WATER QUALITY STATUS REPORT

DRY CREEK
(Twin Falls & Cassia Counties)

1976-1977

Department of Health & Welfare
Division of Environment
Boise, ID 83720

April 1979

Report No. WQ-39

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(Twin Falls & Cassia Counties)

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Data Collected By:

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April 1979

Department of Health & Welfare
Division of Environment
Statehouse
Boise, Idaho 83720

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ABSTRACT

Water quality samples were collected monthly at one station in Water Year 1977 to determine the water quality status of Dry Creek, in Twin Falls and Cassia Counties.

The stream was sampled near the mouth upstream from Murtaugh Lake. This section of Dry Creek above Murtaugh Lake is intermittent and only flows during the irrigation season. Dissolved oxygen and pH at this station were within IDHW-DOE water quality standards. Total and fecal coliform bacteria exceeded the standards. Turbidity, suspended solids, temperature, and nutrient concentrations generally exceeded accepted instream criteria.

The source of flow at this station is probably irrigation return flows and should not be considered indicative of the entire drainage. It is recommended that the lower section of the stream be protected for aesthetics and agricultural water supply only, and that the upper section in Cassia County remain protected for all uses as a Class A stream.

INTRODUCTION

A limited survey was conducted on Dry Creek to determine the water quality status of the stream. The creek is presently designated for planning purposes as segment USB-710, and is protected for all uses as a Class A_2 stream according to IDHW-DOE Water Quality Standards and Wastewater Treatment Requirements.

Dry Creek is located south of the Snake River in Twin Falls and Cassia Counties. Dry Creek originates in the Sawtooth National Forest at an elevation of approximately 7,200 feet and flows through arid sagebrush hills until it emerges into the highly developed Snake River plain. Near the Twin Falls/Cassia County line, the creek becomes intermittent, only flowing during the irrigation season. The Dry Creek channel is inundated by Murtaugh Lake near Murtaugh, Idaho. Any remaining flow in the creek as it emerges from the lake is dominated by water diverted from Milner Dam. Murtaugh Lake is operated as a storage reservoir for the Twin Falls Main Canal, and contains a Bullhead Catfish and Yellow Perch fishery.

Land uses in the Snake River plain section of Dry Creek are primarily irrigated agriculture and pasture for cattle. Crops grown in this area include alfalfa, beans, beets, corn, peas, and potatoes.

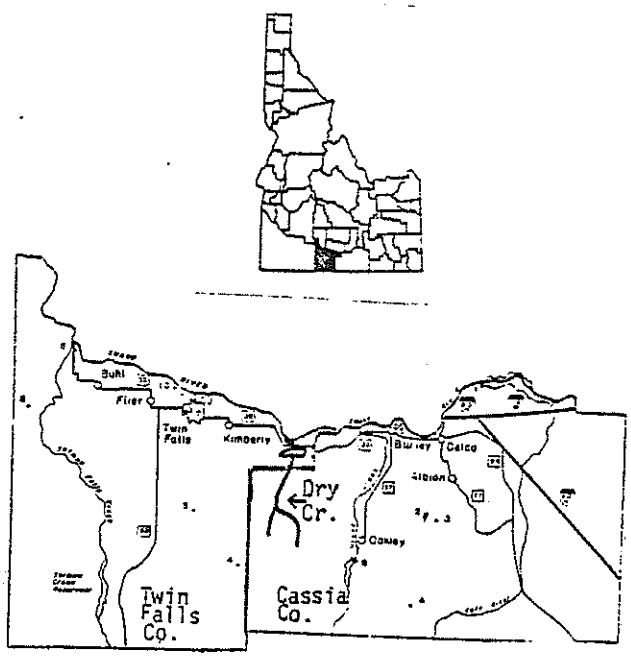
Flows were not measured during the survey but were extremely low especially since WY 1977 was a drought year. The stream was dry from October through March at the sampling station. The remainder of the year during sampling periods, the flow probably did not exceed 10 cfs, Peak flow is estimated at roughly 50 cfs.

MATERIALS AND METHODS

Water quality samples were collected monthly at one station located approximately 1/2 mile upstream from Murtaugh Lake (See Figure 1). Samples were collected in September 1976 and between March and August 1977. The creek was dry at the sampling station the rest of the year.

Temperature and dissolved oxygen were measured in the field with a Yellow Springs Instruments Dissolved Oxygen Meter, Model 54. pH was measured with a Model 404 Orion pH meter.

Samples for laboratory analysis were collected in approximately one liter cubitainers. Samples for nutrients were preserved with sulphuric acid, and samples for minerals and solids were untreated and put on ice according to the Idaho Department of Health and Welfare, Division of Environment, Technical Procedures Manual. Laboratory analyses were performed according to EPA, Methods for Chemical Analysis of Water and Wastes.



IGURE 1: Location of Sampling Station on Dry Creek in Twin Falls and Cassia County, ID.

Station

Dry Creek Channel

Intermittent

Field and laboratory analyses were:

Temperature	BOD
Dissolved Oxygen	COD
pH	TOC
Total Coliform	Turbidity
Fecal Coliform	Total Solids
Fecal Streptococcus	Suspended Solids
Nitrate-N	Specific Conductance
Nitrite-N	Alkalinity
Ammonia-N	Chloride
Total Kjeldahl Nitrogen	Hardness
Total Phosphorus	Sodium
Ortho-Phosphate (as P)	Potassium

WASTE SOURCES

No point sources discharge to Dry Creek.

Nonpoint sources that would impact the lower end of the stream are related to agricultural practices. Cattle grazing and irrigation waste flows are expected to be the major pollution sources.

RESULTS

Idaho Water Quality Standards and Wastewater Treatment Requirements include specific instream standards for total and fecal coliform bacteria, dissolved oxygen, and pH. The other parameter categories fall into the "General Water Quality Standards" section and are evaluated according to EPA Quality Criteria for Water and other sources. The rationale for the criteria used are listed in Appendix C. Raw data, means, and variance are listed in STORET printouts in Appendix A. Figures of parameters versus time in months are shown in Appendix B.

Temperature: (Figure 2)

Parameter	Criteria	Number	Mean	Range	Criteria Exceeded-%	Protected Uses Affected
Temperature Deg.^{o}C	19^{o} Max.	7	16.4	9-21	43	Cold Water Biota

Temperatures recorded during the summer exceeded the recommended maximum of 19^{o}C for cold water biota on several occasions. Although this data is limited to a few discrete sampling periods, it appears that high summer temperatures will inhibit a salmonid fishery at this station.

Dissolved Oxygen: (Figures 3 and 4)

Parameter	Criteria	Number	Mean	Range	% Violation	Protected Uses Affected
Concentration mg/l	6 mg/l Min.	7	9.3	8.0-11.9	None	None
Percent Saturation %	90% Min.	6	108	100-122	None	None

Dissolved oxygen was at or exceeded saturation at all sampling periods. Water velocity is fast enough to maintain high aeration at the shallow depths at this station.

No problems with dissolved oxygen was recorded or is expected.

pH: (Figure 5)

Parameter	Criteria	Number	Mean	Range	% Violation	Protected Uses Affected
pH	6.5-9.0	7	--	7.9-8.5	None	None

Recorded pH values were within limits specified by the Idaho Water Quality Standards.

Bacteria*: (Figures 6 and 7)

Parameter	Criteria	Number	Geometric Mean	Range	% Violation	Protected Uses Affected
Total Coliform	240	5	1,114	270-51,000	33	Contact Recreation, Domestic Water Supply
Fecal Coliforms	50	5	90	2-600	83	
Fecal Streptococcus	--	6	257	54-1,100	N.A.	

Bacterial densities were high at almost every sampling run. Fecal coliform concentrations exceed Class A_2 Water Quality Standards. Since cattle are grazed on the stream banks in the immediate vicinity of the station (and fecal streptococcus densities are high), the source of the bacteria appear to be domestic livestock and not a human source.

*Total coliform Class A_2 standard is a geometric mean of 240/100 ml, Class B standard is geometric mean of 1,000/100 ml. Fecal coliform Class A_2 standard is geometric mean of 50/100 ml, single sample of 500/100 ml; Class B standard is geometric mean of 200/100 ml, single sample of 800/100 ml.

Trophic: (Figures 8-10)

Parameter	Criteria	Number	Mean	Range	Criteria Exceeded-%	Protected Uses Affected
Nitrate-N mg/l	.3	7	0.7	0.31-1.1	100	
Total Kjeldahl Nitrogen	--	7	1.3	0.8-2.6	N.A.	
Ammonia Nitrogen mg/l	.20	7	0.02	0.01-0.05	None	
Total Phosphorus mg/l (P)	.05	7	0.35	0.11-1.08	100	Recreation, Aesthetics
Ortho-Phosphate mg/l (as P)	.025	7	0.03	0.01-0.08	29	
Chemical Oxygen Demand mg/l	--	7	19.4	9.2-30.0	N.A.	
Biochemical Oxygen Demand mg/l	--	7	3.2	1.6-5.1	N.A.	

Nutrient concentrations of phosphorus and nitrates are high at this station. Both total phosphorus and nitrate-nitrogen exceed recommended maximum values set to prevent excessive algal or fungal growth. Total phosphorus peaked in April and was associated with the peak in suspended solids. These high nutrient concentrations will stimulate nuisance growths of periphytic algal mats or aquatic macrophytes if other habitat conditions are suitable.

Aesthetic: (Figure 11)

Parameter	Criteria	Number	Median	Range	Criteria Exceeded-%	Protected Uses Affected
Turbidity JTU	25	7	38	19-190	57	Aesthetics, Fisheries

Turbidity was high throughout the sampling period and often exceeded the recommended 25 JTU maximum. Turbidity peaked at 190 JTU's in April.

Solids: (Figures 12 and 13)

Parameter	Criteria	Number	Mean	Range	Criteria Exceeded-%	Protected Uses Affected
Total Solids	--	7	659	421-1,620	N.A.	
Suspended Solids	80	7	290 (Median 142)	37-1,360	71	Aesthetics,
Conductivity (umhos/cm)	750	7	552	465-611	None	Fisheries
Total Alkalinity	--	7	197	173-258	N.A.	
Chloride	--	7	31	24-39	N.A.	

Turbidity and suspended solids were highly correlated. Suspended solids exceeded the recommended maximum of 80 mg/l for protection of fish and other aquatic life. Suspended solids peaked in April 1977 at 1,360 mg/l.

The dissolved solids are fairly high at this station as indicated by the conductivity although it did not exceed recommended maximum criteria.

Inorganic Toxicity, Dissolved Gas, Radioactivity, Organic Toxicity:

These parameter categories were not sampled during this survey.

STREAM DESIGNATION AND PROTECTED USES

Dry Creek is a low flow intermittent stream starting approximately one mile south of Artesian City. Above this point especially within the Sawtooth National Forest it is a permanent stream which supports an excellant Cutthroat Trout fishery (ID Fish & Game, personal communication).

At the lower end at the sampling site near Murtaugh Lake, water quality is poor and flows are low. Water flowing at this site is probably not derived from surface flows in the drainage and is not representative of water quality in the upper section. The source of discharge can be speculated as derived from irrigation return flows, groundwater augmentation during the pumping season, or from water in the Milner Low Lift Main Canal which crosses the stream approximately ¼ mile above the station.

For water quality management purposes, the lower section should be considered separately from the upper section. Due to the nature of the stream in the vicinity of the sampling station, the lower section should be protected only for aesthetics and agricultural water supply. However, no activities should be allowed to further degrade water quality which may interfere with protected uses downstream - e.g., the warmwater fishery in Murtaugh Lake.

The upper segment should continue to be protected for all water uses. According to the USGS topographic map (Murtaugh, ID quadrangle) the lower 8.5 miles of Dry Creek is intermittent. This coincides approximately with the Twin Falls/Cassia County border near Artesian City which would form a convenient segment boundary.

CONCLUSIONS AND RECOMMENDATIONS

1) Dissolved oxygen and pH are within standards in IDHW Water Quality Quality Standards and Wastewater Treatment Requirements.

2) Total and fecal coliform bacteria exceed Class A_2 standards. The geometric mean for fecal coliforms for the sampling period was 90/100 ml.

3) Turbidity exceeds accepted criteria for aesthetic uses. Temperature and suspended solids exceed maximum criteria for cold water fish. Nitrates and total phosphorus exceed maximum criteria set to prevent nuisance aquatic growths.

4) The poor water quality listed above measured at the single station near Murtaugh Lake is only indicative of the lower ephemeral stream section and is probably due to irrigation return flows. The upper section of Dry Creek which is a permanent stream is probably of high quality and cannot be characterized by the station sampled during this survey.

5) For water quality management purposes the stream should be divided into two sections near the Twin Falls/Cassia County border. The lower section (approximately 8.5 River Miles) should be protected for aesthetics and agricultural water supply uses only. The upper section should continue to be protected for all designated uses.

6) Best Management Practices developed under the 208 Agricultural Pollution Abatement Plan should be applied to agricultural activities in the watershed to reduce any impacts Dry Creek may have on Murtaugh Lake.

APPENDIX A

STORET RETRIEVAL AND INVENTORY

STORET DATE 79/02/07

2040060
42 27 09.0 114 08 53.0 5
DRY CREEK NEAR MOUTH
16083 IDAHO
PACIFIC NORTHWEST 130605
UPPER SNAKE RIVER BASIN
211DSURV 761104
0000 CLASS 00

/TYPA/AMOUNT/STREAM

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00010	WATER	TEMP	CENT	7	16.4286	27.2803	5.22362	.317960	1.97434	21.0000	9.00000	76/07/22	77/08/10
00042	ALTITUDE	FEET	AB MSL	1	4130.00					4130.00	4130.00	01/01/01	01/01/01
00061	STRM/M	FLOW,	INST-CFS	7	.000000	.000000	.000000		.000000	.000000	.000000	76/08/17	77/03/16
00070	TURB	JKSN	JTU	7	56.1428	3712.81	60.9328	1.08532	23.0304	190.000	19.0000	76/07/22	77/08/10
00095	CNDUCTVY	AT 25C	MICROMHO	7	452.286	2426.33	49.2576	.089109	18.6177	611.000	465.000	76/07/22	77/08/10
00300	DO		MG/L	7	9.29999	2.02010	1.42130	.152828	.537202	11.9000	8.00000	76/07/22	77/08/10
00310	BOD	5 DAY	MG/L	7	3.21428	1.62478	1.27467	.396563	.481779	5.10000	1.60000	76/07/22	77/08/10
00335	COD	LOW LEVEL	MG/L	7	19.3857	53.8653	7.33930	.378593	2.77399	30.0000	9.20000	76/07/22	77/08/10
00400	PH		SU	7	8.19999	.046713	.216224	.026369	.081725	8.50000	7.90000	76/07/22	77/08/10
00403	LAB	PH	SU	7	8.21428	.258179	.508113	.061857	.192049	8.60000	7.10000	76/07/22	77/08/10
00410	T ALK	CACO3	MG/L	7	197.429	801.302	28.3073	.143380	10.6991	258.000	173.000	76/07/22	77/08/10
00425	LOW ALK	CACO3	MG/L	2	180.000	288.000	16.9706	.094281	12.0000	192.000	168.000	76/07/22	76/09/09
00430	CO3 ALK	CACO3	MG/L	2	7.00000	18.0000	4.24264	.606091	3.00000	10.0000	4.00000	76/07/22	76/09/09
00500	RESIDUE	TOTAL	MG/L	7	659.143	182145	426.784	.647484	161.309	1620.00	421.000	76/07/22	77/08/10
00505	RESIDUE	TOT NFLT	MG/L	7	289.571	224814	474.145	1.63740	179.210	1360.00	37.0000	76/07/22	77/08/10
00610	NH3-N	TOTAL	MG/L	7	.024974	.000206	.014370	.575393	.005431	.050000	.010000	76/07/22	77/08/10
00615	NO2-N	TOTAL	MG/L	7	.013548	.000074	.008599	.634710	.003250	.025836	.003000	76/07/22	77/08/10
00620	NO3-N	TOTAL	MG/L	7	.703979	.083995	.289820	.411746	.109542	1.12415	.310000	76/07/22	77/08/10
00625	TOT KJEL	N	MG/L	7	1.33571	.413930	.643374	.481671	.243173	2.60000	.800000	76/07/22	77/08/10
00665	PHOS-TOT		MG/L P	7	.345714	.116428	.341216	.986969	.128967	1.08000	.110000	76/07/22	77/08/10
00669	PHOS-TOT	HYDRO	MG/L P	2	.160000	.003200	.056569	.353554	.040000	.200000	.120000	77/07/06	77/08/10
00680	T ORG C	C	MG/L	5	5.98000	1.10706	1.05217	.175946	.470543	7.40000	4.90000	76/09/09	77/08/10
00900	TOT HARD	CACO3	MG/L	5	222.400	478.828	21.8821	.098391	9.78599	250.000	200.000	77/04/13	77/08/10
00929	SODIUM	NA,TOT	MG/L	5	31.5800	13.0576	3.61353	.114425	1.61602	35.0000	26.4000	77/04/13	77/08/10
00937	POTSSIUM	K,TOT	MG/L	5	5.00000	.220047	.469092	.093818	.209784	5.60000	4.60000	77/04/13	77/08/10
00940	CHLORIDE	CL	MG/L	7	31.2857	29.2309	5.40730	.172836	2.04377	39.0000	24.0000	76/07/22	77/08/10
31501	TOT COLI	MEMBRNFLT	/100ML	6	9053.33	.422E+09	20554.1	2.27033	8391.16	51000.0	270.000	76/07/22	77/08/10
31616	FEC COLI	MEM-FCOR	/100ML	6	395.333	199195	446.312	1.12895	182.206	1200.00	2.00000	76/07/22	77/07/06
31679	FCSTREP	MF M-ENT	/100ML	7	382.571	179754	423.974	1.10822	160.247	1100.00	54.0000	76/07/22	77/08/10
70507	PHOS-T	ORTHO	MG/L P	7	.027071	.000621	.024921	.920549	.009419	.081500	.010000	76/07/22	77/08/10

STREET RETRIEVAL DATE 77/02/09

/TYPE/AMBIENT/STREAM

2140010
42 27 09.0 114 0[illegible] 53.0 5
DRY CREEK NEAR SOUTH
16093 IDAHO
PACIFIC NORTHWEST 130605
UPPER SNAKE RIVER (7/5)M
211DSURV 761104
0000 FEET DEPTH CLASS 00

DATE TIME ID	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00061 STREAM FLOW, INST-CFS	00300 DO MG/L	00310 BOD 5 DAY MG/L	00335 COD LOW LEVEL MG/L	00400 PH SU	00403 LAB PH SU	31501 TOT COLI MFTHMEMOD /100ML	31616 FEC COLI MFM-FCBR /100ML	31679 FECSTREP MF 1-ENT /100ML
76/07/22			21.0		8.4	1.6	19.9	7.90	7.1	1400	1200	94
76/08/17				0								
76/09/09			15.0		9.7	5.1	16.3	8.10	8.2	900	120	220
76/10/21				0								
76/11/09				0								
76/12/16				0								
77/01/25				0								
77/02/16				0								
77/03/16				0								
77/04/13			10.0		11.9	4.6	30.0	8.50	8.4	420	2F	94
77/05/10	12 00		9.0		10.3	3.3	9.2	8.40	8.4	330	320	120
77/06/08	12 15		21.0		8.6	3.1	20.0	8.20	8.5	270	130	210
77/07/06	13 00		18.0		8.7	2.0	21.8	8.00	8.6		600B	11001
77/[illegible]/10	12 00		21.0		8.6	2.8	12.5	8.30	8.3	51000		880

DATE TIME ID	TIME OF DAY	DEPTH FEET	00610 NH3-N TOTAL MG/L	00615 NO2-N TOTAL MG/L	00620 NO3-N TOTAL MG/L	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00665 PHOS-TOT MG/L P	70507 PHOS-T ORTHO MG/L P	00669 PHOS-TOT HYDRO MG/L P	00680 T ORG C MG/L	00670 TURB JTU
76/07/22			0.039	0.026	1.124		1.000	0.220	0.081			50.0
76/09/09			0.023	0.003	0.665		0.700	0.430	0.010K		7.4	20.0
77/04/13			0.050	0.023	0.310		2.600	1.060	0.020			190.0
77/05/10	12 00		0.010K	0.007	0.910		1.100	0.110	0.014		5.0	19.0
77/06/08	12 15		0.013	0.007	0.410		1.400	0.190	0.014		4.9	38.0
77/07/06	13 00		0.020	0.013	0.620		0.650	0.120	0.031	0.120	6.1	20.0
77/[illegible]/10	12 00		0.040	0.016	0.890		1.700	0.270	0.019	0.200	6.5	50.0

42 27 05.0 114 08 53.0 5
DRY CREEK NEAR MOUTH
16013 IDAHO
PACIFIC NORTHWEST 170605
UPPER SNAKE RIVER BASIN
211DSURV 761104
0000 FEET DEPTH CLASS 00

/TYPE/AMMONIA/LEAD

DATE FROM TO	TIME OF DAY	DEPTH FEET	00095 CONDUCTVY AT 25C MICROMHO	00530 RESIDUE TOT NFLT MG/L	70300 RESIDUE DISS-180 C MG/L	00500 RESIDUE TOTAL MG/L	00505 RESIDUE TOT VOL MG/L	00410 T ALK CACO3 MG/L	00425 HCO3 ALK CACO3 MG/L	00430 CO3 ALK CACO3 MG/L	00900 TOT HARD CACO3 MG/L	00929 SODIUM NA,TOT MG/L
76/07/22			525	166		518		192	192	4K		
76/09/09			465	108		464		174	166	10		
77/04/13			533	1360		1620		173			200	22.00
77/05/16	13 00		595	37		569		196			232	34.50
77/06/08	12 15		465	142		473		258			200	29.50
77/07/06	13 00		572	71		421		186			230	32.50
77/08/10	13 00		511	143		545		199			250	35.00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00937 POTASSIUM K,TOT MG/L	00940 CHLORIDE CL MG/L	01027 CADMIUM CD,TOT UG/L	01042 COPPER CU,TOT UG/L	01051 LEAD PB,TOT UG/L	01092 ZINC ZN,TOT UG/L	71900 MERCURY HG,TOTAL UG/L	00042 ALTITUDE FEET AB MSL
03/01/01										4130
76/07/22				24						
76/09/09				28						
77/04/13			4.60	28						
77/05/16	12 00		4.80	36						
77/06/08	12 15		4.60	29						
77/07/06	12 00		5.60	35						
77/08/10	13 00		5.40	39						

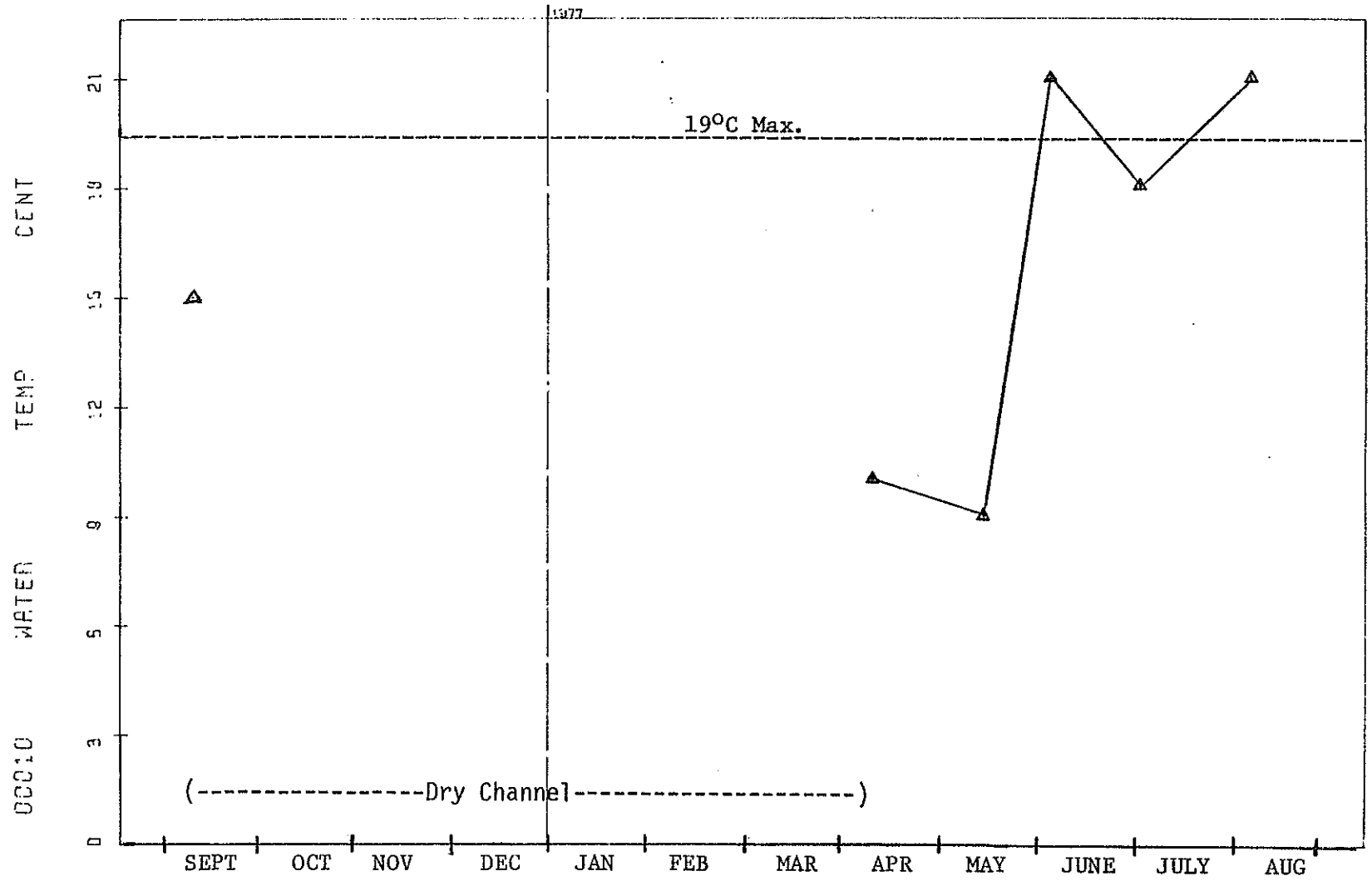
APPENDIX B

FIGURES

STORET
2040080
42 27 09.0 114 08 53.0 5
DRY CREEK NEAR MOUTH

PACIFIC NORTHWEST
UPPER SNAKE RIVER BASIN

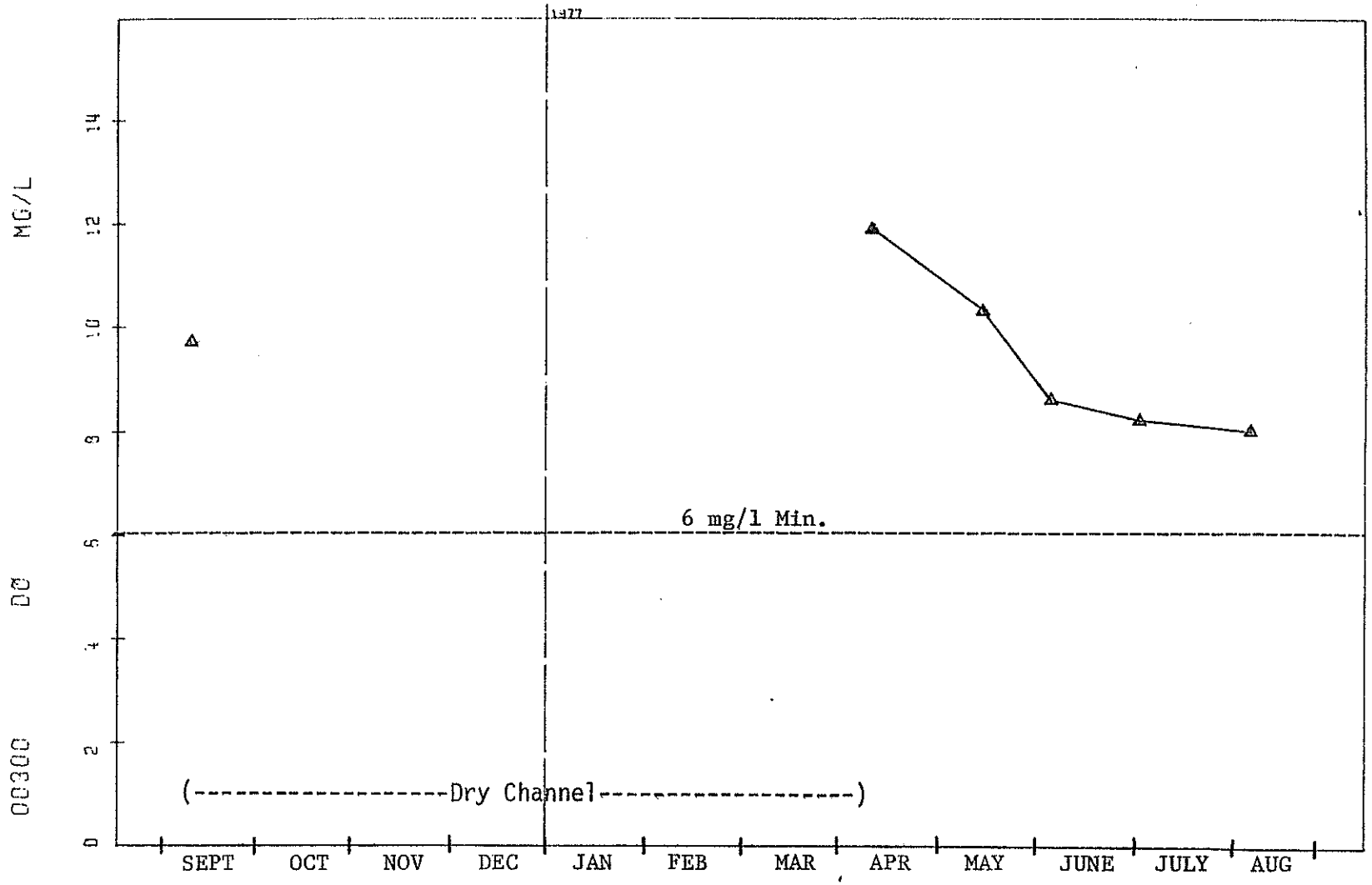
FIGURE 2: Water Temperature, Celcius, at Dry Creek, Water Year 1977



STORET
2040080
42 27 09.0 114 08 53.0 5
DRY CREEK NEAR MOUTH

PACIFIC NORTHWEST
UPPER SNAKE RIVER BASIN

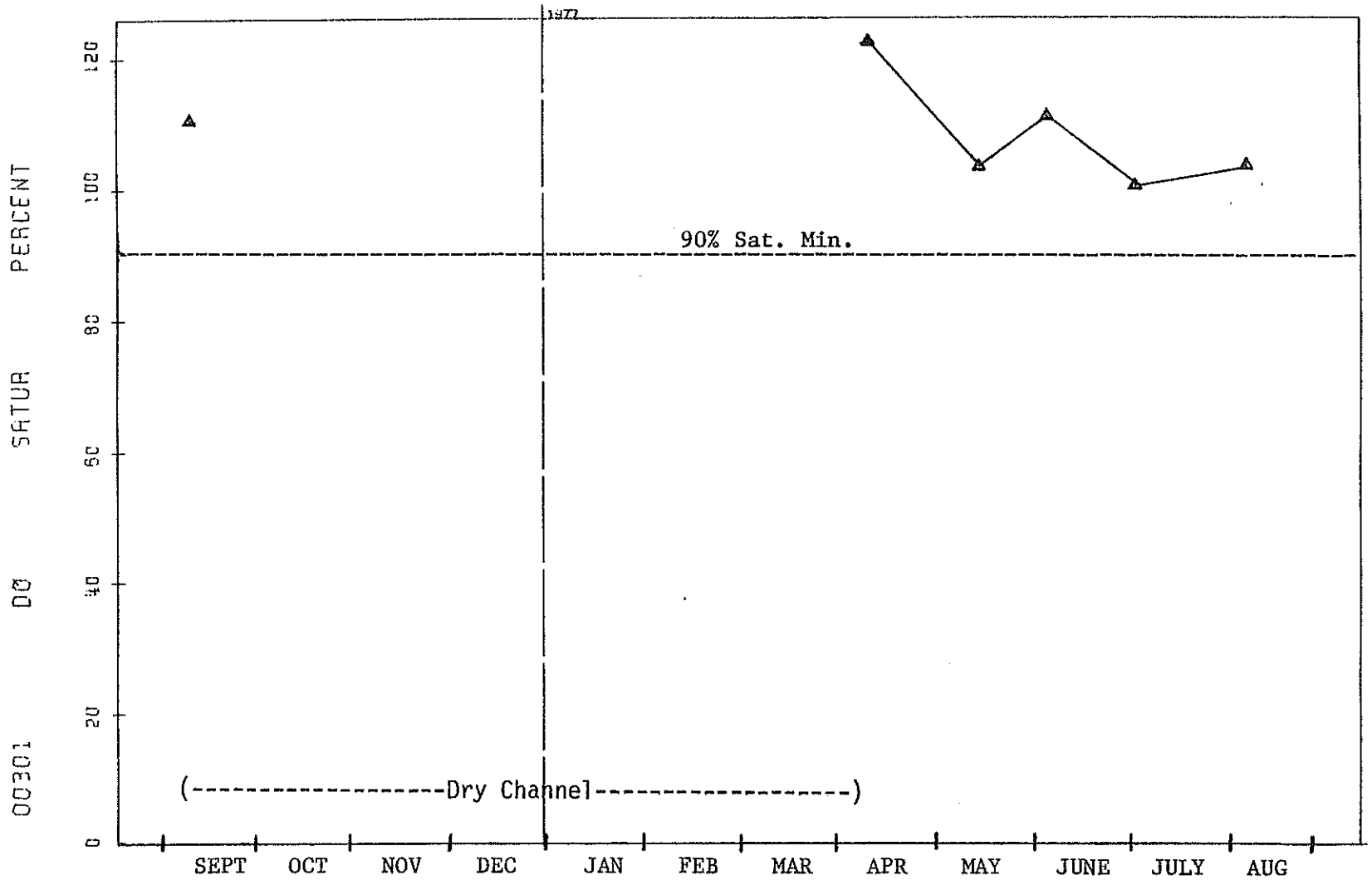
FIGURE 3: Dissolved Oxygen, mg/l, at Dry Creek, Water Year 1977



STORET
2040080
42 27 09.0 114 08 53.0 5
DRY CREEK NEAR MOUTH

PACIFIC NORTHWEST
UPPER SNAKE RIVER BASIN

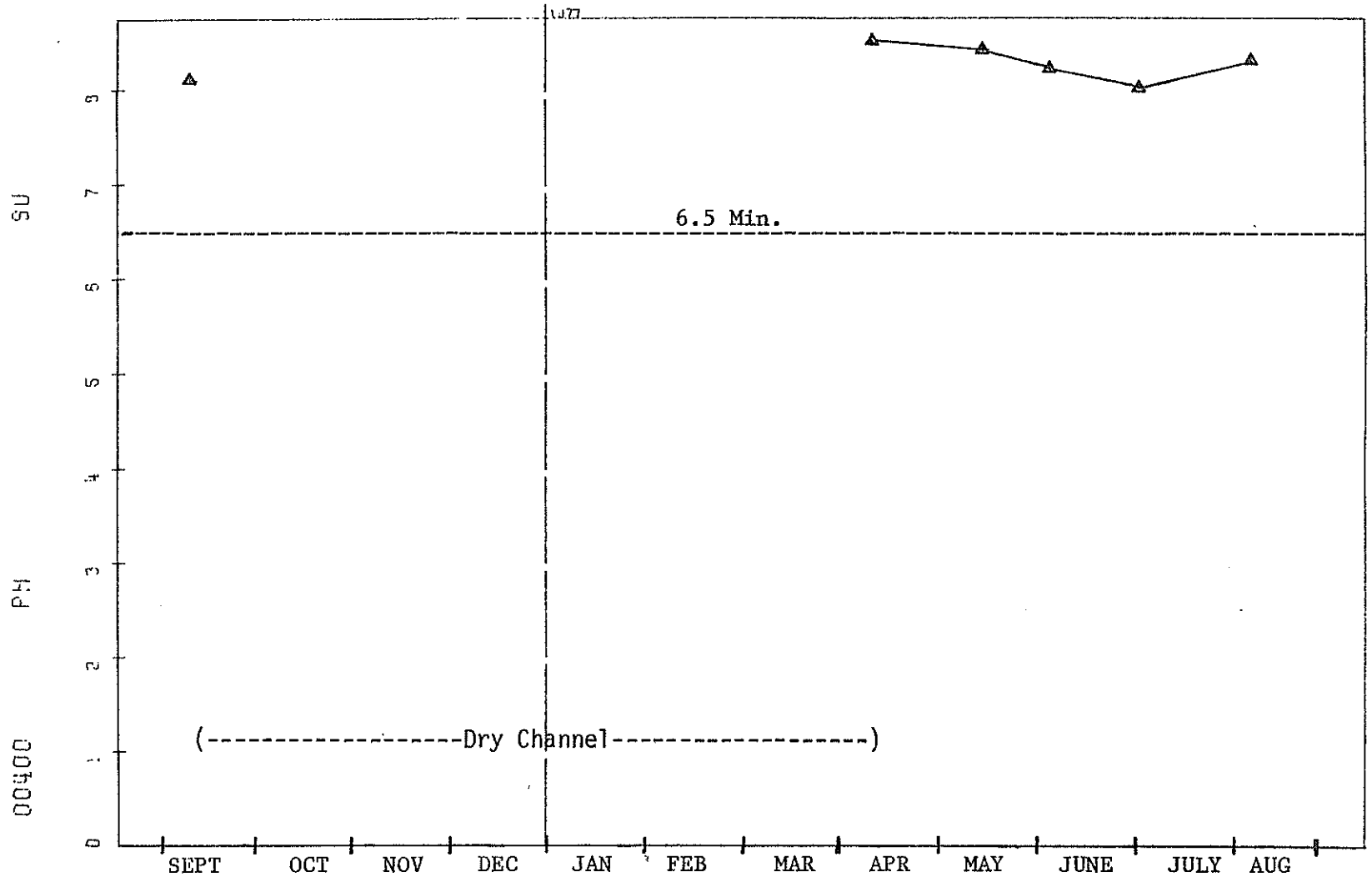
FIGURE 4: Dissolved Oxygen, percent saturation, at Dry Creek, Water Year 1977



STORET
2040080
42 27 09.0 114 08 53.0 5
DRY CREEK NEAR MOUTH

PACIFIC NORTHWEST
UPPER SNAKE RIVER BASIN

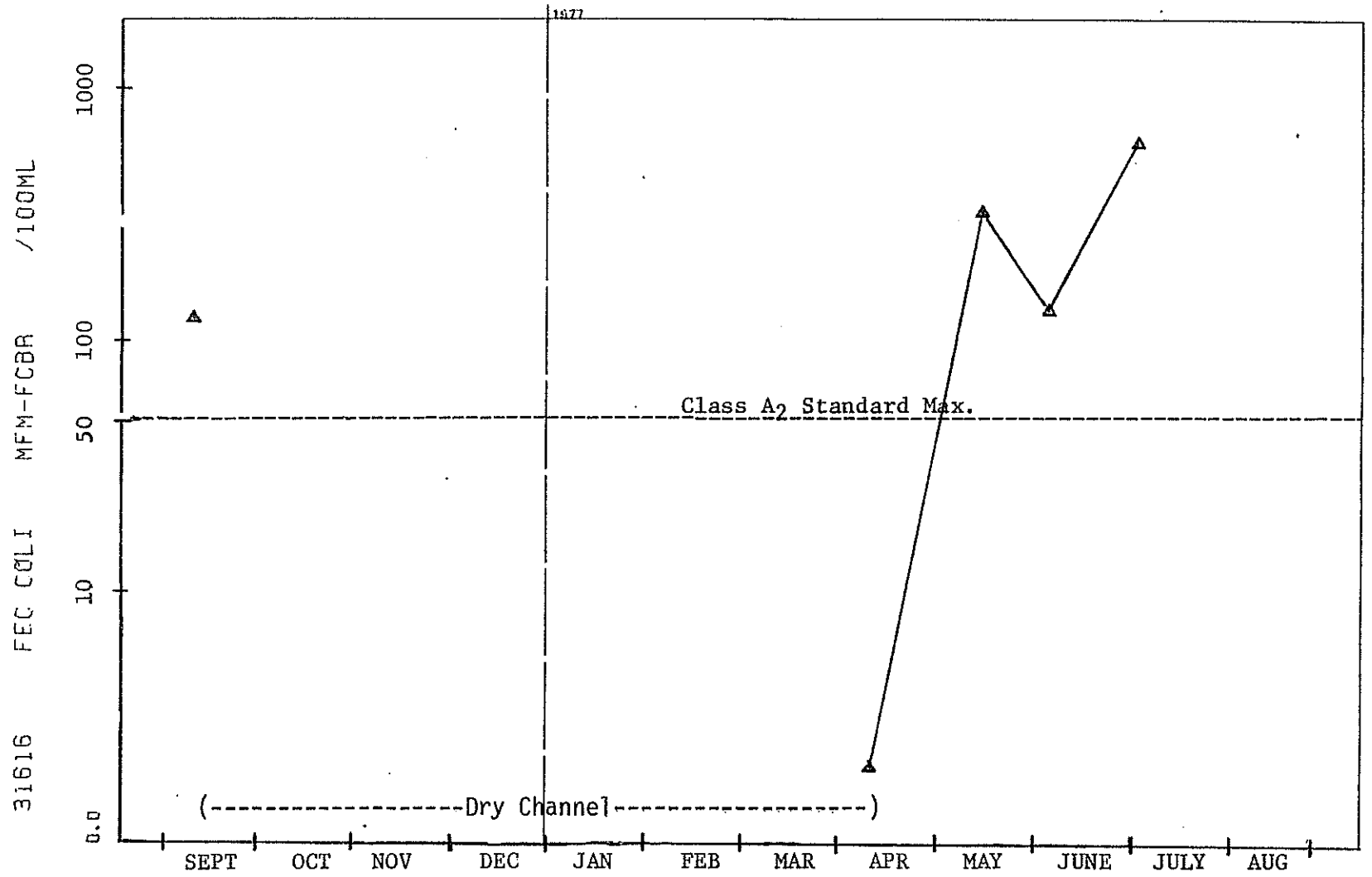
FIGURE 5: pH, standard units, at Dry Creek, Water Year 1977



STØRET
2040080
42 27 09.0 114 08 53.0 5
DRY CREEK NEAR MOUTH

PACIFIC NØRTHWEST
UPPER SNAKE RIVER BASIN

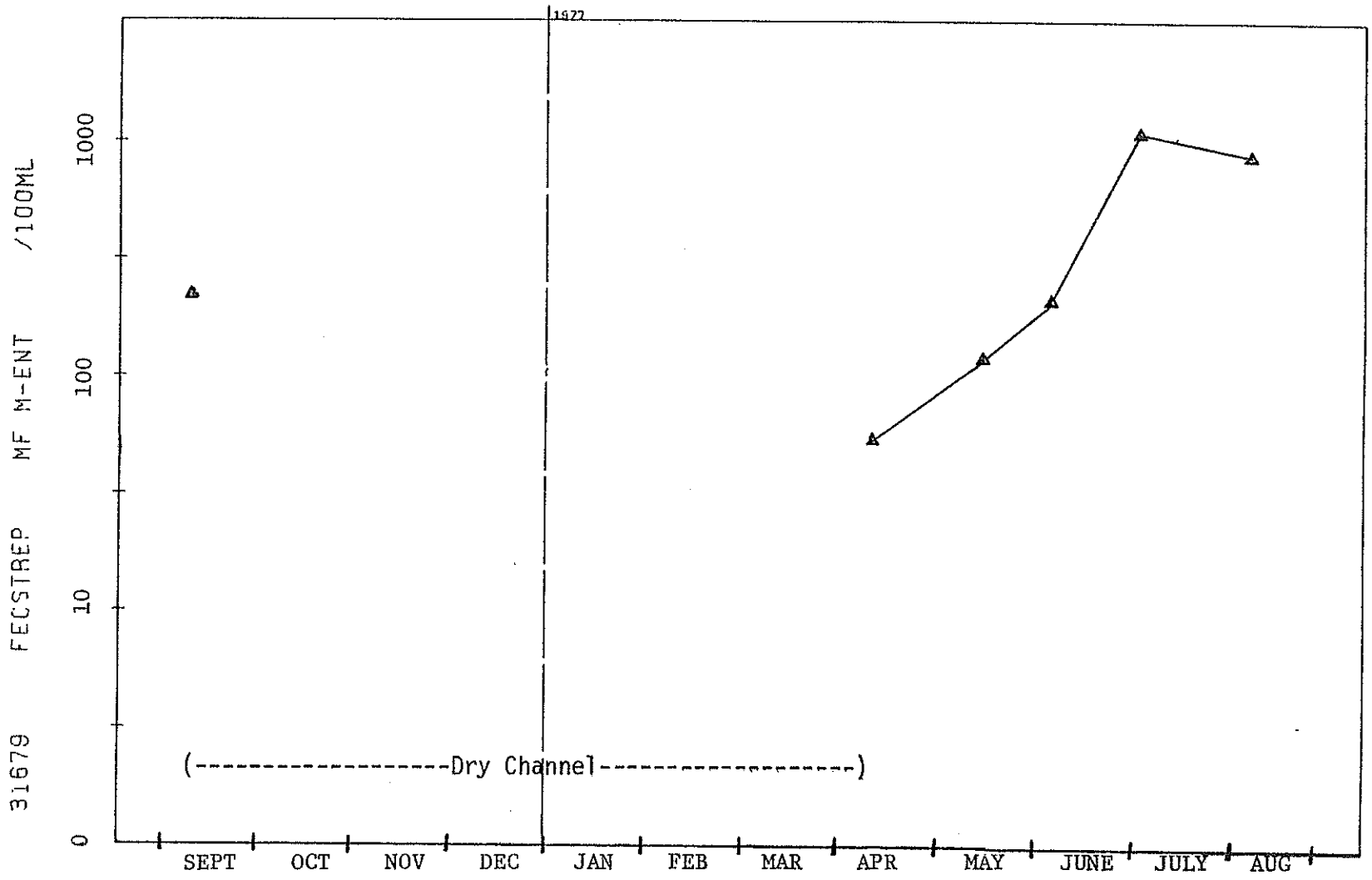
FIGURE 6: Fecal Coliform Bacteria, per 100 ml, at Dry Creek, Water Year 1977



STØRET
2040080
42 27 09.0 114 08 53.0 5
DRY CREEK NEAR MOUTH

PACIFIC NØRTHWEST
UPPER SNAKE RIVER BASIN

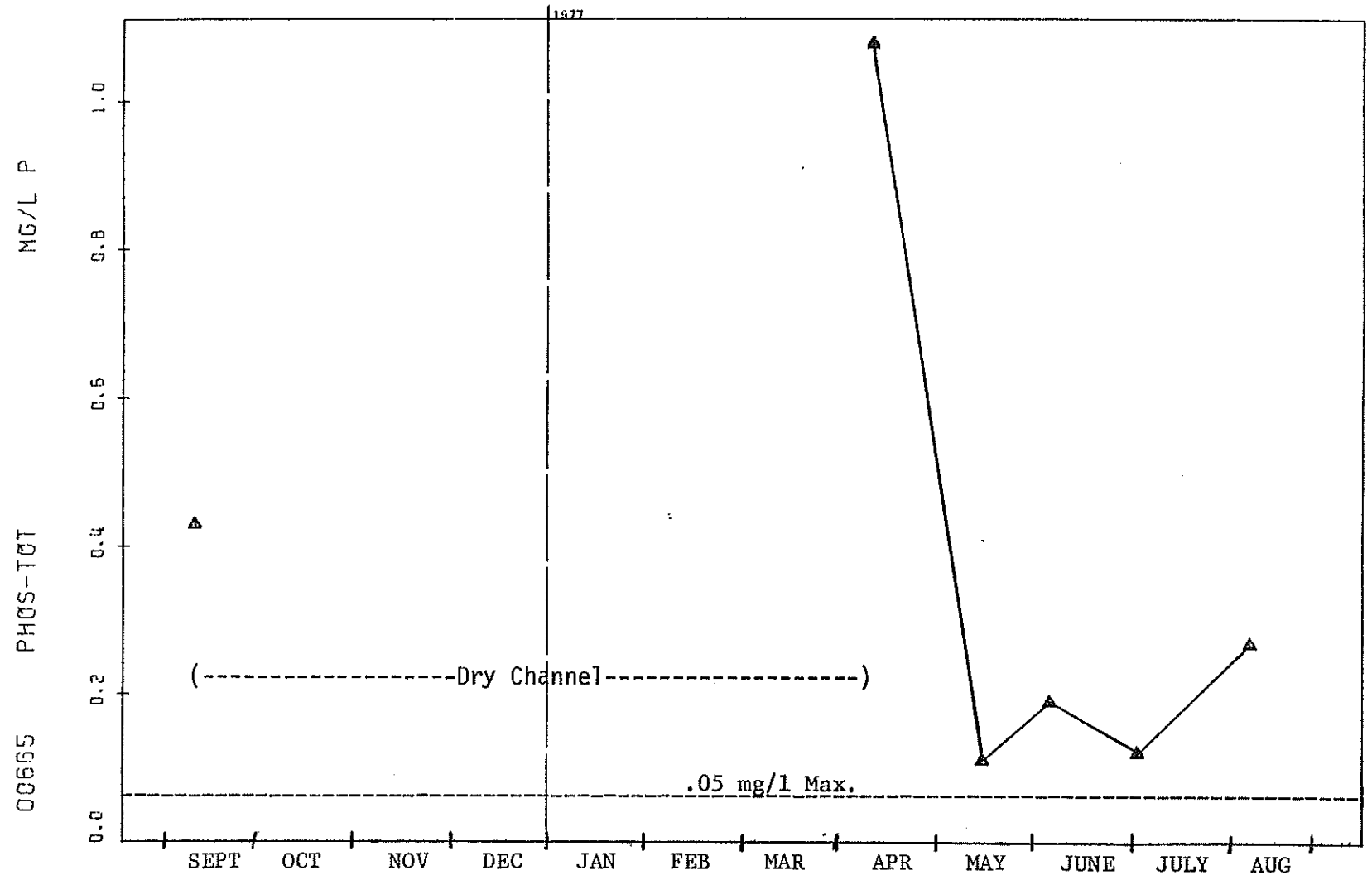
FIGURE 7: Fecal Streptococcus Bacteria, per 100 ml, at Dry Creek, Water Year 1977



STORET
2040080
42 27 09.0 114 08 53.0 5
DRY CREEK NEAR MOUTH

PACIFIC NORTHWEST
UPPER SNAKE RIVER BASIN

FIGURE 8: Total Phosphorus, as P, mg/l, at Dry Creek, Water Year 1977



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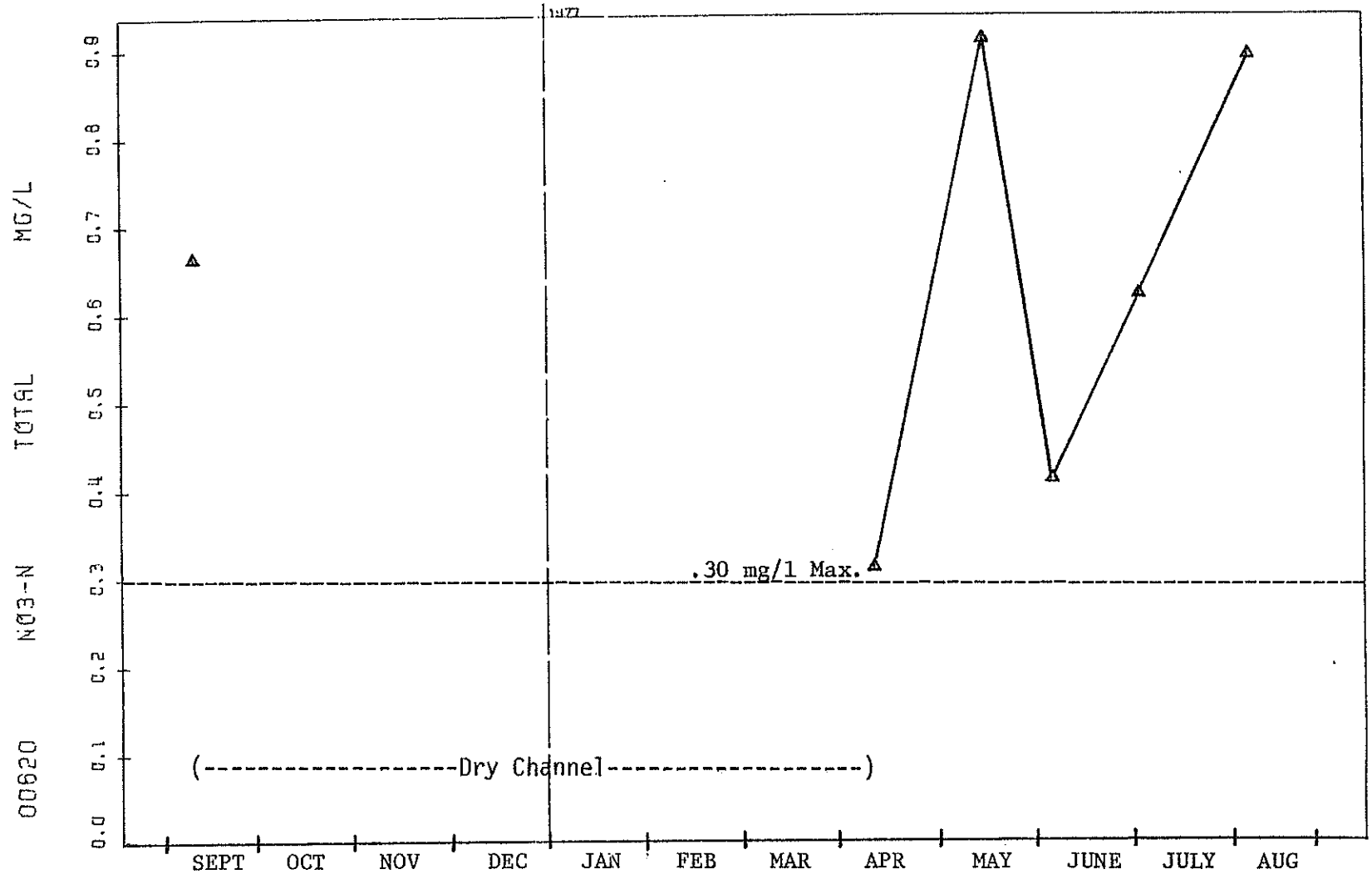
DRY CREEK NEAR MOUTH

PACIFIC NORTHWEST
UPPER SNAKE RIVER BASIN

FIGURE 9: Total Nitrate-Nitrogen, mg/l, at Dry Creek, Water Year 1977



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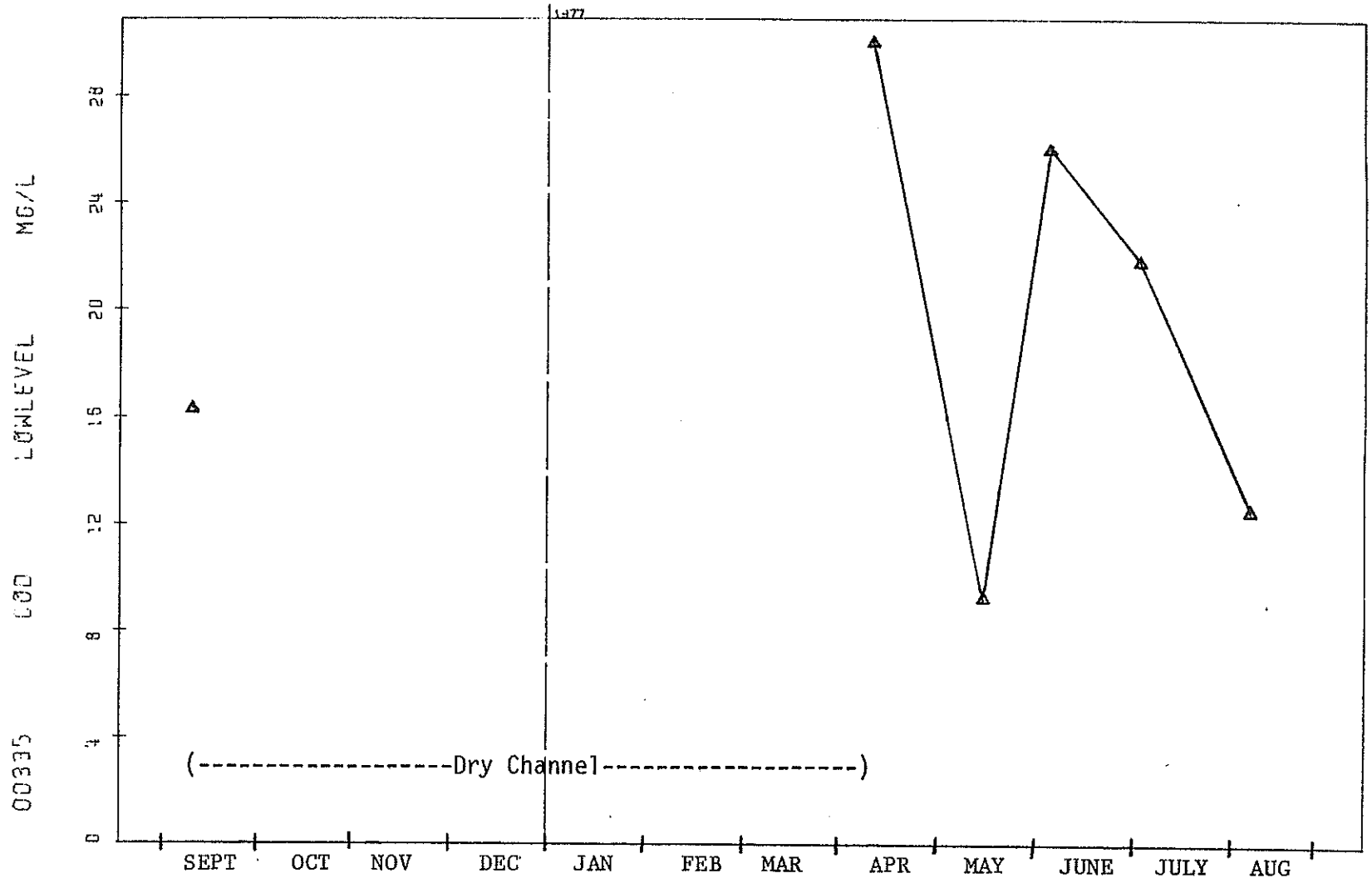
DRY CREEK NEAR MOUTH

PACIFIC NORTHWEST
UPPER SNAKE RIVER BASIN

FIGURE 10: Chemical Oxygen Demand, mg/l, at Dry Creek, Water Year 1977



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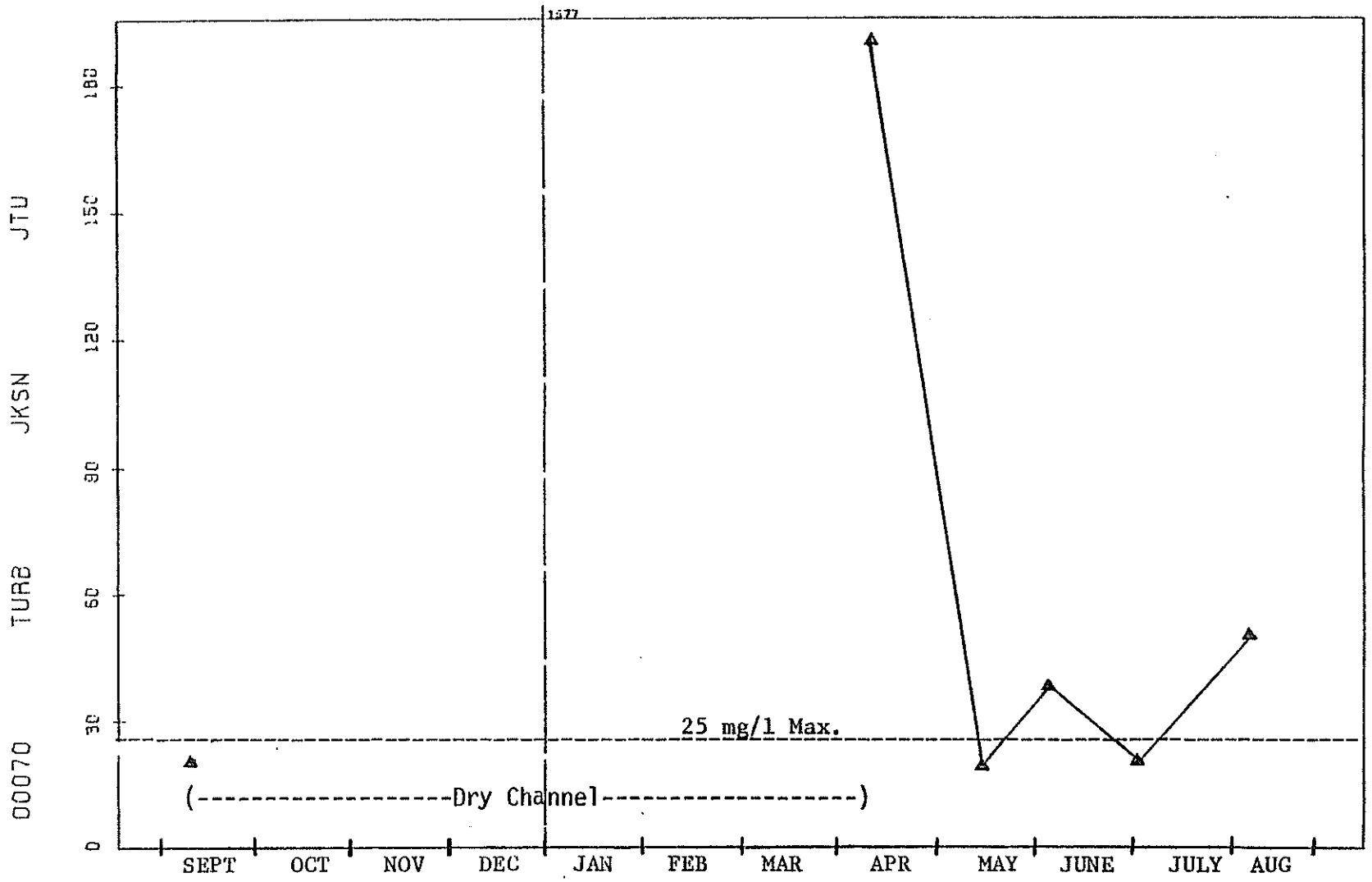
PACIFIC NORTHWEST
UPPER SNAKE RIVER BASIN

FIGURE 11: Turbidity, JTU, at Dry Creek, Water Year 1977



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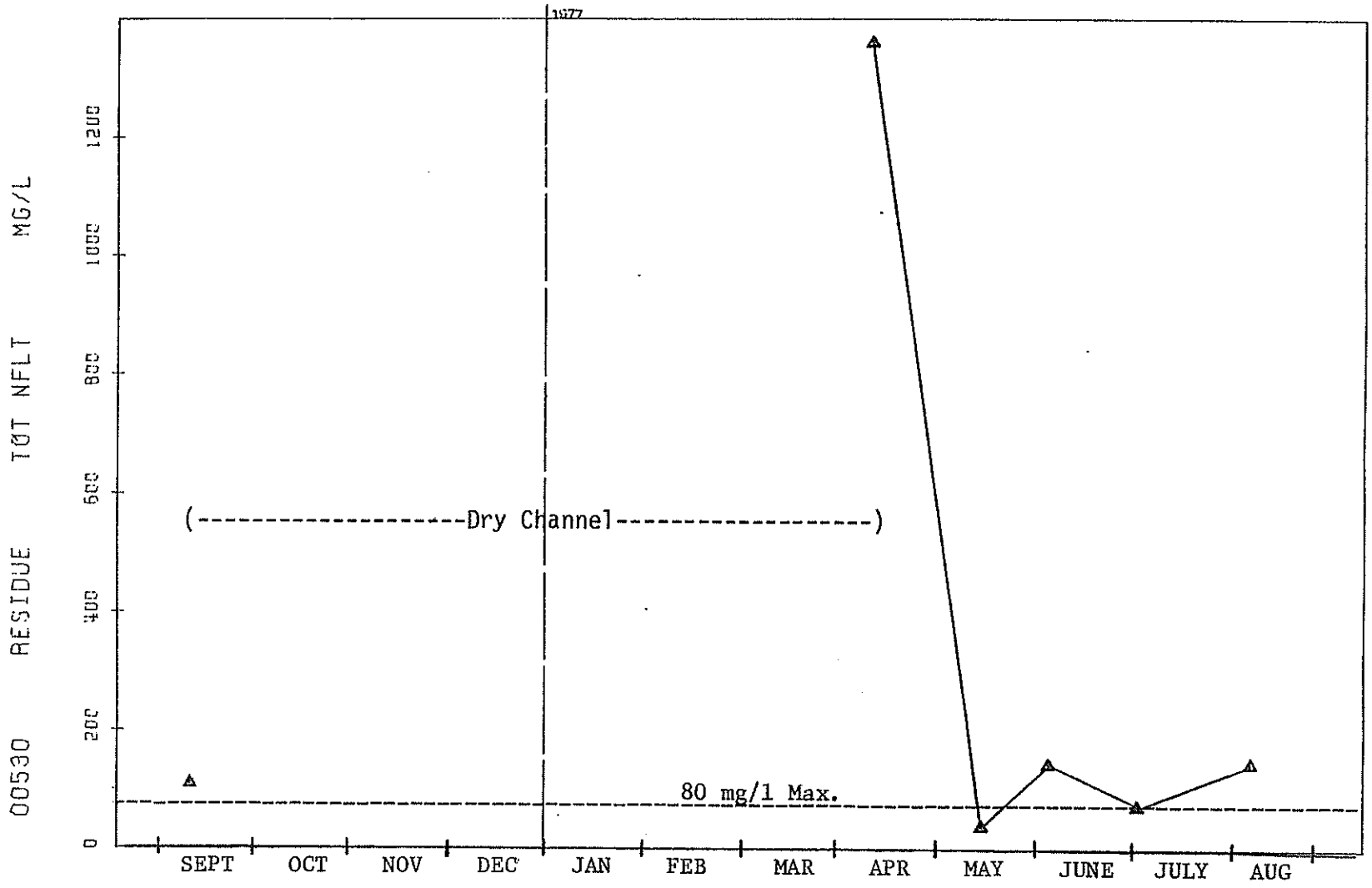
DRY CREEK NEAR MØUTH

PACIFIC NØRTHWEST
UPPER SNAKE RIVER BASIN

FIGURE 12: Total Nonfilterable Residue (suspended solids), mg/l, at Dry Creek, Water Year 1977



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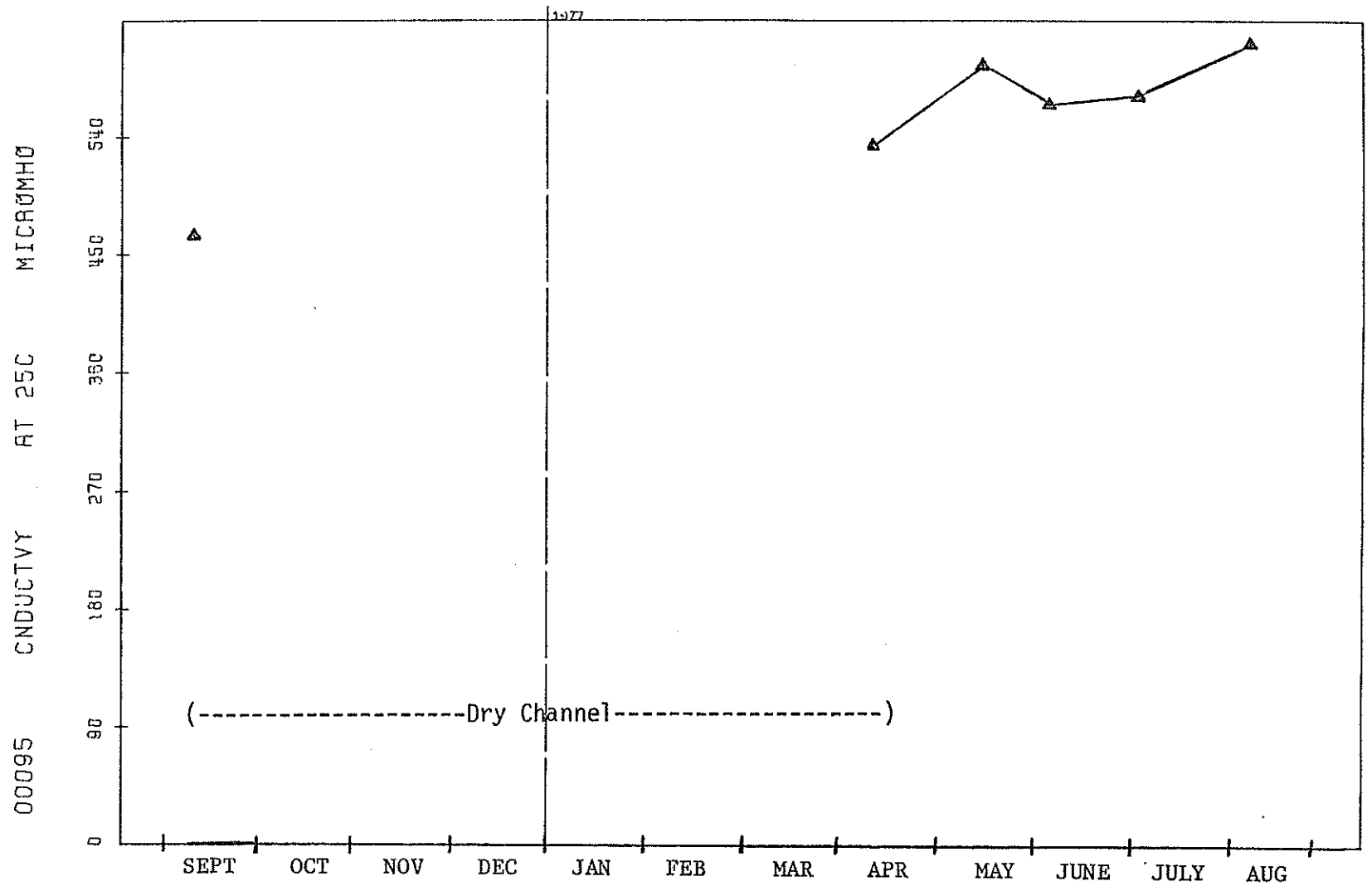
DRY CREEK NEAR MØUTH

PACIFIC NØRTHWEST
UPPER SNAKE RIVER BASIN

FIGURE 13: Specific Conductance, micromhos/cm, at Dry Creek, Water Year 1977



APPENDIX C

IDAHO WATER QUALITY STANDARDS AND APPROPRIATE CRITERIA

III. GENERAL REQUIREMENTS

A. Interstate Compacts, Court Decrees and Adjudicated Water Rights

It shall be the policy of the Board that the adoption of water quality standards and the enforcement of such standards is not intended to conflict with the apportionment of water to the State of Idaho through any of the interstate compacts or court decrees, or to interfere with the rights of Idaho appropriators in the utilization of the water appropriations which have been granted to them under the statutory procedure or to interfere with water quality criteria established by mutual agreement of the participants in interstate water pollution control enforcement procedures.

