The Lake Walcott Subbasin Assessment, Total Maximum Daily Load, and Implementation Plan

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The Lake Walcott Watershed Advisory Group was instrumental in the preparation of the Lake Walcott Subbasin Assessment and TMDL (or SBA-TMDL). The principle writer, Clyde H. Lay, prepared the SBA-TMDL. It was written to satisfy the Idaho Division of Environmental Quality's Suggested TMDL Outline. Rob Sharpnack, IDEQ-TFRO, prepared the maps and figures. Additionally, Dr. Balthasar Buhidar was instrumental in shaping the final document. Much of his work with the Upper Snake Rock TMDL severed as a guide, in addition to the suggested outline, for the Lake Walcott SBA-TMDL. Dr. Tom Miller also prepared an early version of the Subbasin Assessment of which portions were incorporated into the final SBA-TMDL.

A presentation was made to the WAG on September 22, 1999 with a solicitation of comments from the group. A presentation was also made to the Upper Snake Basin Advisory Group on October 6, 1999. Comments were incorporated into Preliminary Draft No. 1 on October 11, 1999. A Preliminary Draft was prepared for internal IDEQ-Twin Falls Regional Office beginning October 11, 1999. Those involved included: Darren Brandt, Dr. Balthasar Buhidar, Rob Sharpnack and Mike Etcheverry. From comments received with additional extensive research, a Public Review Draft was prepared and a 30-day public review began on November 1, 1999. The Lake Walcott SBA-TMDL was distributed to interested parties.

The Subbasin Assessment was intended to be iterative during the TMDL development phase, so that the assessment and the final TMDL would complement each other in content when final submittal to USEPA-Boise/Seattle occurs on or before December 31, 1999.

TABLE OF CONTENTS

PREPARERS AND CONTRIBUTORS i
TABLE OF CONTENTS ii
LIST OF TABLES vi
LIST OF FIGURES viii
ACRONYMS AND GLOSSARY ix
1.0 EXECUTIVE SUMMARY OF THE LAKE WALCOTT SUBBASIN ASSESSMENT AND TMDL DEVELOPMENT 1
2.0 INTRODUCTION 4
2.0.1 Identification System 4
2.0.2 Compilation of Databases 4
2.0.3 Watershed Advisory Group Involvement 7
2.1 Characterization of the Watershed 9
2.1.1 Subbasin General Characteristics 9
2.1.1.1 Land use and ownership 10
2.1.1.2 Population and recreation 13
2.1.2 Ecoregion 15
2.1.2.1 Topography 17
2.1.2.2 Potential natural vegetation 17
2.1.2.3 Climatology: precipitation, humidity, temperature 17
2.1.2.4 Soils and geology 18
2.1.3 Subbasin Hydrology 20
2.1.3.1 Snake River-Lake Walcott Reach 23
2.1.3.2 Reservoirs 23
2.1.3.3 Aquifers 24
2.1.3.4 Tributaries 28
2.1.3.5 Canals and drains 33
2.1.4 Biological Characteristics 35
2.1.4.1 Fisheries 35
2.1.4.2 Macroinvertebrates 40
2.1.4.3 Waterfowl 41
2.1.4.4 Endangered, threatened, and sensitive species 41
2.1.4.5 Aquatic vegetation 41
2.2 Water Quality Concerns and Status 42
2.2.1 General Information on Point and Nonpoint Sources 44
2.2.2 Water Quality Limited Stream Segments in Subbasin 45
2.2.2.1 American Falls to Eagle Rock 46
2.2.2.2 Eagle Rock to Massacre Rocks 46
2.2.2.3 Massacre Rocks to Lake Walcott 46
2.2.2.4 Minidoka Dam to Milner Dam 47
2.2.2.5 Rock Creek, East Fork, South Fork 47
2.2.2.6 Marsh Creek 48

2.2.2.7 Other tributaries.. 48
2.2.3 Applicable Beneficial Uses and Water Quality Standards 49
2.2.3.1 Applicable designated and existing beneficial uses 52
2.2.3.2 Applicable water quality standards 52
2.2.3.3 Flow alteration.. 54
2.2.3.4 Effects on threatened and endangered aquatic species............................. 54
2.2.3.5 Fisheries concern on §303(D) listed waterbodies 54
2.2.3.6 Recreational uses and its impacts... 55
2.2.4 Analysis of Existing Water Quality Data 55
2.2.4.1 The Lake Walcott Reach of the Snake River 59
2.2.4.2 Agricultural drains and fecal coliform bacteria.. 81
2.2.4.3 Pesticides: Massacre Rocks to Lake Walcott 82
2.2.4.4 Oil and grease 83
2.2.4.5 Rock Creek stream segments 85
2.2.4.6 Summary of existing water quality data 90
2.2.5 Identification of data gaps 91
2.3 Pollution Source Inventory.. 92
2.3.1 Identification of Point and Nonpoint Sources 93
2.3.1.1 American Falls to Eagle Rock.. 93
2.3.1.2 Eagle Rock to Massacre Rocks 94
2.3.1.3 Massacre Rocks to Lake Walcott 94
2.3.1.4 Minidoka Dam to Milner Dam... 98
2.3.1.4.1 Minidoka Dam to Burley/Heyburn Bridge 98
2.3.1.4.2 Burley/Heyburn Bridge to Milner Dam..................................... 99
2.3.1.5 Rock Creek, East Fork, South Fork.. 100
2.3.1.6 Marsh Creek 101
2.3.1.7 Other tributaries.. 101
2.3.2 Characterization of Specific Pollutant Per Industry 101
2.3.2.1 Hydroelectric impoundments for generation and agriculture................. 101
2.3.2.2 Municipalities... 102
2.3.2.3 Food processors.. 102
2.3.2.4 Aquaculture 102
2.3.2.5 Nonpoint sources.. 102
2.3.3 Groundwater Concerns.. 104
2.4 Summary of Past/Present Pollution Control Efforts.. 105
2.4.1 Nonpoint Source Pollution Control Efforts.. 105
2.4.1.1 Water quality projects 106
2.4.1.2 э401 Water quality certification process 106
2.4.1.3 Idaho Department of Lands 107
2.4.1.4 Irrigation community pollution control projects 108
2.4.1.5 э319 Projects 108
2.4.1.6 104(B) Projects.. 108

2.4.1.7 Ground water 108
2.4.2 Point Source Pollution Control Efforts 109
2.4.2.1 Aquacultures general permit 109
2.4.2.2 Food processors NPDES permits 110
2.4.2.3 Municipalities NPDES permits 110
2.4.2.4 Mid-Snake phosphorus TMDL 111
2.4.2.5 The Portneuf, American Falls, and Blackfoot TMDLs 111
2.4.3 Monitoring in the Lake Walcott Reach 111
2.4.3.1 Soil Conservation District monitoring 111
2.4.3.2 NPDES ambient water quality monitoring 112
2.4.3.3 BURP monitoring 112
2.4.4 No-Net Increase Policy on TMDLs 113
2.4.4.1 Nonpoint source provision of NNI policy 114
2.4.4.2 Point source (NPDES) provision of NNI policy 114
2.4.4.3 General provision of NNI policy 116
2.4.5 Pollution Prevention 118
2.5 Public Participation 118
2.5.1 Upper Snake Basin Advisory Group 118
2.5.2 The Lake Walcott Watershed Advisory Group 119
2.5.3 Public Notice 119
3.1 Instream Water Quality Target(s) 119
3.1.1 American Falls To Massacre Rocks 119
3.1.1.1 Sediment 120
3.1.2 Massacre Rocks To Lake Walcott 121
3.1.2.1 Sediment 121
3.1.2.2 Dissolved oxygen/organic enrichment 121
3.1.2.3 Pesticides 121
3.1.3 Minidoka Dam To Milner Dam 122
3.1.3.1 Sediment 122
3.1.3.2 Oil and grease 122
3.1.3.3 Dissolved oxygen/organic enrichment 123
3.1.3.4 Flow alteration 123
3.1.3.5 Nutrients 123
3.1.4 Rock Creek 123
3.1.4.1 Sediment 123
3.1.5 East Fork Rock Creek 124
3.1.5.1 Sediment 124
3.1.6 South Fork Rock Creek 124
3.1.6.1 Sediment 124
3.2 Estimate Of Existing Pollutant Waste Loads From Point Sources 125
3.2.1 American Falls to Massacre Rocks 125
3.2.2 Massacre Rocks to Lake Walcott 125
3.2.3 Minidoka Dam to the Burley/Heyburn Bridge 126

3.2.4 Burley/Heyburn Bridge to Milner Dam 126
3.2.5 Rock Creek 127
3.2.6 East Fork Rock Creek 127
3.2.7 South Fork Rock Creek 127
3.3 Estimate Of Existing Loads From Nonpoint Sources 127
3.3.1 American Falls to Massacre Rocks 128
3.3.2 Massacre Rocks to Lake Walcott 128
3.3.3 Minidoka Dam to Milner Dam 128
3.3.3.1 Sediment 129
3.3.3.2 Oil and grease 129
3.3.3.3 Total phosphorus 130
3.3.4 Rock Creek 131
3.3.5 East Fork Rock Creek 132
3.3.6 South Fork Rock Creek 132
3.4 Load Capacity And Margin Of Safety 133
3.4.1 Sediment 133
3.4.2 Oil and Grease 138
3.4.3 Total Phosphorus 138
3.5 Loading Analysis Model and TMDL 138
3.5.1 Sediment 139
3.5.2 Oil and Grease 139
3.5.3 Total Phosphorus 140
3.6 Total Maximum Daily Loads 140
3.6.1 American Falls to Massacre Rocks TMDL 140
3.6.2 Massacre Rocks to Lake Walcott TMDL 141
3.6.3 Minidoka Dam to Milner Dam TMDL 141
3.6.4 Rock Creek System TMDL 143
3.7 Reasonable Assurance And Implementation Schedule 143
3.7.1 Point Sources 144
3.7.2 Nonpoint Sources 145
3.7.3 Trend Monitoring Plan Goal 151
3.7.4 Legal Authorities that Defends Control and Management Actions 153
3.7.5 Connectivity Effect 155
3.7.6 Feedback Loop and Adaptive Management 155
4.0 REFERENCES 157
5.0 APPENDIX A. RIVER MILE INDEX 178
6.0 APPENDIX B. SNAKE RIVER IDEQ DATA 180
7.0 APPENDIX C. TREND MONITORING PLAN (TO BE COMPLETED BY THE LAKE WALCOTT WAG) 198
8.0 APPENDIX D PUBLIC COMMENT RESPONSES 199
9.0 APPENDIX E SUBMISSON AND APPROVAL LETTERS 215
10.0 APPENDIX F AGRICULTURAL IMPLEMENTATION PLAN 229
11.0 APPENDIX G CITY OF BURLEY IMPLEMENTATION PLAN 265

12.0 APPENDIX H CITY OF HEYBURN IMPLEMENTATION PLAN 303
13.0 APPENDIX I McCAIN FOODS IMPLEMENTATION PLAN 327
14.0 APPENDIX J SIMPLOT IMPLEMENTATION PLAN 359

LIST OF TABLES

Table 1. Land Use in the Lake Walcott Subbasin 10
Table 2. Time Comparison of Some Fish Species Distribution Occurring in the Lake Walcott Reaches of the Snake River 35
Table 3. BURP/WBAG 1996 Assessments, Lake Walcott Subbasin Tributaries 40
Table 4. Endangered Species in the Lake Walcott Subbasin 41
Table 5. 1996 э303(D) Listed Waterbodies in the Lake Walcott Subbasin 44
Table 6. 1992 э305(B) Report: Pollutants and Sources 45
Table 7. Time Period of Dissolved Oxygen Standards below American Falls Dam 49
Table 8. State of Idaho Recognized Beneficial Uses 51
Table 9. Designated Beneficial Uses of the Lake Walcott Subbasin 52
Table 10. TSS and TP Source Inventory for the Snake River, Lake Walcott Subbasin 62
Table 11. University of Idaho [IWRRI] Water Quality Data, Lake Walcott Subbasin 64
Table 12. Statistical Relations of Water Quality Parameters of the Snake River below American Falls Dam 64
Table 13. Statistical Relations of Water Quality Parameters of the Snake River below Massacre Rocks 65
Table 14. Statistical Relations of Water Quality Parameters of the Snake River below Minidoka Dam 65
Table 15. Statistical Relations of Water Quality Parameters of the Snake River below the Burley/Heyburn Bridge 66
Table 16. General Characteristics of Water Quality Parameters in the Lake Walcott Subbasin.. 66
Table 17. Temperature Exceedances in the Lower Segment of Milner Pool 72
Table 18. Outflow Routes from Milner Pool 73
Table 19. Fecal Coliform Exceedances in Each Segment of the Snake River 81
Table 20. Estimated Oil and Grease Loads from Stormwater Runoff from the Burley/Rupert/Heyburn Urban Area 84
Table 21. Land Use Information from Burley City Planning and Zoning 85
Table 22. IDEQ Sampling 1997-98, Rock Creek 88
Table 23. NPDES Permitted Facilities-Burley/Heyburn to Milner Dam 99
Table 24. Land Uses in the Rock Creek Watersheds 100
Table 25. Land Ownership Percentages and Categories in the Rock Creek Watersheds 100
Table 26. Major Sources of Nonpoint Source Pollutant 103
Table 27. Confined Feeding Types in the Lake Walcott Subbasin 105
Table 28. Pl-566 Projects in the Lake Walcott Subbasin 106
Table 29. Underground and Leaking Underground Storage Tanks 109
Table 30. Burp Monitoring Parameters 112
Table 31. Existing Point Source Pollutant Loads American Falls to Massacre Rocks 125
Table 32. Existing Point Source Pollutant Loads Minidoka Dam to Burley/Heyburn Bridge... 126
Table 33. Existing Point Source Pollutant Loads Burley/Heyburn Bridge to Milner Dam 126
Table 34. Existing Point Source Pollutant Loads Rock Creek: from East Fork/South Fork

Confluence to Snake River ... 127
Table 35. Existing Nonpoint Source Sediment Load in the American Falls to Massacre Rocks Segment ... 128
Table 36. Existing Nonpoint Source Sediment Load in the Massacre Rocks to Lake Walcott Segment ... 128
Table 37. Existing Nonpoint Source Sediment Load in the Minidoka Dam to Milner Dam Segment ... 129
Table 38. Existing Nonpoint Source Oil and Grease Load in the Minidoka Dam to Milner Dam Segment ... 129
Table 39. Existing Background, Nonpoint Source, and Total Monthly Total Phosphorus Load in the Minidoka Dam to Milner Dam Segment ... 130
Table 40. Existing Monthly Nonpoint Source Sediment Loads in the Three Rock Creek Watersheds ... 131
Table 41. Existing Monthly Nonpoint Source Sediment Loads in the Rock Creek Watershed. 131
Table 42. Existing Monthly Nonpoint Source Sediment Loads in the East Fork Rock Creek Watershed ... 132
Table 43. Existing Monthly Nonpoint Source Sediment Loads in the South Fork Rock Creek Watershed ... 132
Table 44. Suggested TSS Concentration Guidelines, Effects and Protection Levels. ... 134
Table 45. Sediment Load Capacity, Background, Wasteload, Load Allocation and Unallocated Load; American Falls to Massacre Rocks Segment ... 140
Table 46. Sediment Load Capacity, Background, Wasteload, Load Allocation, and Unallocated Load; Massacre Rocks to Lake Walcott Segment ... 141
Table 47a. Sediment. Load Capacities, Background, Wasteload Allocations, Load Allocations, and Unallocated Loads; Minidoka Dam to Milner Dam Segment ... 141
Table 47b. Oil and Grease. Load Capacities, Background, Wasteload Allocations, Load Allocations, and Unallocated Loads; Minidoka Dam to Milner Dam Segment... 142
Table 47c. Total Phosphorus. Load Capacities, Background, Wasteload Allocations, Load Allocations, and Unallocated Loads; Minidoka Dam to Milner Dam Segment... 142
Table 48. Sediment Load Capacity, Wasteload Allocation, Load Allocation, And Unallocated Load; Rock Creek Watersheds ... 142
Table 49. Short-and Long-Term Goals for Point Sources and IDEQ-TFRO on a Pollutant Basis ... 144
Table 50. Short-and Long-Term Goals for Nonpoint Sources and IDEQ-TFRO on a Pollutant Basis ... 150
Table 51. Recognized Land Management Agencies in the TMDL Process ... 153

List Of Figures

Figure 1. Hydrologic Unit Code 17040209 5
Figure 2. Subwatersheds Of 17040209 6
Figure 3a. Land Use Of 17040209 11
Figure 3b. Land Ownership Of 17040209 12
Figure 4. Population Centers In 17040209 14
Figure 5. Ecoregion Of 17040209 16
Figure 6. Average K-Factors 21
Figure 7. Dams Along The Lake Walcott Reach 22
Figure 8. Aquifers In 17040209 26
Figure 9. Reach Gains/Losses Between Massacre Rocks And Lake Walcott 27
Figure 10. Historical Rock Creek Flow 29
Figure 11. Other Tributaries In 17040209 34
Figure 12. э303(d) Listed Waterbodies 43
Figure 13a. DEQ and IWRRI Sampling Locations 57
Figure 13b. Gianotto Sampling Locations 58
Figure 14. American Falls To Massacre Rocks Temperature 68
Figure 15. Massacre Rocks To Lake Walcott Temperature 69
Figure 16. Minidoka Dam To Burley/Heyburn Bridge Temperature 70
Figure 17. Burley/Heyburn Bridge To Milner Dam Temperature 71
Figure 18. American Falls To Massacre Rocks Dissolve Oxygen 74
Figure 19. American Falls To Massacre Rocks 24 Hour Dissolved Oxygen 75
Figure 20. Massacre Rocks To Lake Walcott Dissolved Oxygen 76
Figure 21. Minidoka To Milner Dam Dissolved Oxygen 77
Figure 22. Minidoka To Milner Dam 24-Hour Dissolved Oxygen 78
Figure 23. Minidoka Gage To Neeley Gage Flow Relationship 79
Figure 24. Milner Dam Gage To Minidoka Gage Flow Relationship 80
Figure 25a. Land Use Corridor Massacre Rocks To Lake Walcott 96
Figure 25b. Land Ownership Corridor Massacre Rocks To Lake Walcott 97
Figure 26. American Falls To Massacre Rocks Design Flows 135
Figure 27. Massacre Rocks To Lake Walcott Design Flows 136
Figure 28. Minidoka Dam To Milner Dam Design Flows 137

ACRONYMS AND GLOSSARY

The acronyms and glossary used in this document are summarized in the following list. The list is only inclusive for those terms used in this Subbasin Assessment.

TERM	***DEFINITION***
Acute toxicity	The ability of a substance to cause poisonous effects resulting in severe biological harm or death soon after a single exposure or dose.
ArcViewϑ	ArcView is a computer Windows based program made by Environmental Systems Research Institute, Inc. (ESRI) for the creation of GIS-type maps.
Biopolitics	The integral relationship between the human institution of politics and the natural elements of the environment, such that no matter how scientific of technically correct certain processes or guidelines may seem, they are without foundation until accepted and established through the existing political system.
BSU	Boise State University (Boise, Idaho)
CPUE	Catch Per Unit Effort
BURP	Beneficial Use Reconnaissance Project of IDEQ.
Ephemeral stream	A stream which functions as a drainage channel that is normally dry but carries water in response to storms or annual snowmelt. There is no Idaho Administrative Procedures Act (IDAPA) definition. The United States Bureau of Land Management (USBLM) describes ephemeral streams as streams that flow for brief periods of time. Many ephemeral streams do not appear on USGS maps as solid blue lines.
Epiphyte	Plants living on another plant or partly within the plant, but not as a parasite, deriving nutrients from the air, water, or debris accumulating around it.
GIS™	Geographic Information System (by ArcView)
HUC	Hydrologic Unit Code (USGS designation)
HUC 17040209	Lake Walcott Subbasin
HUC 17040212	Upper Snake Rock Subbasin
HUC 4th Field	Subbasin hydrologic unit
HUC 5th Field	Watershed hydrologic unit (a sub component of 4th Field HUCs)
IDA	Idaho Department of Agriculture
IDL	Idaho Department of Lands
IDEQ	Idaho Division of Environmental Quality
IDFG	Idaho Department of Fish and Game

TERM	*DEFINITION*
ISCC	Idaho Soil Conservation Commission
ISU	Idaho State University (Pocatello, Idaho)
IDWR	Idaho Department of Water Resources
Intermittent stream	IDAPA §16.01.02.003.50 defines intermittent stream(s) as "a stream that has a period of zero flow for at least one week during most years. Where flow records are available, a stream with a 7Q2 hydrologically based design flow of less than one-tenth (0.1) cfs is considered intermittent. Streams with perennial pools, which create significant aquatic life uses, are not intermittent." USBLM describes intermittent streams as streams that have periodic interruptions in a normal pattern or process. United States Department of Agriculture Forest Service (USDA FS) describes intermittent streams as streams in contact with the ground water table that flow only certain times of the year, such as when the ground water table is high or when it receives water from springs or from some surface source such as melting snow in mountainous areas. It ceases to flow above the streambed when losses from evaporation or seepage exceed the available stream flow (USDA FS 1997d).
IWRRI	Idaho Water Resources Research Institute (University of Idaho)
LA	Load allocations for nonpoint source industries
LC	Load Capacity : TMDL = Assimilative Capacity – (WLA + LA + MOS)
Man-made water body	IDAPA §16.01.02.003.57 defines man-made waterways as "canals, flumes, ditches, and similar features, constructed for the purpose of water conveyance." In Upper Snake Rock there are many natural stream drainage channels which have been converted into man-made waterways.
Mid-Snake TAC	Middle Snake River Technical Advisory Committee
Mid-Snake WAG	Middle Snake River Watershed Advisory Group
MOS	Margin of safety in a TMDL
Nonpoint source	Any unconfined and diffuse source of contamination, such as stormwater or snowmelt runoff, or atmospheric pollution. Legally, a nonpoint source of water pollution is any source of water pollution that does not meet the definition of "point source" in §502(14) of the Clean Water Act. (USEPA 1997k [p. xii])
NRCS	Natural Resources Conservation Service
Perennial stream	A stream which flows year-round in most years. There is no IDAPA definition. USBLM describes perennial streams as streams which have uninterrupted flow from year to year. USDA FS describes perennial streams as streams that flow continuously throughout the year (permanently) (USDA FS 1997d).
Point source	Any discernable, confined or discrete conveyance (pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation (CAFO), or vessel or other floating craft from which pollutants are or may be discharged. (USEPA 1997k)

TERM	***DEFINITION***
QA/QC	Quality Assurance/Quality Control
SBA	Subbasin Assessment
SCC	Soil Conservation Commission (the equivalent of ISCC)
SCD	Soil Conservation District
TFRO	Twin Falls Regional Office
TMDL	Total maximum daily load. The standard formula for a TMDL is TMDL= Loading Capacity= Assimilative Capacity= Point Source Wasteloads+ Nonpoint Source Loads+ Margin of Safety.
UI or U of I	University of Idaho (Moscow, Idaho)
Upper Snake BAG	Upper Snake Basin Advisory Group
USBLM	United States Bureau of Land Management
USBOR	United States Bureau of Reclamation
USDA/ARS	United States Department of Agriculture/Agriculture Research Service
USEPA	United States Environmental Protection Agency
USDAFS	United States Department of Agriculture Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WLA	Wasteload allocations for point source facilities.

1.0 EXECUTIVE SUMMARY OF THE LAKE WALOCOTT SUBBASIN ASSESSMENT AND TMDL DEVELOPMENT

The Lake Walcott Subbasin Assessment and Total Maximum Daily Load (SBA-TMDL) for surface waters of the Hydrological Unit Code (HUC) 17040209 describes eight waterbodies that are listed on the 1996 and 1998 §303(d) lists prepared by the State of Idaho. These water bodies are considered water quality limited and may not meet their beneficial uses as defined by the State of Idaho water quality standards. The SBA provides information pertaining to existing and designated beneficial uses. The information in the SBA includes those pollutants and the sources of pollutants that are affecting these beneficial uses. The information was obtained from a variety of sources including monitoring efforts of Idaho Division of Environmental Quality (IDEQ) and other agencies and individuals. The public has also been involved in the development of the SBA-TMDL through a variety of venues. Most notably, the Lake Walcott Watershed Advisory Group and the Upper Snake Basin Advisory group have provided comment and advice throughout the development of the SBA-TMDL.

The Lake Walcott Subbasin general physical and biological characteristics have a strong influence on the water quality of the Subbasin. Additionally the scattered population centers and land uses of the Subbasin exert a significant influence on the water quality of the basin. Land use in the Subbasin is predominantly rangeland and agricultural lands used for nonirrigated agriculture. Limited irrigated agriculture also exists in the Subbasin where water is either pumped from the ground or diverted from the Snake River at American Falls Dam, Minidoka Dam, or Milner Dam. The major population center of the basin is the Burley/Heyburn area. Other small towns are scattered throughout the Subbasin. These are usually located near a water source such as the town of Rockland.

The Subbasin contains three different water sources: the Snake River; surface tributaries; and the Snake River Plain Aquifer. These sources affect water quality to varying degrees. The Snake River itself affects water quality most significantly as the amount of water entering the Subbasin from the American Falls Reservoir can be several orders of magnitude greater than either the surface tributaries or the ground water interchange. Surface tributaries can influence the water quality of the Snake River; however, usually this influence is only seen during low flow periods in the Snake River. The major aquifer may exert its most influence in the Upper Snake Rock Subbasin downstream of the Lake Walcott Subbasin. Although some limited interaction with the Snake River in the Lake Walcott Subbasin does occur.

The Subbasin land form, vegetation, topography and precipitation can be defined by three ecoregions. The predominant ecoregion of the Subbasin is the Snake River Basin High Desert. The Snake River Basin High desert ecoregion is predominantly sage-steppe grasslands. Most of the surface streams are now intermittent in nature due to irrigation withdrawals, loss of bank storage, channel modification, and evaporation. As a result, limited riparian habitat exists within the Subbasin. Those streams that remain perennial usually form from spring sources in the southern mountains of the Subbasin. Along these stream courses some riparian habitats persist. The largest remaining perennial stream in the Subbasin, aside from the Snake River, is Rock Creek and its two tributary streams the East Fork and South Fork.

Sediment is the most common listed pollutant in the Subbasin. Sediment was a listed pollutant on all 1996 §303(d) listed waterbodies within the Subbasin. Other listed pollutants include nutrients, low dissolved oxygen, pesticides, oil and grease, flow and unknown. The SBA portion of the SBA-TMDL determines the current amount of a particular pollutant in the Snake River and the Rock Creek watersheds. The SBA also determines what impact to the beneficial uses that each pollutant may have.

In general the impacts to the beneficial uses were determined by assessing the past biological communities and comparing them with the present community. In the Lake Walcott Subbasin, a general trend of improving fisheries can be seen in almost all segments of the Snake River. This is most notable over the past two decades especially in the Milner Pool. The three dams have both positive and negative effect of the salmonid populations in the Snake River. The dams remove much of the suspended sediment load entering the river, however may limit the recovery of the trout populations. These populations historically used the tributaries as spawning grounds. With the construction of the dams many populations were cut off from these spawning grounds. Additionally, the tributaries have been altered to such an extent for or due to, agriculture that few are accessible to the salmonid fishes of the river at this time. Little improvement in Salmonid fisheries, however, can be seen in the Rock Creek watersheds. Beneficial Use Reconnaissance Project (BURP) sites located in these three watersheds indicates that coldwater biota and salmonid spawning beneficial uses are not being supported.

In general, the water quality of the Snake River is very good. The reservoirs, created by the dams located on the Lake Walcott segment of the Snake River, act as large settling basins. As a result, concentrations of suspended materials (as suspended solids and sediment) are very low throughout the Snake River. Additionally, the three dams effectively remove the bedload portion of sediment from the Snake River. In all cases, average concentrations of total suspended sediment (TSS) are below 25 mg/L in the Snake River. This concentration has been determined by the National Academy of Science and National Academy of Engineers (NAS/NAE) to provide for high levels of protection for aquatic communities. The suspended sediment concentrations in the Rock Creek watersheds, however, are much higher than that of the Snake River. In the Rock Creek watersheds TSS concentrations range from 6 mg/L to 150 mg/L, well above the NAS/NAE suggested limits for even moderate protection of aquatic communities. As a result, the TMDL for the Rock Creek Watersheds will require an 88% reduction in TSS load. The single point source in these watersheds, the City of Rockland, is not a significant contributor of TSS therefore no reductions in TSS will be required of this source.

Nutrients are a listed pollutant in the Milner Pool segment of the Lake Walcott Subbasin. In this reach it was determined that total phosphorus (TP) can be a limiting nutrient, and that all nutrients may be in excess. As a result, a reduction in TP would provide the greatest reduction in nuisance aquatic vegetation. Background TP concentrations at the tailraces of the Minidoka Dam were near 0.060 mg/L; concentrations near the Milner Dam averaged 0.109 mg/L. Both point and nonpoint sources contribute to this increase in TP concentration through Milner Pool. The United States Environmental Protection Agency (USEPA) has set guidelines for TP concentrations in free-flowing rivers. The Milner Pool, however, is a run-of-the-river reservoir and may not fit into the free-flowing guideline. As a result the Mid-Snake TMDL and the USEPA guidelines were used to develop a 0.080 mg/L TP concentration target for the Milner Pool that better reflects the operational nature of the pool. A 37% reduction in TP will be required for point sources, nonpoint sources within Milner Pool area, and nonpoint sources above Minidoka Dam in order to meet this target. The reductions in those sources above Minidoka Dam will be achieved through TMDLs written and implemented in Subbasins upstream of the Lake Walcott Subbasin. The TMDL proposes to phase the Milner Pool reductions in over time. In the first five years the sources will be required to reduce TP concentrations by 20%. In the following five years monitoring data collected during the first phase will be reassessed and if needed, the final 17% reduction will be required. At that time an assessment of the reductions in TP achieved through upstream TMDLs will also be made.

The other listed pollutants in the Subbasin, in general, were well below any standard or guideline established for the protection of beneficial uses. From information gathered for the SBA it was determined that low dissolved oxygen, pesticides, sediment, and oil and grease were not a problem in the Snake River segments where these pollutants were listed. Operational guidelines, targets and limits were established in the TMDL for sediment and oil and grease. These limits would protect the current level of water quality and beneficial use support and provide protection for these uses in the future.

Flow issues were not discussed in the SBA-TMDL due to current IDEQ policy. It is IDEQ policy that flow is not a "TMDLable" pollutant and that flow is not the purview of IDEQ. As a result, a TMDL will not be completed on segments listed with flow as a pollutant.

Temperature, under the current standards may be a minor problem in some segments of the Lake Walcott Subbasin. At this time, bioassessment data and concurrent temperature information indicates that current water quality standards may be in error. IDEQ has begun a temperature study to reevaluate current temperature standards. Following the conclusion of the temperature study, temperature exceedances in the Lake Walcott Subbasin will be reassessed and if needed a temperature TMDL will be completed.

2.0. INTRODUCTION

The Lake Walcott Subbasin Assessment and TMDL describe those waterbodies HUC 17040209 listed on the 1996 э303(d) list of the Clean Water Act. In this HUC, six waterbodies were listed in 1996. Three are segments of the Snake River, one is a run-of-the-river reservoir on the Snake River, and the fifth is a tributary to the Snake River. The final listed segment is a small tributary to Rock Creek (the listed tributary to the Snake River). Additionally, the SBA-TMDL describes two water bodies added to the 1996 э303(d) list during the 1998 listing cycle, including the South Fork of Rock Creek and Marsh Creek.

2.0.1. Identification System

Throughout this SBA-TMDL the watershed delineation and numbering system (HUCs) developed by the United States Geological Survey (USGS) will be used. This system provides a standard method for describing subbasins and the watersheds within a particular subbasin. The Lake Walcott Subbasin corresponds with the fourth field HUC of 17040209. Within this subbasin, twelve watersheds have been delineated as fifth field Hydrological Units. Further resolution of subwatersheds (sixth field HUCs) is possible within the HUC system but will not be used in this SBA-TMDL. Figure 1 shows HUC 17040209 in relationship with other surrounding HUCs. Figure 2 shows the twelve watersheds found within the subbasin.

2.0.2. Compilation of Databases

The development of the SBA-TMDL required a substantial amount of data collection from sources other than Idaho Division of Environmental Quality-Twin Falls Regional Office (IDEQ-TFRO). These sources, besides IDEQ-TFRO ambient water quality monitoring, included USGS, U.S. Bureau of Reclamation (USBOR), U.S. Fish and Wildlife Service (USFWS), USEPA, U.S. Department of Agriculture/Agricultural Research Service (USDA/ARS), Natural Resources Conservation Service (NRCS), Idaho Department of Fish and Game (IDFG), Idaho Department of Lands (IDL), Idaho Department of Water Resources (IDWR), Soil Conservation Commission (SCC), several Soil Conservation Districts (SCD), and the University of Idaho/ Idaho Water Resources Research Institute (UI/IWRRI).

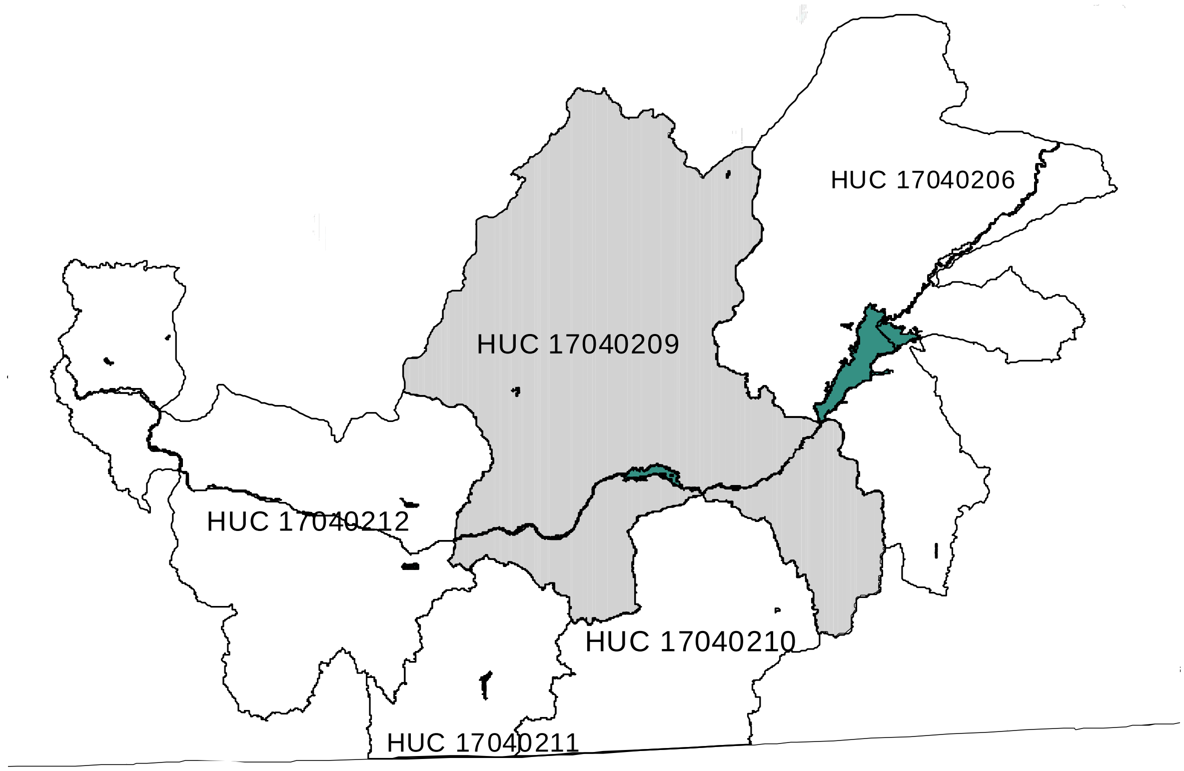


Figure 1. The Lake Walcott Subbasin, showing the surrounding Subbasins, the Snake River and reservoirs, and the Idaho state line.

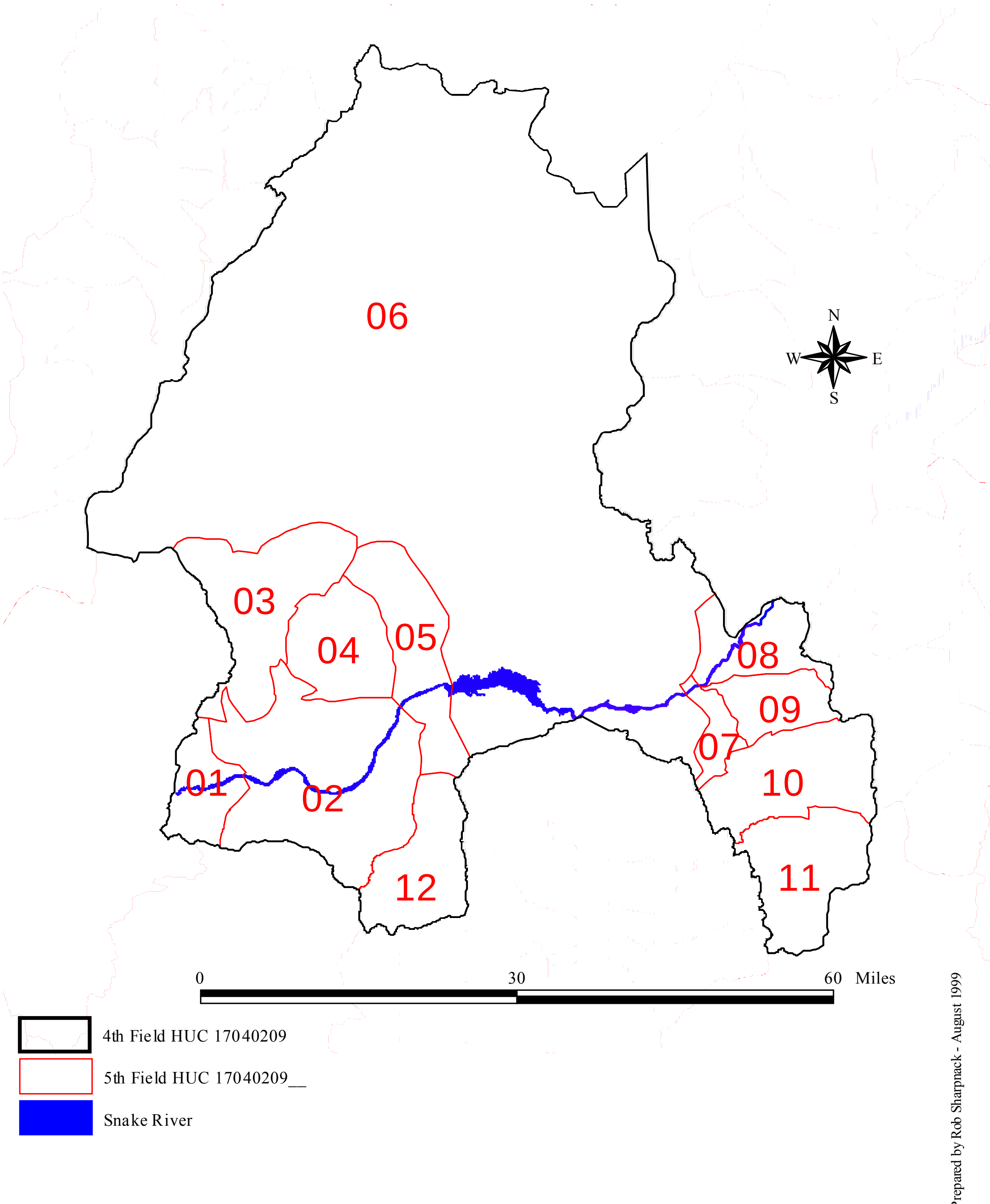


Figure 2. Watersheds located within the Lake Walcott Subbasin.

The compilation and review of data from these sources was focused primarily on assessing pollutant loads within the Snake River and from various sources that confluence with the river. It is expected that where current technology-based controls are inadequate to achieve water quality standards, the implementation of a TMDL will provide more stringent water quality-based controls. Where water quality standards are being met, or violations of narrative water quality standards are not clear cut, an antidegradation TMDL and the subsequent water quality-based controls will provide for future protection of designated and existing beneficial uses. A TMDL of this nature will protect current levels of a supported beneficial use. It will also prevent future degradation of the water quality so that beneficial uses will be maintained or improved. The Lake Walcott TMDL will be structured on wasteload allocations (WLA=s) for point sources, load allocations (LAs) for nonpoint sources, and a margin of safety (MOS): where TMDL = WLA + LA + MOS. The MOS will account for scientific uncertainty in the TMDL due to insufficient or poor quality data, lack of understanding in receiving waters assimilative capacity, and the lack of understanding on the effects of pollutant loading rates on the load capacity of receiving waters. The margin of safety, most often, will be implicit due to a conservative approach taken in determination of load capacity, point and nonpoint source loads, and conservation of pollutants in mass balance modeling.

2.0.3 Watershed Advisory Group Involvement

As envisaged in Idaho's 39-3601 et seq. legislation and the TMDL process, using the Upper Snake Basin Advisory Group (BAG) and Lake Walcott Watershed Advisory Group (WAG) have encouraged public participation for the Lake Walcott Subbasin Assessment and TMDL. Additionally, subdivisions of state government such as Soil Conservation Districts and some private civic groups have also participated.

Upper Snake Basin Advisory Group

This group provides guidance and advice to the Lake Walcott WAG and to IDEQ in the final development of SBAs and TMDLs. Part of this assistance consists of review of the document after formal presentation, to provide comments and assessment. The Subbasin Assessment and TMDL was presented to this group on October 6, 1999.

Lake Walcott Watershed Advisory Group

Following public announcements, this group organized in early 1997 and was formally recognized by the Upper Snake BAG that June. They meet bimonthly with a program of educational presentations concerning water quality issues in the sub-basin. The first elected Chair was Randy Bingham, followed by Rod Smith in early 1998. The current elected chair is Earl Christensen elected in January 1999. Findings from the draft Lake Walcott SBA and TMDL were presented to this WAG on September 22, 1999. The draft Subbasin Assessment and TMDL will be presented to this group with comments solicited.

Middle Snake River Watershed Advisory Group

This group (and its scientific arm, the Middle Snake River Technical Advisory Committee) deals with the sub-basin downstream of the Lake Walcott reach, and as the immediately receiving catchment, has expressed interest in the progress of the Lake Walcott SBA. Additionally, some of the early nutrient reductions for NPDES permitted dischargers were formulated by the adoption of the Mid-Snake Watershed Management Plan. These nutrient reduction agreements were developed by the Mid-Snake WAG, before the formation of the Lake Walcott WAG.

Soil and Water Conservation Districts (SCD); Local conservation districts began organizing in Idaho in 1940, and are legal subdivisions of State government whose volunteer district supervisors are locally elected. The district supervisors have encouraged participation from their constituents in the Lake Walcott WAG. The four districts within the area of the SBA include:

East Cassia SCD (Burley); Organized in 1956, some first types of conservation measures undertaken by this organization were windbreak plantings, range improvements, and grass seed plantings. Later, terracing of eroding farmland and gravity sprinkler installations followed. The District receives operating funds from Cassia County and the state of Idaho, and supplements these funds by renting equipment and selling trees for windbreaks (Idaho Association of Soil Conservation Districts1998).

West Cassia SCD (Burley); This area organized in 1958. Their present priorities are improved water management in irrigated land and installing terraces on non-irrigated cropland. Presently they are working to complete a study in the Oakley Fan area to decide how best to augment underground aquifers, and are cooperating with local power companies to increase the efficiency of irrigation pumps. Their programs are also funded by Cassia County and the state of Idaho, and are supplemented by conducting snow surveys for the Natural Resources Conservation Service (NRCS); renting equipment, and holding auctions (Idaho Association of Soil Conservation Districts 1998).

Minidoka SCD (Rupert); Organized in 1955, the group spent its first five years helping farmers level land, build irrigation structures, and develop proper crop rotations. More recently it has helped farmers convert to sprinkler irrigation and promotes other conservation practices (Idaho Association of Soil Conservation Districts, 1998).

Power SCD (American Falls); The earliest of the subbasin=s SCD=s, it was organized in 1948. Initially, it focused on contour and contour strip farming, conservation education programs and providing equipment for such measures. The Rock Creek Small Watershed Project (Public Law 566) eventually installed 40 miles of level farm terraces (Idaho Association of Soil Conservation Districts 1998).

State of Idaho

The State has supported individual studies occasionally in the past aimed at addressing discharge of pollutants and remedying problems (Idaho Water Resource Board 1973).

Middle Snake River Recreation Work Group (Twin Falls)
The mission of this association is to "... foster recreational uses of our abundant cultural and natural resources in such a way that will ensure long term conservation ... and quality of life." Their area of interest is the Middle Snake River Corridor (from American Falls to King Hill).

2.1 Characterization of the Watershed

The characterization of the Lake Walcott Subbasin will be based on its physical and biological features and how they interplay with the ecoregional and hydrological traits. The Lake Walcott Subbasin is complex in its ecoregional and hydrological traits principally due to its highly developed and modified hydrological characteristics, highly variable biological communities, and a rich and diverse human population that live, use, and recreate upon its waters. Part of that complexity is the issue of nonpoint source pollution within the waterbodies, which is affected by soil characteristics, climate, vegetation, topography, and human activities. This complexity is described and discussed in the following subsections relative to pollutants and their sources.

2.1.1 Subbasin General Characteristics

As defined by the fourth field HUC system, the Lake Walcott Subbasin is about 3,670 mi^2 (USEPA 1998) in South Central Idaho and encompasses three widely varying water sources:

1. The major water source is the Snake River as it is sequentially released from the impoundments of American Falls Dam, Minidoka Dam, and Milner Dam, with mean annual discharges (post-dam construction) of 7,300, 6,300, and 2,700 cubic feet per second (cfs), respectively. The downstream decreases are the result of withdrawals for irrigation.

2. Tributaries, in general, are the second source. Although Rock Creek is currently the only remaining major tributary to the Snake along this 75-mile-long reach. Rock Creek has a mean annual flow of approximately 34 cfs. The sub-area of the Rock Creek drainage is 320 mi^2 (USGS 1990) and represents 8.7% of the Subbasin.

3. The Snake River Plain aquifer is the third source. The aquifer flows beneath the majority of the surface area of the Subbasin north of the Snake River. At its southern fringe the aquifer has relatively minor contact with the Snake River in the Lake Walcott reach, and nearly all of its flow emerges downstream in HUC 17040212. Discharge from the aquifer occurs in the Thousand Springs reach of the Middle Snake River with a total discharge of 5,800 cfs. Other smaller aquifers provide localized influence.

Due to the hydrologic modification, flow in this reach of the Snake River is almost completely controlled by dam releases. Additionally, the volume of the river is so large (nearly 200 times greater on average) in comparison with that of its major tributary, Rock Creek, that the latter can only exert significant influence during low flow periods in the Snake River. Other surface flows into the Snake River in this reach are even smaller. Furthermore, the arid area in the north of the watershed, overlying the large Snake River Plain aquifer, contributes very little surface flow to the Snake River in this subbasin. The cumulative impacts of the aquifer in the Lake Walcott Subbasin are minor when compared to the dilution effects of the aquifer discharge in the Middle Snake River of the Upper Snake Rock Subbasin.

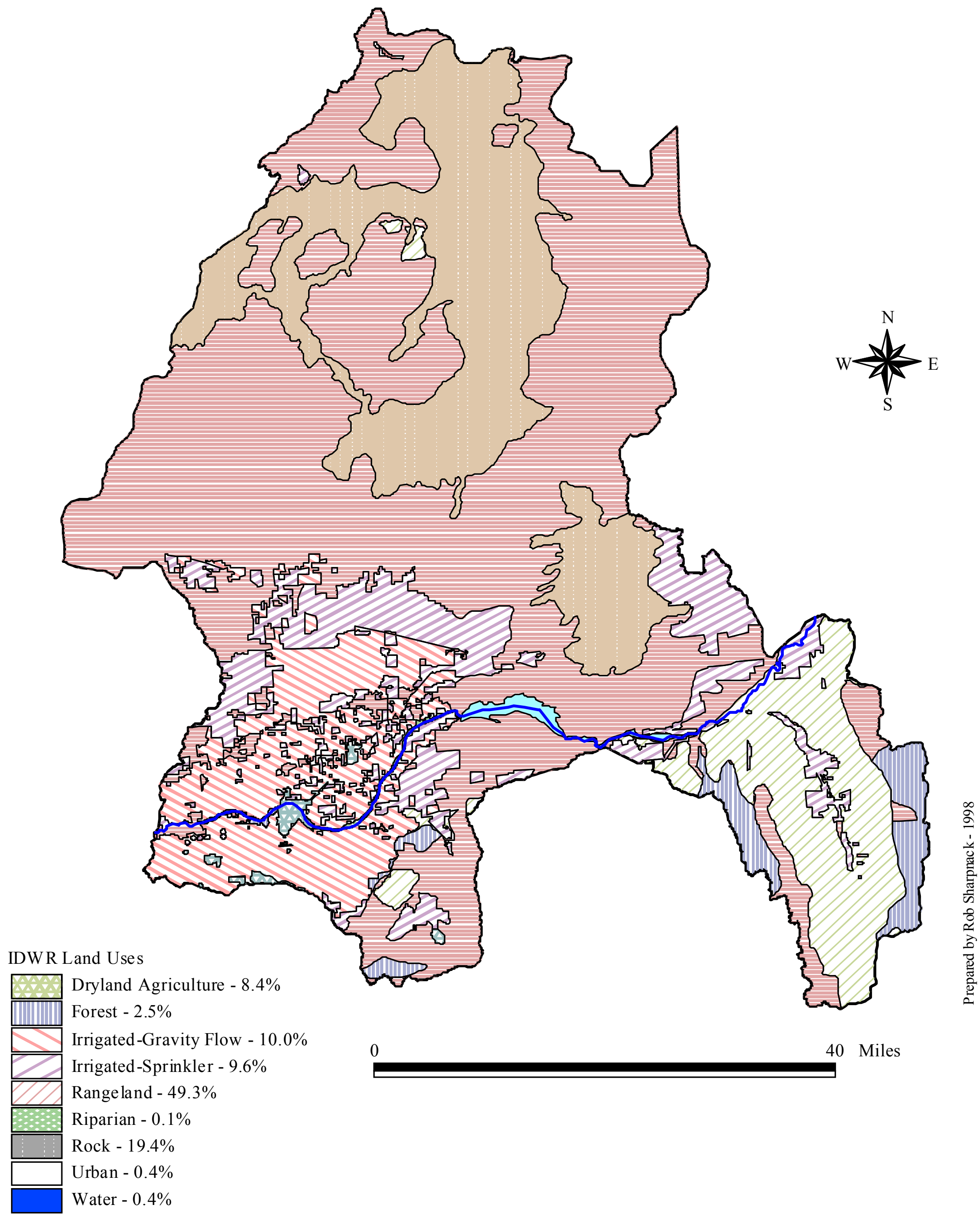
For this reason, the application of the Clean Water Act (CWA) used for determining water quality in the Lake Walcott Watershed is a matter of assessing the condition of the Snake River under differing hydrological regimes, and then assessing Rock Creek. The condition of the Snake River Plain aquifer, relative to the CWA is being assessed with at its outlet to the Snake River, in the Upper Snake Rock Subbasin (HUC 17040212), where the bulk of its discharge occurs.

2.1.1.1 Land Use and Ownership

As seen in Figures 3a and 3b, and Table 1, more than two-thirds of the sub-basin are barren basalt flows and rangeland. Nearly all the remaining is irrigated or dryland agriculture. A very small portion is forested, and urban areas are minimal.

Table 1. LAND USE IN THE LAKE WALCOTT SUBBASIN (EPA 1998**)**

Land Use Type	% of total area
Range	54
Agricultural	25
Desert	16
Forest	4
Urban	1


N
W
E
S
IDWR Land Uses
Dryland Agriculture - 8.4%
Forest - 2.5%
Irrigated-Gravity Flow - 10.0%
Irrigated-Sprinkler - 9.6%
Rangeland - 49.3%
Riparian - 0.1%
Rock - 19.4%
Urban - 0.4%
Water - 0.4%
0
40 Miles
Prepared by Rob Sharpnack - 1998

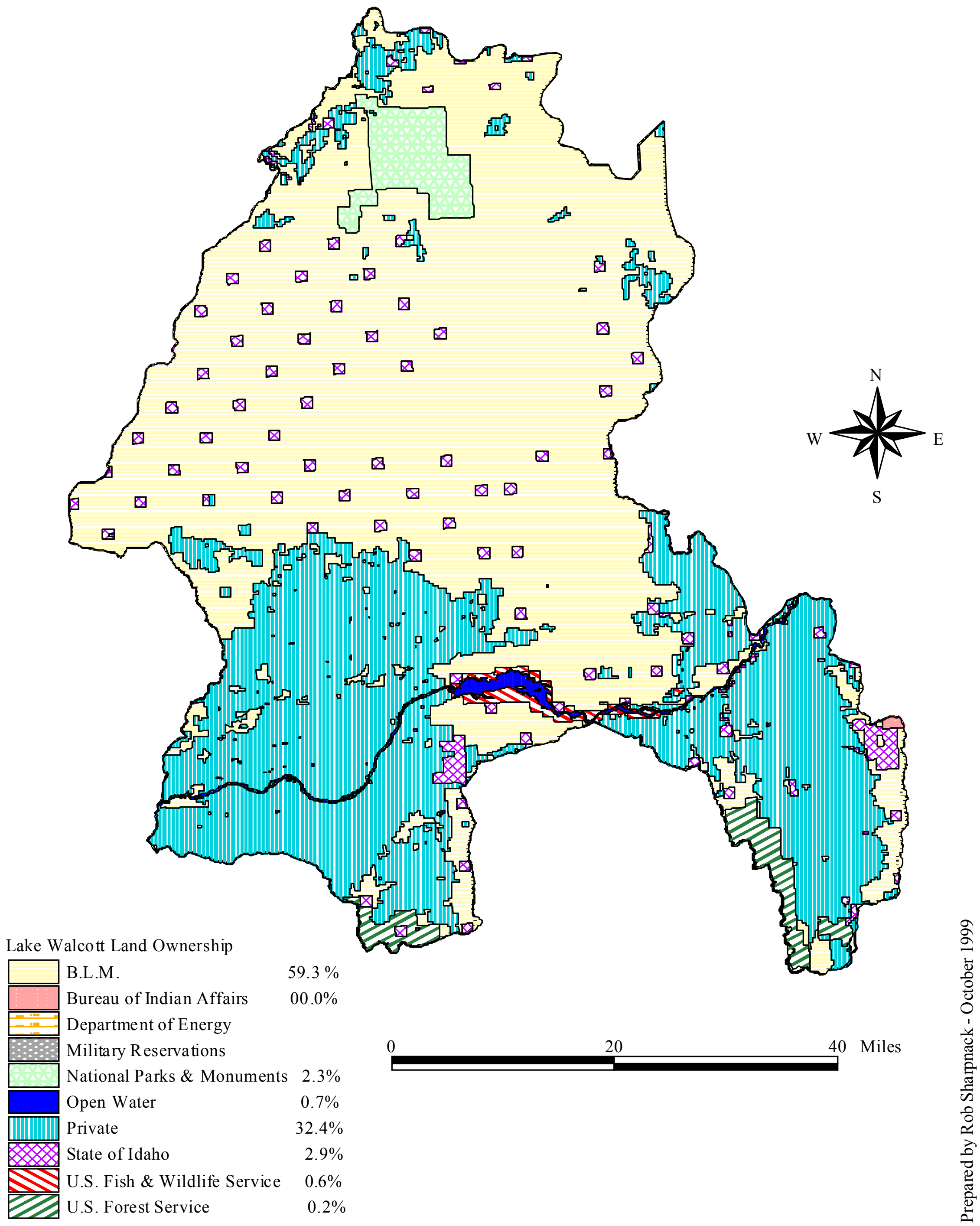


Figure 3b. Land Ownership of the Lake Walcott Subbasin

The sub-basin falls within eight counties: Jerome, Minidoka, Blaine, Butte, Power, Cassia and a portion of Oneida. Privately owned land (32.4 % of the Subbasin) are essentially the same lands that are used for agriculture. The majority of the remainder (59.3 % of the Subbasin) is managed by the BLM, these are treeless rangelands. The scattered Aschool sections ≅ (sections 16 and 36) under the management of the Idaho Department of Lands (IDL) comprise only 2.9 % of the Subbasin. The limited forested areas (0.2 % of the Subbasin) are managed by the USFS. The small area comprising Lake Walcott and the surrounding lands is under the jurisdiction of the US Fish and Wildlife Service. Less than 2 mi^2 on the crest of the Deep Creek Range are part of the Fort Hall Tribal Lands. Interstates 84 and 86 parallel the Snake River in this HUC and cross it east of Burley. US 30 follows the Snake on the south side, west of Burley. Other state and county secondary paved roads connect towns near the river, such as Highway 37 though Rockland. US 93 follows the northern edge of the Snake River Plain through Craters of the Moon, but the majority of the Subbasin is desert basalt rangeland with few roads of any kind.

2.1.1.2 Population and Recreation

The population in the Subbasin was about 37,000 in 1990 (EPA 1998), and is estimated at 40,000 in 1999. The largest municipalities are those of Burley, Rupert, Paul, and Heyburn (Figure 4). The underlying foundation for economic activity in the area is agriculture (farming, dairies, feedlots, and grazing) and associated food processing.

The area appears to have been initially inhabited by peoples of Indo-European decent perhaps 10 to 40,000 years before present. These were later displaced or absorbed by peoples of Asiatic origin at about the end of the last Ice Age. When descendants of European cultures began to settle the area in the mid-1800's, the dominant aboriginal group was that of the Shoshone Tribe.

Most of the initial agricultural activity in the area was historically dryland farming. Decreed surface rights for irrigation in the eastern plain increased from 204 cfs in 1880 to more than 25,000 cfs by 1905. In 1905 there was insufficient flow in the river to meet demands (Kjelstrom, 1986). Large-scale modification of the hydrologic regime began to occur about 1905-06 with the construction of Minidoka and Milner dams on the Snake River. Milner Dam is capable of diverting the entire Snake River in most months into irrigation canals (downstream of the Subbasin). Minidoka Dam allowed diversion of flow from the river into irrigation canals north and south of the river with return of some flow of degraded quality to the river downstream. American Falls Dam was constructed in 1927 for irrigation and power generation. Irrigation water is pumped via an aqueduct to the West Main Canal. Little if any water returns to the river from this diversion. In the late 1940's, the A & B Irrigation Project was developed north of the river, which primarily pumps water from the aquifer, with irrigation excess returned through injection wells. The most recent large-scale impact has been that of the modification and management of Milner Dam since 1989 by Idaho Power Company to create a year-round pool backed 16 miles upstream (Wilkison et al. 1997). Although, maximum pool depth and irrigation season operation did not change with this modification.

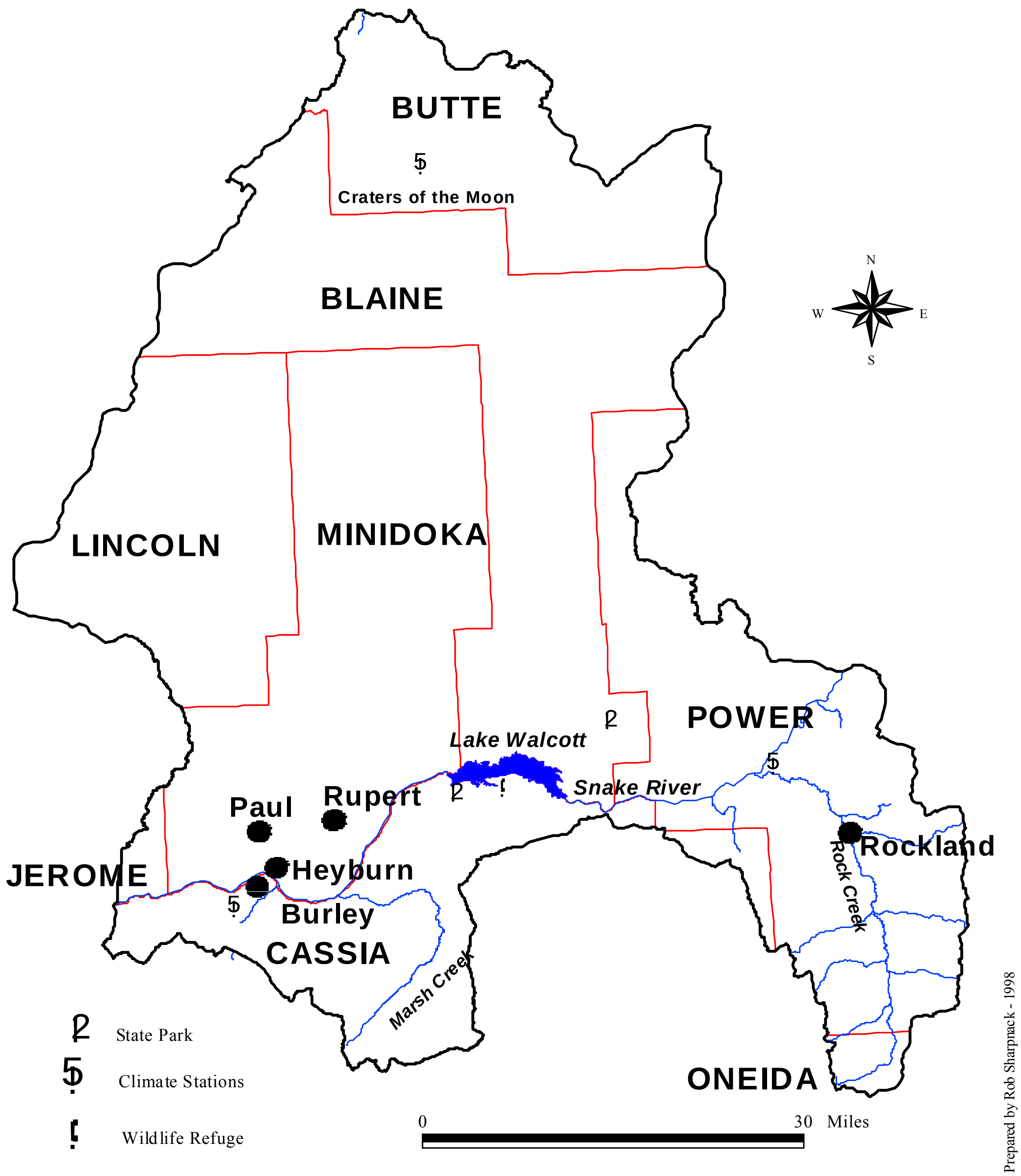


Figure 4. Population Centers and County Boundaries in the Lake Walcott Subbasin

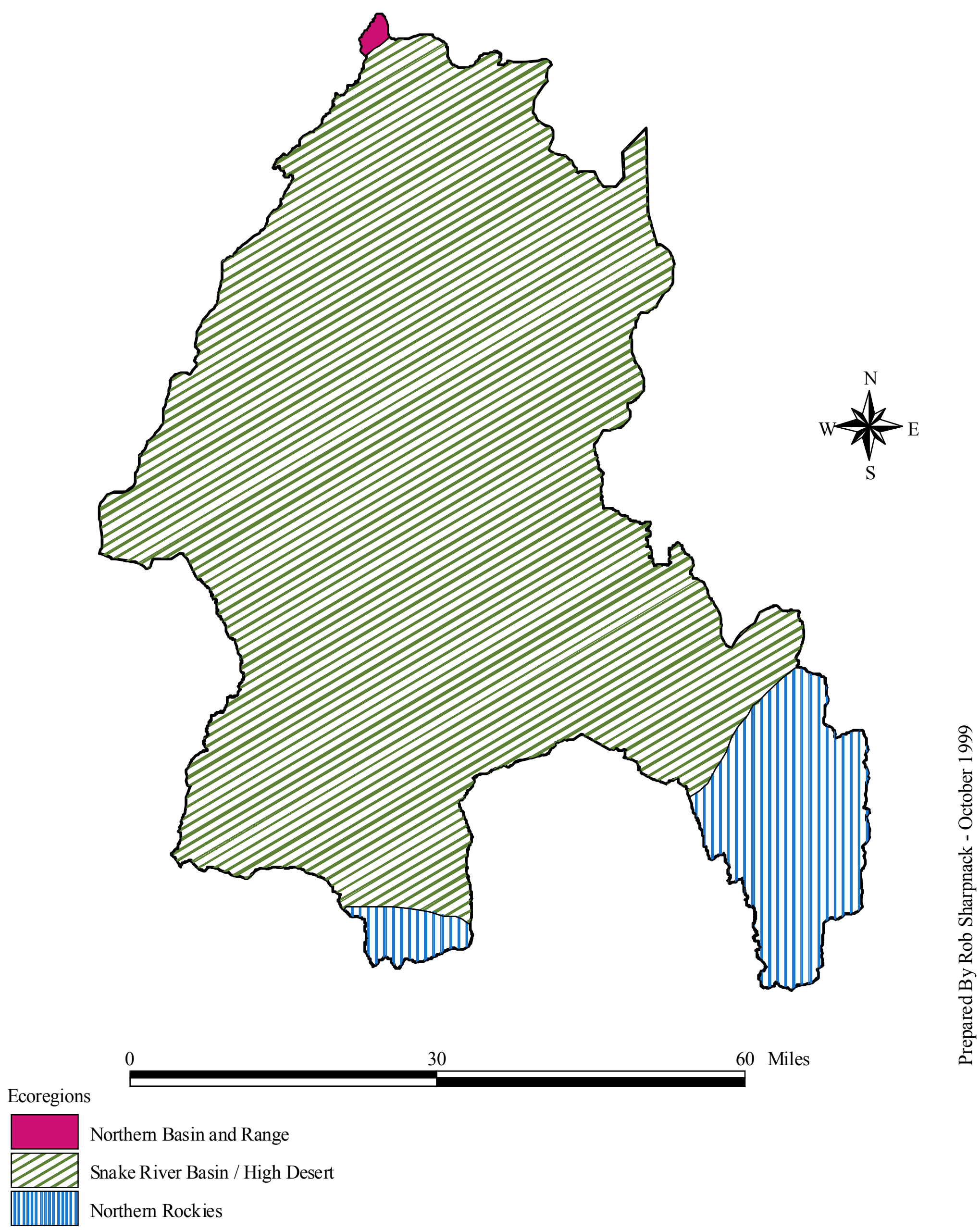
Recreation is an important water-user industry of the Lake Walcott reach. The Snake River provides for a varied recreational experience. The tailwaters of the two upstream dams supports trout fisheries considered by some to be the best in the area. The reservoirs also provide trout and bass fishing. Additionally, the reservoirs in the Lake Walcott reach are some of the most used waters for recreational boating in the south-central portion of Idaho. The per capita boat and recreational watercraft use of 0.071 in the Lake Walcott reach is among the highest in the state. Additionally, the percentage of boats and recreational water craft registered in the state used in the Lake Walcott reach is 4.2 %, while only 4% of the population live in the area (IDPR 1999). This indicates that people are traveling to the region to recreate. The economic impact of recreation on these waters, however, has yet to be quantified. As a result, the value of recreation has often been underappreciated. The Snake River, and the reservoirs located within the Lake Walcott reach, are also very accessible to the general public. This is unlike most of the river down stream in the Mid-Snake area where access is very limited. Many private and public boat docks exist in the Milner Pool section of this reach. Because of the ease-of-access to the river, Milner Pool specifically, it is highly used for recreation.

2.1.2 Ecoregion

The Lake Walcott Subbasin is predominantly within the Snake River Basin/High Desert ecological region (Figure 5), as described by Omernik and Gallant (1986) and Omernik (1986):

> Most of the perennial streams in the ecoregion are large rivers originating in adjacent more humid ecoregions, irrigation canals interconnected with the large rivers, and small streams originating in the atypical scattered mountain ranges. The small mountain streams become intermittent at lower elevations due to irrigation, seepage, and evaporation.... Scattered springs occur throughout the region, as do a moderate number of reservoirs.
>
> Sagebrush/wheatgrass steppe is the dominant vegetation type throughout the region, sometimes including stands of juniper. Large tracts of saltbush/greasewood vegetation also occur. Some playas and recent lava flows are entirely devoid of vegetation. Streamside vegetation is generally the same as the surrounding regional vegetation due to the intermittent or ephemeral nature of most streams. Where perennial flow does occur, dense stands of sedges and forbs line the riparian zone. In perennial streams with moderate annual flow, woody vegetation consists of alder, willow, cottonwood, clematis, rose and mock orange.
>
> Upland soils developed under shrub and grassland vegetation are mostly Haplargids, Durargids, and Argixerolls. A variety of soils are derived from lacustrine deposits. Well-drained lacustrine soils are Camborthids, Durargids, and Durothids, poorly drained soils are Haplaquolls and Haplaquepts. In the northwestern portion of the ecoregion, extensive pumice deposits have produced Vitrandepts under forest vegetation and Camborthids and Haploxerolls under shrub-grassland vegetation.
>
> Most of this region is used as rangeland though some areas in basins or bordering large streams are irrigated for pasture and production of potatoes, corn, alfalfa, sugar beets and small grains. Where access by livestock is concentrated, loss or reduction of streamside vegetation is severe, causing stream bank erosion and sedimentation. Water withdrawal for irrigation often results in completely

dry channels downstream from diversions.



2.1.2.1 Topography

The region is cartographically covered by 1:24000-scale and higher USGS topographic quadrangle maps. The total vertical relief in the area is 4,302 feet, from an elevation of 4,134 feet at Milner Dam to 8,436 feet in the Deep Creek Mountains. Locally, slopes in the Snake River Plain are usually quite gentle (although overall relief is considerable), with considerably steeper slopes in the mountains.

The topography is chiefly an expression of the geologic structure. The faulted, linear mountain chains of the Basin and Range border the Snake River Plain to the south with mountains of the Northern Rockies to the north. The Plain itself slopes gently from the north, bordered by the Snake River on the south. The Plain is an expanse of unintegrated depressions, low volcanic hills, and rough, irregular basalt flows.

The Snake River borders the Plain on the south and has entrenched to varying depths. Below American Falls Dam it flows through a gorge of almost 150 feet depth with alluvial terraces rising to 40 feet above the river. It then enters the Lake Walcott reservoir that is filled to the level of the old river gorge. Below Minidoka Dam the river is generally entrenched perhaps 20 feet below the land surface until it flows into the Milner Pool. There, occasional bluffs of perhaps 100 feet border it. The overall drop of the river in the reach is from 4,354 at American Falls Reservoir to 4,134 feet at the Milner Pool, a total of 220 feet. The overall slope from American Falls Dam to Milner Dam is 2.9 feet per mile. To the south of the river is a network of integrated perennial and ephemeral streams heading in rolling hills that gradually merge into the mountains and valleys of the Basin and Range.

2.1.2.2 Potential natural vegetation

Variability in the makeup of natural vegetation in the Lake Walcott reach is minimal: sagebrush-grass vegetation predominates the entire Subbasin with limited riparian vegetation in the tributaries and along the Snake River (0.1% of the Subbasin). Following the construction of irrigation canals and irrigation return drains some of the sage-grass vegetation changed to agricultural crops, pasturelands, and riparian vegetation.

2.1.2.3 Climatology: precipitation, humidity, temperature

The Lake Walcott reach of the Snake River in South Central Idaho runs from American Falls Dam (River Mile 714) to Milner Dam (River Mile 639). The surrounding area of the Subbasin reach outward to the border of the Snake River Basin High Desert with the mountains of the Basin and Range geologic province to the south and the beginnings of the mountainous region of the Northern Rockies to the north. As a result of the elevation difference across the Subbasin, there are pronounced differences in climate from the Snake River Plain to the mountains. Precipitation varies from less than 10 inches/year on the Plain to exceed 30 inches/year. on the mountain summits. Using the Koeppen system of climate classification, the plains would be classified as BSk or "cold steppes" and the mountains as "undifferentiated highland climates." A further description would be that the region is:

> "... mid-latitude, semiarid, and on the boundary between steppe or semiarid and desert or arid.... [with] warm, dry summers, and relatively low annual precipitation. The relative humidity is typical of a semiarid climate. It averages nearly 70 percent on a normal winter afternoon and nearly 2 percent on a normal summer afternoon. The growing season ranges from an average of 150 days in areas immediately adjacent to the Snake River to 120 days [in higher elevations]..." (Hansen 1975).

Three climate stations of the Western Regional Climate Center (Western Regional Climate Center 1998) best characterize the watershed: Craters of the Moon National Monument; Burley FAA Airport; and Massacre Rocks State Park. There are few data sets available for the bulk of the Snake River Plain north of the Snake River in the Lake Walcott Subbasin. As noted, nearly all the flow of the Snake River in this watershed is released from dams, and all tributary flow comes from the mountains to the south of the Snake River Plain.

Craters of the Moon National Monument; This area is north of the Snake River Plain at approximately 6000 feet elevation. The climate is semi-arid with an annual precipitation of just under 16 inches. Over half the precipitation falls as snow in the months of November to mid-April. Except for the wettest months of December and January, the monthly mean precipitation is evenly distributed through the year. Any runoff seeps into the aquifer below and emerges at the Thousand Springs reach of the Middle Snake River. The annual temperature is a cool 43°F, with cold winters and warm summers.

Burley FAA Airport; Burley is south of the Snake River at an elevation of 4,100 to 4,200 feet. It is an arid climate, with an annual mean precipitation just under 10 inches; about a quarter of this is snowfall. The year has a pronounced precipitation minimum from July through October, and an even distribution the other eight months. The annual temperature is a cool 48°F, with cool winters and warm summers.

Massacre Rocks State Park; A third permanent station is at Massacre Rocks State Park, the closest to the Rockland area. It lies at the edge of the Snake River Plain at an elevation of 4264 feet. The Massacre Rocks area is semi-arid with an annual mean precipitation of 12.6 inches, about 15% as snow. This is distributed as a dry summer and wet spring. The annual temperature is a cool 49°F, with cold winters and hot summers.

2.1.2.4 Soils and geology

Each of the three Soil Conservation Districts in the Mini-Cassia area have a published soil survey. These soil surveys describe the soils as:

> Local soils can be conceptualized as three soil provinces, the silty soils of the gently rolling basalt plains, the highly stratified alluvial soils of the flat Burley Basin and the soils of the Northern Basin and Range province. Soils on the basalt plains formed mostly in silt and very fine sand deposited by wind and water. The basalt bedrock is typically two to fifteen feet below the surface. Most soils in the basalt plains have lime silica-cemented hardpans somewhere in the profiles... Soils of the flat Burley basin developed in stratified alluvium and slack water deposits from the Snake River and/or eolian sand derived from these deposits... In the Basin and Range part of the resource area, agricultural soils and the best range soils are located in the large valleys, where wind-blown silt deposits and young silty and loamy alluvium overlay gravely [sic] alluvium deposited during glacial times, when stream flows on Raft River and Goose Creek were much greater... Deflocculation and the loss of soil aggregation caused by salts also increase the severity of wind erosion, a major problem in the Raft River Valley. (Minidoka and Cassia Counties, Idaho 1997)

The Soil Map of Idaho (USDA SCS 1984) shows that a variety of soil groups occur in the Subbasin, but only three are of any significance along the Snake River. These are labeled as Map Units 42, 46, and 36 on the USDA Soil Map of Idaho, and detailed below. These soil types form the majority of sediment input into the river through the erosion processes, which includes four categories. The four types of soil erosion occurring on cropland in the Mini-Cassia Resource area include sheet and rill, gully, wind, and irrigation-induced erosion on fields with steeper slopes.

Unit 42; From American Falls Dam downstream to past Minidoka Dam, the Snake is in a basalt-bordered gorge, with contact almost entirely with soils on alluvial terraces or low plateaus formed in eolian sand and wind-worked alluvium.

Unit 36; After Minidoka Dam, the river flows through a slightly entrenched run cut into somewhat poorly drained soils on low terraces, formed in stratified mixed alluvium with some aeolian influence.

Unit 46; The final section of the reach is entrenched in basalt, covered by soils on basalt plains, formed in deep loess. (Hansen 1975)

The average soil slope provides a gage of potential soil erosion, or risk erodibility. The topographic maps show as anticipated, that slopes are low (0-9%) in the valleys and plain and gradually increase as one approaches the bordering mountain ranges. The slopes are fairly steep in the mountain ranges, exceeding 30% in places.

The "K-factor" is the soil erodibility factor in the Universal Soil Loss Equation (Wischmeier and Smith 1965). The factor is comprised of four soil properties: texture; organic matter content; soil structure; and permeability. The K-factor values range from 1.0 (most erosive) to 0 (nearly non-erosive). As seen in Figure 6, the weighted average K-factors range from very low on the flat interior slopes of the plain, to quite high on the friable soils of the main agricultural areas such as

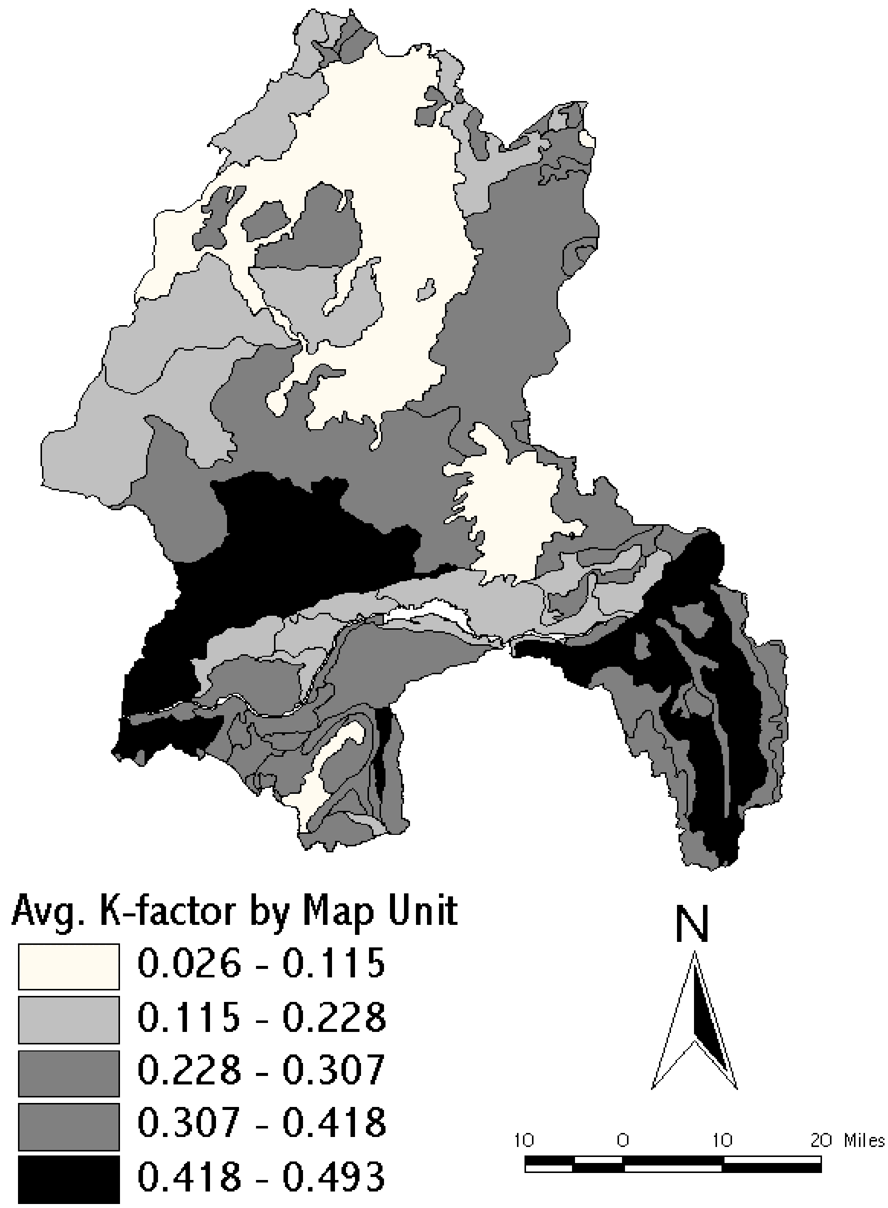
Rockland. On the steeper, but rocky, unweathered slopes of the mountains the erosion potential is moderate.

The overall geologic structure of the area is within the northern extent of the north to south oriented Basin and Range Province. The Snake River Plain crosscuts this east to west. Locally thick deposits of loess (wind-blown silt) overlie these rocks, particularly in the volcanic Snake River Plain (Alt and Hyndman 1989). The Basin and Range is an area of faulted metamorphic and sedimentary rocks uplifted into mountains, separated by basins deeply filled with alluvium. The Snake River Plain is a deep wide structural basin filled with a veneer of volcanic basalt deposits overlying rhyolite. The rocks decrease in age, from west to east, due to migration of a magma source to the location of present-day Yellowstone. Extrusion of basalt (predominantly on the north side of the Plain) has diverted the Snake River to the southern edge.

The typical fractured and layered nature of basalt has created a huge thick area of interconnected voids beneath the Snake River Plain that discourages the formation of integrated surface stream networks, and conducts infiltration underground through one of the world's largest aquifers. This also has the effect of hydrologically isolating runoff of the northern half of the Lake Walcott catchment from the integrated fluvial networks of the Snake River and its tributaries to the south.

2.1.3 Subbasin Hydrology

Water in the Lake Walcott Subbasin moves through a variety of pathways, dominated by the Snake River and Snake River Plain Aquifer routes. Except for the Snake River and the two mountainous southern drainages of Rock Creek and Marsh Creek, most of the surface channels (Raft River and Goose Creek) are no longer perennial tributaries to the Snake River. Perennial flows from the Goose Creek Subbasin ceased in approximately 1911 upon construction of the Lower Goose Creek Reservoir. Flow in the lower segment of Goose Creek is the result of agricultural return flow from the Snipe Creek Drain. The approximate year Raft River ceased perennial flow is unknown at this time. The flow record at Raft River began in 1985 and ended in 1989. During this period flows fell below 0.7 cfs each year. Land owners and managers within the Raft River Subbasin have also noted that Raft River, near the Snake River, does not flow in a majority of years during the summer due to irrigation demands (USDA SCS1991). Flow from these two Subbasins may reach the Snake River in the nonirrigation season, in the case of Raft River, and only in extreme water years for Goose Creek.


Avg. K-factor by Map Unit
0.026 - 0.115
0.115 - 0.228
0.228 - 0.307
0.307 - 0.418
0.418 - 0.493
N
10 0 10 20 Miles

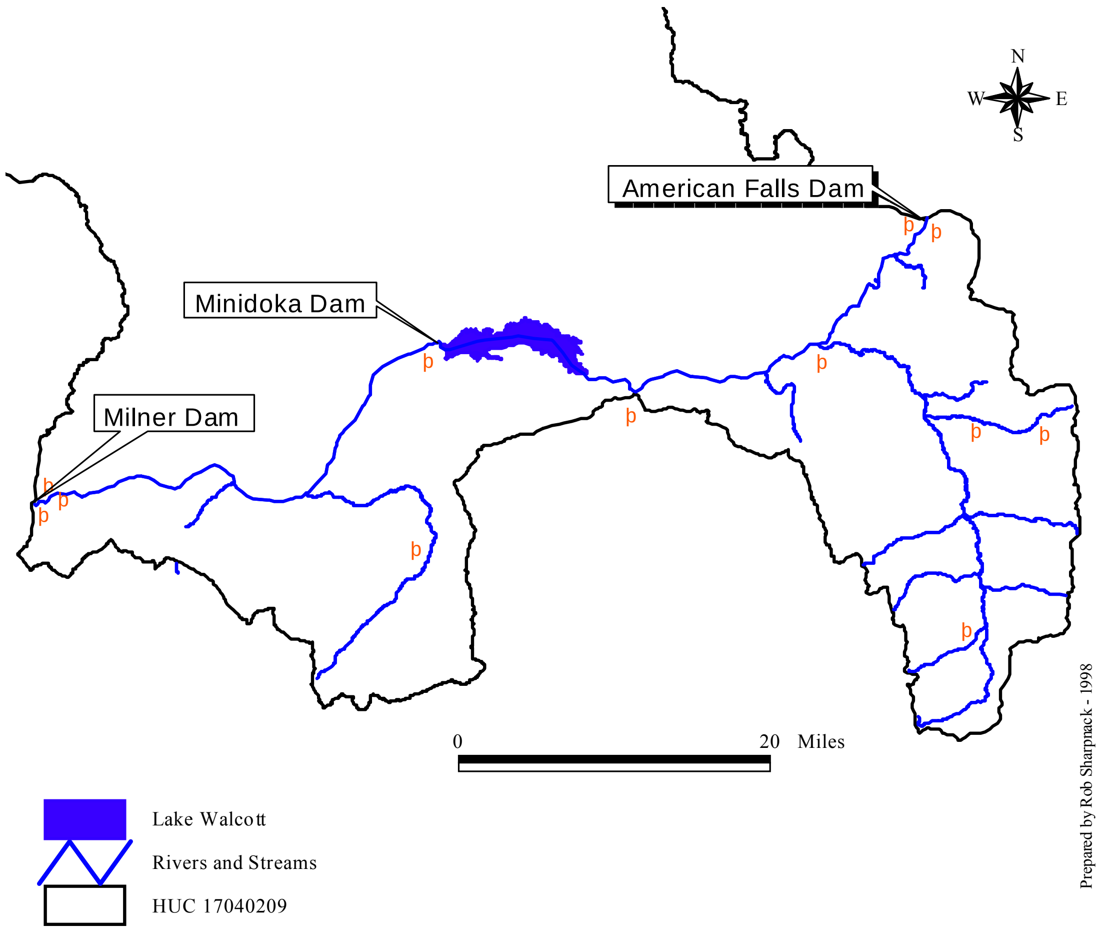


Figure 7. Locations of the Major Hydroelectric Dams and Gauging Stations in the Lake

2.1.3.1 Snake River Lake-Walcott Reach

Generally, the natural hydrology of an area is related to its climate regime and topography, and to a lesser extent on its geology. In this area, however, the flows of the Snake River are largely dependent on releases from the several dams along its reach (Figure 7), which simplifies characterization of its flow behavior. These releases are driven by demands for irrigation, or for meeting expected future demands through storage.

> Flow in the Snake River is naturally high in May and June, but as regulation has increased with time, the May-June flow generally has decreased. Flows in the Snake River, downstream from major irrigation diversions, are generally low during the latter part of the irrigation season (Kjelstrom 1986).
>
> Based on project authorities [legal allocation compacts, i.e. the Carey Act 1894] the reservoir system of the Upper Snake River is operated for two primary purposes--irrigation water supply and flood control. Hydroelectric power generation, recreation, and fish and wildlife... are secondary or incidental to the primary operating considerations (BOR, 1996).

2.1.3.2 Reservoirs

Much of the following information below is from Brennan et al. (1996):

American Falls Dam is located at mile 714 on the Snake River. It is a concrete gravity dam and spillway with earth embankments at either end. It was first completed in 1926, then rebuilt in 1976 and 1977. Its reservoir, managed by the United States Bureau of Reclamation (USBOR) is used for flood control and irrigation. Power generation by Idaho Power Company (IPC) is incidental to these releases. Although, IPC has 44,274 acre-feet of storage space in American Falls Reservoir which they can control for release through the power plant, usually for delivery at Milner Dam. The USGS gage just downstream of the dam (at Neeley, #13077000) reported mean outflow for the 1907-1996 period of 7,300 cfs. An unofficial winter minimum release of at least 300 cfs is maintained from November until spring. This minimum release is based on an agreement with the Governor of Idaho to maintain water quality downstream and to prevent damage to the fishery below American Falls Dam.

Minidoka Dam is located at mile 675, and is a rockfill dam with a concrete core. It was completed in 1906 and is managed by USBOR for power development (the power plant was finished in 1909) and irrigation diversion on the USBOR=s Minidoka Project. For this purpose it is usually maintained at an elevation of 4,245 feet. Water for this project is stored in Jackson Lake, American Falls Reservoir, and Palisades Reservoir, as well as in Lake Walcott according to Hansen (1975). In the fall, when irrigation deliveries will not be effected, the reservoir is drawn down and maintained at elevation 4,240 or lower to protect the spillway from damage (USBOR 1996). The USGS gage (#13081500) just downstream of the dam reported mean outflow for the 1910-1996 period of 6,300 cfs. Lake Walcott, the reservoir created by the dam, constitutes the Minidoka Wildlife Refuge established in 1909, and managed by the U.S. Fish and Wildlife Service (USFWS). In 1991 the USBOR began reconstruction of the powerplant at Minidoka Dam. Five of the seven turbines were retired in 1994 and replaced with two 10-megawatt turbines. The remaining two turbines were rebuilt as part of the project. Renovations of the Walcott State Park, as a separate project, proceeded the powerplant project in 1989.

Milner Dam is located at mile 639, and is a concrete gravity dam constructed in 1905 and used primarily as a diversion dam. The water is used for irrigation by canals diverting at the dam and by pumps from the reservoir. It is owned by Milner Dam Inc. and operated by the Twin Falls Canal Company. The Twin Falls Canal Company is a principle owner of the corporation along with the Northside Canal Company. Rebuilding in 1991-92 allowed generation of electricity by the Idaho Power Company at two power plants operated under FERC licenses, under which IPC is required to pass 200 cfs whenever water is available; both power plants discharge to the Snake River (USBOR, 1996). The USGS gage (#13088000) just downstream of the dam reported mean outflow for the 1909-1996 period of 2,700 cfs, which is a combination of the Milner gauging station and the lower Milner Power Plant. There are at least ten different diversion routes from Milner Pool, displayed in Table 18 (section 2.2.4.1). The progressive downstream decreases in mean annual flow from 7300 to 2700 cfs are the result of the withdrawals for irrigation above each dam.

2.1.3.3 Aquifers

Groundwater flow (Figure 8) into the Snake River and Lake Walcott between American Falls Dam and Minidoka Dam is estimated at about 625 cfs (Kjelstrom, 1986). Although BOR reports that Winter inflow, which includes any release from American Falls plus reach gains, normally total 250-350 cfs. These BOR reported values are an estimation based on the difference between measured river flow at the Neeley gauge and the computed inflow to Lake Walcott. Inflow to Lake Walcott is the sum of change in storage, measured discharge to the Snake River, and measured diversions of two canals. It should be noted, however, that inflow could not be measured directly because of the many ungauged surface inputs. Inflow, however, can be an important component of total flow at low river discharges, although generally it is overwhelmed by the volume of flow in the river itself. Inflow in this reach is far less than the famous groundwater flows of Thousand Springs, or the underflow near Pocatello. Kjelstrom=s report implies that his figure of 625 cfs does not include the spring sources of Fall Creek, which contribute only about 20 cfs annually. Similar analysis conducted by IDEQ using discharge data at the Neely gauge, outflow discharge records at Minidoka Dam and the two canals, and average monthly flow records at various tributaries indicates that ground water inputs to the reach are much less than those reported by Kjelstrom. Additionally, there was a pronounced seasonality to ground water interchange. Between American Falls Dam and Minidoka Dam, the Snake River gains between 140-170 cfs during the winter, 0-120 cfs during the spring, (-) 20-115 cfs during the summer, and 115-185 cfs in the fall. The surface water inputs can account for most of these changes. In some cases, the surface inputs are much higher than the difference between the Neely gauge and the sum of discharge into the canals and from Minidoka Dam, indicating that the river is contributing to the ground water. In other cases, the surface inputs are much smaller than the river gain between the dams. This indicates that the ground water is contributing to the river. During the winter IDEQ estimates that the Snake River contributes as much as 67 cfs to the ground water, while in the late summer and fall the river receives approximately 150 cfs from the ground water (Figure 9). Between Minidoka and Milner dams, Kjelstrom estimated about 470 cfs discharge into the Snake River Plain aquifer (i.e. exit the river), presumably to re-emerge in the springs between Milner and the Thousand Springs reach. IDEQ analysis, however, indicates on an annual basis there is no net exchange with ground water in this area, or at least if there is a net exchange it is minimal. For the analysis, IDEQ used discharge records from the gauge below Minidoka Dam and a reconstructed inflow record at Milner Dam. The reconstruction of inflow records for Milner Dam is discussed in section 2.2.4.1

The area north of Burley and Paul irrigation water comes from the Snake River Plain aquifer through pumping of the aquifer. The A&B district encompasses a total irrigated acreage of 76,796 acres of cropland. The cropland is primarily potatoes, sugar beets, wheat, barley, corn and beans. The water to irrigate this cropland is obtained from 177 electrically pumped irrigation wells with excess water returned directly to the aquifer via large capacity injection wells. These wells are owned by the USBOR. The A&B Irrigation District and the USBOR have been working to close as many of these injection wells as possible. Their recent efforts have included the construction of collection systems and pump back systems to reuse the water. They have also moved some of the water to constructed wetlands where the water is allowed to evaporate, is used by the wetland plants, or returned to the aquifer through infiltration. The EPA has designated the Snake River Plain aquifer as a Sole Source Aquifer (Mitchell and Cowling 1997).

In the southern part of Minidoka County, near the Snake River, ground water flow displays a complex pattern because of recharge from the shallow, perched irrigation-induced alluvial aquifer in the Minidoka Irrigation District (Minidoka Soil and Water Conservation District 1996). The extent of interaction of these Goose Creek-Golden Valley and Marsh Valley aquifers with the Snake River is unreported at present.

In 1963, the aquifer in the Raft River drainage was declared a Critical Groundwater Area by the Idaho Department of Water Resources (IDWR). Expansion of the area under protection continued until 1977, restricting deep well pumping. Studies indicated that annual groundwater contribution from the basin (presumably to the Snake River) was 80,000 acre-feet/year (af/yr). (~110 cfs), but that pumping withdrawals in excess of 105,000 af/yr were endangering this flow and causing declining groundwater tables (SCS 1991). Another substantial influx is Rock Creek, whose groundwater flow to the Snake is estimated at 51,000 af/yr, or about 70 cfs (Williams and Young 1982), equating to twice the surface flow.

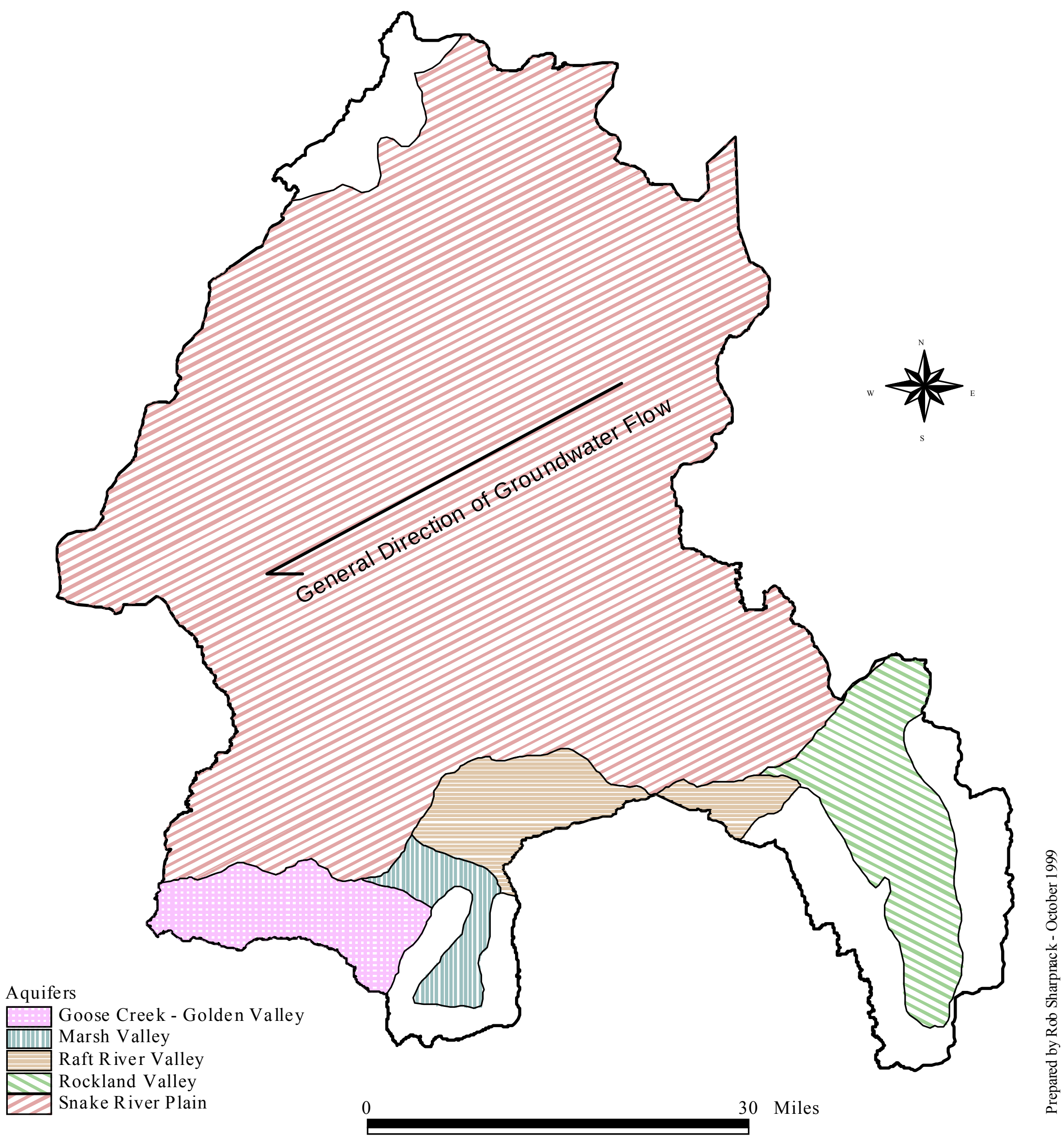


Figure 8. Major Aquifers of the Lake Walcott Subbasin

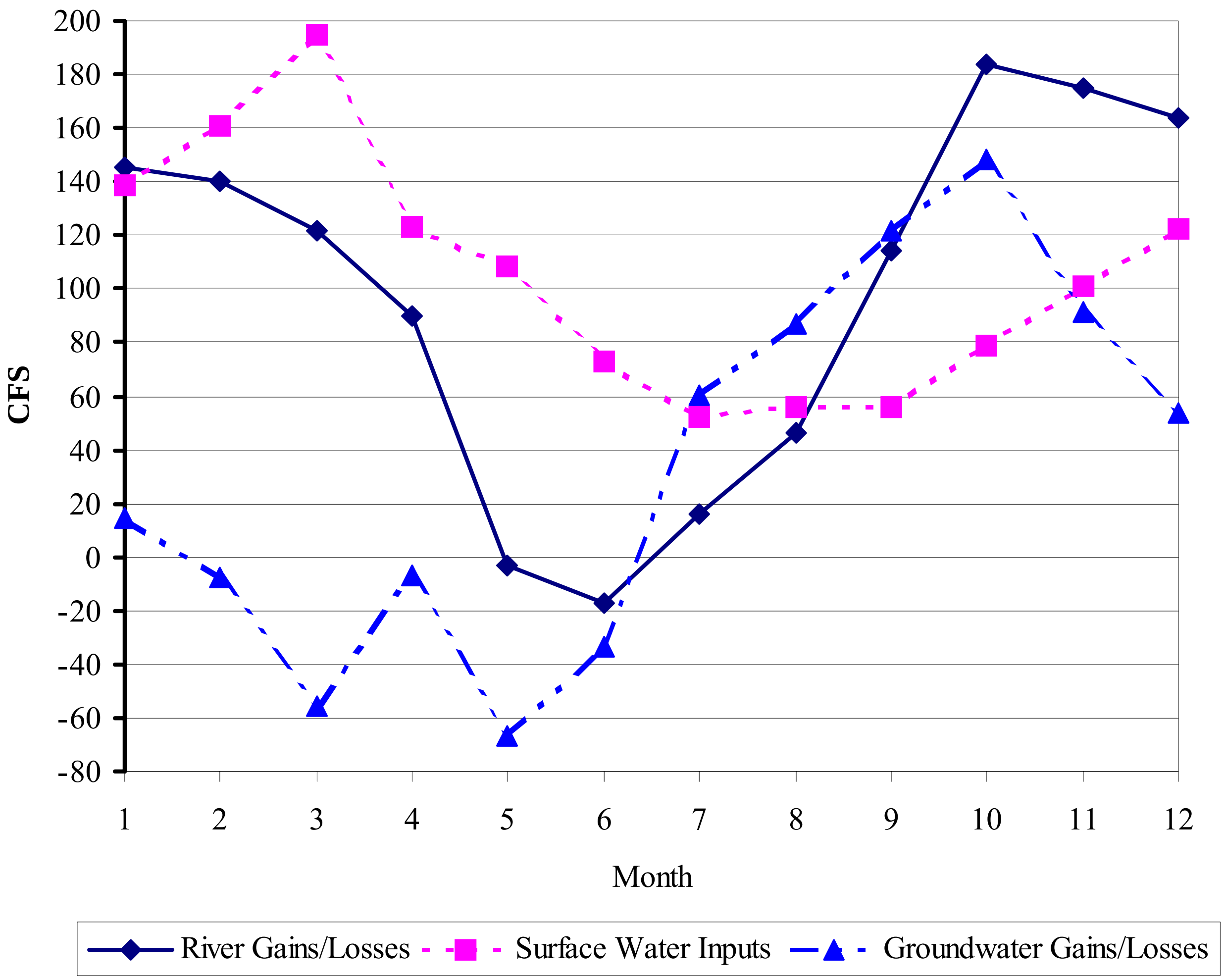


Figure 9. Reach gains and losses in the Massacre Rocks to Lake Walcott Segment, showing surface inputs total reach gain/loss, and ground water gain/loss by month.

2.1.3.4 Tributaries

Rock Creek is the largest intact tributary to the Snake River in the Lake Walcott Subbasin (Figure 10.) with a catchment of 320 mi^2. USGS records of gage #13077650 from 1978-80 and 1985-90 show a mean annual flow of 33.5 cfs at its confluence with the Snake River for those years (USGS 1990).

Williams and Young (1982) observed:

> Collection of streamflow data in Rockland Basin began in 1955 with establishment of the gauging station Rock Creek near Rockland (#13077500). Since 1955, various gages were operated intermittently to record daily flows. From 1955-1960, a gauging station was operated on the East Fork Rock Creek near Rockland (#13077600). From 1960-1964, the station was relocated about 2 miles upstream. The station was discontinued in 1964.

The pre-1967 discharges in the Rockland area were published by Decker et al. (1970). Williams and Young (1982) reactivated the upper East Fork gage for their study, collected the first continuous discharge at the mouth of Rock Creek near American Falls (#13077650), and took monthly measurements at miscellaneous sites and during high flows in 1978-80. Their report is the most detailed account of the hydrologic character of the Rock Creek watersheds.

La Point (1979) conducted water quality and biological sampling just prior and during the same period. In 1997-98, IDEQ personnel sampled the major waterbodies and IDEQ BURP/Waterbody Assessment Guidance (WBAG) assessments have occurred since 1993.

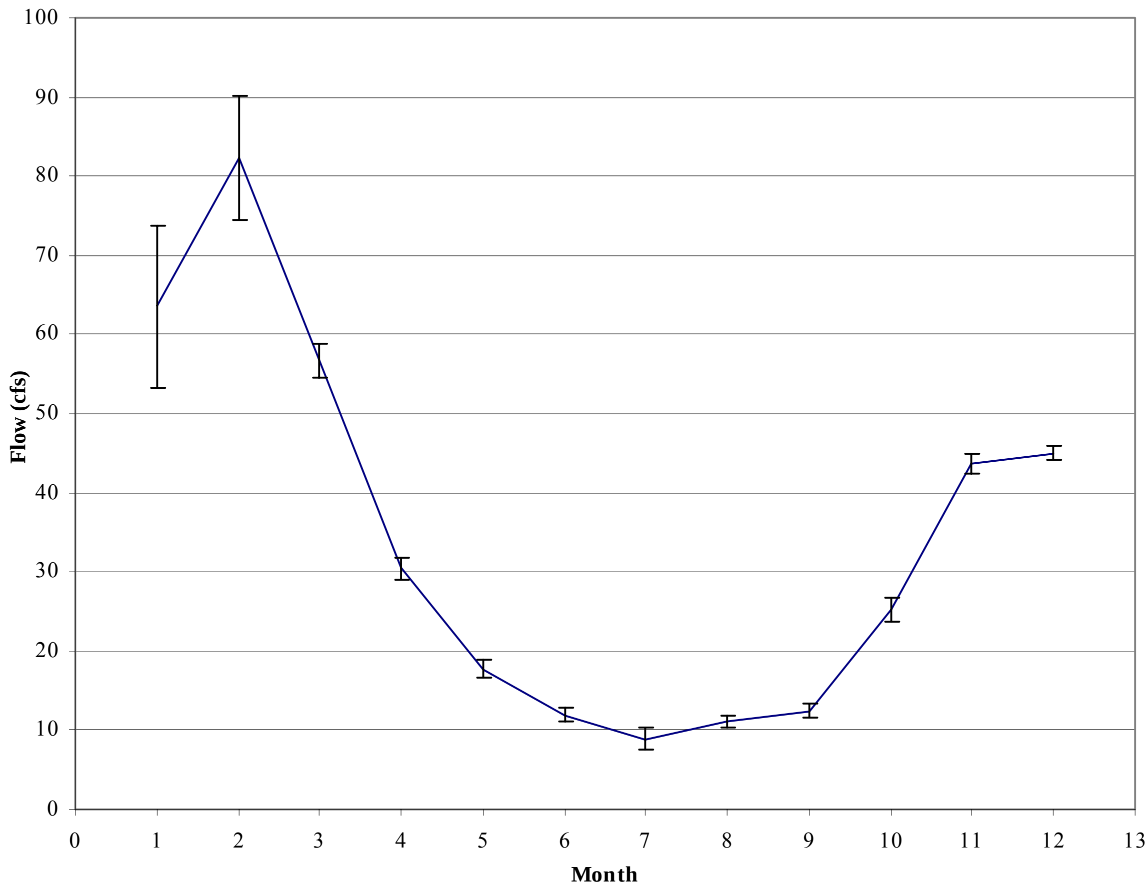


Figure 10. Monthly Average Discharge in Rock Creek during 1978-80 and 1985-90 (+/- one standard error)

Geology: The geology of the Rockland basin has played an important role in establishing its hydrologic character. Intensely folded, individual faulted blocks of pre-Tertiary sedimentary rocks (chiefly marine carbonates) forms the mountain borders of the basin. Tertiary detrital clastic rocks and Tertiary-Quaternary volcanics underlie the watersheds. Pleistocene gravels and calcareous loess, with thin deposits of Holocene alluvium, cover the surface (Williams and Young 1982). The disposition of the carbonate rocks to solutional activity has led to a situation where nearly all runoff in the mountains seeps underground to emerge as springs in the sedimentary aquifers of the central watershed. Because of this, integrated streams in the mountains and consequent runoff of sediment-laden streams to the valley floor are virtually absent. Overland flow in Rock Creek is derived mainly from precipitation and snowmelt on the valley floor, but the largest contributor of perennial flow to Rock Creek is the large spring in East Fork Rock Creek.

Land Use: Two decades ago, LaPoint (1979) wrote:

> The basin is characterized by dryland farms and livestock grazing. Those dryland farms which border Rock Creek often have ploughed fields directly abutting the creek with little or no riparian vegetation or 'buffer zones'... The lower portion of Rock Creek passes through a canyon cut through steep hills ... the tops and sides of many of the hills are dryland farms subject to severe erosion during storms and spring runoff.

The description is still largely accurate today, although considerable irrigation also occurs, particularly on the east slopes of the basin where the Bench Ditch channels water of East Fork of Rock Creek. In recent decades, groundwater pumping of the basin aquifers has been increasing. Williams and Young (1982) wrote:

> Prior to about 1950, irrigators in the basin depended almost entirely on diversions of surface water from Rock, South Fork Rock, and East Fork Rock Creeks... a small amount of spring discharge was collected in ponds for watering of stock. Since the early 1950's, irrigation of agricultural lands from surface water has been supplemented by an increasing amount of ground water.

Climate: There are no weather stations located in the Rockland basin. The closest station is at Massacre Rock State Park, about 8 miles north. It lies at the edge of the Snake River Plain at an elevation of 4,264 feet, whereas Rockland is at 4,679 feet between two mountain ranges, and should be cooler with a slightly higher precipitation. The area surrounding Massacre Rocks is semi-arid with an annual mean precipitation of 12.6 inches with about 15% as snow. This is distributed as a dry summer and wet spring. The annual temperature is a cool 49° F, with cold winters and hot summers.

Williams and Young (1982) installed precipitation-storage cans at high altitude locations in the basin in order to estimate precipitation-altitude relations. Their results indicate a variance in climate from semi-arid on the valley floor to semi-humid in the mountains. They estimate 11 inches for the lowest, northern part of the valley, to as much as 35 inches near Bannock Peak. Generally, the precipitation (snow and rain) increases with altitude and is greatest on west facing slopes. Their estimate for mean basin precipitation is 17.3 inches, based on a mean altitude of 5,700 feet.

Hydrology: Visits to the Sublett (west side) and Deep Creek (east side) ranges found very few developed stream channels in these canyons, which minimizes runoff contributions from the forested lands of the mountains. Flow in Rock Creek is derived from overland runoff of precipitation and snowmelt, spring-fed tributaries, and ground water discharge (Williams and Young 1982). As previously noted, Rock Creek perennial flows emerge as springs along the west flank of the Deep Creek Mountains. The largest of these springs is the source of the East Fork of Rock Creek.

The East Fork of Rock Creek has been gauged at two sites. The #13-0775 location measured flows in 1956-60 downstream of a major irrigation diversion, referenced as the Bench Ditch Diversion, at 5.1 cfs. The # 13-0776 gage was 42 miles east of the confluence with the South Fork, upstream of the Bench Ditch, with mean annual flows in the years 1960-64 of 12.9-17.4 cfs (USGS 1960). The difference between the two is a good indicator of the amount diverted for agriculture (7.8-12.3 cfs). In 1997-98, IDEQ measurements noted a decrease of 8 cfs (32 vs. 24 cfs) between the East Fork source and just prior to its confluence with the South Fork. Presumably, this decrease was for irrigation demands.

East Fork resurges from a single large spring at the mouth of the East Fork Rock Creek Canyon. The carbonate rocks, and its carbonate water chemistry (Williams and Young, 1982), imply it is an integrated karst-type spring. The canyon upstream has no developed stream channel.

> With the exception of East Fork and Spring Creeks, tributary streams to Rock Creek are intermittent and flow only during periods of heavy rainfall. Perennial flow in East Fork Rock and Spring Creeks is sustained by springs (Williams and Young 1982).

Using the estimated annual precipitation of 17.3 inches, the total annual water yield available was estimated at 85,000 acre feet (117 cfs), of which 12,000 acre feet (17 cfs) is used for irrigation and 3,500 acre feet is pumped. Using the difference in flow measured at the gage at the mouth of Rock Creek (Figure 10) and these losses, underflow from the Rockland aquifers to the Snake River is estimated at 51,000-af/yr (70 cfs). An amount twice that measured at the surface gage.

> At the present (1980) state of ground water development in Rockland basin, streams and aquifers are hydraulically connected... There are no long-term regional water table declines at the present time. (Williams and Young 1982)

Within the broad valley of Rock Creek downstream from Rockland are numerous diversions in small canals out of and back into Rock Creek.

The South Fork of Rock Creek is also fed by perennial springs. Because of the large catchment area through which the channel runs in the valley south of Rockland storm and melt runoff is sometimes added. Other than the springs, the creek flow is ephemeral. There are no developed drainage channels in the mountains to either east or west.

The two other subbasins that once contributed to the Snake River in the Lake Walcott reach are the Raft River and Goose Creek watersheds. Both are scheduled for completion of SBAs by 2002. As noted below, their contributions to the present-day Snake River flow are usually insignificant.

Raft River (HUC 17040211) is the drainage immediately west of Rock Creek (12.8 river miles). It comprises an area of 922,000 acres (1440 mi^2), about 95% of which are in Idaho, the remainder in Utah. It rarely contributes direct flow to the Snake River during the summer because of water consumption for irrigation upstream. These rare flows, however, have been estimated to bring considerable sediment and nutrients to the Snake River when they occur. An annual loading of 900 tons of phosphorus and 840 tons of nitrogen has been estimated (USDA SCS et al. 1991), and 10-35 tons of sediment/acre/year. As previously discussed, some ground water flow occurs to the Snake River from the Raft drainage.

The Goose Creek Basin (HUC 17040210) is located to the west of the Raft River watershed (34.9 river miles). It has an area of 1160 mi^2, part of it in Nevada. Since construction of the earthen dam at Oakley Reservoir in 1913 (USGS 1996), it has produced flow to the Snake River only once, in the very wet year of 1984. It lacks a natural channel because of development within the city of Burley and because of farming activities in the old Goose Creek channel according to Minidoka and Cassia Counties (1997).

From west to east, the perennial steams (excluding the independent HUCs of Goose Creek and Raft River) feeding the Snake River in the Walcott Subbasin include Marsh Creek, Fall Creek and other miscellaneous tributaries.

Marsh Creek drains the north side of the Albion Mountains. Citing records from 1967-74 (Station 13082300), Kjelstrom (1986) estimated that the Marsh Creek drainage produced about 15,000 acre feet of runoff per year (~21 cfs), of which a third is consumed for agriculture in the Albion Valley upstream of the gage. Downstream, the remainder is intercepted by an impoundment on the Skaggs Ranch, and used for further irrigation. Flow from this point to within one to two miles of the Snake River is infrequent. The final miles of Marsh Creek may receive ground water (Christensen 1999) or tail water from fields during the irrigation season (Campbell 1997) and consequently, this segment of Marsh Creek flows year-round. IDEQ-TFRO will investigate the impacts of the perennial flow in the lower segment of Marsh Creek prior to the next §303(d) listing cycle

A set of large springs provides permanent flow to Fall Creek, a two-mile-long tributary of the Snake River. The springs are likely the outlet for the carbonate rocks of the Sublett Mountains to the south, which have few developed channels in their surface drainages. Downstream of their emergence, the spring flow is diverted into the NPDES-permitted aquaculture facilities previously operated by Rangen Inc. The fish hatchery is currently not in operation. Kjelstrom (1986) has estimated Fall Creek's ungauged annual flow at 4,000 acre feet (~5.6 cfs), although Gianotto (1995) and IDEQ sampling in 1997-98 measured 17-22 cfs (Table 10). The differences may be attributable to Kjelstrom measuring flow during a lower flow year than IDEQ.

Further east, at the northwest end of the Deep Creek Mountains are Little Warm, Warm (its source is the Indian Hot Springs spa), and Cold Creeks, all created by permanent springs. Their flow is captured and diverted for agricultural use, and output to the Snake River is ephemeral except for storms and snowmelt (Gianotto 1995). Thus, agriculture utilizes 100% of the flow in most average years.

The extreme northern area of the Lake Walcott Subbasin drains a number of small streams on the south flank of the Pioneer Mountains (Figure 11). These streams are Copper (and its tributaries Barn and Payne), Cottonwood, and Little Cottonwood Creeks. None were named on the 1996 §303(d) list. All disappear at the boundary of the mountains with the basalt plain. Thus, their waters merge with the Snake River Plain aquifer. As mentioned earlier, the northern half of the Lake Walcott Subbasin has no integrated surface drainage: all runoff is subsurface into the Snake River Plain aquifer, which drains southwest to emerge along the Snake River canyon in the vicinity of the Thousand Springs (Heath 1984).

2.1.3.5 Canals and drains

Lake Walcott supplies water for irrigation on the low terraces bordering the Snake River below Minidoka Dam. According to Hansen (1975), the quality of the stored water is good, but that of the return flow and the water recovered by the pumping from drainage ditches, or about 45,000 acre feet of water, is of questionable water quality. Kjelstrom (1986) estimates that during the irrigation season about 940 cfs is diverted on the north side of the river and about 780 cfs on the south.

The Idaho Department of Agriculture oversaw a monitoring program from April 1996-April 1997, that collected water quality and flow data for 15 agricultural drains in the Burley and Minidoka Irrigation Districts (Campbell 1997). These drains returned flow to the Snake River after use in agriculture. In that year, the total return flow of these major drains on the south side was 79.4 cfs, and 83.2 cfs on the north side. The mean flow leaving Lake Walcott at the 1-A Lift (the south side canal) was 650 cfs in 1997. The difference (570 cfs) is presumably due to agricultural consumption, seepage loss through earthen bottomed and cracked cement canals, and evaporation. The Bureau of Reclamation, Burley Irrigation District, and the Minidoka Irrigation District have continued to monitor these drains during the irrigation season.

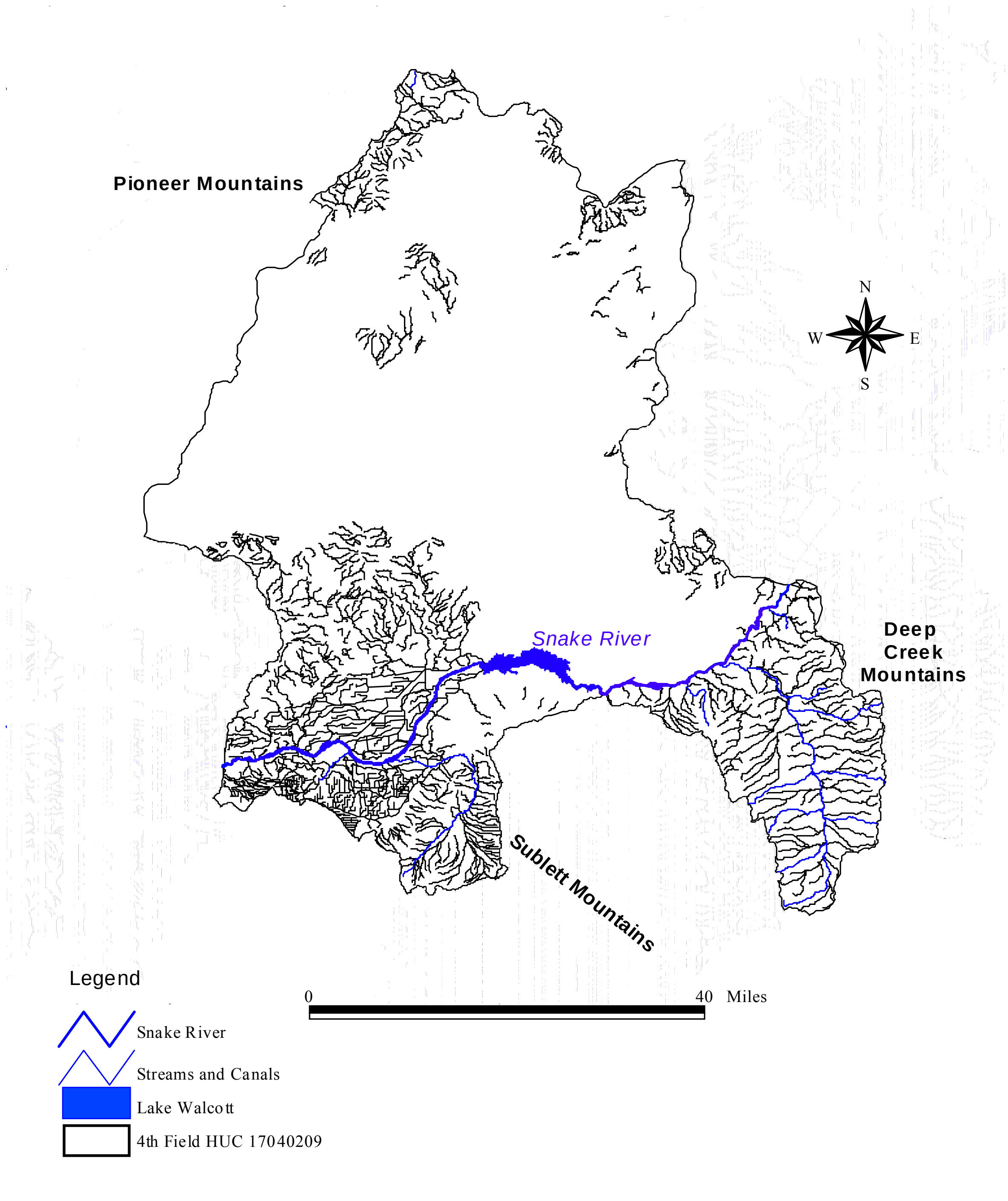


Figure 11. Tributaries and Canal Ways in the Lake Walcott Subbasin, Showing Locations of Three Mountain Ranges and the Snake River

2.1.4 Biological Characteristics

This section discusses historical and present day distribution, populations, and any biological assessments completed with regards to fisheries, macroinvertebrates, waterfowl, aquatic vegetation, and threatened and endangered species.

2.1.4.1 Fisheries

A comparison of the watershed's designated uses with fishery assessments will provide linkage for meeting beneficial uses. One assessment approach is to compare historical fish information with that of the most current distribution (Table 2). From Table 2, IDEQ-TFRO concludes that the current native assemblage of fishes is similar to those historically found in the Lake Walcott Reach. Additionally, that water quality is sufficient to not exclude any of the native fishes found historically within the reach. Nonnative fishes, however, have increased in the number of species present. This may be due to stocking programs of the IDFG and private individuals in the case of game fishes, and a change in available habitat types after the construction of the dams. Two new species, the common carp and the yellow bullhead, are present in the fish assemblage that may indicate degraded water quality. These species, however, are now found throughout the west since their introduction and are capable of living in almost any water quality condition. The majority of new species are similar to the native species in their tolerance to organic pollution and temperature increases.

Table 2. Time Comparison Of Some Fish Species Distribution Occurring In The Lake Walcott Reach Of The Snake River (X= observed period of occurrence)

Species	Scientific Name	Tolerance	Pre-Dam	1910-1975	Post-1975
Native Fish Species					
Yellowstone Cutthroat Trout	Oncorhynchus clarki bouvieri	HI	X	X	X
Mountain Whitefish	Prospium williamsoni	MI.	X	X	X
Utah Chub	Gila atraria	HT	X	X	X
Utah Sucker	Catostomus ardens	HT	X	X	X
Mottled Sculpin	Cottus bairdi	MI.	X		X
Redside Shiners	Richardsonius balteatus	MI.	X	X	X
Non Native Fish Species					

Coho Salmon	Oncorhynchus kisutch	HI		X	
Kokanee Salmon	Oncorhynchus nerka	HI		X	
Brown Trout	Salmo trutta	MI.		X	
Rainbow Trout	Oncorhynchus mykiss	HI		X	X
Yellow perch	Perca flavescens	MI.		X	X
Common Carp	Cyprinus carpio	HT		X	X
Black Crappie	Pomoxis nigromaculatus	MT			X
White Crappie	Pomoxis annularis	MT		X	X
Yellow Bullhead	A. natalis	HT			X
Largemouth Bass	Micropterus salmoides	MI.		X	X
Smallmouth Bass	Micropterus dolomieui	MI.			X
Bluegill	Lepomis macrochirus	MT		X	X
Channel Catfish	Ictalurus punctuatus	MT			X

Barr et al. 1994; Bell 1980; Brown and Randolph 1992; Brown et al 1993; DesVoigne et al. 1976; Grunder et al. 1987; Grunder et al 1989; Nellis 1998; Partridge 1987; Reid 1972; Wilkison et al. 1995; Wilkison et al. 1996; Wilkison et al. 1997; Ohio Environmental Protection Agency 1989. HI = Highly Intolerant, MI = Moderately Intolerant,
MT = Moderately Tolerant, HT = Highly Tolerant.

As previously noted, the major modifications of the Snake River that created the present situation were begun in 1905 with the construction of Milner Dam, followed by Minidoka Dam in 1906, and American Falls Dam in 1927. Other changes followed as a result of these modifications. Habitats within the river changed due to impoundment. In the reservoirs, habitat changed due to sedimentation resulting from the large quiescent zones. Normally this sediment would have been transported through these reaches. Habitat was further changes because of decreased sedimentation in the riverine sections because of the dams blocking downstream movement of bedload and wash load. With the dams also came conversion of native vegetation to agricultural uses that increased the sediment transported to the reservoirs. Additionally, new sources of nutrients have been introduced to the river directly from tributaries as a result of runoff from fertilized agricultural fields, industrial processing wastes, and municipal sewage. Another problem has been introduction of exotic fish species more tolerant of warmer water temperatures.

Water quality problems in Milner Reservoir resulted in major fish kills in the 1960's (Grunder et al. 1987). In the winter of 1966 a kill of 500,000 occurred, blamed on high BOD (biochemical oxygen demand) and low dissolved oxygen (DO). Other kills were reported in Milner Pool in 1960, 1961, 1963 as well (DesVoigne et al. 1976). Since that time water quality has improved dramatically due in part to intensive pollution control management by the point source dischargers (Grunder 1989).

Reid (1972) reported on the condition of the fisheries between American Falls and Milner Dam, stating that good trout fishing is found in fairly clean free-flowing sections especially from Walcott to American Falls, where 21,000 rainbow trout were caught, as well as cutthroat, brown trout, Coho salmon and whitefish. This was because in that section, the Snake River from Minidoka Dam upstream to American Falls is relatively clear and silt free.

Reid also claimed good trout fishing was found primarily in flowing river sections below American Falls Dam and below Minidoka Dam, noting that in Lake Walcott, Utah chub and suckers predominated, with concentrations of carp. Other species caught by gillnet were rainbow, Coho, and crappie. Yellow perch and largemouth bass had been reported in the past in Lake Walcott, but not in 1971, however. In Milner Pool, sucker, Utah chub, whitefish, and carp were found, but as with other impounded reservoir sections (Lake Walcott and Upper Salmon Falls Reservoir), practically no trout or warmwater fishing occurs except in areas of springs. This situation may have been rectified by the stabilization of the Milner Pool level and the subsequent increase in cover available for the fish assemblage.

DesVoigne et al. (1976) studied the influence of the discharges of Ore-Ida Foods, J.R. Simplot, and A & P Companies upon the Milner Pool. They noted that the most important and valuable resource of the Milner Reservoir is carp because they are pollution-tolerant, but that they compete with native fish for food. They were also critical of the habitat of the Milner Pool at that time inferring that the uniform bottom of Milner Pool may limit the production of forage. DesVoigne et al. were also pessimistic about an increase in water quality, stating there is no possibility or probability of reversing the trends in fish populations toward that which existed before the construction of the river blocking barriers. Therefore, pollution sources (such as TSS) may not necessarily be the culprit in reducing the fisheries. It is highly probable that pollution sources (such as flow alteration) may account for a stronger influence as surmised by local constituents.

In recent years there have been a number of studies outlining the current situation as described in Table 2, as well as a major change in the hydrology of the reach with the re-structuring of Milner Dam since 1990. By the 1980's a number of IDFG reports funded through the Federal Aid in Fish Restoration program documented little change in the reach as a whole although water quality had improved dramatically in Milner Pool (Grunder et al. 1987). Milner Pool supported a minor fishery for channel catfish which are stocked when available (Grunder et al. 1989), and also present were smallmouth and largemouth bass, blue catfish, yellow perch, and bluegill. Nongame suckers and carp were abundant, although only two smallmouth bass were caught in gillnets. Partridge (1987) noted prior to the modification of the flow regime in Milner Pool that:

> A major reason for low numbers of game fish is the lack of available habitat. Due to the flowing water, wave action and years of sedimentation, the bottom structure is uniformly even, shallow and heavily silted. Rooted aquatic vegetation is limited to a few areas on the downriver side of islands in shallow water. Since the bottom is relatively shallow and exposed, there is a lack of structure to attract preferred fish species.

The major change in fishery regime of the Lake Walcott reach since the initial construction of the dams early in the century was the construction of a hydroelectric project at Milner Dam in 1990 by the Twin Falls Canal Company, the North Side Canal Company, and Idaho Power Company. Prior to that time, the pool behind the dam was affected entirely by irrigation demands, and was drained annually in the winter, exposing the river channel. These large seasonal changes in level were too dramatic to provide a stable environment for most species of fish to survive. These fluctuations also effectively eliminated much of the aquatic macrophyte beds required by most fishes as hiding and escape cover, leaving only the bare uniform bottom. Part of the requirements imposed by FERC was mitigation for fishery resources impacted by the project, as well as monitoring of water quality and aquatic resources.

A series of reports produced by Idaho Power Company for these FERC requirements document the recent status of fish in the Milner Pool (Brown and Randolph 1992; Brown et al. 1993; Barr et al. 1994; Wilkison et al. 1995; Wilkison et al. 1996; Wilkison et al. 1997). Milner Pool is described as turning into a good smallmouth bass fishery, now that it is winter-stabilized.

In the summer of 1997, sampling on the river and overflights by IDEQ personnel found accumulations of the macrophyte *Potamogeton* downstream from American Falls Dam in shallow areas of the river and in upper Lake Walcott where depths were less than six feet. Growths were also present in similar environments in the Milner Pool, and along the banks of Lake Walcott. Such accumulations were noticeably absent at that time from Minidoka Dam to Burley. These accumulations have provided for increase hiding and escape habitat for the various fishes in the reach. In some cases these growths have been accelerated, following the pool-stabilization, due to high levels of nutrients and are in excess of what may be needed by the fishery.

It is also important to emphasize that the Snake River historically did not provide all of the types of habitats that native fish require throughout various phases of their lives. Those habitats that were not provided by the river were spawning and rearing grounds (IDFG 1999b). Consequently, the cold water salmonids in the Snake River evolved as fluvial populations that relied upon the tributaries for spawning and rearing of young. Additionally, IDFG personnel noted that the probability of salmonid spawning ever occurring in the Lake Walcott reach was very low. IDFG personnel also noted that salmonid spawning has never been documented in the American Falls to Massacre Rocks sections of the Snake River. Idaho Fish and Game personnel felt that the majority of spawning took place in the tributaries that have since been effectively eliminated from the system through irrigation withdrawals and dam construction. Due to the stocking regimes of the IDFG, however, the current status of cold-water fisheries below American Falls

Dam to Massacre Rocks and below Minidoka Dam are some of the best in the state. This assertion is supported by the high use of fishermen in these reaches throughout the year, the quality of the fish taken in these reaches, and the good catch per unit effort (CPUE) (information from creel surveys in these reaches). Dick Scully of the IDFG (1999C) also noted that fishermen density on opening day in the American Falls to Massacre Rocks section to be one of the highest in the state. Recent declines in CPUE below American Falls Dam have been attributed to increases in angling pressure and reduced stocking rates over the same period (Smith 1991). Therefore, recreational concerns are affected to a great extent by the viability of various non-native, exotic, and native fisheries. The survivability of these populations may be linked more closely with predation, both natural and from the high fishing pressures, than with water quality in much of the Lake Walcott Reach (Smith 1991).

Historically, fisheries populations in the Milner Pool were probably similar to those in the American Falls to Massacre Rocks reaches. The salmonid population would have consisted of fluvial cutthroat trout and whitefish. These fishes would have relied upon the tributaries for spawning and rearing grounds, returning to the river after they had gained enough size to compete for food and avoid predation. Whitefish spawning could have occurred and may still occur in the very limited spring areas within the river (as evidenced by the continued presence of whitefish in the reach). Although such spawning has also never been documented in this reach (IDFG 1999b). Additionally, the construction and operation regimes of the Milner Pool have changed the historical habitats found within the river. Homogenization of the bottom substrates from nearly 100 years of operation as a summer-time reservoir, and increased sediment trapped from the tributaries due to the settling effect of a reservoir. Although, the Large River BURP, and numerous gravel-mining operations indicate good quality gravels still exist in the river reach. The lowered velocity through the reach, however, and increasing the thermal load may have resulted in a limited cold water fishery. Operation of Milner pool prior to 1989 may also have affected winter hold over of adult and juvenile fishes, although the current operation regime should be more favorable to a salmonid fishery (IDFG 1999b). IDFG personnel also note that the water quality and substrate of the upper portion of Milner pool is of sufficient water quality that a viable put and take trout fishery is not out of the question. Also noted was that whitefish spawn and maintain a population within the reach.

After stocking catchable trout in the reach in 1991-92 IDFG personnel noted, however, that return rates from the fishery were quite low. Escapement into the canals and drains were documented as the reasons for these low return rates. According to Partridge (IDFG 1999b) once the fishermen discovered the fish were in the canals they did quite well, some of the fish caught were up to 3 pounds. Because of the past operation of Milner Pool and the high escapement rates into the canals, IDFG have managed the Milner Pool as a bass fishery due to the tendency of bass to remain in the area and not migrate out through the extensive canals.

Given the presence of the three major dams constructed early in the century, 50 years before passage of the Clean Water Act, the Lake Walcott reach has been impacted beyond the point of restoration to its natural condition. Increasing population and industrialization in mid-century resulted in a further degradation in water quality noticeable even in the post-dam environment. Enactment of the Clean Water Act (affecting National Pollution Discharge Elimination System (NPDES)-effluents), however, has increased water quality from that just a decade earlier. With the winter stabilization of the Milner Pool, it is likely that the fisheries condition of the reach may be at its most productive level of the past 70 years. As a result of these changes, the largest remaining limiting factors to maintaining a natural cold water fishery in the reach are; the escapement into the canal system of adult fish, and the isolation from spawning grounds located in the tributaries.

2.1.4.2 Macroinvertebrates

The IDEQ has developed a multi-metric index of macroinvertebrate communities called the Macroinvertebrate Biotic Index (MBI) to use as an indicator of stream health (IDEQ 1996). The MBI assesses the status of aquatic life beneficial uses in wadeable streams in Idaho. Seven metrics (measures of certain aspects of macroinvertebrate community structure based upon the species present and their relative abundance) are combined. These metrics are normalized by taking the ratio to their ecoregion benchmark, thus giving equal weight to each (and a maximum score of 7 for MBI), and then summed. The macroinvertebrate community, and the waterbody in which it resides, are considered impaired if the MBI score is less than or equal to 2.5. With a score greater than or equal to 3.5, the waterbody is considered not impaired, or in good health. Values between 2.5 and 3.5 are considered inconclusive, and require verification before a definitive status call can be made.

The five tributaries in the eastern part of the sub-basin were sampled using this protocol in 1996, with the results shown in Table 3. Several of the stream segments were found to be not meeting their designated beneficial uses.

Table 3. BURP/ WBAG 1996 ASSESSMENTS, LAKE WALCOTT SUBBASIN TRIBUTARIES (IDEQ 1996)

WATERBODY	HUC/PNRS	Boundaries	MBI/HI	CWB-Support Status	SS-Support Status
Rock Creek	209-11/365	E. Fk. /Lower Rockland Valley	2.62/48	NFS	----
South Fork Rock Creek	209-02/365	headwaters/ E.Fk.	1.83/42	NFS	----
East Fork (upper) Rock Creek	209-29/366	headwaters/ elevation 4920	3.74/110	FS	FS

WATERBODY	HUC/PNRS	Boundaries	MBI/HI	CWB-Support Status	SS-Support Status
East Fork (lower) Rock Creek	209-29/366	elevation 4920/ So. Fk.	2.88/52	NFS	NFS
Fall Creek	209-09/---	headwaters/ Snake River	2.92/70	NV	----

CWB= cold water biota; SS=salmonid spawning; FS=full support; NFS=not full support; NV=needs verification; ---- Not Assessed

2.1.4.3 Waterfowl

The Lake Walcott Reach is a major wintering area and migration corridor for waterfowl using the pacific flyway. Numerous ducks and Canada geese comprise much of the waterfowl population using the flyway. Waste grain from croplands along the river corridor provides much of the forage for the birds. The Lake Walcott Wildlife Refuge and smaller refuges within the Milner Pool provide relative safety for these birds along their migration flyway. Additionally the abundant agricultural cropland and water resources entice many birds to become year round residents. As many as a half a million ducks migrate through the area each winter (FERC 1997). Nutrient loads have been estimated for waterfowl though the Lake Walcott reach and can be quite high during spring and fall migration periods (Gianotto 1995). This portion of the nutrient load will be considered part of the natural background load.

2.1.4.4 Endangered, threatened, and sensitive species

The Lake Walcott reach is the historical and present range of several rare, threatened, and endangered species. Table 4 displays species found within the Lake Walcott reach between American Falls Dam and Milner Dam.

Table 4. ENDANGERED SPECIES IN THE LAKE WALCOTT SUBBASIN

Species Common Name	Scientific Name	Comments
Snake River physa	*Physa natricine*	Not found in reach in 1996 or 1997, Federally listed- Endangered
Utah Valvata snail	*Valvata utahnesis*	Found in reach, Federally listed- Endangered
American bittern	*Botaurus lentiginosus*	Found in reach, State listed- Rare

Species Common Name	Scientific Name	Comments
Trumpeter swan	*Cygnus buccinator*	Found in reach, State listed-Rare
White sturgeon	*Acipenser transmontanus*	Found in reach, State listed-Rare

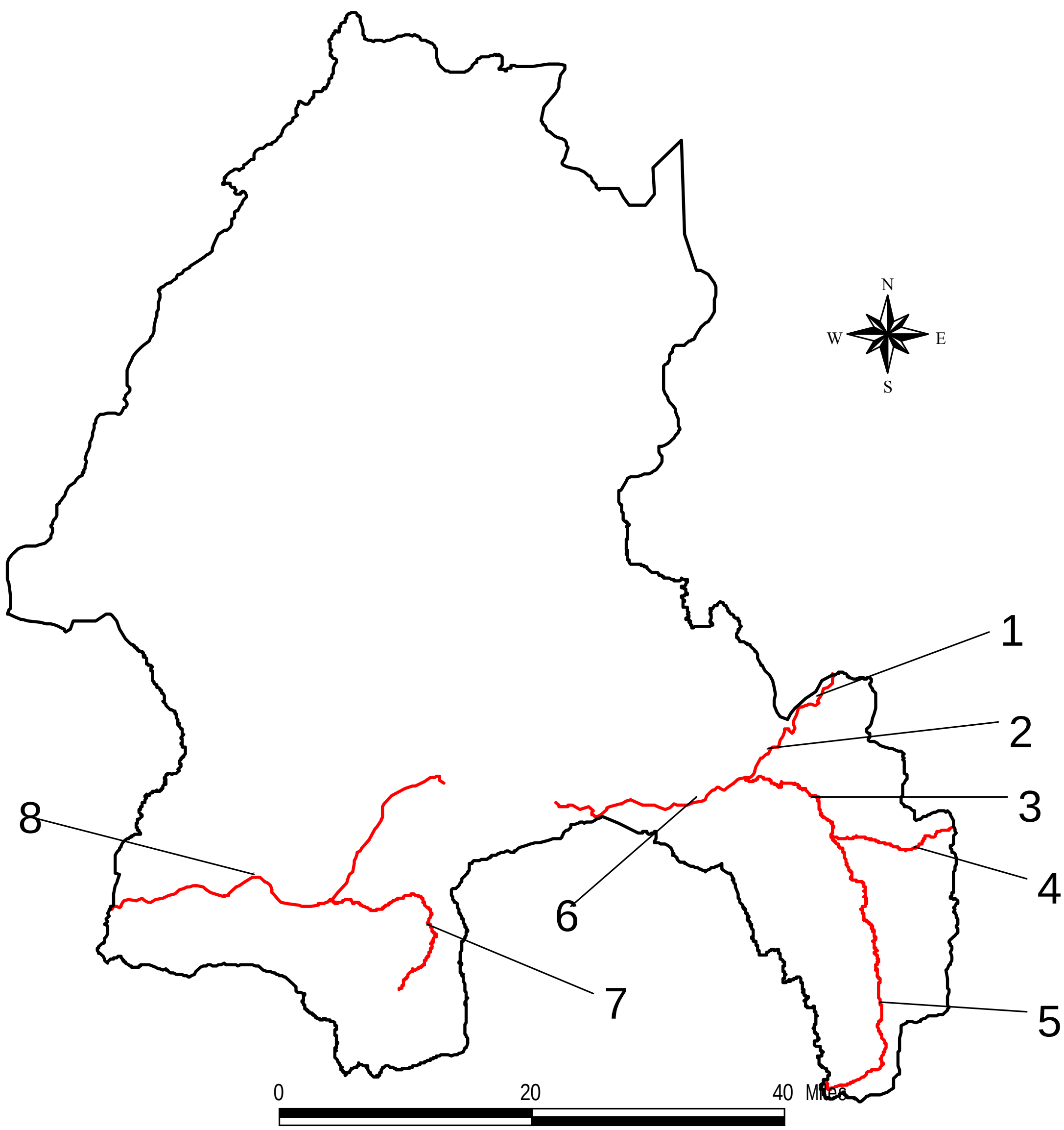
2.1.4.5 Aquatic vegetation

In the summer months a visible degradation of water quality occurs in Milner Pool in the form of relatively dense mats of macrophytes (chiefly *Potamogeton*) that grow in shallow areas of the river channel near shore, where depths are less than six feet. In other areas of the Lake Walcott reach, similar accumulations have not been identified at nuisance levels. Consequently, a reduction in nutrients will be necessary for the Milner Pool reach to reduce nuisance aquatic vegetation.

The macrophytes are found downstream from American Falls Dam on the flooded banks of the old river channels. Within Milner Pool, they grow throughout the river channel, although mainly in shallow near-shore areas. Unexpectedly, they are virtually absent on the river run below Minidoka Dam to the start of the Milner Pool. This is probably due to the amount of high quality gravels located within this reach of the pool limiting nutrient uptake from the sediments by the rooted macrophytes and providing less suitable attachment substrates. In addition, this increase in macrophyte abundance may be related to the increasing number of point and nonpoint sources of nutrients in this reach in comparison to the upstream reaches.

2.2 **Water Quality Concerns and Status**

The CWA established a process for restoring the nation’s water bodies to health. Part of this was the designation of impacted waters by the States, through listing such waters as in §303(d). The 1996 §303(d) list for the State of Idaho (EPA 1996) included six segments occurring within the region designated as the Lake Walcott Subbasin (Table 4 and Figure 12). Four segments of the Snake River and two of Rock Creek are on the 1996 §303(d) list. These segments are described below and in following tables and figures.



Water Quality Limited Segments

1) Snake River from American Falls Dam to Eagle Rock.
2) Snake River from Eagle Rock to Massacre Rock.
3) Rock Creek from the Headwaters to Snake River.
4) East Fork of Rock from Bench Citch to Rock Creek.
5) South Fork of Rock Creek from Headwaters to Rock Creek.
6) Snake River from Massacre Rock to Lake Walcott.
7) Marsh Creek from Land Creek to Snake River.
8) Milner Lake.

Figure 12. Water Quality Limited River and Stream Segments of the Lake Walcott Subbasin

Table 5. 1996 ∍303(d) LISTED WATERBODIES IN THE LAKE WALCOTT SUBBASIN

WATERBODY	STREAM SEGMENT HUC / PNRS	BOUNDARIES	POLLUTANTS AND/OR STRESSORS			
			1	2	3	4
Snake River	17040209 / 363	American Falls Dam to Eagle Rock	S			
Snake River	17040209 / 363	Eagle Rock to Massacre Rocks	S			
Snake River	17040209 / 362	Massacre Rocks to Lake Walcott	S	DO	P	
Milner Reservoir	17040209 / 359	Minidoka Dam to Milner Dam	S	DO	N	O G
Rock Creek	17040209 / 366	Confluence (S. Fk. & E.Fk.) to Mouth	S			
Rock Creek, East Fork	17040209 / 365	Headwaters to Rock Creek	S			
South Fork Rock Creek	17040209/ NA	Headwaters to Rock Creek	uk			
Marsh Creek	17040209/ NA	Land Creek to Snake River	uk			

HUC = Hydrologic Unit Code designation by USGS for Upper Snake Basin. PNRS = Pacific Northwest River Study designation number.
Pollutants and/or stressors are listed as they appear on the 1996 §303(d) list. Unknown pollutants and streams associated with them are from the draft 1998 §303 (d) list. Pollutants and/or stressors: N = Nutrients S = Sediment DO = Dissolved Oxygen P = Pesticides OG = Oil and Grease uk = Unknown

2.2.1 General Information on Point and Nonpoint Sources

The Major source of pollutants for the Lake Walcott reach were identified in the 1992 ∍305(b) report. This report contains information regarding the types of pollutants affecting beneficial uses and the major sources of these pollutants. Notably only two point sources were identified as major sources of pollutants. These were animal holding areas and confined feeding operations located in the Milner Pool area and the East Fork of Rock Creek (IDEQ 1992). These sources are NPDES permitted and have a zero discharge limit of pollutants.

Other sources of pollutants from point sources may include aquaculture, food processors, municipalities, and industries. The pollutants listed from the NPDES permits are: ammonia; BOD; biological waste; deleterious materials; fecal coliform and other bacteria; floating, suspended or submerged matter; nutrients, including phosphorus and nitrogen compounds; oil and grease; oxygen demanding materials; residual disinfectants, including residual chlorine; residual disease control drugs and other chemicals; residual feed and nutritional supplements; sediment; settable solids; temperature; pH; total suspended solids; toxic substances; and turbidity.

For the Lake Walcott reach, the 1992 ∍305(b) report indicated that nonpoint sources as major contributors of pollutants were: nonirrigated crops; irrigated crops; range; highway, road, and bridge construction; pastures; storm drains; dredging; flow regulation; stream bank destabilization; and tank leaks (IDEQ 1992). Typical pollutants from these sources include sediment, nutrients, pathogens, salts, toxic substances, oil and grease, and pesticides.

2.2.2 Water Quality Limited Stream Segments in Subbasin

The following sections describe the boundaries of each water quality limited segment located in the Lake Walcott reach, and the pollutants identified by various agencies from the 1992 э305(b) Report (Table 6).

Table 6. 1992 з05(b) REPORT: POLLUTANTS AND SOURCES

Segment	Pollutant Source	Agency Providing Data	Pollutant			
American Falls to Eagle Rock	Nonirrigated crop	IDFG	S			
American Falls to Eagle Rock	Irrigated crop	IDFG	S			
Massacre Rocks to Lake Walcott	Nonirrigated crop	IDFG	S			
Massacre Rocks to Lake Walcott	Irrigated crop	IDFG	S			
Massacre Rocks to Lake Walcott	Nonirrigated crop	BLM	S	O	P	
Massacre Rocks to Lake Walcott	Irrigated crop	BLM	S	O	P	
Massacre Rocks to Lake Walcott	Range	BLM	S	O	P	
Milner Pool	Highway/bridge construction	BLM	S			
Milner Pool	Irrigated crop	IDEQ TFRO	S	N		
Milner Pool	Pasture	IDEQ TFRO	B			
Milner Pool	Feedlots	IDEQ TFRO	N	O	B	A
Milner Pool	Storm drains	IDEQ TFRO	S	OG		
Milner Pool	Dredging	IDEQ TFRO	S			
Milner Pool	Flow regulation	IDEQ TFRO	F			
Milner Pool	Stream bank destabilization	IDEQ TFRO	S			
Rock Creek	Tank leaks	IDFG	OG			
Rock Creek	Nonirrigated crops	IDFG	S			
Rock Creek	irrigated crops	IDFG	S			
Rock Creek	Pasture	IDFG	S			

Segment	Pollutant Source	Agency Providing Data	Pollutant			
East Fork Rock Creek	Stream bank destabilization	IDFG	S			
East Fork Rock Creek	Nonirrigated crop	IDFG	S			
East Fork Rock Creek	Pasture	IDFG	S			
East Fork Rock Creek	Animal holding	IDFG	S			
East Fork Rock Creek	Stream bank destabilization	IDFG	S			
South Fork Rock Creek	Unknown	IDFG	uk			
Marsh Creek	Unknown	IDFG	uk			

S = Sediment
N = nutrients
OG = Oil and Grease
P = Pesticides
F = Flow alteration
O = Organic enrichment/Dissolved Oxygen
B = Bacteria
A = Ammonia
uk = Unknown

2.2.2.1 American Falls to Eagle Rock

This is a free-flowing segment in the basalt gorge of the Snake River that begins after the 60-foot drop of American Falls Dam (river mile 714) and ends at an old proposed dam site at Eagle Rock (river mile 709). The channel meanders moderately for 5 miles from the American Falls Dam to Eagle Rock, dropping 48 feet (9.6 feet/mile-- this is relatively steep, e.g. the Colorado River through the Grand Canyon drops an average of 8 ft/mile). There are a few rocky islands in the channel and numerous rapids. Cliffs up to 140 feet high border the west side, with lesser cliffs and occasional gentle slopes to the east. The river's elevation here ranges from 4,248-4,200 feet.

2.2.2.2 Eagle Rock to Massacre Rocks

Immediately downstream of the above segment is another free-flowing reach of the Snake River. It begins at the Eagle Rock dam site (river mile 709) in a deeper basalt gorge and continues downstream to Massacre Rocks (Beaver Island - river mile 706). The rocky cliffs on the northwest side are as much as 200 feet high, facing lower 100-foot drops to the east. There are a few rocky islands, with deep scour pools in the lower section. Very limited data exist in this area of the Lake Walcott reach. Because of its similarities with the American Falls to Eagle Rock reach and the lack of data, this reach will be combined for further analysis with the upstream segment. The relative slope of this section, however, is nominal.

2.2.2.3 Massacre Rocks to Lake Walcott

This 22-mile low-gradient section within the basalt gorge of the Snake River empties into the

Lake Walcott Reservoir at 4,195 feet elevation; its terminus varies according to the reservoir levels, and there may or may not be a noticeable surface gradient. The relative slope of the river in this section is 0.23 feet per mile. The river meanders around massive bar deposits resulting from the Lake Bonneville Floods of approximately 15 thousand years BP. These deposits are locally irrigated and farmed where they are sufficiently wide. Due to the variability in reservoir levels the downstream terminus of this segment, for this TMDL, will be considered Smith Springs. These springs are located in the Lake Walcott Wildlife Refuge at approximately river mile 684. At this point GIS coverages indicate the transition from Snake River to Lake Walcott.

2.2.2.4 Minidoka Dam to Milner Dam

The Milner Pool varies in elevation depending on releases and inflows, averaging 4,134 elevation. The §303(d) listed segment is considered to extend from the base of Minidoka Dam (river mile 674.5) to Milner Dam (river mile 639.1), however at least two miles of the reach, from Minidoka to near Burley usually displays flow velocities more related to a river than a pool. The relative slope of the river in this segment is 1.72 feet per mile. The Snake River at this point is moderately entrenched below the level of the Snake River Plain. (The Burley/Heyburn Bridge, river mile 653.7, forms an internal boundary for this segment that denotes a change in designated beneficial uses discussed in later sections of this document).

2.2.2.5 Rock Creek, East Fork, South Fork

The headwaters of Rock Creek begin at the union of the East and South Fork, to the west of Rockland at an elevation of 4,600 feet. The creek flows north for about six miles through irrigated pasture and farmland. The valley floor here is half a mile wide, bordered with numerous irrigation diversions and returns, and drops 160 feet. Numerous shallow tributaries enter, all are ephemeral, and most are farmed. Eventually the gradient steepens; losing 250 feet as it enters a three-mile, deepening gorge that ends at the Snake River near Register Rock. The river's elevation there is about 4,200 feet. Thus, the relative slope of Rock Creek is 34.78 feet per mile.

The East Fork originates as a considerable spring at the mouth of East Fork Canyon in the Deep Creek mountains at 5,200 feet. It is likely a karst spring emerging from local carbonate rocks, and for some distance downstream it flows over travertine dams of its own mineral precipitates. As with other local canyons, it continues as a wide entrenched valley through the farmed alluvial apron at the mountain base until it reaches the broad level floor of the Rockland Valley. From this point, the second half of this reach is through irrigated pasture and farm land bordering the creek, until it passes through the community of Rockland to join with the South Fork of Rockland Creek at 4600 feet. Prior to this, the Bench Ditch diverts considerable flow (5-10 cfs) from the East Fork north onto irrigated highlands. The relative slope of the East Fork of Rock Creek is 60 feet per mile.

The South Fork of Rock Creek originates in the Sublett mountain range at 6,000 feet. Most tributaries and the South Fork of Rock Creek are ephemeral in nature until much lower in the watershed were integrated stream channels begin at a spring source from the Deep Creek mountain range. This source is approximately 10 miles south of the city of Rockland. The integrated channel begins in the broad level floor of the Rockland valley. Through this area, it flows through irrigated pastures and farmlands bordering the stream where it joins the East Fork of Rock Creek to form Rock Creek. Mean annual flow in the South Fork of Rock Creek varies from 3 to 7 cfs. Snow melt and rain-on-snow events can increase the flow in South Fork considerably. For instance, a peak flow event of 123 cfs was measured following one of these events. The relative slope of the South Fork of Rock Creek, from the spring source, is 18.9 feet per mile.

2.2.2.6 Marsh Creek

Marsh Creek was listed on the 1998 Draft э303(d) list. An assessment of its water quality and a TMDL are planned for 2006. Marsh Creek originates in the Albion Mountain range at 5,800 feet. Its headwaters are forested, transitioning to a broad alluvial valley. Much of the flow of Marsh Creek is diverted for irrigation uses. Agricultural return flows, however, enter the channel from numerous drains and canals along its length thus providing continuous flow in Marsh Creek. A large diversion dam located on the Skaggs ranch is capable of drying Marsh creek entirely during the summer months. Further down the valley waste agricultural waters return to the Marsh Creek channel before it enters the Snake River in the Milner Pool area. The э303(d)-listed portion of Marsh Creek begins at the confluence of Land Creek and continues to the confluence with the Snake River.

2.2.2.7 Other tributaries

Raft River periodically flows into the Lake Walcott reach. At this time a Subbasin Assessment and TMDL are planned for HUC 17040210 in year 2002. Upon completion of the implementation phase of the Raft River TMDL further reductions in sediment, nutrients, bacteria, and ammonia will be seen in the Snake River due to reductions in the Raft River Subbasin. These reductions may provide habitat changes in Raft River that will result in year-round flow into the Snake River. Year-round flow would provide access for salmonids in the mainstem to their historic spawning grounds.

Goose Creek is э303(d) listed from the State line to the Lower Goose Creek Reservoir. Stream flow historically reached the Snake River from Goose Creek near the city of Burley. Upon completion of the lower Goose Creek Reservoir, however, flows have only reached the Snake River once, in 1984. These flows were diverted through an emergency canal dug to the Snake River following an old railroad grade. These flows entered the Snake River approximately two miles west of the city of Burley (approximate river mile 649). This canal has since been refilled and reclaimed as farm ground. Since that time a channel was dug to the southwest to bring excess water from the Goose Creek Reservoir to the Twin falls Canal at Murtaugh Lake. The excess water is used to increase aquifer recharge. The Snipe Creek drain returns agricultural wastewater into the old Goose Creek channel, prior to the confluence with the Snake River. Goose Creek (Snipe Creek) joins the Snake River near the city of Burley's municipal golf course at river mile 653.8. A Subbasin Assessment and TMDL are planned for the Goose Creek Subbasin in the year 2002. At this time it is not expected that historical flows will be returned to the Goose Creek channel, through Burley, as most of the historic channel has been used for farming and for housing developments. Pollutant loads from the Snipe Creek/Goose Creek drain, however, will be addressed in the Lake Walcott TMDL for Milner Pool.

2.2.3 Applicable Beneficial Uses and Water Quality Standards

Under the state water quality standards, Idaho is divided into six separate hydrologic basins. Within each basin, the major rivers, lakes/reservoirs, and creeks are identified (designated) for specific beneficial uses. Most tributary waters, however, are not yet designated. These undesignated waters are protected for all recreation uses and for the protection and propagation of fish, shellfish, and wildlife wherever attainable (Idaho Administrative Procedures Act (IDAPA) §16.01.02.101.01). Industrial water supply, wildlife habitats and aesthetics are minimum designated standards for all waters of the state.

Other water quality standards that apply to the Lake Walcott Subbasin Assessment and TMDL are IDAPA §16.01.02.051.01-02, which is the State's Antidegradation Policy. It reads:

> Maintenance of Existing Uses for All Waters. The existing in stream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
>
> High Quality Waters. Where the Quality of the waters exceeds levels necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the Department finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the Department's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the Department shall assure water quality adequate to protect existing uses fully...

IDAPA §16.01.02.276.04 is the State's dissolved oxygen standards for waters discharged from American Falls Dams. It reads:

> Dissolved Oxygen Concentrations Below American Falls Dam. All waters below American Falls Dam shall contain the following dissolved oxygen concentrations during the time period indicated:

Table 7. TIME PERIOD OF DISSOLVED OXYGEN STANDARDS BELOW AMERICAN FALLS DAM

American Falls Dam	mg/L Dissolved Oxygen

American Falls Dam	mg/L Dissolved Oxygen		
Time Period (Annually)	30 Day Mean	7 Day Mean Minimum	Instantaneous Minimum
May 15 - Oct 15	5.5	4.7	3.5

In addition, IDAPA §16.01.02.276.05 for the point of measurement for DO below hydroelectric facilities reads:

> Point of Measurement. For the purpose of determining compliance with Subsection 276.02, 276.04 and 276.04, the dissolved oxygen shall be measured at a single location in the river downstream from the hydroelectric facilities. Such location shall be as close to the facilities as practical to obtain a representative measurement, but in all cases shall be sufficient distance downstream to allow thorough mixing of reaerated waters, spilled by-pass waters, and other waters that have passed through the facility.

э16.01.02.50.01 states:

> Apportionment of water. 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 through any of the interstate compacts or court decrees, or to interfere with the rights of Idaho appropriators, either now of in the future, in the utilization of the water appropriations which have been granted to them under the statutory procedure…

э16.01.02.50.02.a states:

> Wherever attainable, surface waters of the state shall be protected for beneficial uses which for surface waters includes all recreational use in and on the water surface and the preservation and propagation of desirable species of aquatic biota;

э16.01.02.50.02.c states:

> In all cases, existing beneficial uses of the waters of the state will be protected.

Table 8 summarizes Idaho's beneficial uses and criteria for its water bodies. Those uses designated for selected water bodies within the Lake Walcott Subbasin are identified in Table 9, as defined in IDAPA §16.01.02.150. Note that these segments of the Snake River differ from those on the §303(d) listing. Note also the change in designation from Cold Water Biota to Warm Water Biota at the Burley/Heyburn Bridge.

Table 8. STATE OF IDAHO RECOGNIZED BENEFICIAL USES

BENEFICIAL USES	APPLICABLE CRITERIA
Agricultural Water Supply	Waters which are suitable or intended to be made suitable for the irrigation of crops or as drinking water for livestock. (IDAPA §16.01.02.100.01.a) Numeric criteria as needed are derived from the EPA's Blue Book. (IDAPA §16.01.02.250.03.b)
Domestic Water Supply	Waters which are suitable or intended to be made suitable for drinking water supplies. (IDAPA §16.01.02.100.01.b) Numeric criteria for specific constituents and turbidity. (IDAPA §16.01.02.250.03.1)
Industrial Water Supply	Waters which are suitable or intended to be made suitable for industrial water supplies. This use applies to all waters of the state. (IDAPA §16.01.02.100.01.c) Numeric criteria are categorized as general surface water quality criteria. (IDAPA §16.01.02.200)
Cold Water Biota	Waters which are suitable or intended to be made suitable for protection and maintenance of viable communities of aquatic organisms and populations of significant aquatic species which have optimal growing temperatures below 19°C. (IDAPA §16.01.02.100.02.a) Numeric criteria are established for pH, DO, gas saturation, residual chlorine, water temperature, ammonia, turbidity, and toxics. (IDAPA §16.01.02.250.02.a and c)
Warm Water Biota	Waters which are suitable or are intended to be made suitable for protection and maintenance of viable communities of aquatic organisms and populations of significant aquatic species which have optimal growing temperatures above 19°C. (IDAPA §16.01.02.100.02.b) Numeric criteria are established for pH, DO, gas saturation, residual chlorine, water temperature, ammonia, and toxics. (IDAPA §16.01.02.250.02.a and b)
Salmonid Spawning	Waters which provide or could provide habitat for active self-propagating populations of salmonid fishes. (IDAPA §16.01.02.100.02.c) Numeric criteria are established for pH, gas saturation, residual chlorine, DO, intergravel DO, water temperature, ammonia, and toxics. (IDAPA §16.01.02.250.02.a and d)
Primary Contact Recreation	Surface waters which are suitable or are intended to be made suitable for prolonged and intimate contact by humans or for recreational activities when the ingestion of small quantities of water is likely to occur. Such waters include, but are not restricted to; those used for swimming, water skiing, or skin diving. (IDAPA §16.01.02.100.03.a) Numeric criteria are established for fecal coliform bacteria applied between May 1 and September 30 (recreation season). (IDAPA §16.01.02.250.01.a)
Secondary Contact Recreation	Surface waters which are suitable or are intended to be made suitable for recreational uses on or about the water which are not included in the primary contact category. These waters may be used for fishing, boating, wading, and other activities where ingestion of raw water is not probable. (IDAPA §16.01.02.100.03.b) Numeric criteria are established for fecal coliform bacteria. (IDAPA §16.01.02.250.01.b)
Wildlife Habitats	Waters which are suitable or are intended to be made suitable for wildlife habitats. This use applies to all surface waters of the state. (IDAPA §16.01.02.100.04) Numeric criteria are categorized as general surface water quality criteria. (IDAPA §16.01.02.200)
Aesthetics	This use applies to all surface waters of the state. (IDAPA §16.01.02.100.05) Numeric criteria are categorized as general surface water quality criteria. (IDAPA §16.01.02.200)

BENEFICIAL USES	APPLICABLE CRITERIA
Special Resource Water	Those specific segments or waterbodies which are recognized as needing intensive protection to preserve outstanding or unique characteristics. Designation as a special resource water recognizes at least one of the following characteristics: (1) the water is of outstanding high quality, exceeding both criteria for primary contact recreation and cold water biota; (2) the water is of unique ecological significance; (3) the water possesses outstanding recreational or aesthetic qualities; (4) intensive protection of the quality of the water is in paramount interest of the people of Idaho; (5) the water is part of the National Wild and Scenic River System, is within a State or National Park or wildlife refuge and is of prime or major importance to that park or refuge; (6) intensive protection of the quality of the water is necessary to maintain an existing but jeopardized beneficial use. (IDAPA §16.01.02.054) Special resource waters receive additional point source discharge restrictions. (IDAPA §16.01.02.054.03 and 400.01.b)

NOTE: All waters are protected through general surface water quality criteria. Narrative criteria prohibit ambient concentrations of certain pollutants that impair designated uses. Narrative criteria established in Idaho water quality standards include: hazardous materials; toxic substances; deleterious materials; radioactive materials; floating; suspended; or submerged matter; excess nutrients; oxygen demanding materials and sediment. (See IDAPA §16.01.02.200.)

2.2.3.1 Applicable designated and existing beneficial uses

Applicable designated and existing uses are those uses designated by the State Legislature through negotiated rule making based on recommendations provide by IDEQ via the Board of Idaho Department of Health and Welfare (IDHW) and those uses discovered through the BURP process and subsequent Waterbody Assessment to be existing in the waterbody.

Table 9. DESIGNATED BENEFICIAL USES OF THE LAKE WALCOTT SUBBASIN

WATER BODY	DWS	AWS	CWB	WWB	SS	PCR	SCR	SRW
SNAKE RIVER American Falls Dam to Eagle Rock	X	X	X			X	X	
SNAKE RIVER Eagle Rock To Massacre Rocks	X	X	X			X	X	
SNAKE RIVER Massacre Rocks To Lake Walcott	X	X	X			X	X	
SNAKE RIVER Minidoka Dam to Burley Bridge		X	X		X	X	X	
SNAKE RIVER Burley Bridge to Milner Dam		X		X		X	X	
ROCK CREEK (Power Co.) Source to mouth		X	X		X	*	X	
MARSH CREEK Source to mouth		X	X		*	*	X	
South Fork Rock Creek Headwaters to Rock Creek		E	E				E	
East Fork Rock Creek Headwaters to Rock Creek		E	E		E		E	

DWS = Domestic Water Supply
AWS = Agriculture Water Supply
CWB = Cold Water Biota
WWB = Warm Water Biota
SS = Salmonid Spawning
PCR = Primary Contact Recreation
SCR = Secondary Contact Recreation
SRW = Special Resource Water
* = Protected for future use
X = Protected for general use
E = Existing Beneficial Use documented

2.2.3.2 Applicable water quality standards

Violation of narrative and numeric water quality standards include the following on the Lake Walcott Reach of the Snake River and its tributaries:

A. Floating, suspended, or submerged matter

Surface waters of the state shall be free from floating, suspended, or submerged matter of any kind in concentration causing nuisance or objectionable conditions or that may impair designated beneficial uses. This matter does not include suspended sediment produced as a result of nonpoint source activities (IDAPA э16.01.02.200.05). Nuisance is defined as anything which is injurious to the public health or an obstruction to the free use, in a customary manner, of any waters of the state (IDAPA э16.01.02.003.65).

B. Excess nutrients

IDAPA э16.01.02.200.06 states: Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses. Nutrients in excess quantities often cause rapid eutrophication of aquatic systems. The primary production in an aquatic system is often times limited by the available concentrations of one of these micronutrients at a time (Brorchardt 1996). In the Western United States, phosphorus is typically the nutrient that most limits production of aquatic plants and algae. Nitrogen (N) to phosphorus (P) ratios are often used to determine the limiting factor in aquatic vegetation production and biomass. If all nutrients are in excess quantities, however, the ratios are of little use (Schanz and Juon 1983). Other factors then may limit production of aquatic macrophytes such as light or available substrates. Although the N:P ratios for the Lake Walcott reach indicate that nitrogen may be limiting the growth of aquatic vegetation, indicating that there is excess phosphorus in the system.

A reduction in phosphorus would likely balance the system or switch the system to P limitation, which may further reduce vegetative growths. This shift and reduction in production and biomass would likely be due to the magnitude of vegetative growths associated with the different micronutrients. When nitrogen is limiting, additions of the nutrient can increase vegetation biomass theoretically by 70 times the molecular weight of the nutrient. In contrast, with phosphorus additions the increase is closer to a 500-fold increase in biomass (Wetzel 1975). Because of this, a reduction in phosphorus can reduce the aquatic vegetation to a greater extent than can reductions in nitrogen.

While no State standards exist for the numeric value of excess nutrients (phosphorus in this case), USEPA has suggested guidelines to determine when phosphorus is in excess. To prevent the development of biological nuisance and to control accelerated cultural eutrophication, total phosphorus (as P) should not exceed 0.05 mg/L in streams where it enters a lake or reservoir (USEPA 1977, 1988). As a guideline, the USEPA has suggested that total phosphorus (as P) not exceed 0.1 mg/L in any stream or other flowing waters (USEPA 1986). The Snake River in the Milner Pool reach and the tributaries that enter into this reach often exceed these guidelines.

C. Sediment and settable solids

Sediment is the most common listed pollutant in the Lake Walcott Reach. It is a pollutant on all water bodies in this subbasin listed in 1996. Sediment impacts the aquatic life beneficial uses by smothering fish spawning and rearing ground leading to a homogenization of available habitats. Additionally it reduces the available habitats for the food organisms of the fishes as well as smothering the food organisms themselves (IDHW 1991a). In addition, increased sedimentation leads to a loss of juvenile rearing and over-wintering habitat. As water temperatures decline in the winter, juvenile salmonids seek interstitial spaces in the substrate where they become torpid. When sediment fills the interstitial spaces, it leaves the juvenile fish with no cover during this period of inactivity and makes them more vulnerable to predation. Furthermore, the most common nonpoint pollutant in the State of Idaho is sediment (IDHW 1989b), and the dominant portion of sediment loads in southern Idaho is suspended sediment (IDHW 1988). Due to the hydraulic modification of the Lake Walcott reach by the construction of the three dams, the other portions of the sediment load, bed load and wash load, have effectively been eliminated. The reservoirs serve as extremely large quiescent zones in which the bed and wash loads drop out.

The IDAPA criteria for suspended sediment are narrative. Therefore, other sources were reviewed to determine appropriate limits and targets for suspended sediment. Suggested limits for suspended sediment have been developed by the European Inland Fisheries Advisory Commission and the National Academy of Sciences and adopted by the State of Idaho in previous TMDLs. A limit of 25 mg/L of suspended sediment would provide a high level of protection of the aquatic organisms; 80 mg/L moderate protection; 400 mg/L low and over 400 mg/L very low protection (USDA FS 1990b; Thurston et al. 1979).

2.2.3.3 Flow alteration

Currently there are no IDEQ water quality standards, either narrative or numeric, which address flow alteration. The State of Idaho has also held a position that flow alteration is not a pollutant per э303(d) of the CWA. Additionally the estimation of load capacity and load allocations for flow alteration is not practical. Due to these constraints, a TMDL for flow alteration will not be completed for the Milner Pool area. It should be noted, however, that the change in operation regime in the Milner Pool, by the Twin Falls Canal Company and Idaho Power, might have alleviated the concerns over flow alteration in this segment

2.2.3.4 Effects on threatened and endangered species

Changes implemented by the Lake Walcott TMDL on NPDES permits, and ongoing FERC relicensing, fall under the auspices of э7 consultation of the Endangered Species Act with the

USEPA and the USFWS. Because these are federally permitted activities a biological evaluation is required to determine the impacts on the threatened and endangered species from the discharges covered by these permits. If federal monies are used in conjunction with reductions in nonpoint source loads, those activities may require э7 consultation as well.

2.2.3.5 Fisheries concern on э303(d) listed water bodies

The water quality in the Lake Walcott reach has improved over the past one to two decades due mainly to reissuance of NPDES permits in the area, self and FERC imposed operational limits of the hydroelectric facilities, and past soil conservation projects such as conversion to sprinkler irrigation. Because of the improvement of water quality over the past one to two decades, the fishery could be assumed to have improved over that same time period as well. Although the proposed TMDL for the Lake Walcott reach does not propose to restore water quality to historical levels (pre-dams), but rather to levels where water quality is sufficient to protect beneficial uses and provide water quality capable of supporting self-sustaining populations of aquatic biota. This does not mean that viable populations will exist in the reach following implementation of the TMDL, but, that the water quality will be sufficient such that the population could exist. Other factors that may limit the populations, such as high escapement into canal systems or limited access to tributary spawning grounds due to development and dam construction may have to be assessed in other forums. These factors may have altered the system to the extent that the current put and take fishery is the only option.

2.2.3.6 Recreational uses and its impacts

As noted earlier, recreation in the Lake Walcott reach is some of the highest in the south central portion of Idaho. The construction of the three dams has provided for more access to the reach than prior to construction. Coupled with the increasing population of the Magic Valley the impacts to the river from recreational activities are growing. Currently limited information exist as to the extent of this impact, much of the information is anecdotal from the people living within the area and near the river. Several people have noted that after the change in operation of Milner Dam increased stream bank destabilization and erosion has occurred due to the year-long wave action generated by the passing boats. Consequently, most homeowners along the Milner Pool have been forced to riprap the banks or build retaining walls. Many of the small islands, historically present in the Milner pool area, have been eroded completely from view. Additionally, with increase recreational use of the river there is an increased risk of bacterial contamination. Quantification of this increase, however, is not feasible since other sources of bacteria exist within the reach. Presently, however, there are no violations of the bacteria standards for primary or secondary recreation beneficial uses. Additionally, there are also no limits or standards that can be applied to recreational water craft and oil and grease discharged from these vehicles. In conclusion, an essential factor facing the recreation industry in the following years is to document the value of, and the impacts from, the recreational uses along the Lake Walcott reach.

2.2.4 Analysis of Existing Water Quality Data

The Snake River has long been viewed as a stream course with water quality problems. By 1973, EPA reports had identified excessive algal growth and bacteria, and dissolved oxygen depressions as critical problems (EPA 1973). This report was followed by several others in the 1970's (e.g. Houck and Kreizenbeck 1975, EPA 1975, EPA 1976, BOR 1975, IDHW 1979) that attributed these problems to nutrients, sediment, and associated pollutants reaching the river as a result of regional industrial and agricultural activities.

These summations of the water quality and efforts at restoration noted for example:

> The Snake River begins as a river with relatively high water quality, with nutrient levels below those considered potentially causative to algal activity. However, below Heise nutrient concentration rises and the quality of the river is degraded. Phosphorus enters the Snake River through all of the major tributaries, but particularly via the Malheur, Weiser, and Portneuf Rivers... Generally, the Snake River in its upper portion has relatively low nutrient concentrations. However, during its flow it is influenced by its major tributaries, particularly the Portneuf River, and ground water inflow, and becomes a river characterized by high nutrient levels (EPA 1975).

The USDA, SCS, USDAFS, IDWR et al. (1979) referenced the high soil erosion rates of the basin, and an IDHW analysis (1979):

> The available data on the Snake River from the Idaho-Wyoming border to Weiser shows a general increase in nutrient concentration from upstream to downstream stations, and these recorded concentrations exceed recommended criteria over most of the river a majority of the time. In most Snake River segments and major tributaries, point sources are not major contributors of nutrients and the major reduction in nutrient loadings will come from nonpoint source controls.

The alteration in hydrologic environment was also recognized:

> The population change, from cold-water game fish toward warm-water non-game fish is a factor of the impoundment and its management, not of the industrial effluents. Regardless of the NPDES discharge limitations there is no possibility of reversing the trend in fish population dominance back toward that species distribution existing prior to the construction of Milner Dam (Boise Environmental Science and Technology, Inc. 1978).

As previously noted earlier in this document, these concerns are largely identical to the present situation. A recent USGS report (Clark 1994) summarized the present situation and analyzed trends, showing that nutrient concentrations still generally increased in a downstream direction and noting the influence of "agriculturally-affected" sampling stations. The influence of annual hydrologic variation was also noted.

> Mass movement of nutrients and suspended sediment in the upper Snake River Basin is controlled primarily by changes in streamflow. Between two and three times as much total nitrogen, total phosphorus, and suspended sediment were transported out of the basin in water year 1984 (high- flow

year) compared with 1989 (low-flow year) (Clark 1994).

The most detailed collection of the water quality of the Lake Walcott reach at present is that data collected in separate studies by the Idaho Water Resources Research Institute (IWRRI), and personnel of IDEQ. The IWRRI group is with the University of Idaho's Kimberly Research and Extension Center and has conducted these studies since 1990. The IWRRI sampling was done from three on-shore sites (University of Idaho 1998). IDEQ data was collected from early 1997-99, and enlarged upon the IWRRI collection by sampling from boats on the river and several additional sites below the three major dams (Figure 13a). In addition, Gianotto's M.Sc. thesis (1995) forms an important group of samples looking at overall nutrient loadings of both the Snake River and tributaries between American Falls and Minidoka dams (Figure 13b).

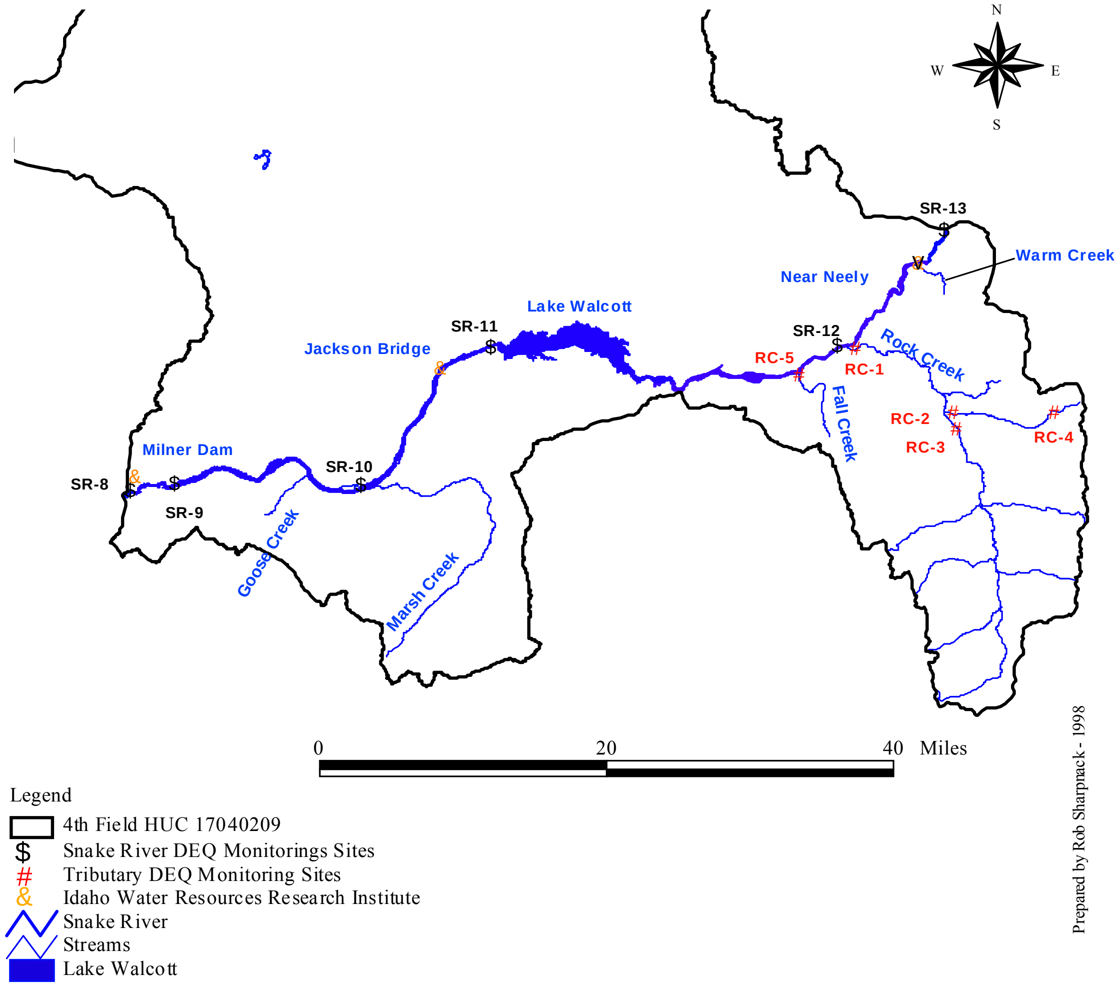


Figure 13a. IDEQ and IWRRI Sampling Locations in the Lake Walcott Subbasin, showing stream tributaries and the Snake River

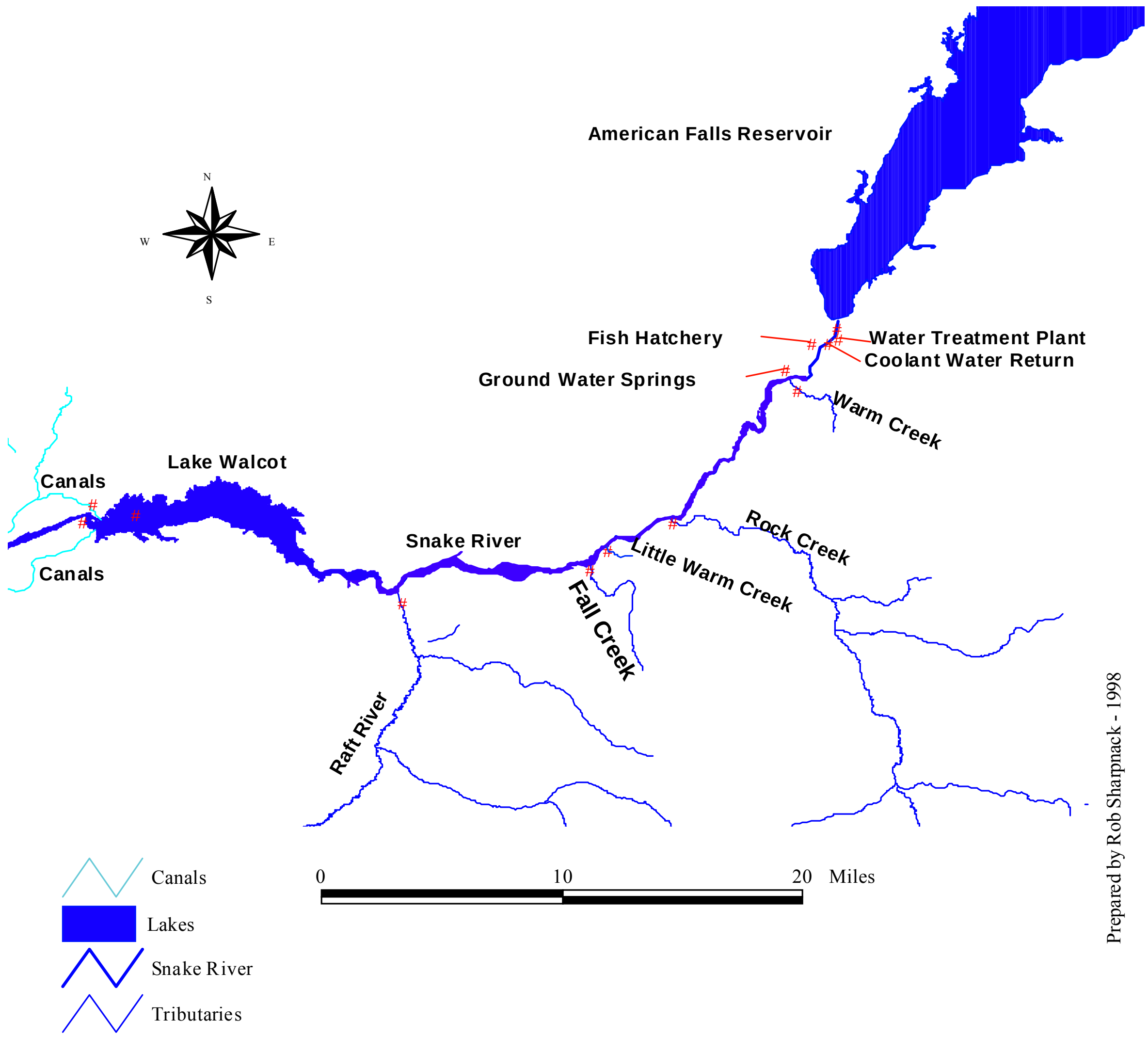


Figure 13b. Sampling Locations of D.F. Gianotto (1995) Along the Snake River and Reservoirs in the Lake Walcott Subbasin.

Total suspended solids will be the focus of much of the following sections because it is the dominant §303(d) listed pollutant and/or stressor. Other listed pollutants will be discussed later in this document as they are listed primarily in only a single segment. In all these data collections, the contribution of bedload is ignored, because of the difficulty of measuring it, but more importantly because the dams and reservoirs should effectively interrupt transport of this component of sediment in the river.

2.2.4.1 The Lake Walcott Reach of the Snake River

Mean concentrations of suspended material remained relatively constant throughout the river, although highly variable at all locations, however, mean concentrations of TSS were below 25 mg/L. TSS concentrations below American Falls Dam were more variable than TP, ranging from 1 to 156 mg/L, with a mean of 19 mg/L and a standard deviation of 27 mg/L. After normalization of the data a useful correlation between TSS and discharge from the dam was developed. The extreme peak of 156 mg/L occurred in 1994. The yearly average TSS concentration discharged from the dam in 1994 was 73.2 mg/L. This was probably the result of sediment mobilized though exposure of unconsolidated beach material following reservoir drawdown in September and October. The extreme export of TSS during 1994 occurred when American Falls Reservoir was at the minimum level seen for the water years 1994 and 1995. In recent years, however, (including the high flow years of 1997) the yearly average TSS concentration has decreased significantly from 39.3 mg/L two decades ago to 6.2 mg/L in 1995. No data was analyzed, or available, during 1990 when the reservoir was at 0.0 acre/feet of storage.

In the Massacre Rocks to Lake Walcott section TSS concentration increase as the river become more accessible to nonpoint activities. In this reach, the dominant nonpoint source of sediment is rangeland or grazing, although limited farming occurs higher on the benches south of the river. Mean TSS concentrations in this segment were 22.5 mg/L with a standard deviation of 34.3 mg/L. The range of TSS concentrations prior to 1975 were between 8 and 230 mg/L with an average of 44.9 mg/L. The peak TSS concentration from the data set occurred in 1975. After 1975, mean TSS concentrations were 10.2 mg/L.

Below Minidoka Dam, in the upper section of the Milner Pool, TSS concentration averaged 10.3 mg/L with a standard deviation of 22.6 mg/L for the period of record. The highest measured value was 147 mg/L taken in 1998 by IDEQ personnel. In the lower section of Milner Pool TSS concentrations averaged 14.7 mg/L with a standard deviation of 37.4 mg/L. The peak TSS concentration occurred in 1993 at 49 mg/L TSS.

A subset of the data taken in the high flow years of 1997 and 1998 was also analyzed. The data set shows a steady increase in TSS concentration along the course of the river: a mean of 9.5 mg/L at the base of American Falls Dam; a mean of 8.9 mg/L at Massacre Rocks; a mean of 12.9

above the Burley/Heyburn Bridge; and a mean of 15 mg/L at Milner Dam. This part of the river channel is moderately entrenched in easily erodible materials. Additionally, numerous agricultural drains enter the Milner Pool in this area. Also due to changes in the pool level related to its operating procedures, and its relatively shallow depth, it is easier for suspended material to become entrained and to stay in suspension as far as Milner Dam. This increase in concentration may be attributable to these marked changes in physical regime of the Snake River downstream of Minidoka Dam. There are also dredging operations in or along the river that have or have had an unknown effect. Also noted earlier the increased erosion of the banks and islands due to the changes in operation of the Milner Dam may contribute to this increase.

Unlike TP, the physical properties of sediment are somewhat more variable within the body of the river, and interpretation of loading differences of the order of a few tens of thousands of pounds per day is irrelevant. The overall trends seen on the river, however, are real. There are a variety of sources for the major pollutants of concern in the watershed listed in Tables 10 and 26. Chief among these categories are pollutants introduced through human alteration of tributary flows (or those directly added though industrial, agricultural and municipal usage) and inflows of groundwater.

It is likely that the apparent stability of TSS from American Falls to the Burley/Heyburn Bridge is a result of few point and nonpoint sources contributing sediment to the reaches. In addition sediment is dropping out of the river and accumulating in the low-velocity waters of the reservoirs. The additions of seasonal sediment loads from Raft River and Rock Creek apparently simply sink to the bottom of Lake Walcott.

The steady increases below Minidoka between the dam and Burley can be accounted by the increasing number of agricultural return flows. These increases in sediment may also represent erosion of the banks and central islands of the river, or re-mobilization of streambed sediments. Many people from the Burley area have noted that recent high water flows, and maintenance of the Milner Pool at higher elevations year round has resulted in increased mobilization of bank material.

The additions of TSS in the lower segment of Milner Pool may occur through and just past Burley. This is an area of numerous agricultural return drains. Further below Burley the number of agricultural return drains steadily drops off. By the time Milner Dam is reached, the TSS load of the river has increased compared to what is leaving the American Falls and Minidoka dams. Most of the obvious point or non-point sources can account for this increase. Erosion or re-transport of previously deposited alluvium, however, may also be an additional source. As previously noted, dredging operations for aggregate in this section have or have had an unknown effect, and may require further study. TSS concentrations in this reach are still below levels associated with deteriorating fisheries communities. Furthermore, a reduction in TP concentrations within this reach, as required by the TMDL (section 2.2.4.6), may result in reduced TSS concentrations to levels similar to the upstream segments due to the relationship of

TSS and TP. A reduction in TSS may be the most effective means by which to get this TP reduction for nonpoint sources and consequently reductions in TSS could be realized in this segment.

Because of the disruptive influence of the dams upon a normal river regime, there were few valuable statistical relations of TP concentrations with flow at the individual sample sites. At IDEQ-TFRO sampling location SR-12, near the end of the free-flowing segment below American Falls Dam, a small but statistically significant amount ($r^2 = 0.210$) of the variation in TP was explained in a regression of TP upon discharge and total suspended solids concentration. There was also very good correlation of TSS with flow, with a simple regression explaining 61% of the variation of TSS. Such correlations have been found for free-flowing sections of streams tributary to the Snake River in this region (LaPoint 1979, and Miller 1997, 1998a, 1998b).

The most significant input of nutrient loads to the Lake Walcott reach is that of the releases of American Falls Dam into the Snake River channel; this is simply because of the river volume in comparison to all other sources. During the period of sampling by IDEQ, flow was 9.99 million acre-feet (mean flow of 13,800 cfs) in the 1997 water year, at USGS gage #13077000. IDEQ-TFRO samples were taken at the tailrace of the dam (Station SR-13), prior to all downstream inputs. Little change in mean concentration of TP (from 0.058 mg/L to 0.061 mg/L) occurs in the river until below the Burley/Heyburn Bridge (0.109 mg/L). In this area nonpoint sources contribute to the river from the numerous drains and tributaries.

During the period of IDEQ sampling below American Falls Dam, mean TP concentration was 0.058 mg/L, within a relatively steady range of 0.03-0.07 mg/L, it should be noted that these samples were taken in an extreme high flow year. There were two occurrences where concentrations exceeded 0.100 mg/L. The mean concentration of phosphorus measurements taken below American Falls Dam for all sampling dates was 0.064 mg/L with a standard deviation of 0.059 mg/L. There are two NPDES permitted facilities that discharge directly to the river in this area.

In the Massacre Rocks to Lake Walcott segment, mean TP concentration was 0.061 mg/L with a standard deviation of 0.024 mg/L. Due to the infrequency of other entities sampling at this location for TP the majority of the data, available for analysis, was collected in high flow years. There are no NPDES permitted facilities in this segment.

In the upper section of the Milner Pool (above the Burley/Heyburn Bridge), the mean concentration of TP was also 0.061 mg/L and a standard deviation of 0.066 mg/L. In this area nonpoint sources contribute to the river from many drains and tributaries (approximately 22). These drains and tributaries become more numerous from upstream to downstream. Additionally, one NPDES permitted facility is allowed to discharge in this segment although it rarely does.

In the lower section of Milner Pool (below the Burley/Heyburn Bridge), the mean concentration of TP was 0.109 mg/L with a standard deviation of 0.080 mg/L. In this area nonpoint sources contribute to the river from the numerous drains and tributaries (approximately 28). These drains and tributaries become less numerous from upstream to downstream. Additionally, four NPDES permitted facilities discharge in this segment.

The most striking feature of TP concentrations in the subbasin is its relative stability from American Falls to below Minidoka Dam and then the sudden jump as the river passes through Burley. This increase can be accounted for by the contributions of McCains (formerly Ore-Ida), Simplot, Burley=s Municipal treatment facility, and Heyburn=s municipal treatment facility as well as the influence of irrigation drain returns and other nonpoint sources in the Milner Pool area.

Table 10. TSS AND TP SOURCE INVENTORY FOR THE SNAKE RIVER, LAKE WALCOTT REACH

SITE (cited source)	Flow cfs	TSS mg/L	TSS Load pounds/day	TP mg/L	TP Load pounds/day
American Falls Dam IDEQ Gianotto Parametrix	 13,800 5,400 10,055	 10	 707,000	 0.058	 4,300 1,400 4,300
Groundwater Parametrix Gianotto	 700	 ----	 ------	 0.017	 64 (est.) 7
ID F&G Fish Hatchery Gianotto Parametrix	 19 ----				 5 11
Ind. Coolant Water Gianotto)	 1.48				 <1
Water Treatment Plant American Falls Gianotto	 2				 21
Precipitation Parametrix	 18				 8
Warm Creek Gianotto	 3.9			 0.108	 <1
Fall Creek IDEQ Gianotto	 22.04 ~17	 32	 3,800	 0.118	 14 4

Rock Creek IDEQ Gianotto Williams and Young	 31.8	 151	 25,880 52,000+	 0.190	 33 3
Raft River Parametrix	 9				 25
Marsh Creek Parametrix	 13				 24
Irrigation Returns Campbell, 1997 Parametrix	 191 22	 18	 18,490	 0.110	 113 22
Simplot Gianotto Parametrix	 7.6		 1,142		 572 609
Ore-Ida Gianotto Parametrix	 6.2		 443		 620 533
Amalgamated Sugar (Paul) Parametrix	 9.2				 33
Rupert Parametrix	 2				 150
Heyburn Gianotto Parametrix	 0.3				 8 13
Burley Gianotto Parametrix	 1.5				 69 45
Waterfowl Gianotto					 62.7
Outflow at Milner IDEQ	 13,200	 14	 1,300,000	 0.090	 6400

DATA SOURCES: IDEQ 1997 and 1998, Parametrix and Tetra Tech 1979, Gianotto1995, Williams and Young 1982, and Campbell 1997.

Other data sources

The largest collection of Snake River water quality data in the reach is that of IWRRI (Table11). It is complementary and supportive of the IDEQ data set, but differs in the location of the sampling sites (Figure 13a). At American Falls the IWRRI collection was downstream of the point source inputs and thereby measured nutrient concentrations higher than that released from the reservoir and at Minidoka Dam the IWRRI site was four miles downstream. The distance below the dams at both sites allowed oxygenation of the river to occur in the turbulence of the stream prior to measurement.

Table 11. UNIVERSITY OF IDAHO [IWRRI] WATER QUALITY DATA, LAKE WALCOTT SUBBASIN

SNAKE RIVER SITE	**TP mg/L**	**TNR mg/L** ~ TSS mg/L	**Maximum Temperature ^{0}C**
Pipeline Crossing near Neeley	0.07	6.8	21.1
Jackson Bridge below Minidoka Dam	0.06	9.6	25.3
At Milner Dam	0.12	15.1	24.2

TP and TNR (total nonfilterable residue ~ total suspended solids) are **mean** values

The following discussion will be confined largely to pollutants or stressors having a negative impact on the system. The data properties of Temperature, pH, Specific conductivity (SC), dissolved oxygen, TSS, TP, ammonia (NH3), nitrogen (NO_2+NO_3), Total Kjeldahl Nitrogen, colony forming units (cfu) of fecal coliform bacteria are listed in Tables 12-15, most are well below levels causing concern.

Table 12. STATISTICAL RELATIONS OF WATER QUALITY PARAMETERS OF THE SNAKE RIVER BELOW AMERICAN FALLS DAM

Parameter\Property	**Mean**	**S.D.**	**Minimum**	**Maximum**	**# Samples**
Temperature (^{0}C)	10.89	7.08	0.00	23.00	909
pH	8.30	0.33	7.30	8.90	153
SC (m Siemens)	392	64	276	720	154
Dissolved Oxygen (mg/L)	10.12	5.11	5.50	21.80	607
TSS (mg/L)	19	27	1	156	197
Total P (mg/L)	0.064	0.059	0.020	0.660	130
NH_3 mg/L)	0.056	0.051	0.010	0.350	129
NO_2+NO_3 mg/L)	0.211	0.177	0.003	0.730	130
TKN mg/L)	0.35	0.18	0.10	1.52	130
Fecal Coliform (cfu/100 mL)	73	354	0	3300	103

Note: Bacteria exceeded standards (500 cfu/100mL) three times, 5/8/69, 6/17/69, and 8/6/75

S.D. = standard deviation.

Table 13. STATISTICAL RELATIONS OF WATER QUALITY PARAMETERS OF THE SNAKE RIVER BELOW MASSACRE ROCKS

Parameter\Property	Mean	S.D.	Minimum	Maximum	# Samples
Temperature (^{0}C)	10.37	6.22	0.74	20.35	55
pH	8.31	0.26	7.63	8.73	26
SC (m Siemens)	368	53	281	500	26
Dissolved Oxygen (mg/L)	9.89	3.40	6.27	17.00	52
TSS (mg/L)	22.5	34.3	0.5	230.0	81
Total P (mg/L)	0.060	0.025	0.024	0.111	24
NH_3 mg/L)	0.032	0.018	0.016	0.070	22
NO_2+NO_3 mg/L)	0.191	0.175	0.028	0.760	23
TKN mg/L)	0.37	0.16	0.18	0.91	23
Fecal Coliform (cfu/100 mL)	81	357	2	2000	31

Note: Bacteria exceeded standards (500 cfu/100mL) one time, 7/17/75.

Table 14. STATISTICAL RELATIONS OF WATER QUALITY PARAMETERS OF THE SNAKE RIVER BELOW MINIDOKA DAM

Parameter\Property	Mean	S.D.	Minimum	Maximum	# Samples
Temperature (^{0}C)	10.69	7.14	-0.20	25.5	222
pH	8.47	0.26	7.50	9.60	221
SC (m Siemens)	403	57	287	565	220
Dissolved Oxygen (mg/L)	10.45	2.05	5.75	15.70	221
TSS (mg/L)	10.3	12.7	0.5	147.0	153
Total P (mg/L)	0.061	0.066	0.005	0.840	165
NH_3 mg/L)	0.024	0.017	0.005	0.110	174
NO_2+NO_3 mg/L)	0.174	0.216	0.003	1.800	174
TKN mg/L)	0.34	0.11	0.12	0.71	152

Fecal Coliform (cfu/100 mL)	29	77	0	520	90

Note: Bacteria exceeded standards (500 cfu/100mL) one time, 8/12/85.

Table 15. STATISTICAL RELATIONS OF WATER QUALITY PARAMETERS OF THE SNAKE RIVER BELOW BURLEY/HEYBURN BRIDGE

Parameter\Property	Mean	S.D.	Minimum	Maximum	# Samples
Temperature (^{0}C)	10.79	7.20	0.00	25.00	232
pH	8.52	0.32	6.90	9.40	231
SC (m Siemens)	404	51	289	560	229
Dissolved Oxygen (mg/L)	10.73	2.09	6.56	17.00	223
TSS (mg/L)	14.5	7.82	1.0	49.0	212
Total P (mg/L)	0.109	0.080	0.010	0.610	212
NH_3 mg/L)	0.026	0.021	0.006	0.140	212
NO_2+NO_3 mg/L)	0.337	0.359	0.010	2.060	212
TKN mg/L)	0.45	0.25	0.03	1.54	212
Fecal Coliform (cfu/100 mL)	25	40	0	270	123

Examining the data (Appendix B), there was a general pattern of response of measured parameters in the river from American Falls Dam to the end of Milner Pool as described by the following table.

Table 16. GENERAL CHARACTERISTICS OF WATER QUALITY PARAMETERS IN THE LAKE WALCOTT SUBBASIN

Station	NO_2 + NO_3	DO	SC	pH
SR-8 to 13 (IDEQ sampling stations from Milner Pool to American Falls)	general decline to August (but with flow, TP, and N peaks in June), then sharp winter rise; spring drop	At 6.00 mg/L , below only 3 times in last decade	Inverse relation with temperature	Slightly lower in spring / summer Range : 7.44-8.89

A rise of nitrogen (as NO_2 + NO_3) was noted that occurred in the winter, simultaneously with a rise in SC (indicating more-mineralized water). TP concentrations dipped slightly during this period. This combination at a period of lower flow may be due to a greater share from steady groundwater flow at this time of year, e.g. Rupert (1995) found in a study of Upper Snake River Basin wells that concentrations of $NO_2 + NO_3$ were higher (2.3 mg/L) than that measured in river waters, while TP was lower (0.030 mg/L).

DO was listed as a stressor for two segments of the §303(d) list (including Milner Pool, classified as warm water biota habitat). As a dissolved gas, DO is also intimately related to temperature (a major factor in healthy fish habitat) but temperature is not a property directly listed as a stressor for the Lake Walcott reach. Generally, the higher the temperature, the lower the concentration of any dissolved gas.

