ -varies from 15 to 90 ft
- 6-10 _____ - (3-15 ft)
- 1-5 _____ -riparian zone absent

2. Completeness of riparian zone ("Breaks" = change from riparian to other vegetation types, or bare ground)

- 16-20 _____ -Riparian zone intact without breaks in vegetation
- 11-15 _____ -Breaks occurring intermittently
- 6-10 _____ -Breaks frequent with some gullies and scars every 100 - 150 ft.
- 1-5 _____ -Deeply scarred with active headcutting and gully formation all-along reach

Is there evidence of sediment from the upper watershed or riparian area reaching the stream channel?

____yes ____no

3. Characteristics of the Riparian vegetation

- 16-20 _____ -Diversity of perennial plant species reflects potential for site; Dense growth (hard to walk through. Note: sedge community types may be exception); good plant vigor and age diversity
- 11-15 _____ -Approximately 60% of climax plant species present; plant vigor stable, density of growth mostly open (easy to walk through)
- 6-10 _____ -Little diversity in perennial plant species, and/or age of trees; plants scattered; vigor poor
- 1-5 _____ -Site is dominated by annual forbs and weeds; few perennial or climax plants present

4. Width/Depth Ratio - Rated channel width divided by depth as measured at the ordinary high water mark (OHM). OHM is the point where high flow normally reaches on the bank and is most easily determined on straight channel sections where the "scoured" channel meets the "permanent" vegetation. Look for characteristics such as terracing, soil changes (rock to soil), presence/absence of vegetation or debris.

- 10-12 ☐ -Width/depth ratio < 8
- 7-9 ☐ -Width/depth ratio 8 to 15
- 4-6 ☐ -Width/depth ratio 15 to 25
- 1-3 ☐ -Width/depth ratio > 25 or stream is channelized

5. Bar formation

- 10-12 ☐ -Bar development uncommon and/or bars stable and well vegetated.
- 7-9 ☐ -Some gravel bars of coarse stones and well-washed debris present, little silt
- 4-6 ☐ -Point bars enlarging by gravels, sand and/or silt, new bars forming
- 1-3 ☐ -Channel divided into braids or stream is channelized

6. Bank erosion

- 16-20 ☐ -Little or none evident, banks appear stable and are held firmly by vegetation
- 11-15 ☐ -Erosion occurring on some outside bends and channel constrictions; non-eroding banks stable
- 6-10 ☐ -Erosion common on most outside bends and channel constrictions
- 1-5 ☐ -Erosion predominant on entire channel (straight sections, inside and outside bends, etc.)

(Answer either 7a. or 7b.)

7a. Stream bottom - (Fast Moving/Riffle dominated streams)

- 16-20 ☐ -Stable, stony bottom of multiple sizes, interstices obvious
- 11-15 ☐ -Stony bottom easily moved, with little silt
- 6-10 ☐ -Bottom of silt, gravel and sand, stable in places
- 1-5 ☐ -Uniform bottom of sand and silt loosely held together, stony substrate absent

7b. Stream bottom - (Slow moving/Pool dominated streams)

- 16-20 ☐ -Mixture of substrate materials with gravel and firm sand prevalent; vascular root mats and submerged vegetation common
- 11-15 ☐ -Mixture of soft sand, mud or clay; mud may be dominant; some vascular root mats and submerged vegetation present
- 6-10 ☐ -All mud or clay, or channelized with sand bottom; little or no submerged vegetation
- 1-5 ☐ -Hardpan clay or bedrock; no vascular root mat or submerged vegetation

(Answer either 8a. or 8b.)

8a. Riffle/pool frequency - (Fast moving/riffle dominated streams)

- 16-20 ☐ -Distinct, occurring at intervals of 5-7 x stream width
- 11-15 ☐ -Irregularly spaced, 8-15 x stream width
- 6-10 ☐ -Long pools separating short riffles, meanders absent, 16-25 x stream width
- 1-5 ☐ -Meanders and riffles/pools absent or stream channelized, > 25 x stream width

8b. Pool characteristics - (Slow moving/pool dominated streams)