B. Waters of the State Protected

All waters of the State to be protected for appropriate beneficial use shall include all recreational use in and/or on the water surface and for preservation and propagation of desirable species of aquatic biota shall include all natural streams and lakes, reservoirs or impoundments on natural streams and other specified waterways unless excepted on the basis of existing irreparable conditions which preclude such uses. Man-made waterways, unless otherwise specified, shall be protected for the use for which the waterways were developed.

C. Highest and Best Practicable Treatment and Control Required

Notwithstanding the water quality standards contained herein, where a higher standard can be achieved, the highest and best practicable treatment and/or control of wastewaters, activities and flows shall be provided so as to maintain dissolved oxygen at the highest desirable levels and overall water quality as good as possible, and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor and other deleterious factors at the lowest desirable levels. Such policy to apply not only to existing wastewater sources but to future wastewater sources as they may develop, and for such other streams not listed herein.

D. Antidegradation of State Waters

Waters whose existing quality is better than the established standards as of the date on which such standards become effective will be maintained at their existing high quality. These and other waters of Idaho will not be lowered in quality unless and until it has been affirmatively demonstrated to the Department and the Federal Environmental Protection Agency that such change is justifiable as a result of necessary economic or social development and will not interfere with or become injurious to any assigned uses made of, or presently possible in, such waters. This will require that any industrial, public or private project or development which would constitute a new source of water pollution or an increased source

of water pollution to high quality waters will be required, as part of the initial project design, to provide the highest and best degree of wastewater treatment available under existing technology, and, since there are also Federal standards, these wastewater treatment requirements will be developed cooperatively.

IV. RESTRICTIONS ON THE DISCHARGE OF SEWAGE AND INDUSTRIAL WASTEWATERS AND HUMAN ACTIVITIES WHICH AFFECT WATER QUALITY IN THE WATERS OF THE STATE

A. No wastewaters shall be discharged and no activities shall be conducted in such a way that said wastewaters or activities either alone or in combination with other wastewaters or activities will violate or can reasonably be expected to violate the water quality standards contained herein.

B. It is noted that from time to time certain short-term activities which are deemed necessary to accommodate essential activities and protect the public interest may be authorized by the Department under such conditions as the Department may prescribe, even though such activities may result in a reduction of water quality below the standards contained herein.

V. MAINTENANCE OF STANDARDS OF QUALITY

A. The degree of sewage or wastewater treatment required to restore and maintain the standards of quality shall be determined in each instance by the Board and shall be based upon the following:

1. The uses which are or may likely be made of the receiving stream.

2. The size and nature of flow of the receiving stream.

3. The quantity and quality of the sewage or wastewater to be treated.

4. The presence or absence of other sources of water pollution on the same watershed.

B. The water quality standards are subject to revision (following public hearings and concurrence of the Administrator of the EPA) as technical data, surveillance programs, and technological advances make such revisions desirable. Further, public hearings for the purpose of reviewing water quality standards shall be initiated in accordance with Title 67, Chapter 52, Idaho Code.

C. Established water quality standards shall not be applicable in the receiving waters within the mixing zone of limited size adjacent to and/or surrounding a wastewater discharge outfall as defined by specific mixing zone boundaries. Aesthetic values of receiving waters shall be protected irrespective of mixing zone boundaries.

Receiving water quality outside the mixing zone will be maintained at water quality standards contained herein, or existing water quality levels, whichever is higher.

D. In the application of the use classification, the most stringent criterion of a multiple criteria shall apply.

E. Sample collection, preservation and analytical procedures to determine compliance with these standards shall conform to the procedures prescribed by the latest edition of Standard Methods For The Examination Of Water And Wastewater, and other superseding methods published by the Department following consultation with adjacent states, and the concurrence of the Environmental Protection Agency.

VI. WATER USE CLASSIFICATION

The designated use(s) for which the waters of the State are to be protected shall include, but not necessarily limited to domestic and industrial water supply, irrigation and stock watering, recreation and/or aesthetic qualities. (See appendix, USES TO BE PROTECTED.) Recreational waters are further divided into two classes: (1) primary contact, and (2) secondary contact. Primary contact recreational waters (Class A) are for uses where the human body may come in direct contact with the raw water to the point of complete submergence. The raw water may be accidently ingested and certain sensitive organs such as eyes, ears, nose, etc. may be exposed to the water. These waters may be used for swimming, water skiing, skin diving, support and propagation of fish, aquatic and semi-aquatic life, and other forms of wildlife.

Primary contact recreational waters are further divided into sub-classes A_1 and A_2. Class A_1 is restricted to lakes and impoundments in which exceptionally high water quality exists. Waters of all lakes and impoundments shall be class A_1 unless otherwise excepted. In the instances where a flowing stream is classified and subsequently becomes an impoundment, that impoundment shall carry the same classification as the flowing stream. Class A_2 includes the remainder of the primary contact recreational waters.

Secondary contact recreational waters (Class B) are for uses in which the raw water supply is suitable for support and propagation of fish and other aquatic and semi-aquatic life, and other forms of wildlife. These waters may be used for boating, wading and other activities where ingestion of the raw water is not probable.

Waters classified as excepted (Class E) are waters in which, due to natural and/or man-made cause, the quality is not compatible with recreational uses. These waters are protected for the use(s) specified. The numerical value of the various parameters for specific Water Quality Standards contained herein under Section VIII shall apply to all Class E waters unless an alternate value for a given parameter is specified in Section IX for the waters under consideration.

Natural tributaries to the stream reaches are classified as primary recreational waters, Class A_2, unless otherwise specified. Waterways defined as a point source in Section 502(14), Public Law 92-500, are a means of conveyance for waters with no use classification. Canals and other man-made waterways excluded as a point source are protected for agricultural uses and aesthetic qualities and may be protected for other uses when specified.

In the instance where a flowing stream is classified and subsequently becomes an impoundment, that impoundment shall carry the same classification as the flowing stream. The criteria established for the various use-classifications may be modified by the Administrator for limited periods when receiving waters fall below their assigned water quality standards due to natural causes or if, in the opinion of the Administrator, the protection of the overall interest and welfare of the public requires such a modification.

VII. GENERAL WATER QUALITY STANDARDS FOR WATERS OF THE STATE

The following general water quality standards will apply to waters of the State, both surface and underground, in addition to the water quality standards set forth for specifically classified waters. Waters of the State shall not contain:

A. Toxic chemicals of other than natural origin in concentrations found to be of public health significance or to adversely affect the use for which the waters have been classified.*

B. Deleterious substances of other than natural origin in concentrations that cause tainting of edible species of fish or tastes and odors to be imparted to drinking water supplies.

C. Radioactive materials or radioactivity other than of natural origin which

   1. Exceed 1/3 of the values listed in Column 2, Table II, Appendix A, Idaho Radiation Control Regulations as adopted by the Board on May 9, 1973.

   2. Exceed the concentrations specified in the 1962 U. S. Public Health Service Drinking Water Standards for waters used for domestic supplies.

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* Guides such as the Water Quality Criteria published by the State of California Water Quality Control Board (Second Edition, 1963) and more recent research papers will be used in evaluating the tolerances of the various toxic chemicals for the use indicated.

3. Have a demonstrable effect on aquatic life.

The concentration of radioactive materials in these waters shall be less than those required to meet the Radiation Protection Guides for maximum exposure of critical human organs recommended by the former Federal Radiation Council in the case of foodstuffs harvested from these waters for human consumption.

D. Floating or submerged matter not attributable to natural causes.

E. Excess nutrients of other than natural origin that cause visible slime growths or other nuisance aquatic growths.

F. Visible concentrations of oil, sludge deposits, scum, foam or other material that may adversely affect the use indicated.

G. Objectionable turbidity which can be traced to a man-made source.

VIII. SPECIFIC WATER QUALITY STANDARDS

No wastewaters shall be discharged and/or no activity shall be conducted in waters of the State which either alone or in combination with other wastewaters or activities will cause in waters of any specified reach, lake or impoundment, or in general surface waters of the State

A. The organism concentrations of the coliform group

1. In waters of lakes and impoundments (A_1), except the following, which are classified as A_2 waters:

American Falls Reservoir	R.M. 738.0 to R.M. 714.0
Lake Walcott	
Milner Lake	R.M. 675.0 to R.M. 640.0
Murtaugh Lake	R.M. 690.0 to R.M. 675.0
Crane Falls Reservoir	
C. J. Strike Reservoir	R.M. 514.0 to R.M. 492.0
Lake Lowell	
Brownlee Reservoir	R.M. 338.0 to R.M. 285.0
Oxbow Reservoir	R.M. 285.0 to R.M. 273.0
Hells Canyon Reservoir	R.M. 273.0 to R.M. 247.0

a. Total coliform concentrations where associated with a fecal source(s) to exceed a geometric mean of 50/100 ml., nor shall more than 20 percent of total samples during any 30-day period exceed 200/100 ml. (as determined by multiple-tube fermentation or membrane filter procedures and based on not less than 5 samples for any 30-day period).

b. Fecal coliform concentrations to exceed a geometric mean of 10/100 ml., nor shall more than 10 percent of total samples during any 30-day period exceed 20/100 ml,; or greater than 50/100 ml. for any single sample.

Coliform criteria for shoreline waters shall conform with that of Class A_2 waters. Shoreline water waters shall be defined as the 100 feet of water surface as measured from the shoreline.

2. In waters protected for primary contact recreation (A_2)

a. Total coliform concentrations where associated with a fecal source(s) to exceed a geometric mean of 240/100 ml., nor shall more than 20 percent of total samples during any 30-day period exceed 1000/100 ml. (as determined by multiple-tube fermentation or membrane filter procedures and based on not less than 5 samples for any 30-day period).

b. Fecal coliform concentrations to exceed a geometric mean of 50/100 ml., nor shall more than 10 percent of total samples during any 30-day period exceed 200/100 ml.; or greater than 500/100 ml. for any single sample.

3. In waters protected for secondary contact recreation (B)

a. Total coliform concentrations where associated with a fecal source(s) to exceed a geometric mean of 1000/100 ml., nor shall more than 20 percent of total samples during any 30-day period exceed 2400/100 ml. (as determined by multiple-tube fermentation or membrane filter procedures and based on not less than 5 samples for any 30-day period).

b. Fecal coliform concentrations to exceed a geometric mean of 200/100 ml., nor shall more than 10 percent of total samples during any 30-day period exceed 400/100 ml.; or greater than 800/100 ml. for any single sample.

B. Dissolved Oxygen

The DO concentration to be less than 6 mg/l or 90 percent of saturation, whichever is greater.

1. The DO standard shall apply to all flowing waterways.

2. The DO standard shall apply to the waters of all natural lakes and reservoirs except as excluded below:

a. In depths of water less than 100 feet in natural lakes or reservoirs, the bottom 20 percent of water depth shall

be excluded from application of the DO standard. In water depths greater than 100 feet, the bottom 20 feet of water depth shall be excluded for application of the DO standard.

b. Waters below a thermocline in stratified lakes or impoundments shall be excluded from application of the DO standard.

c. No wastewaters shall be discharged and/or no activity shall be conducted in waters excluded by a. and b. above, which either alone or in combination with other wastewaters or activities will cause the DO concentration in these waters to be less than 4 mg/l.

3. Notwithstanding exclusion of a. and b. above, the DO standard shall always apply to the top two feet of any lake or reservoir.

C. Hydrogen Ion Concentration (pH)

The pH values to be outside the range of 6.5 to 9.0. The induced variations shall not be more than 0.5 pH units.

D. Temperature

1. Any measurable increase when water temperatures are 66°F or above, or more than 2°F increase other than from natural causes when water temperatures are 64°F or less (unless otherwise specified).

2. Any increase exceeding 0.5°F due to any single source, or 2°F due to all sources combined.

For purposes of determining compliance, a "measurable increase" means no more than 0.5°F rise in temperature of the receiving water as measured immediately outside of an established mixing zone. Where mixing zone boundaries have not been defined, cognizance will be given to the opportunity for admixture of wastewater with the receiving water.

3. Any measurable increase when water temperatures are 68°F or above, or more than 2°F increase other than from natural causes when the water temperatures are 66°F or less in the following waters:

a. The main stem of the Snake River from the Oregon-Idaho border (R.M. 407) to the interstate line at Lewiston, Idaho (R.M. 139).

b. The Spokane River from Coeur d'Alene Lake outlet to the Idaho-Washington border.

c. The Palouse River from Princeton to the Idaho-Washington border.

d. The Pend Oreille River from the Pend Oreille Lake outlet to the Idaho-Washington border.

E. Turbidity

The turbidity other than of natural origin to exceed 5 Jackson Turbidity Units (JTU). Whenever the receiving water is greater than 5 JTU, due to conditions other than those caused by man, then no discharge and/or activity either alone or in combination with other wastewater or activity shall cause an increase of more than 5 JTU.

F. Total Dissolved Gas

The total concentration of dissolved gas shall not exceed 110 percent of saturation at atmospheric pressure at the point of sample collection due to non-natural causes. (In compliance with this standard Paragraph C, Section III, General Requirements shall apply.)

IX. SPECIFIC WATER QUALITY STANDARDS FOR CLASS E WATERS

Specific water quality standards contained herein under Section VIII shall apply to all Class E waters except as enumerated in this Section.

A. No wastewater shall be discharged and/or no activity shall be conducted which either alone or in combination with other wastewaters will cause the organism concentration of the coliform group in waters of the South Fork Coeur d'Alene River, Mullan to Enaville, or Paradise Creek, upper reaches to State line.

1. The <u>total coliform</u> concentrations where associated with a fecal source(s) to exceed a geometric mean of 240/100 ml., nor shall more than 20 percent of total samples during any 30-day period exceed 1000/100 ml. (as determined by multiple-tube fermentation or membrane filter procedures and based on not less than 5 samples for any 30-day period); or greater than 2400/100 ml. for any single sample.

2. The <u>fecal coliform</u> concentrations to exceed a geometric mean of 50/100 ml., nor shall more than 10 percent of total samples during any 30-day period exceed 200/100 ml.; or greater than 500/100 ml. for any single sample.

B. No wastewaters shall be discharged and/or no activity shall be conducted which either alone or in combination with other wastewaters will cause the DO concentration to be less than 75 percent of saturation in waters of Paradise Creek, upper reaches to the State line.

The states are responsible for the monitoring of and reporting data for interstate streams which include most tributaries to the major rivers.

3. PARAMETRIC COVERAGE:

The parametric coverage for the stations in the NWQSS network is shown on Table 2. At the present time there is some discrepancy among the various agencies' parametric coverage; however, negotiations are presently underway to develop a uniform parameter package. Station parameters covered by this report include a selection of those constituents which are, 1. considered significant in ambient station analysis and/or, 2. collected at each NWQSS station in the river basin under consideration.

4. REGION 10 WATER QUALITY CRITERIA:

Parameter	Criteria Level/Units	Environmental Impact and Reference
Temperature	20°C (68°F) MAX	To protect growth and migration routes of salmonids (Federal Water Pollution Control Administration (FWPCA), Water Quality Criteria, 1968).
Dissolved Oxygen	6 mg/l MIN 90% SAT MIN	For good growth and the general well-being of trout, salmon, and other species of cold water aquatic life, DO concentrations should not be below 6 mg/l (FWPCA, Water Quality Criteria, 1968). In addition, state water quality standards normally require 90% saturation for dissolved oxygen (Idaho and Oregon).
Dissolved Gas	110% SAT MAX	To prevent fish fatalities by "gas bubble disease", in which dissolved gases in their circulatory system come out of solution to form bubbles (emboli), which block the flow of blood through the capillary vessels (Environmental Protection Agency, Quality Criteria for Water, 1976).

Parameter	Criteria Level/Units	Environmental Impact and Reference
pH	6.5 MIN 8.5 MAX	The pH range of 5 to 9 is not directly lethal to fish. However, the toxicity of several common pollutants is markedly affected by pH changes within this range, and increasing acidity or alkalinity may make these poisons more toxic. Therefore, a pH range of 6.5 to 9.0 is desirable to protect freshwater aquatic life (EPA, Quality Criteria for Water, 1976). In primary contact recreation waters, the pH should be within the range of 6.5-8.3 (except when due to natural causes) to prevent the possibilities of eye irritations in humans (FWPCA, Water Quality Criteria, 1968). State pH standards range from 6.5 to 9.0 for Idaho and 6.5 to 8.5 for Oregon and Washington. In light of the above information, our criteria has been set at 6.5 to 8.5.
Turbidity	25 JTU MAX	Most state standards have a turbidity standard of "not to exceed 5 JTU over background or natural conditions". This is rather ambiguous as to what "background or natural conditions" are. Also, this type of standard does not relate to the fishable/swimmable concept. Excessive turbidity reduces photosynthesis by aquatic plant life and damages the spawning grounds of fish and habitat of aquatic invertebrates. Buck (1956) observed that maximum production in hatchery ponds and reservoirs occurred where the average turbidity was less than 25 JTU (FWPCA, Water Quality Criteria, 1968).

Parameter	Criteria Level/Units	Environmental Impact and Reference
Phosphorus	Total 0.05 mg/l-P Total 0.15 mg/l-PO_4 Ortho 0.025 mg/l-P Ortho 0.075 mg/l-PO_4 Diss. Ortho 0.01 mg/l-P	Limited studies made to date indicate that different species of algae have somewhat different phosphorus requirements, with the range of available phosphorus usually falling between 0.01 and 0.05 mg/l as P. At these levels, when other conditions are favorable, blooms may be expected. While there is no set relationship between total and available phosphorus (because the ratio varies with season, temperature, and plant growth), the total phosphorus is governing, as the reservoir supplies the available phosphorus. A desirable guideline for total phosphorus is 0.05 mg/l as P where streams enter lakes or reservoirs (FWPCA, Water Quality Criteria, 1968). The other criteria levels for different units and forms of phosphorus have been determined by unit conversion and relationships found between the phosphorus forms in Region 10. The other forms of phosphorus are used only as indicators when data for total phosphorus is lacking.
Nitrate Nitrogen	0.30 mg/l-N 1.33 mg/l-NO_3	Mackenthum (1965) cited results indicating that inorganic nitrogen at 0.30 mg/l and inorganic phosphorus at 0.01 mg/l, at the start of an active growing season, subsequently permitted algal blooms (FWPCA, Water Quality Criteria, 1968).
Ammonia Nitrogen	Unionized 0.02 mg/l-N Total 0.20 mg/l-N Total 0.26 mg/l-NH_4	The amount of unionized ammonia is very much dependent upon pH, temperature, and concentration of total ammonia. A maximum level of 0.02 mg/l as unionized ammonia is recommended to minimize toxicity to freshwater aquatic life (EPA, Quality Criteria for Water, 1976). Concentrations of total ammonia above 0.20 mg/l as N are indicative of organic pollution (Klein, River Pollution 1., Chemical Analysis, 1959).

Parameter	Criteria Level/Units	Environmental Impact and Reference
Bacteria	Total Coliform 1000/100 ml Fecal Coliform 240/100 ml	Total and fecal coliform are microbiological indicators used to determine or indicate the safety of water for drinking, swimming, and shellfish harvesting. A fecal coliform log mean of 200 per 100 ml for bathing waters and 14 per 100 ml for shellfish harvesting waters is recommended by Quality Criteria for Water, EPA, 1976. State standards range from 240 total/50 fecal per 100 ml for primary contact recreation in Idaho, 1000 total per 100 ml in Oregon for general beneficial use, and 1000 total per 100 ml in Washington for Class B general recreation. From the above discussion, the suggested criteria level based on general recreation is 1000 per 100 ml for total coliform and 240 per 100 ml for fecal coliform.
Dissolved Solids Conductivity	TDS 500 mg/l Cond. 750 umho/cm	High levels of dissolved solids are a hazard for irrigation water. A maximum level of 500 mg/l is indicated for water from which no detrimental effects will usually be noticed. For domestic water supply, the maximum level is 250 mg/l (EPA, Quality Criteria for Water, 1976). A relationship exists between dissolved solids and conductivity where total dissolved solids = .6 to .8 times the conductivity.
Boron	750 ug/l	For long term irrigation, a maximum level of 750 ug/l is recommended for sensitive crops (EPA, Quality Criteria for Water, 1976).

Parameter	Criteria Level/Units	Environmental Impact and Reference
Benthic Invertebrate Biomass	--	Is a measure of the standing crops of the benthic fauna. Typical responses of the standing crop to environmental stress are: Stress — Standing Crop Response Toxic Substance — Reduce Severe Temperature Alterations — Variable Silt — Reduce Inorganic Nutrients — Increase Organic Nutrients (high O_2 demand) — Increase (EPA Biological Field and Laboratory Methods, 1973.)
Chlorophyll a	3 mg/l 3-20 mg/l 20 mg/l	Oligotrophic Mesotrophic Eutrophic (Vollenweider, Dr. R.A., Water Management Research, Scientific Fundamentals of the Eutrophication of Lakes and Flowing Waters with Particular Reference to Nitrogen and Phosphorus as Factors in Eutrophication, DAS/CSI/68.27).
Species Diversity	<1 polluted 1-3 moderate pollution >3 unpolluted	The species diversity index reflects the response of the benthic macroinvertebrate community to pollutional stress (Wilhelm 1970).

Heavy Metals Toxicity

Metal	Criteria Level	Environmental Impact	Reference
Cadmium	30 ug/l	Aquatic life protected in hard water	1
	3 ug/l	Eggs and larvae of salmon in hard water	
Chromium	50 ug/l	Mixed aquatic populations protected	1
Copper	20 ug/l	96 hour TL_{50} to Chinook salmon in soft water was 31 ug/l at hatch and 18 ug/l at 1 month old	2
Lead	30 ug/l	Aquatic life protected	1
Mercury	0.2 ug/l	Selected species of fish and predatory aquatic organisms protected	1
Zinc	100 ug/l	96 hour TL_{50} to Chinook salmon in soft water at 1 month old	2
	80 ug/l	Algalcidal concentration for Selenastrum Capriconutum	3

References:

1. EPA R3.73.033, Ecological Research Series, Water Quality Criteria 1972, U.S. Government Printing Office, 1973.

2. EPA, Quality Criteria for Water, 1976.

3. Green, et. al., Report to Region X on the Results of the Spokane River Algal Assays, 1973.

4. Wilhelm, J.L. 1970. "Range of Diversity Index in Benthic Macroinvertebrate Populations" JWPCF, 42(S); R221-R224.

Pesticide Toxicity

The following criteria levels are recommended to protect the freshwater aquatic life (EPA, Quality Criteria for Water, 1976).

Pesticide	Criteria Level
Aldrin	.003 ug/l
Dieldrin	.003 ug/l
Chlordane	.010 ug/l
DDT	.001 ug/l
Endrin	.004 ug/l
Heptachlor	.001 ug/l
Lindane	.010 ug/l
Malathion	.100 ug/l
Parathion	.040 ug/l