

PORTNEUF RIVER TMDL

WATER BODY ASSESSMENT AND
TOTAL MAXIMUM DAILY LOAD

Prepared by

Idaho Division of Environmental Quality
Pocatello Regional Office
224 South Arthur
Pocatello, ID 83204

March 1999

Table of Contents

1. Executive Summary	1
2. Portneuf River Subbasin Description	4
2.1 General	4
2.1.1 Watershed Characteristics	12
2.1.2 Cultural Characteristics	24
2.2 Water Quality Concerns & Status	31
2.2.1 Water Quality Limited Segments Occurring in the Subbasin	36
2.2.2 Applicable Water Quality Standards	36
2.2.3 Summary and Analysis of Existing Water Quality Data	39
Flow Alteration	43
Dissolved Oxygen	43
Oil and Grease	50
Bacteria	51
Sediment	56
Nutrients	64
Organic Compounds	70
Metals	71
Temperature	72
2.2.4 Streams Fully Supporting Beneficial Uses	78
2.3 Summary of Past and Present Pollution Control Efforts	78
3. Portneuf River Loading Analysis	81
3.1 General	81
3.1.1 Reasonable Assurance	85
3.2 Pollutant Standards/Targets and Load Analysis	86
3.2.1 Flow Alteration	86
3.2.2 Dissolved Oxygen	87
3.2.3 Bacteria	88
3.2.4 Oil and Grease	95
3.2.5 Sediment	99
3.2.6 Nutrients	116

Acronyms and an Abbreviated Glossary	136
Literature Cited	143
Appendices	155
Appendix A. <i>State Of Idaho water quality standards</i>	155
Appendix B. <i>Results of Beneficial Use Reconnaissance Project monitoring</i>	157
Appendix C. <i>Additional bacteria information</i>	159
Appendix D. <i>Additional sediment information</i>	171
Appendix E. <i>Additional nutrient information</i>	188
Appendix F. <i>Summary of regression/correlation statistics</i>	200
Appendix G. <i>Methods to estimate nutrient loads</i>	203

List of Figures

Figures

1.	Portneuf River subbasin 303(d) waterbodies and USGS surface-water stations	5
2.	Portneuf River subbasin cities and towns	6
3.	Weighted average soil slope in the Portneuf River subbasin	7
4.	Weighted average K-factor in the Portneuf River subbasin.	8
5.	Land ownership in the Portneuf River subbasin	26
6.	Land use in the Portneuf River subbasin.	28
7.	Exceedances of fecal coliform standards for primary contact recreation in the Portneuf River subbasin, 1990-1994.	53
8.	Fecal coliform monitoring at USGS surface-water stations, 1989-1996.	54
9.	Fecal streptococci monitoring at USGS surface-water stations, 1989-1996	55
10.	Temperature monitoring at the Marsh and Pocatello USGS surface-water stations, 1996	74
11.	Temperature monitoring at the Topaz USGS surface-water station, 1993-1996	75
12.	Instantaneous temperature sampling at various sites in the Mink Creek watershed, 26 July 1997	76
13.	Temperatures recorded by miniature temperature loggers at two sites, Forest Service boundary and Portneuf Road bridge, in the Mink Creek watershed, July to September 1977	77
14.	Regressions between flow and suspended sediment at USGS surface-water stations	106
15.	Regressions between flow and total inorganic nitrogen at USGS surface-water stations	119
16.	Regressions between flow and total phosphorus at USGS surface-water stations	120

List of Tables

Table

ES	Load analyses of pollutants identified in the Portneuf River subbasin	3
1.	Monthly precipitation at the National Weather Service Station - Pocatello	10
2.	Monthly temperatures (Fahrenheit) at the National Weather Service Station - Pocatello	10
3.	Flow information from USGS surface-water stations in the Portneuf River subbasin	11
4	Waterbodies in the Portneuf River subbasin on the 303(d) list	13
5	Watershed characteristics of 303(d)-listed tributaries in the Portneuf River subbasin	14
6	Qualitative habitat characterization of streams in the Portneuf River subbasin, September 1987	16
7.	General information of waterbodies in the Portneuf River subbasin	17
8.	Stream channel stability rating for Portneuf River subbasin streams on the Caribou National Forest	20
9.	Habitat conditions of fishery streams on Bureau of Land Management land	22
10.	Recognized beneficial uses for waterbodies in the Portneuf River on the 303(d) list . . .	23
11.	Electrofishing results for streams on Ceded Lands of the Shoshone-Bannock Indian Tribes, September 1987	25
12.	Land ownership in the Portneuf River subbasin	27
13.	Land use in the Portneuf River subbasin	27
14.	Demographic information for Bannock and Caribou counties, Idaho	29
15.	Total employment and real earnings by sector for Bannock and Caribou counties, Idaho, 1992	30
16.	National Pollution Discharge Eliminator System (NPDES) permits in the Portneuf River subbasin	32
17.	Reservoirs and irrigation canals in the Portneuf River subbasin	33
18.	Groups working to improve water quality in the Portneuf River subbasin	34
19.	Water quality limited segments in the Portneuf River subbasin on the 303(d) list	37
20.	State of Idaho water quality numeric standards	38
21.	Sediment targets for consideration in writing Total Maximum Daily Loads	40
22.	Status of 303(d)-listed waterbodies in the Portneuf River subbasin as to support of their beneficial uses	41
23.	Status of non-303(d)-listed waterbodies in the Portneuf River subbasin as to support of their beneficial uses	42
24.	Temperature and dissolved oxygen data in Hawkins Reservoir from Idaho Department of Fish and Game sampling in July 1991, IDFG sampling in January 1993, and Idaho Division of Environmental Quality sampling in August 1997	45
25.	Temperature and dissolved oxygen monitoring at USGS surface-water stations, 1989-1996	46

26.	Results of monitoring Mink Creek at the Forest Service boundary and the Portneuf Road bridge, November 1997 to August 1998	49
27.	Exceedances of fecal coliform standards for primary contact recreation in the Portneuf River subbasin	52
28.	Channel stability evaluation of sections of the upper Portneuf River, Toponce Creek, and Twentyfourmile Creek	57
29.	Sediment input into the Portneuf River subbasin	59
30.	Estimated erosion and sedimentation from agricultural land in Portneuf River subbasin	60
31.	Annual mean, standard deviation and range of turbidity and total suspended solids in Portneuf River and Marsh Creek, 1976	61
32.	Mean suspended sediment and sediment loading from cropland in subwatersheds in the lower Portneuf River subbasin, November 1985 to July 1986	62
33.	Flow-weighted average pounds/day for nutrients by yearly average flow in the upper Portneuf River subbasin, March to October 1985	66
34.	Ortho phosphate monitoring in the Portneuf River, 1972 and 1991	67
35.	Water quality monitoring in the lower Portneuf River, July 1992 to May 1993	69
36.	Exceedances of state water quality standards for temperature in the Portneuf River subbasin since 1991	73
37.	Water quality projects in the Portneuf River subbasin	79
38.	Descriptive statistics summary for sediment and nutrients monitored at USGS surface-water stations	82
39.	Results of F-tests and t-tests between early and late periods for sediment and nutrients monitored at USGS surface-water stations	84
40.	Exceedances of state water quality standards for fecal coliform in the Portneuf River subbasin since 1990	89
41.	Fecal coliform information, instantaneous and geometric mean, from Southeastern District Health Department, Idaho Division of Environmental Quality, and USGS surface-water stations at Pocatello and Tyhee	91
42.	Geometric mean of fecal coliform in the Portneuf River	93
43.	Load reductions for fecal coliform in the lower Portneuf River	94
44.	Estimated total suspended solids and oil and grease loads from stormwater runoff from the Pocatello-Chubbuck urban area	96
45.	Estimated monthly load and target load of oil and grease in the Portneuf River	98
46.	Estimated sediment loads in the Portneuf River subbasin	101
47.	Estimated sediment load above the Pocatello USGS surface-water station	102
48.	Estimated sediment load above the Marsh Creek USGS surface-water station	103
49.	Estimated sediment load above the Topaz USGS surface-water station	104
50.	Estimated natural sediment load in the Portneuf River subbasin	105

51.	Suspended sediment target concentrations at USGS surface-water stations and percentile rank of target concentrations within the range of concentrations observed at stations during the respective time periods	107
52.	Estimated reductions in load for suspended sediment at USGS surface-water stations	109
53.	Severity of ill effect from target loads of suspended sediment for high flows and low flows in the Portneuf River subbasin	111
54.	Duration of exposure at suspended sediment concentrations of 50 and 80 mg/l which results in a severity of ill effect below the lethal and para-lethal class for eggs and larvae of salmonids and nonsalmonids and adult freshwater nonsalmonids	111
55.	Suspended sediment load reductions by source based on percentage of sediment yield by land use	113
56.	Concentrations of total suspended solids discharged into the Portneuf River by NPDES-permitted facilities in the last 12 months for which information was available	114
57.	Estimated nutrient loads in the Portneuf River subbasin	118
58.	Nutrient loads at USGS surface-water stations estimated from flow:nutrient regression analysis for daily flows and mean concentration and average monthly flows, 1955-1995	122
59.	Mean and median for nutrient loading estimates at USGS surface-water stations in the Portneuf River	123
60.	Selected low concentrations of nutrients in the Portneuf River subbasin	126
61.	Potential sources of concentrations of parameters in springs in the lower Portneuf River reach	129
62.	Estimated reduction in loads for nutrients at the Pocatello, Marsh Creek, and Topaz USGS surface-water stations	131
63.	Estimated annual loads from sources that contribute to nutrients loads at the Tyhee USGS surface-water station	132
64.	Estimated reduction in loads from sources that contribute to nutrient loads at the Tyhee USGS surface-water station	133
A-1	State of Idaho water quality numeric standards	156
B-1	Status of waterbodies in the Portneuf River subbasin as to support of their beneficial uses	158
C-1	Fecal coliform information from the Portneuf River subbasin	160
C-2	Fecal coliform information from the Portneuf River subbasin	163
C-3	Fecal streptococci information from the Portneuf River subbasin	165
C-4	Bacteria counts in the Portneuf River subbasin, November 1985 to July 1986	167
C-5	Bacteria counts in the Portneuf River subbasin in the vicinity of Pocatello, August 1977	168
C-6	Fecal coliform sampling in Mink Creek, lower Portneuf River, and Pocatello Creek, August to October 1998	169
C-7	Fecal coliform concentrations at six sites in the Downey Canal reach of the Portneuf River, 1995-1997	170

D-1	Suspended sediment from tributaries in the lower Portneuf River, November 1985 to July 1986	172
D-2	Turbidity and suspended sediment monitoring at USGS surface-water stations, 1989-1996	173
D-3	Turbidity and total suspended solids monitoring in streams in the Portneuf River subbasin	176
D-4	Sediment delivery resulting from streambank erosion for streams in the upper Portneuf River subbasin	177
D-5	Mean annual computed sediment discharge at the USGS Tyhee and Pocatello surface-water stations, 1950-1989	178
D-6	Mean computed sediment discharge by month at two sites on the Portneuf River	179
D-7	Turbidity monitoring at 10 sites in the Portneuf River, 1969-1971	180
D-8	Rates used to estimate sediment loads for the Portneuf River subbasin	181
D-9	Daily suspended sediment loads based on the regression equation ($\log SS = 0.93(\log \text{flow}) - 0.270$) summed by month, Pocatello USGS surface-water station, 1955-1995	182
D-10	Daily suspended sediment loads based on the regression equation ($SS = 2.277(\text{flow}) - 80.979$) summed by month, Marsh Creek USGS surface-water station, 1955-1995	183
D-11	Daily suspended sediment loads based on the regression equation ($SS = 0.559(\text{flow}) - 25.795$) summed by month, Topaz USGS surface-water station, 1955-1995	184
D-12	Target suspended sediment loads based on the monthly average x target concentration, Pocatello USGS surface-water station, 1955-1995	185
D-13	Target suspended sediment loads based on the monthly average x target concentration, Marsh Creek USGS surface-water station, 1955-1995	186
D-14	Target suspended sediment loads based on the monthly average x target concentration, Topaz USGS surface-water station, 1955-1995	187
E-1	Mean values for surface water parameters measured at 16 sites in the Portneuf River in the Pocatello area in July and October, 1992 and February and April, 1993	189
E-2	Nutrient (mg/l) monitoring at USGS surface-water station, 1970-1996	190
E-3	Nitrogen and phosphorus monitoring in the Portneuf River subbasin in the vicinity of Pocatello, August 1977	194
E-4	Nutrient input from tributaries into the lower Portneuf River, November 1985 to July 1986	195
E-5	Annual mean, standard deviation, and range of nutrients in Portneuf River and Marsh Creek, 1976	197
E-6	Nitrate (mg/l) monitoring at 10 sites in the Portneuf River, 1969-1971	198

E-7	Nutrient and sediment monitoring in Marsh Creek, 1988	199
F-1	Regression/correlation statistics summary for sediment and nutrients monitored at USGS surface-water stations	201
G-1	Daily total inorganic nitrogen loads based on the regression equation ($TIN = -0.001(\text{flow}) + 2.793$) summed by month, Tyhee USGS surface-water Station, 1986-1993	209
G-2	Daily total inorganic nitrogen loads based on the regression equation ($\log TIN = 0.802(\log \text{flow}) - 2.223$) summed by month, Pocatello USGS surface-water station, 1955-1995	210
G-3	Daily total inorganic nitrogen loads based on the regression equation ($TIN = -0.002(\text{flow}) + 1.051$) summed by month, Marsh Creek USGS surface-water station, 1955-1995	211
G-4	Daily total inorganic nitrogen loads based on the regression equation ($TIN = -0.001(\text{flow}) + 0.884$) summed by month, Topaz USGS surface-water station, 1955-1995	212
G-5	Daily total phosphorus loads based on the regression equation ($TIN = -0.0001(\text{flow}) + 0.529$) summed by month, Tyhee USGS surface-water station, 1986-1993	213
G-6	Daily total phosphorus loads based on the regression equation ($\log TP = 0.825(\log \text{flow}) - 3.147$) summed by month, Pocatello USGS surface-water station, 1955-1995	214
G-7	Daily total phosphorus loads based on the regression equation ($TP = 0.001(\text{flow}) + 0.023$) summed by month, Marsh Creek USGS surface-water station, 1955-1995	215
G-8	Daily total phosphorus loads based on the regression equation ($TP = -0.0004(\text{flow}) - 0.013$) summed by month, Topaz USGS surface-water station, 1955-1995	216
G-9	Total inorganic nitrogen loads based on the average monthly flow x average site concentration (1972-1994), Tyhee USGS surface-water station, 1986-1993	217
G-10	Total inorganic nitrogen loads based on the average monthly flow x average site concentration (1990-1996), Pocatello USGS surface-water station, 1955-1995	218
G-11	Total inorganic nitrogen loads based on the average monthly flow x average site concentration (1990-1996), Marsh Creek USGS surface-water station, 1955-1995	219
G-12	Total inorganic nitrogen loads based on the average monthly flow x average site concentrations (1993-1996), Topaz USGS surface-water station, 1955-1995	220
G-13	Total phosphorus loads based on the average monthly flow x average site concentration (1970-1994), Tyhee USGS surface-water station, 1986-1993	221
G-14	Total phosphorus loads based on the average monthly flow x average site concentration (1990-1996), Pocatello USGS surface-water station, 1955-1995	222

G-15	Total phosphorus loads based on the average monthly flow x average site concentration (1990-1996), Marsh Creek USGS surface-water station, 1955-1995	223
G-16	Total phosphorus loads based on the average monthly flow x average site concentration (1993-1996), Topaz USGS surface-water station, 1955-1995	224
G-17	Target total inorganic nitrogen loads based on the monthly average x target concentration, Tyhee USGS surface-water station, 1986-1993	225
G-18	Target total inorganic nitrogen loads based on the monthly average x target concentration, Pocatello USGS surface-water station 1955-1995	226
G-19	Target total inorganic nitrogen loads based on the monthly average x target concentration, Marsh Creek USGS surface-water station, 1955-1995	227
G-20	Target total inorganic nitrogen loads based on the monthly average x target concentration, Topaz USGS surface-water station, 1955-1995	228
G-21	Target total phosphorus loads based on the monthly average x target concentration, Tyhee USGS surface-water station, 1986-1993	229
G-22	Target total phosphorus loads based on the monthly average x target concentration, Pocatello USGS surface-water station, 1955-1995	230
G-23	Target total phosphorus loads based on the monthly average x target concentration, Marsh Creek USGS surface-water station, 1955-1995	231
G-24	Target total phosphorus loads based on the monthly average x target concentration, Topaz USGS surface-water station, 1955-1995	232
G-25	Estimated nutrient loads from stormwater runoff from the Pocatello-Chubbuck urban area.	233
G-26	Estimated nutrient loads from the Pocatello Sewage Treatment Plant to the Portneuf River.	234
G-27	Reported flows from springs in the lower Portneuf River subbasin	235
G-28	Estimated flows from springs in the lower Portneuf River subbasin.	236
G-29	Monitoring of nutrient sources in the lower Portneuf River	237
G-30	Mean concentrations of nutrients sampled in springs in the lower Portneuf River, July 1992 to May 1993.	238
G-31	Estimated annual nutrient loads for lower Portneuf River springs and FMC IWW ditch	239