- 16-20 ☐ -Even mix of deep, shallow, large and small pools
- 11-15 ☐ -Majority of pools large and deep, very few shallow pools
- 6-10 ☐ -Shallow pools more prevalent than deep pools
- 1-5 ☐ -Majority of pools small and shallow or pools absent

9. Aquatic plant growth

- 10-12 ☐ -Not apparent, but rocks or other submerged objects feel slippery
- 7-9 ☐ -In small patches or along channel edges
- 4-6 ☐ -In large patches or discontinuous mats
- 1-3 ☐ -Mats cover bottom (hyper-enriched conditions) or plants not apparent and rocks not slippery (stream devoid of algae because of toxic conditions)

10. Turbidity

- 10-12 ☐ -Clear
- 7-9 ☐ -Slightly off Color
- 4-6 ☐ -Cloudy(can see through)
- 1-3 ☐ -Opaque(can't see through)

Color: _____ Is rain or runoff influencing turbidity levels today? Yes _____ No _____

10-12 _____
7-9 _____
4-6 _____
1-3 _____

-None
-Slight
-Moderate
-Severe

-Slick _____ Sheen _____ Flecks _____ Other _____

12. Materials other than sediment on channel bottom (examples: iron or aluminum oxides, calcium carbonate)

10-12 _____
7-9 _____
4-6 _____
1-3 _____

-None
-Slight
-Moderate
-Severe

State color _____

13. Salinization

10-12 _____
7-9 _____
4-6 _____
1-3 _____

-None Evident
-Evidence of salinity is present in the watershed, but no salt crusts observed in or near the stream.
-Minor evidence of salts in or near the stream. Plant diversity may be reduced or dominated by salt tolerant species.
-Salt crusts common in or near the stream or on stream banks. Vegetation may be severely reduced due to salt.

14. Water Odor

10-12 _____
7-9 _____
4-6 _____
1-3 _____

-None
-Slight
-Moderate
-Strong

Describe Odor-Sewage _____ Petroleum _____ Chemical _____ Natural _____ Other _____

15. Dewatering - From irrigation or natural factors such as subsurface flows.(assess during critical low flow periods, or you may need to inquire locally about this.)

10-12 _____
7-9 _____
4-6 _____
1-3 _____

-No Apparent water loss (irrigation return flow may be supplementing base flow)
-Water loss noticeable, however flows are adequate to support aquatic organisms
-Flow supports aquatic organisms, but habitat, especially riffles, is drastically reduced
-Channel may be dry or flow low enough to preclude or severely impair aquatic organisms

Are irrigation diversion or return structures present? Yes _____ No _____

16. Amount of fish cover (Relative % of reach with some type of fish cover)

10-12 _____
7-9 _____
4-6 _____
1-3 _____

-Extensive(> 50%)
-Moderate(25-50%)
-Sparse(< 25%)
-Absent or "choking" vegetation only

Fish cover type - mark all that apply with (P) = present, (C) = common, (A) = abundant

Undercut banks _____ Overhanging vegetation _____ Deep Pools _____ Logs/Woody Debris _____
Boulders _____ Rootwads _____ Aquatic Vegetation _____ Other _____

Total _____ ÷ Total Possible (rated parameters only) _____ X 100 = _____ % (Please check one category below)

IMPAIRMENT/USE SUPPORT VALUES

87 - 100% = NON-IMPAIRED, (FULL SUPPORT)
80 - 86% = NON-IMPAIRED, BUT THREATENED, (FULL SUPPORT)
71 - 79% = MINOR IMPAIRMENT, (PARTIAL SUPPORT)
55 - 70% = MODERATE IMPAIRMENT, (PARTIAL SUPPORT)
0 - 54% = SEVERE IMPAIRMENT, (NON-SUPPORT)

Suspected impacts to S.W.A.P.A.C. by land uses in the watershed. Indicate suspected degree of impact and specific examples if observed.

Check each land use that is present, and also those resource suspected of being affected by that land use.

	SOIL	WATER	AIR	PLANTS	ANIMALS	CULTURAL
LAND USE						
Dryland crop						
Irrigated crop						
Grazing						
Feedlots						
Mining-surface						
Mining-subsurface						
Timber Harvest						
Urban						
Roads						
Other()						
Natural						

Comments: (reference to land use and SWAPAC category)

Brief Description of Reach: