87-e04

Segment No. 10-23-13

SALZER CREEK SURVEY

by

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ABSTRACT

A synoptic survey was performed on the Salzer Creek drainage during March, April, and August 1986. Three areas of fecal contamination, three areas of metals loading, and one storm drain emitting waste oil products were located. Several discharges in the drainage had a marked impact on water quality.

INTRODUCTION

The Southwest Regional Office (SWRO) of the Washington Department of Ecology requested a survey to be conducted on the Salzer Creek drainage with emphasis on the lower reaches (Figure 1).

This request included the following objectives:

1. Locate point discharges in Salzer Creek and attempt to identify their sources.

2. Quantify the impact of each discharge on the water quality of Salzer Creek.

3. Assess land use and attempt to identify potential non-point sources of pollution.

Site Description

Salzer Creek has a drainage area of 17.3 square miles and is about 11.7 miles long (Figure 1). The change in elevation between the headwaters and the confluence with the Chehalis River is about 300 feet. From the origin to river mile (r.m.) 2.0, the drainage is primarily rural and agricultural. From r.m. 2.0 to r.m. 0.3, the drainage is characterized as commercial. The remaining portion between r.m. 0.3 and the confluence with the Chehalis River is agricultural.

Background

Salzer Creek has a history of water quality problems (Johnson, 1982; Joy, 1984). Of the six historical samples collected during low-flow surveys, only one had a dissolved oxygen (D.O.) level exceeding 3.0 mg/L. Conductivities were substantially higher than other Chehalis River tributaries in this region. However, during one visit the conductivity measurement was similar in magnitude to other survey stations, thus implying the presence of one or more intermittent sources. The mobile home park on Alpha Road and spills by National Fruit Company have been documented as contributing to the water quality problems.

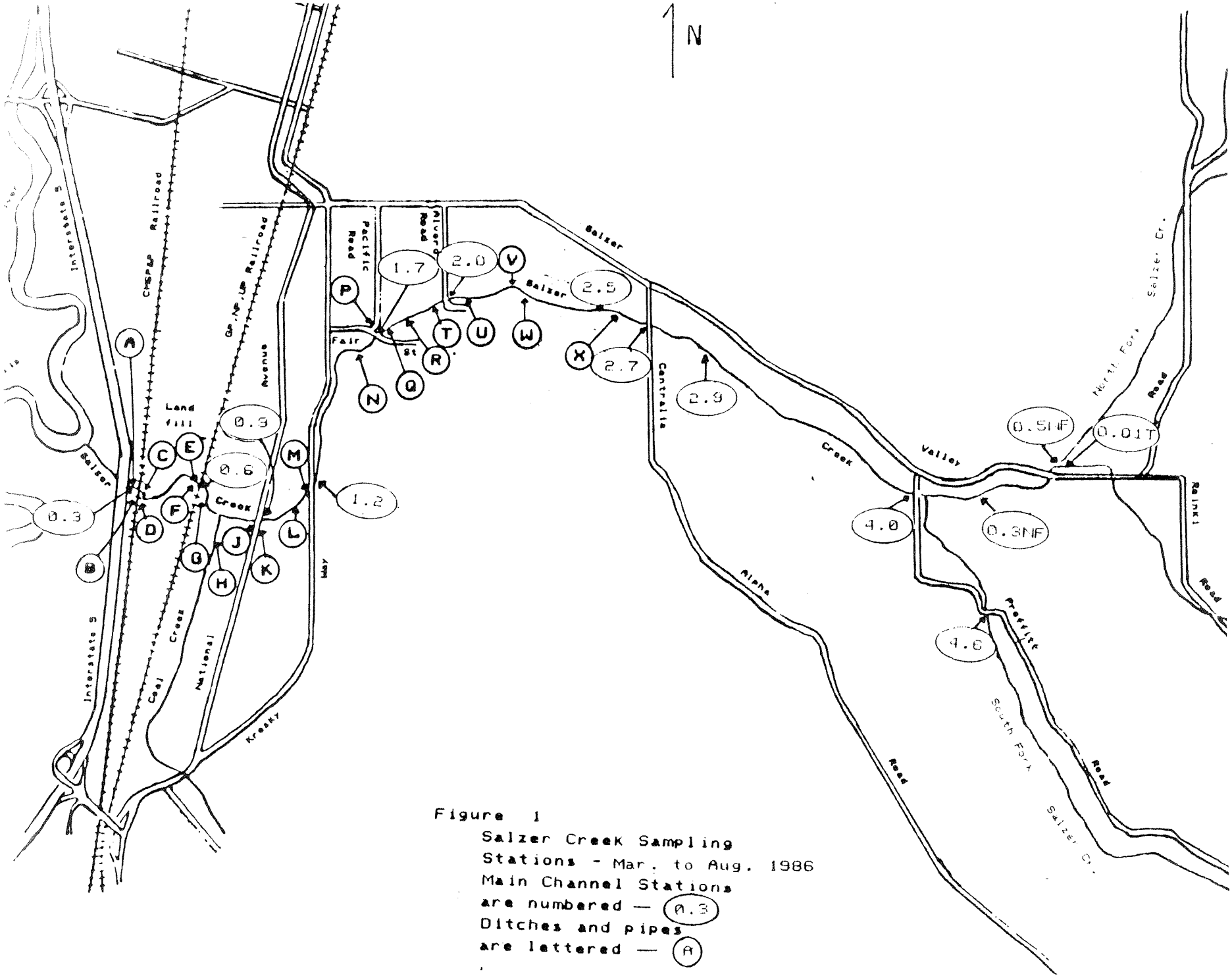

Figure 1
Salzer Creek Sampling Stations - Mar. to Aug. 1986
Main Channel Stations are numbered — (0.3)
Ditches and pipes are lettered — (A)

METHODS

On March 18, 1986, a drive-through survey was performed, selected main channel stations were sampled, and flows were measured. The stream was walked from r.m. 0.3 to r.m. 1.7 on March 19 and from r.m. 1.7 to r.m. 2.7 on March 20. Both sources and main channel stations were sampled. Main channel stations are designated by r.m. numbers and discharges are depicted by letters (Figure 1). Follow-up visits were conducted April 7, 1986, and August 5, 1986, in an attempt to identify the source of water quality problems at or near r.m. 4.0.

Flow measurements were made using a Marsh-McBirney magnetic flow meter at three selected main channel stations. When physical conditions allowed, flows from small discharges were measured by recording the time required to fill a container of known volume (a 500 mL bottle or a 4 L bucket) or estimated when actual measurements were not possible. Temperature, conductivity, and pH measurements were taken in the field. Samples for D.O. were fixed in the field and subsequently analyzed in the Tumwater field laboratory. Samples for chemical oxygen demand (COD), fecal coliform (F.C.), pH, conductivity, chloride, turbidity, and nutrients were stored in the dark on ice and returned to Olympia. The samples were transported to the Ecology/EPA Manchester laboratory on the day following collection.

RESULTS AND DISCUSSION

Stream-use

Several schools of 3- to 4-inch fish were observed at r.m. 4.0 and 0.6. These may have been either dace or salmon fingerlings. Coho salmon spend the first year of their lives in the upper reaches of the drainage. Steelhead and cutthroat spawn in the upper reaches during the fall (Frazier, 1986).

Drainage above r.m. 4.0

Low-intensity agricultural activities constitute the primary use of the land adjacent to the creek between the origin and r.m. 4.0 (Figure 2). Most homes in this area are located on tracts of ten acres or more. Presently much of the farmland seems to be lying idle. Exceptions are found on the east end of Salzer Valley Road, at the west end of Reinki Road, and at the east end of the Proffitt Road. Livestock appear to have access to the creek in this region of the drainage. The land surrounding the valley is forested with some portions logged off.

r.m. 0.5NF (North Fork) (Table 1)

On the March 18 visit, this tributary met Class A standards (Table 2). However nitrate and ammonia levels were elevated. The cause of this nitrogen loading is unknown, but possible sources are:

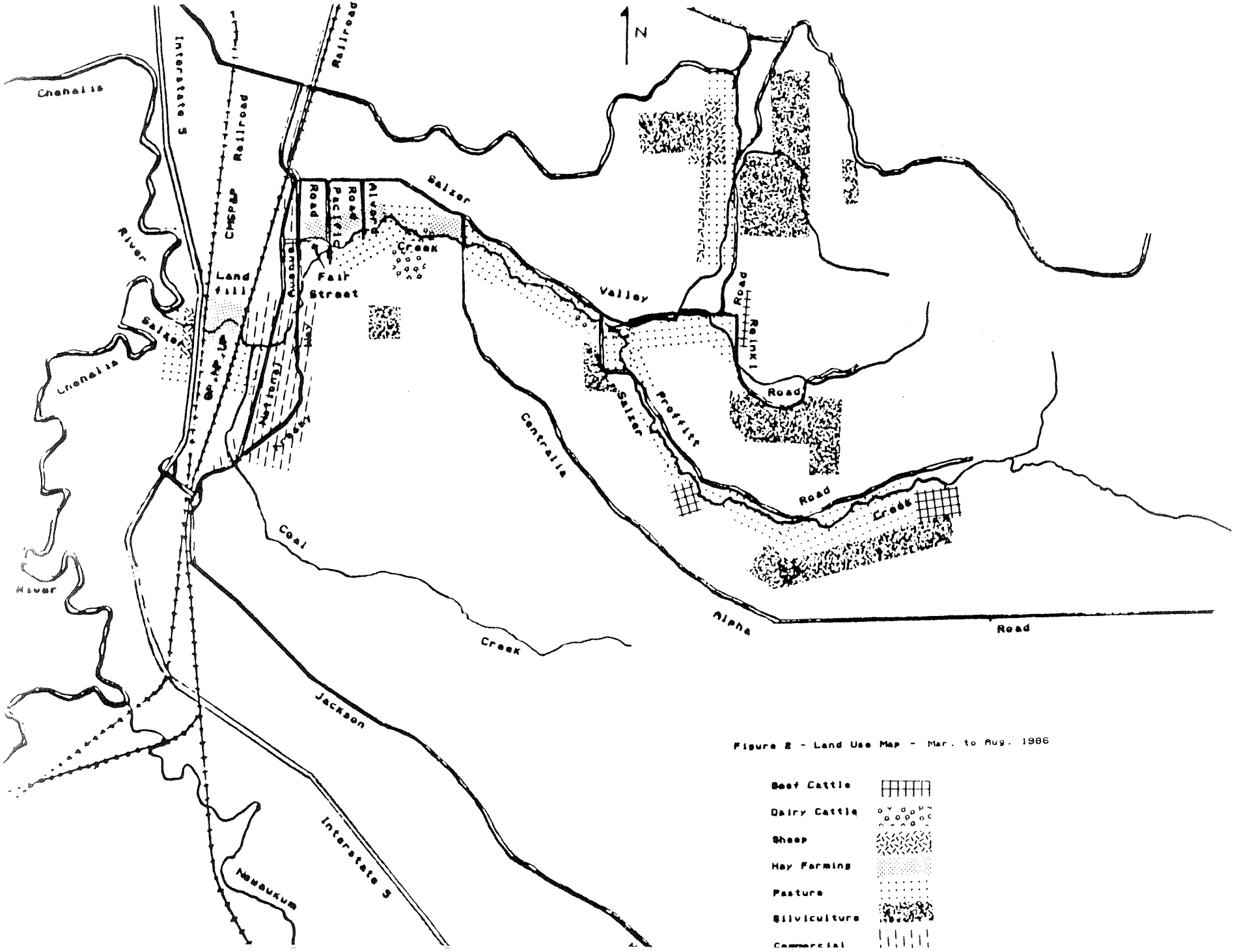

Figure 8 - Land Use Map - Mar. to Aug. 1986

Table 1. Station descriptions for the March, April, and August survey of the Salzer Creek drainage.

Station Symbol	River Mile	Station Description
0.5NF	0.5	North Fork Salzer Creek originating near eastern end of Salzer Valley road - 7 yards north of culvert on Salzer Valley Road 970 yards east of Proffitt Road.
0.01T	0.01	Unnamed tributary originating near Reinki Road - 17 yards east of culvert on Salzer Valley Road approximately 970 yards east of Proffitt Road.
0.3NF	0.3	Below confluence of North Fork Salzer Creek and the unnamed tributary mentioned above; about 350 yards upstream from Station 4.0.
4.6	4.8	South Fork Salzer Creek - Proffitt Road culvert 1410 yards south of intersection of Proffitt and Salzer Valley Roads.
4.0	4.0	Salzer Creek - Proffitt Road culvert 100 yards south of intersection with Salzer Valley and Proffitt Roads.
2.9	2.9	Salzer Creek - approximately 350 yards upstsream from Station 2.7.
2.7	2.7	Salzer Creek - Alpha Road bridge 200 yards south of intersection of Alpha and Salzer Valley Roads.
X	2.6	Drainage ditch on the left bank - 150 yards downstream from the mobile home park.
2.5	2.5	Salzer Creek - 300 yards downstream from the Alpha Road bridge.
W	2.3	Drainage ditch on the left bank - 325 yards upstream from the Alvord Road bridge.
V	2.2	Drainage ditch on the right bank - 300 yards upstream from the Alvord Road bridge.
U	2.1	Six-inch drain tile on the left bank - 150 yards upstream from the Alvord Road bridge.
2.0	2.0	Salzer Creek - under the Alvord Road bridge.
T	1.8	Six-inch drain tile on the left bank - 100 yards downstream from the Alvord Road bridge.
R	1.8	Small creek on left bank - 200 yards upstream from Fair Street bridge.
Q	1.73	Very small stream on left bank - 50 yards upstream from Fair Street Bridge.
P	1.72	Thirty-six inch pipe under Pacific Road - 33 yards from intersection of Fair and Pacific Roads on left bank.
1.7	1.7	Salzer Creek - under the Fair Street bridge.
N	1.6	Thirty-six inch storm drain on right bank - 100 yards downstream from the Fair Street bridge.

Table 1 - continued.

Station Symbol	River Mile	Station Description
1.2	1.2	Salzer Creek - under the Kresky Way bridge.
M	1.18	Ditch on right bank originating at storm sewer - 3 yards downstream from Kresky Way bridge.
L	1.1	Tiny stream on left bank - 150 yards downstream from Kresky Way bridge.
K	0.91	Ditch on left bank - drainage ditch adjacent to National Avenue upstream from the bridge.
0.9	0.9	Salzer Creek - under the National Avenue bridge.
J	0.89	Ditch on left bank - drainage ditch adjacent to National Avenue downstream from the bridge.
H	0.80	Coal Creek on left bank - 150 yards downstream from the National Avenue bridge.
G	0.81	Ditch on left bank - drainage ditch adjacent to the GN, UP railroad tracks.
0.6	0.60	Salzer Creek - under the GP, UP railroad trestle.
F	0.58	Small seep on left bank - small seep emanating from the upstream side of a 100-foot-wide swampy area located about 30 yards downstream from the GP, UP railroad trestle.
E	0.58	Small drainage on right bank - small discharge from swampy area about 25 yards downstream from the GP, UP railroad trestle.
D	0.40	Ditch on left bank - drainage ditch adjacent to CMSP&P railroad tracks on the upstream side of the railroad trestle.
C	0.36	Small spring on right bank - 15 yards upstream from CMSP&P railroad trestle.
B	0.34	Ditch on left bank - drainge ditch adjacent to the CMSP&P railroad tracks 80 yards upstream from the northbound Interstate 5 bridge over Salzer Creek.
A	0.32	Small stream on right bank - 30 yards upstream from the northbound Interstate 5 bridge over Salzer Creek.
0.3	0.3	Salzer Creek - under the northbound Interstate 5 bridge.

Table 2. Class A (excellent) water quality standards (WAC 173-201-045) and characteristic uses.

Characeristic Uses:	Water supply, wildlife habitat; livestock watering; general recreation and aesthetic enjoyment; commerce and navigation; fish reproduction, migration, rearing, and harvesting.
Water Quality Criteria	
Fecal Coliform:	Geometric mean not to exceed 100 organisms/100 mLs with not more than 10 percent of samples exceeding 200 organisms/100 mLs.
Dissolved Oxygen:	Shall exceed 8 mg/L.
Total Dissolved Gas:	Shall not exceed 110 percent saturation.
Temperature:	Shall not exceed 18^{o}C due to human activity. Increases shall not, at any time, exceed t = 28/(T+7); or where temperature exceeds 18^{o}C naturally, no increase greater than 0.3^{o}C. t = allowable temperature increase across dilution zone, and T = highest temperature outside the dilution zone. Increases from non-point sources shall not exceed 2.8^{o}C.
pH:	Shall be within the range of 6.5 to 8.5, with man-caused variation within a range of less than 0.5 unit.
Toxic, radioactive, or deleterious materials:	Shall be below concentrations of public health significance, or which may cause acute or chronic toxic conditions to the aquatic biota, or which may adversely affect any water use.
Aesthetic Values:	Shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(1) the sheep farm adjacent to this tributary between r.m. 0.8 and 1.8, and (2) unknown activities in the five long metal buildings located at r.m. 0.7.

r.m. 0.01T - (Short tributary to North Fork)

On the March 18 visit, this tributary met Class A standards (Table 2).

r.m. 4.6 (South Fork)

This sample site met Class A standards during the March 18 visit, but the D.O. failed (6.3 mg/L) on the August 5 visit.

r.m. 0.3NF (North Fork)

This station was originally selected as a reference station to help pinpoint F.C. problems above the station at r.m. 4.0. However, during the August 5 visit, it became apparent that an F.C. problem also existed upstream. The D.O. level was below Class A requirements.

r.m. 4.0

Data from the first three visits to this site indicated an F.C. problem upstream. By selecting a nearby upstream site, the location of the pollution source was reduced to a 0.3-mile section of the creek in which one farm was located. During the August 5 streamwalk, a drainage ditch that originates above the Salzer Valley Road was located. It passes through a barnyard and into the creek at about r.m. 0.1(NF). Another field ditch terminated at the confluences of the north and south forks of Salzer Creek. These ditches (both were dry at the time of the streamwalk) are the most probable sources of the water quality problems identified during earlier visits to this site. The D.O. concentration dropped to 65 percent of that of the station at r.m. 4.6 (Table 3). No obvious problems were observed between these sites during the August streamwalk.

Reach between r.m. 4.0 and r.m. 1.7

Salzer Creek in this reach is bounded by pasture and hay fields. Numerous drainage ditches are present.

Except for the mobile home park located at r.m. 2.7, all homes and other buildings are located more than 200 yards from the creek.

Table 3. Salzer Creek water quality survey - March, April, and August, 1986 - analytical results.

				Field Data						Laboratory Data																
Station Symbol	River Mile	Date	Time	Flow	Temperature (°C)	pH (S.U.)	Conductivity (umhos/cm)	Dissolved Oxygen (mg/L)	Percent Saturation	pH (S.U.)	Turbidity (NTU)	Conductivity (umhos/cm)	Fecal Coliform (#/100 mL)	COD (mg/L)	Chloride (mg/L)	NO_3-N (mg/L)	NO_2-N (mg/L)	NH_3-N (mg/L)	O-PO_4-P (mg/L)	Total-P (mg/L)	Copper (ug/L)	Zinc (ug/L)	Iron (ug/L)	Nickel (ug/L)	Chromium (ug/L)	Cadmium (ug/L)	Lead (ug/L)
0.5NF	0.5	3/18	1405	--	8.5	6.4	66	11.5	98	6.9	7	73	30	--	3.6	1.8	<.01	.23	.03	.04	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.01I	0.01	3/18	1350	--	8.6	6.7	103	11.2	96	7.0	6	110	13	--	3.0	1.0	<.01	.02	.03	.05	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.3NF	0.3	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		4/07	1150	--	9.0	7.2	100	10.8	93	--	--	--	84e	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		8/05	1030	--	14.1	7.3	200	7.0	68	7.3	15	192	830	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4.6	4.6	3/18	1300	--	8.3	6.4	68	10.7	91	6.8	5	73	8	--	4.6	.64	<.01	.04	.03	.04	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		4/07	1215	--	10.5	7.1	95	9.7	87	--	--	--	68	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		8/05	1000	--	14.3	7.1	305	6.3	62	7.3	11	306	32	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4.0	4.0	3/18	1210	16.3	8.1	6.4	72	11.0	93	6.8	6	78	600	--	4.2	.90	<.01	.03	.03	.06	--	--	--	--	--	--	--
		3/19	1835	13.8	10.8	6.4	69	10.4	93	6.9	7	84	1900	11	4.6	.80	<.01	.03	.02	.04	<1	<1	760	18	<1	<.2	<1
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		4/07	1130	6.1	9.7	7.2	95	10.4	91	--	--	--	>600	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		8/05	0830	.056	14.9	7.0	244	4.1	40	7.2	15	248	90	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2.9	2.9	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		4/07	1110	--	10.0	7.1	92	10.2	90	--	--	--	>4000	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		8/05	1130	--	16.3	6.9	238	.95	1	6.9	5	224	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2.7	2.7	3/18	1150	--	8.4	6.5	73	12.0	102	6.8	6	78	160	--	3.9	.81	<.01	.02	.03	.04	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	1245	--	11.4	--	75	11.4	109	6.7	6	84	160	--	4.1	.71	<.01	.03	.04	.04	--	--	--	--	--	--	--
		4/07	1030	--	10.1	6.5	94	10.1	89	--	--	--	>1200	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		8/05	1050	--	16.2	6.9	232	2.7	27	7.0	6	218	170	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 3 - continued.

Station Symbol	River Mile	Date	Time	Field Data: Flow	Temperature (°C)	pH (S.U.)	Conductivity (umhos/cm)	Dissolved Oxygen (mg/L)	Percent Saturation	Laboratory Data: pH (S.U.)	Turbidity (NTU)	Conductivity (umhos/cm)	Fecal Coliform (#/100 mL)	COD (mg/L)	Chloride (mg/L)	NO_3-N (mg/L)	NO_2-N (mg/L)	NH_3-N (mg/L)	O-PO_4-P (mg/L)	Total-P (mg/L)	Copper (ug/L)	Zinc (ug/L)	Iron (ug/L)	Nickel (ug/L)	Chromium (ug/L)	Cadmium (ug/L)	Lead (ug/L)
X	2.6	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	1230	.5*	10.4	--	65	8.6	77	6.3	6	71	3	--	2.8	.81	<.01	.02	.03	.04	--	--	--	--	--	--	--
2.5	2.5	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	1220	--	10.7	--	76	12.0	108	6.9	6	82	80	--	4.1	.70	<.01	.02	.03	.04	--	--	--	--	--	--	--
W	2.4	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	1200	.004*	19.8	7.5	990	--	--	7.9	41	105	20,000	--	--	.48	<.01	31	6.3	4.5*	--	--	--	--	--	--	--
V	2.2	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	1140	.004*	13.8	--	89	--	--	6.9	21	110	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U	2.1	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	1305	.01*	12.2	--	76	6.9	64	5.4	8	84	10,600	--	--	.43	.01	.86	.08	.13	--	--	--	--	--	--	--
2.0	2.0	3/18	1130	--	8.1	6.4	74	10.9	92	6.8	7	81	150	--	3.8	.82	<.01	.05	.03	.05	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T	1.9	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	1305	.002*	12.1	--	--	10.8	100	6.3	12	60	5	--	--	.30	<.01	.02	.04	.05	--	--	--	--	--	--	--
R	1.8	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	1320	.01*	11.0	--	61	11.1	100	6.5	6	69	3	--	--	.62	<.01	.03	.03	.03	--	--	--	--	--	--	--
1.7	1.7	3/18	1110	--	8.0	6.4	74	10.4	88	6.8	7	81	200	--	3.8	.81	<.01	.03	.03	.05	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N	1.6	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1800	.30*	9.3	6.5	131	10.3	89	6.7	8	165	30	--	--	1.0	<.01	.05	.04	.05	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 3 - continued.

Station Symbol	River Mile	Date	Time	Flow	Field Data: Temperature (°C)	pH (S.U.)	Conductivity (umhos/cm)	Dissolved Oxygen (mg/L)	Percent Saturation	Laboratory Data: pH (S.U.)	Turbidity (NTU)	Conductivity (umhos/cm)	Fecal Coliform (#/100 mL)	COD (mg/L)	Chloride (mg/L)	NO_3-N (mg/L)	NO_2-N (mg/L)	NH_3-N (mg/L)	O-PO_4-P (mg/L)	Total-P (mg/L)	Copper (ug/L)	Zinc (ug/L)	Iron (ug/L)	Nickel (ug/L)	Chromium (ug/L)	Cadmium (ug/L)	Lead (ug/L)
L	1.2	3/18	1020	22.5	7.8	6.4	78	9.8	82	6.8	8	82	170	--	3.9	.81	<.01	.03	.03	.05	--	--	--	--	--	--	--
		3/19	1705	17.6	12.0	8.9	75	12.0	111	8.9	7	84	5	--	--	.71	<.01	.03	03	.05	--	--	--	--	--	--	--
		3/20	1030	13.5	8.1	6.8	74	10.6	92	6.3	7	89	130	15	4.1	.67	<.01	.03	.03	.05	--	--	--	--	--	--	--
M	1.2	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1620	--	14.7	6.7	166	9.6	94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
L	1.1	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1605	--	14.6	6.7	133	9.4	92	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
K	0.91	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1505	--	12.5	6.6	170	6.4	56	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.9	0.91	3/18	1000	--	7.8	6.4	79	9.9	83	6.8	7	82	240	--	3.8	.80	<.01	.03	.03	.05	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
J	0.89	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1500	--	13.1	6.4	176	4.2	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H	0.80	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1430	7.1	10.8	6.5	85	10.3	93	6.3	6	100	25	19	5.2	.87	<.01	.09	.05	.06	84	38	1350	<5	<1	0.2	<1
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
G	0.60	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1420	--	13.4	6.5	97	7.2	69	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.6	0.60	3/18	0840	--	7.7	6.4	80	9.8	82	6.6	7	87	150	--	4.1	.83	<.01	.04	.04	.05	--	--	--	--	--	--	--
		3/19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	0.58	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1525	--	13.5	6.7	120	8.9	84	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 3 - continued.

Station Symbol	River Mile	Date	Time	Field Data: Flow	Temperature (°C)	pH (S.U.)	Conductivity (umhos/cm)	Dissolved Oxygen (mg/L)	Percent Saturation	Laboratory Data: pH (S.U.)	Turbidity (NTU)	Conductivity (umhos/cm)	Fecal Coliform (#/100 mL)	COD (mg/L)	Chloride (mg/L)	NO_3-N (mg/L)	NO_2-N (mg/L)	NH_3-N (mg/L)	O-PO_4-P (mg/L)	Total-P (mg/L)	Copper (ug/L)	Zinc (ug/L)	Iron (ug/L)	Nickel (ug/L)	Chromium (ug/L)	Cadmium (ug/L)	Lead (ug/L)
E	0.58	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1325	.05*	13.5	7.0	500	3.3	31	7.3	5	577	9	49	24.0	.05	<.01	3.8	.08	.10	62	42	1910	<5	<1	.5	<1
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D	0.40	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1240	.17	12.4	6.8	261	4.2	39	6.8	27	327	54	38	45.0	.28	<.01	.51	.45	.45							
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	0.36	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1220	.06*	10.1	6.8	500	4.1	36	6.8	20	628	26	--	37.0	.06	<.01	7.0	.08	.11*	<1	7	3120	9	<1	.3	<1
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B	0.34	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1200	.32	12.0	6.8	201	7.7	71	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
A	0.32	3/18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/19	1205	.12*	9.9	6.7	161	3.8	33	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		3/20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0.3	0.3	3/18	1450	30.6	8.9	6.4	99	10.1	87	6.6	8	100	110	8	5.4	.76	<.01	.32	.04	.06	--	--	--	--	--	--	--
		3/19	1110	26.4	8.6	6.8	96	8.7	85	6.7	7	100	71	19	5.6	.73	<.01	.15	.04	.06	72	3	1110	11	<1	.3	<1

*Estimated flow.

r.m. 2.9

This station was chosen as a reference site for the determination of the water quality impact by the mobile home park's drainfield. During the April visit, F.C. data at both this and the downstream station (r.m. 2.7) were indeterminately high; i.e., both sample values were reported as "greater than." As a result, they identify that problems exist below r.m. 4.6. Approximately 20 cows were observed grazing near this location and probably contribute to the problem. The data for the August visit indicated an absence of an F.C. problem on this date, but the D.O. level was less than 1 mg/L. The cause for the low D.O. was not readily apparent. The land between this station and r.m. 4.0 is used exclusively for pasture.

r.m. 2.7

This site is located just downstream from the mobile home park drainfield. Attempts in March and April to determine potential impact from the park were inconclusive because every parameter tested was higher upstream than downstream. Data from the August survey indicated the F.C. level increased 17-fold between this and the upstream station (r.m. 2.9). However, conductivity decreased, and nutrient and chloride data from previous visits showed a decrease between r.m. 4.0 and 2.7. Furthermore, cattle were present and had access to the creek between the sample sites during the August visit. As a result, definite conclusions at this time are not possible.

r.m. 2.6 (Station X)

The discharge from this ditch downstream from the mobile home park met Class A standards for all parameters (Table 2). Flow from this discharge during March represented approximately 5 percent of the total flow. Numerous drainage ditches are found in ditches between this point and r.m. 1.7.

r.m. 2.5

This main channel station was located about 300 yards downstream from the mobile home park. Data at this site is virtually identical with that of r.m. 2.7.

r.m. 2.4 (Station W)

This ditch drains a barn and livestock-feeding area. The discharge smelled like urine and the temperature was 6 to 9 degrees warmer than any other discharge measured that day. About 40 animals were observed near the barn. The discharge had high conductivity, ammonia, and bacteria concentrations. It

contributed about 1.4 percent of the total inorganic nitrogen (TIN) load and 4.6 percent of the F.C. load (Table 4) at r.m. 1.2 on March 20, but represented only 0.03 percent of the total flow.

r.m. 2.1 (Station U)

The discharge from this six-inch tile contributed 6.5 percent of the total F.C load (Table 4) measured at r.m. 1.2. The origin of this tile is not known. It may be present to drain the large grassy field that it passes under. TIN and total phosphorous (TP) concentrations (Table 3) were 50 to 100 percent higher than values in the receiving water.

r.m. 2.0

Concentrations of measured parameters at this main channel station and at r.m. 1.7 did not vary appreciably from values measured at r.m. 2.7.

Reach between r.m. 1.7 and 0.9

The portion of the drainage between 1.7 and 0.9 is primarily commercial. However only a used car lot and the Greyhound Bus Depot are adjacent to the creek. Roadside ditches in the area drain directly to the creek.

r.m. 1.6 (Station N)

On March 19, oil was observed discharging from a 36-inch storm sewer. SWRO inspector Gary Bailey tentatively identified the source as a nearby carwash. TIN loading (Table 4) from this discharge represented only 1.2 percent of the total load measured at r.m. 1.2, with the flow contributing about 1.7 percent of the total flow.

r.m. 0.9

Except for F.C., no appreciable change in water quality was observed between this main channel station and r.m. 1.2 on March 18. F.C. populations increased by 41 percent. Only roadside ditches were observed discharging into the creek at the time of sampling.

Reach between r.m. 0.9 and the confluence with the Chehalis River

From r.m. 0.9 to its confluence with the Chehalis River, Salzer Creek is (with the exception of two houses and a barn) bounded by open fields. The Southwest Washington Fairgrounds and a sanitary landfill are

Table 4. Salzer Creek constituent loads in pounds/day - March 1986.

Station*	River Mile	Date	Flow	NO_3-N	NH_3-N	TIN	T-P	Chloride	Chemical Oxygen Demand	Fecal Coliform**
4.0	4.0	3/18	16.3	79	2.6	82	5.3	370	--	24
		3/19	13.8	60	2.2	62	3.0	340	--	65
X	2.6	3/20	0.5	2.2	<0.1	2.2	0.1	7.5	--	<0.1
W	2.4	3/20	0.004	<0.1	0.7	0.7	0.1	--	--	0.2
N	1.6	3/19	0.3	1.6	0.1	1.7	0.1	--	--	<0.1
1.2	1.2	3/18	22.5	98	3.6	102	6.1	470	--	9.4
		3/19	17.6	67	2.8	70	4.7	--	--	0.2
		3/20	13.5	49	2.2	51	3.6	300	1100	4.3
H	0.8	3/18	7.1	33	1.1	34	1.9	200	730	0.4
E	0.58	3/19	0.05	<0.1	1.0	1.0	<0.1	6.5	13	<0.1
D	0.4	3/19	0.17	0.3	0.5	0.7	0.4	35	49	<0.1
C	0.36	3/19	0.06	<0.1	2.3	2.3	<0.1	12	--	<0.1
0.3	0.3	3/18	30.6	125	53	180	6.6	890	1300	8.3
		3/19	26.4	100	21	120	8.5	800	2700	4.6

*Numeric station heading denotes a main channel site; letters denote sources.

**1 x 10^{10} org/day.

located 100 to 200 yards north of Salzer Creek between r.m. 0.7 and 0.35. About 20 sheep and a small herd of cattle had access to the creek between r.m. 0.3 and the confluence with the Chehalis river.

r.m. 0.8 (Station H - Coal Creek)

This tributary contributed 27 percent of the total flow on March 19. Chloride, TIN, and TP shares of the total loads (Table 4) at r.m. 0.3 were 25, 28, and 22 percent, respectively. It contributed only 9 percent of the total F.C. loading.

r.m. 0.6

Two drain pipes (6- and 12-inch) originating in the Southwest Washington Fairgrounds terminate adjacent to this station. These were not flowing during the survey, but pose potential water quality problems during rain events because these pipes drain the livestock area.

r.m. 0.59 (Station E)

This surface seepage appears to be diluted leachate from the east end of the Centralia Landfill. Conductivity exceeds the downstream value by a factor of 5.8. The D.O. level was less than half the Class A standard. Ammonia, chloride, COD, and some metals were elevated. However, the loading for all parameters listed was less than 1 percent of the total load measured at r.m. 0.3.

Approximately 150 yards downstream from this station, a blue 10-inch diameter drain pipe was found originating from under a field on the left bank (r.m. 0.45). It was not discharging at the time of the visit and its source is not known.

r.m. 0.40 (Station D)

This discharge originates from the Chehalis storm sewers. The D.O. concentration of 4.2 mg/L failed the Class A standard (Table 2). COD concentrations were elevated. The turbidity was higher than those found in other discharges. Elevated chlorides could be expected because National Fruit Company irrigates fields adjacent to this ditch with their chloride-rich water. No evidence of oil pollution was observed.

r.m. 0.36 (Station C)

Leachate from the Centralia Landfill is supposed to be contained in a ditch (Betts, 1986). However, it appears to percolate out along a road and subsequently flows into Salzer Creek. The ground water had depressed D.O. levels and elevated conductivity, ammonia,

and chloride concentrations. This discharge contributes about 2 percent of the TIN loading and about 1.5 percent of the chloride loading at r.m. 0.3 (Table 4).

r.m. 0.3

Water quality at this station met Class A standards (Table 1). Flow increased about 10 percent; however the high water table in this region may be responsible. Hamilton Farms bounds the creek between this station and the confluence with the Chehalis River. Both sheep and cattle have access to the creek in this portion of the drainage, posing potential water quality problems, particularly with F.C.

CONCLUSIONS

In general, bacteria concentrations were very high during wet-weather conditions. These result predominately from animal-management practices in the drainage between the origin and r.m. 1.2. Animals have access to the creek and its tributaries at numerous points in this reach. Organic and nutrient loading from farming activities could be reducing D.O. levels in the slower flowing portions of the lower drainage. The cause for the very low D.O. concentration (0.95 mg/L) identified at r.m. 2.9 during August is unknown and needs further investigation.

Leachate from the Centralia Landfill is the most serious pollution problem identified between r.m. 1.2 and the confluence with the Chehalis River. Discharges from pipes at the Southwest Washington Fairgrounds and the access of farm animals to the creek near r.m. 0.3 pose potential problems during rain events.

RECOMMENDATIONS

- Conduct follow-up surveys on the bacteria problem above r.m. 4.0 and the low dissolved oxygen concentrations at r.m. 2.9.
- Address illegal discharges at r.m. 2.4, 1.6, 0.59, and 0.36.
- Pursue animal waste problems on Salzer Creek and its tributaries.
- Identify the source of pipes at r.m. 2.1 and 0.45.

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