During most of the year, particularly after the spring runoff has passed, the waters of the Lake Walcott reach in the free-running sections are likely to be shallow, or to be ponded in low-velocity reservoir storage. This makes them susceptible to warming in the summer months, especially when inflows to the reach from American Falls Dam are warm. During the summer of 1997, afternoon surface temperatures of spillway outflow measured by IDEQ were above 20 °C for a six-week period, values also substantiated by the IWRRI river data. The temperature data, available at the time of this TMDL and subbasin assessment, however, were instantaneous temperature measurements. Applicable water quality standard relating to instantaneous water temperature is 22 °C. Additionally, at this time it is IDEQ's policy that temperature TMDLs will not be undertaken until such time that a thorough scientific review of the temperature standards takes place. From a quick review of USEPA Storage and Retrieval database (STORET), and, data collected by IDEQ and other sources it appears that some of the sample sites had measured water temperatures above the instantaneous standard in the summer months. The instances of these exceedances were sporadic through time and usually not greater than +1 °C. American Falls Dam to Massacre Rocks exceeded the 22 °C standard 11 times (approximately 2.5 % of the samples), reaching 23 °C once in 1973 (Figure 14). The remaining exceedances were between 22.2 and 22.7 °C. Typically, these exceedances were only once during a given summer. Given the unknown confidence in calibrations of the temperature probes used over the time period (1965 to 1998) and the inherent variability within the experimental margin of error, IDEQ feels that +/- 1 °C does not constitute a temperature violation in this segment. In the Massacre Rocks to Lake Walcott segment the data available through STORET and other sources never exceeded the 22 °C standard (Figure 15). The temperature in the upper segment of the Milner Pool exceeded 22 °C 13 times (2.6 % of the samples). The highest temperature, 24 °C, occurred in August 1981, dissolved oxygen at that time was 7.20 mg/L. IDEQ does not feel that these exceedances constitute a major violation of the cold water biota temperature standards that would trigger a TMDL (Figure 16). Salmonid spawning temperature standards are often exceeded in this reach. In the salmonid spawning period of April 1 to August 1 these exceedances range from 0-100% of the samples as the summer progresses. In the lower segment of the Milner Pool temperature exceeded 22 °C eight times (2.0 % of the samples) (Figure 17, and Table 17).

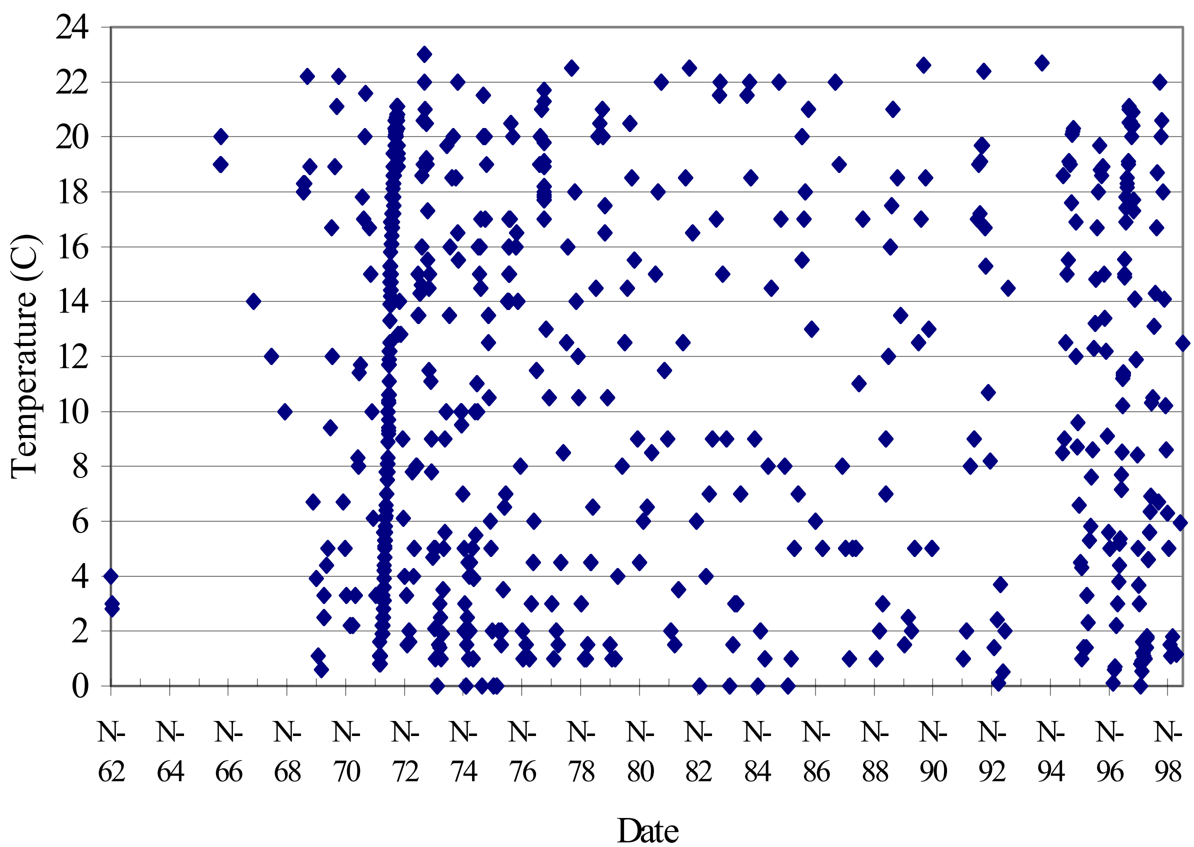


Figure 14. Instantaneous Temperature (˚C) in the American Falls to Massacre Rocks Segment

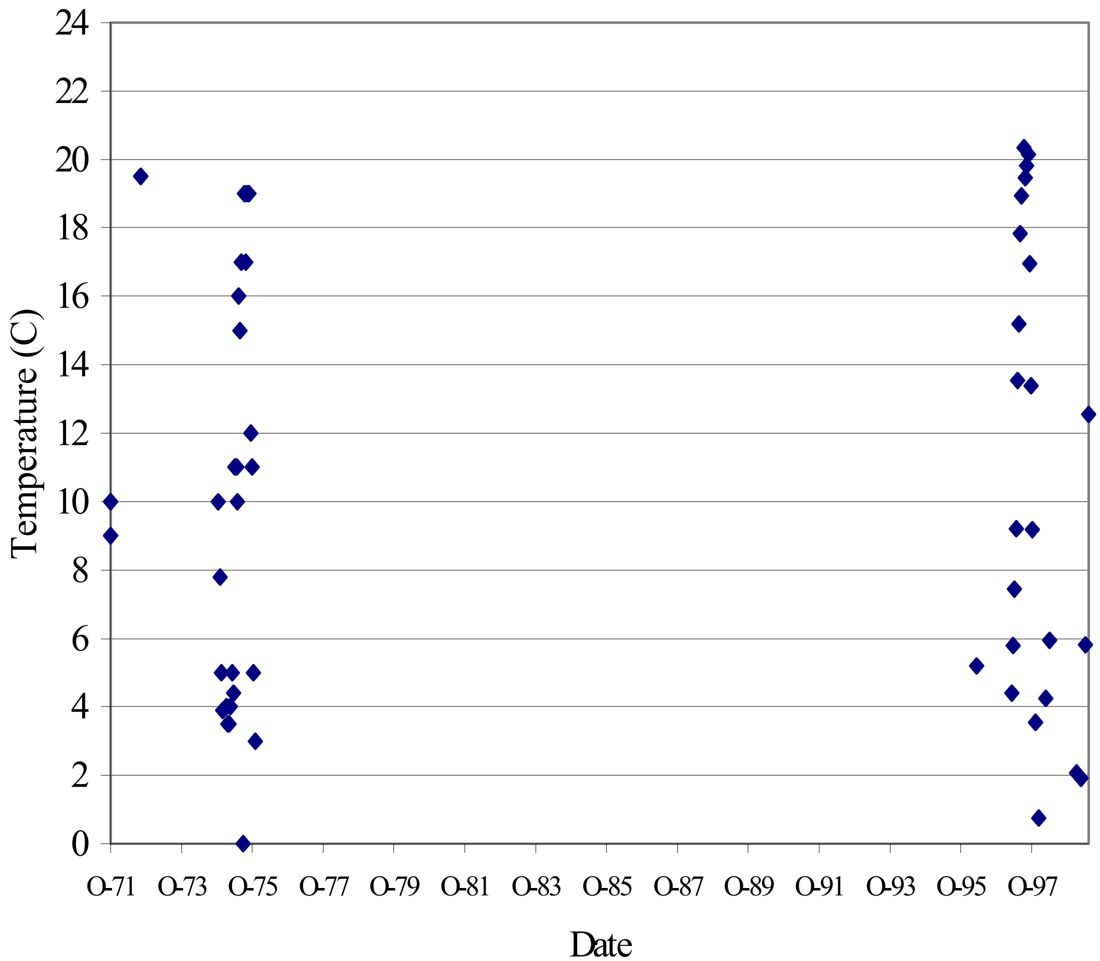


Figure 15. Instantaneous Temperature (°C) in the Massacre Rocks to Lake Walcott Segment

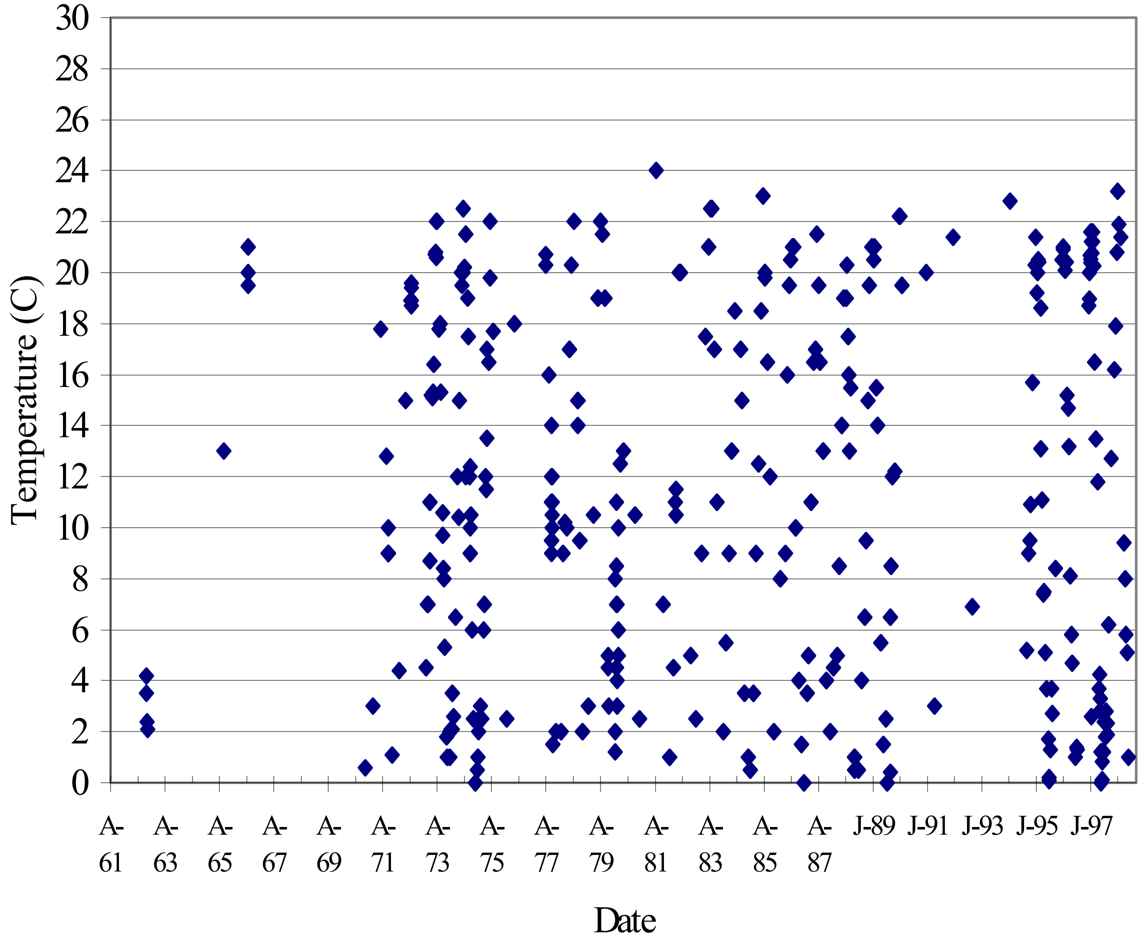
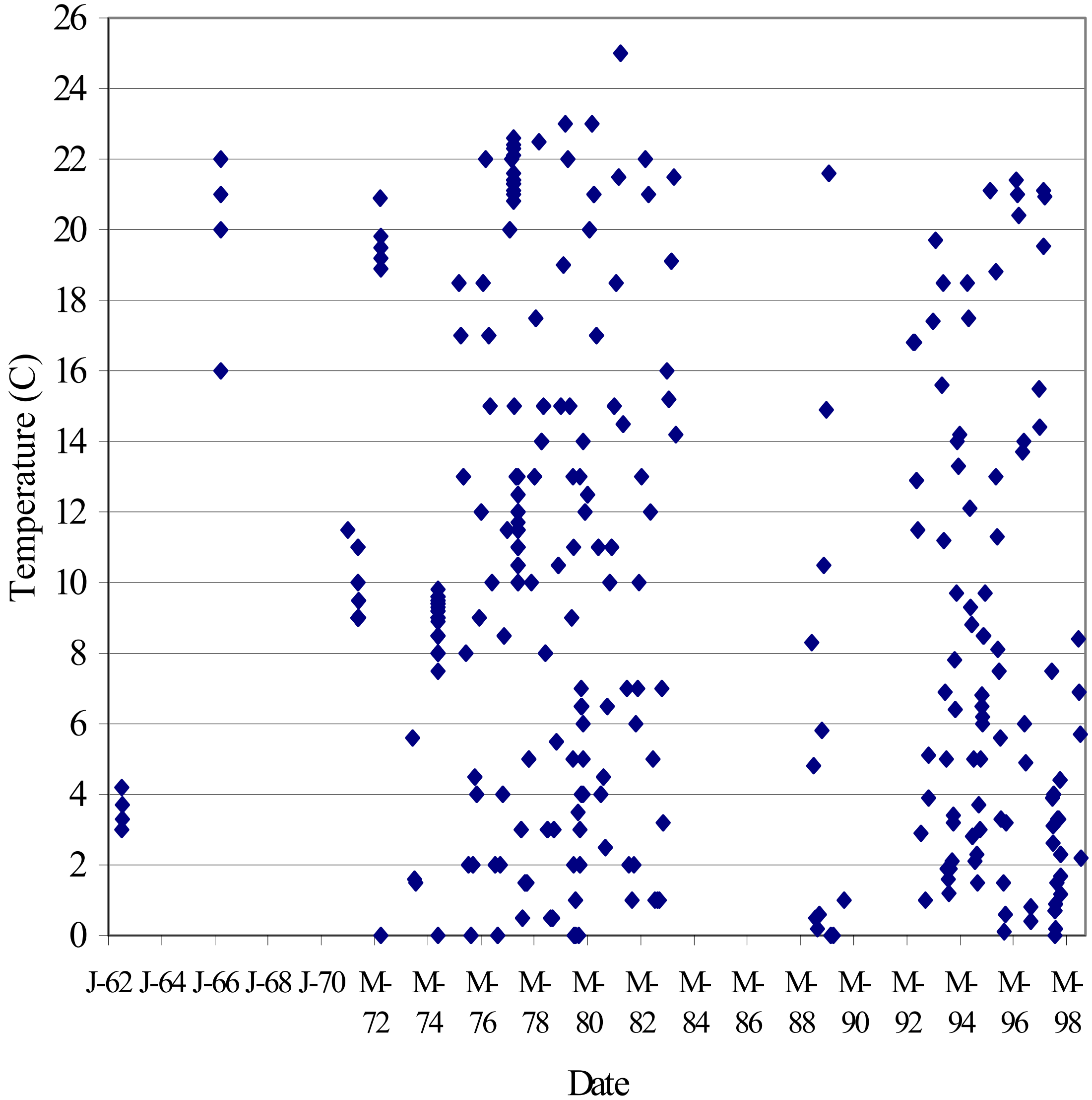


Figure 16. Instantaneous Temperature (°C) in the Minidoka Dam to Burley/Heyburn Bridge Area of the Milner Pool Segment



Temperature (C)
26
24
22
20
18
16
14
12
10
8
6
4
2
0
J-62
J-64
J-66
J-68
J-70
M-72
M-74
M-76
M-78
M-80
M-82
M-84
M-86
M-88
M-90
M-92
M-94
M-96
M-98
Date

Table 17. TEMPERATURE EXCEEDANCES IN THE LOWER SEGMENT OF MILNER POOL

Date	Temperature °C	Dissolved Oxygen mg/L
8/23/77	23.3	8.1
8/23/77	22.6	8.0
8/23/77	22.4	8.0
8/23/77	22.1	7.7
8/4/78	22.5	8.8
7/25/79	23.0	7.6
7/29/80	23.0	not available
8/26/81	25.0	9.3

At all times DO was above 6.0 mg/L. Additionally the lower segment of Milner Pool has been designated as warm water biota. Although temperature exceedances occur in all but one segment, IDEQ will not undertake temperature TMDLs per current IDEQ policy at this time. At this time, bioassessment data and concurrent temperature data indicates that the Idaho Water Quality Standard may be in error. IDEQ is in the process of developing a temperature study to reevaluate the current standards. Following the conclusion of the temperature study, temperature exceedances will be addressed.

Temperature, however, also directly effects DO values, and most stations saw DO drop briefly during the summer months. Although, data gathered from STORET, IWRRI, IDEQ, and others indicate that DO is not a problem in the Lake Walcott reach. DO fell below 6.0 mg/L below American Falls twice, although none were below the 3.5 mg/L standard for American Falls. Additionally, an operational agreement with Idaho Power is in place so that when DO falls below 6.0 mg/L, aeration of the discharge water will take place. In effect, this agreement negates the water quality standard.

Currently IDEQ is not in possession of a continuous daily monitoring record for either temperature or DO. Consequently, we cannot ascertain if there are nighttime DO sags (Figure 18). Some STORET data, however, taken at different times of the day and in different years indicated that DO never fell below 6.0 mg/L at night or in the early mornings (Figure 19). In the Massacre Rocks to Lake Walcott segment, DO never dropped below 6.0 mg/L (Figure 20). In the last decade, in the Minidoka Dam to Milner Dam segment, DO fell below 6.0 mg/L only once (in the summer of 1997). During an intensive sampling study of the Milner Pool segment in

1979-1980 DO, however, was very often below the standard and in some cases fell to less than 2.0 mg/L (Figure 21). A review of the records of that time show that the food processors were out of compliance with the NPDES permits and court proceedings were underway to reevaluate differences in the permits between the two processors. Following a consent order placed by IDEQ and the food processors returning to compliance with their NPDES permits DO levels in the Milner Pool have since rebounded to levels above 6.0 mg/L. An investigation of early morning and nighttime DO levels from STORET indicate that in the Milner Pool DO never fell below 6.0 mg/L (Figure 22).

Discharge data exists below all three of the dams located in the Lake Walcott reach, although numerous canal systems divert water from the three impoundments prior to the gage locations. These canals created a problem, for all but the American Falls to Massacre Rocks segment, as far as load calculation. For the remaining three segments the flow record was "reconstructed" from partial gauged periods of record on the different canals. By doing this, IDEQ was able to account for reach gains and losses from ground water as well as reach gains from various tributaries. All flow data for Lake Walcott reach was obtained from the USGS web site (http://waterdata.usgs.gov) and was analyzed for the period of 1927 to 1998. A complete record was available for this period for the Neeley Gage below the American Falls Dam. The Minidoka Dam flow record was reconstructed from a relationship with the partial flow record from the two canals diverting water from the reservoir the partial flow record below the Minidoka Dam the partial flow records from various tributaries (obtained from Gianotto 1995 http://waterdata.usgs.gov/nwis-w/ID/) and the flow at Neeley for the period of record (Figure 23). This relationship was highly significant ($p < 0.005$) and explained most of the variation in the flow record ($r^2 = 0.980$). Flow reconstruction was also completed for the Milner Pool segment of the reach following the same procedure to calculate the amount of water flowing through the Milner Pool (Figure 24). This was necessary due to the majority of flow being diverted from the Snake River prior to the gage location. Again, the flow relationship from Minidoka Dam to Milner Dam was highly significant ($p < 0.005$) and explained 98% of the variation in flow ($r^2 = 0.982$). During the period of IDEQ sampling, the mean outflow of Milner Dam was 9,296 cfs in the 1997 water year, at USGS Gage #13088000. Milner Dam, however is the crux of a system of complicated canal and hydropower extractions from the main channel of the Snake River, and flows diverge through at least ten different routes (Table 18). No single summation of all these flows existed and a precise value for the total complex discharge at Milner were previously uncalculated. The flow relationship developed by IDEQ, however, will allow load calculations to be made for the Milner Pool prior to the flow diversions.

1.	Snake River [USGS Gage #13088000]	6.	Cross-cut canal
2.	Milner Hydro Plant	7.	A-Lateral
3.	North Side Canal	8.	PA-Lateral
4.	South Side Canal	9.	Milner Irrigation Pumping Plant
5.	Milner-Gooding Canal	10.	A & B Irrigation Pumping Plant

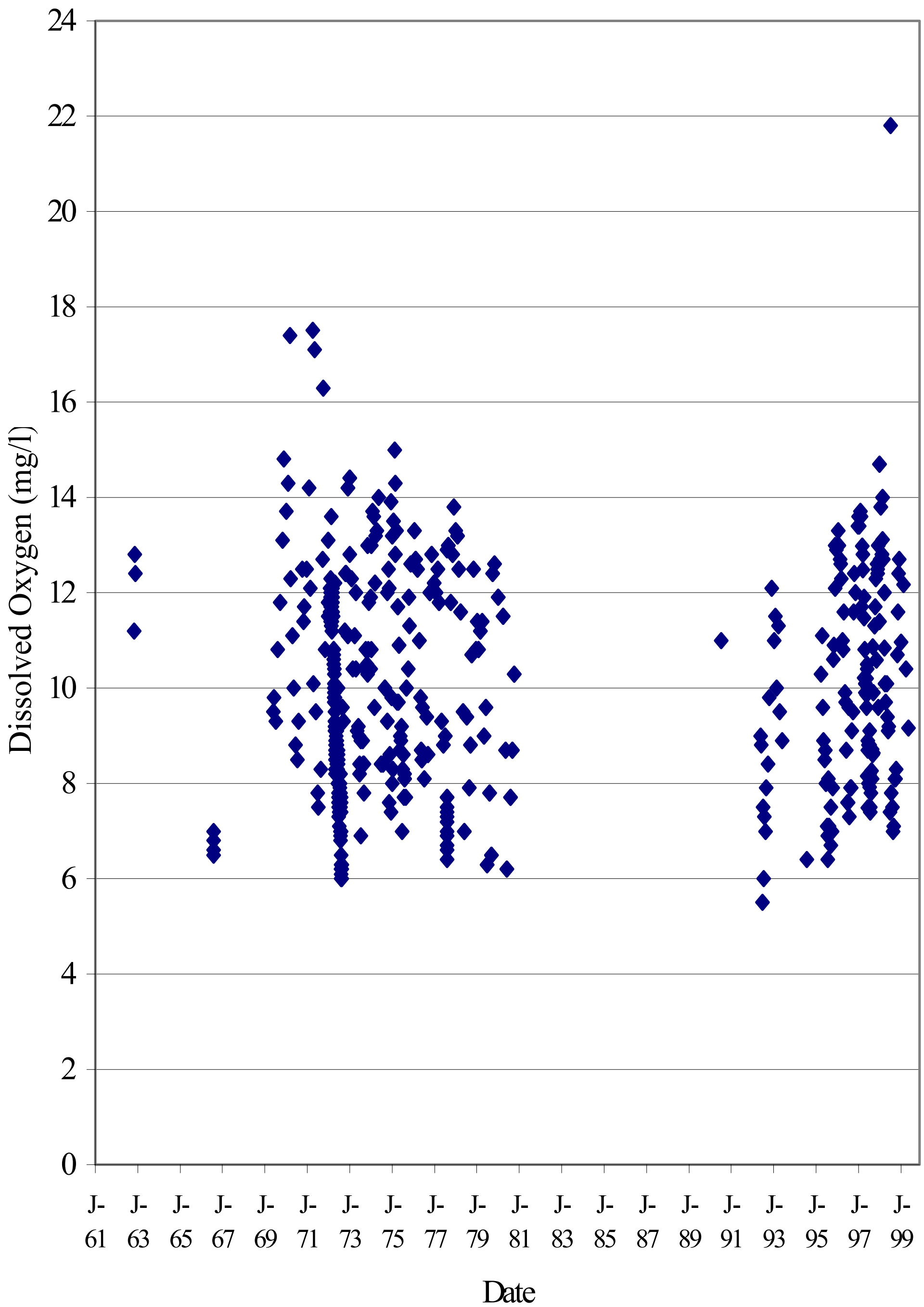


Figure 18. Dissolved Oxygen (mg/L) in the American Falls to Massacre Rocks Segment

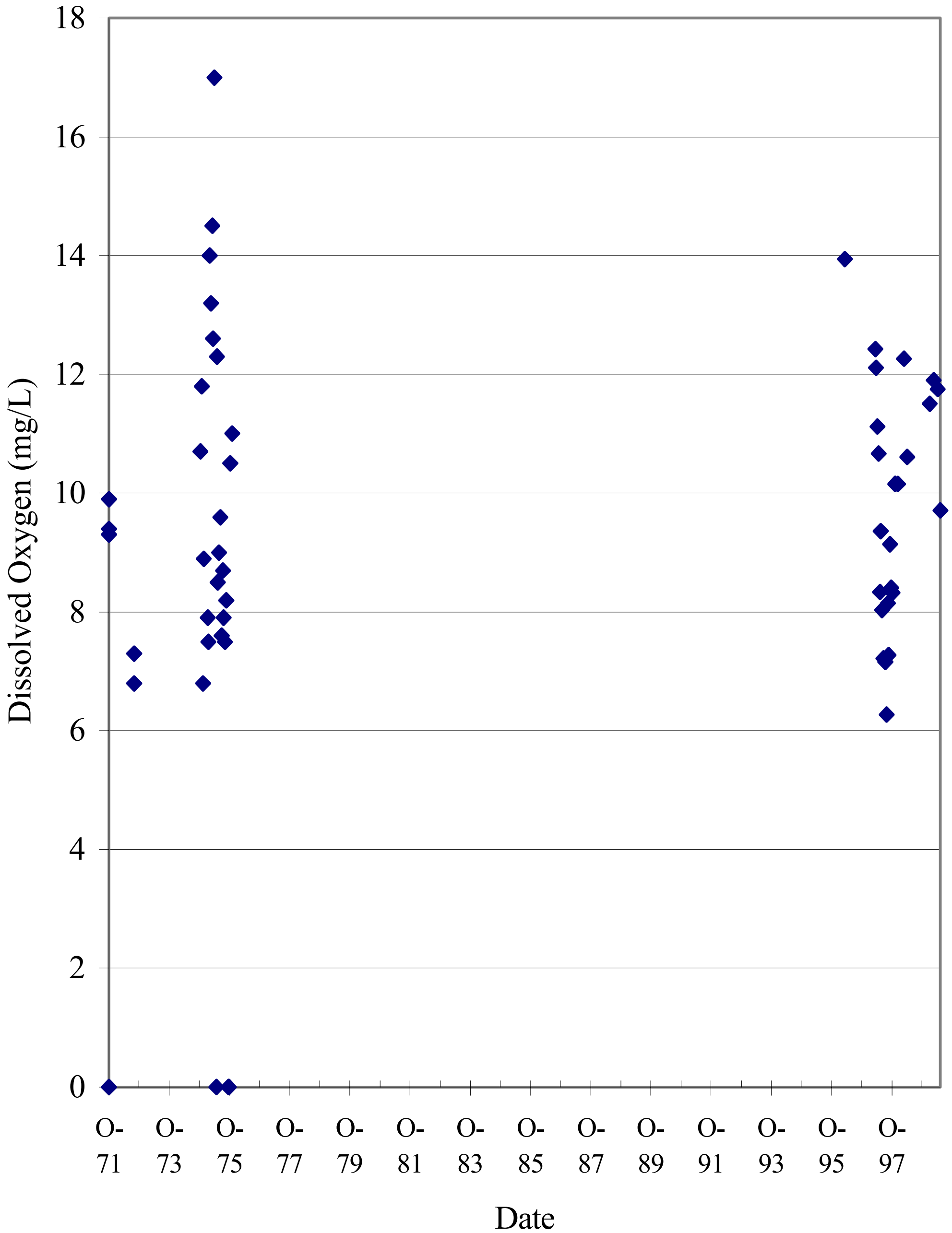


Figure 19. Dissolved Oxygen (mg/L) in the Massacre Rocks to Lake Walcott Segment

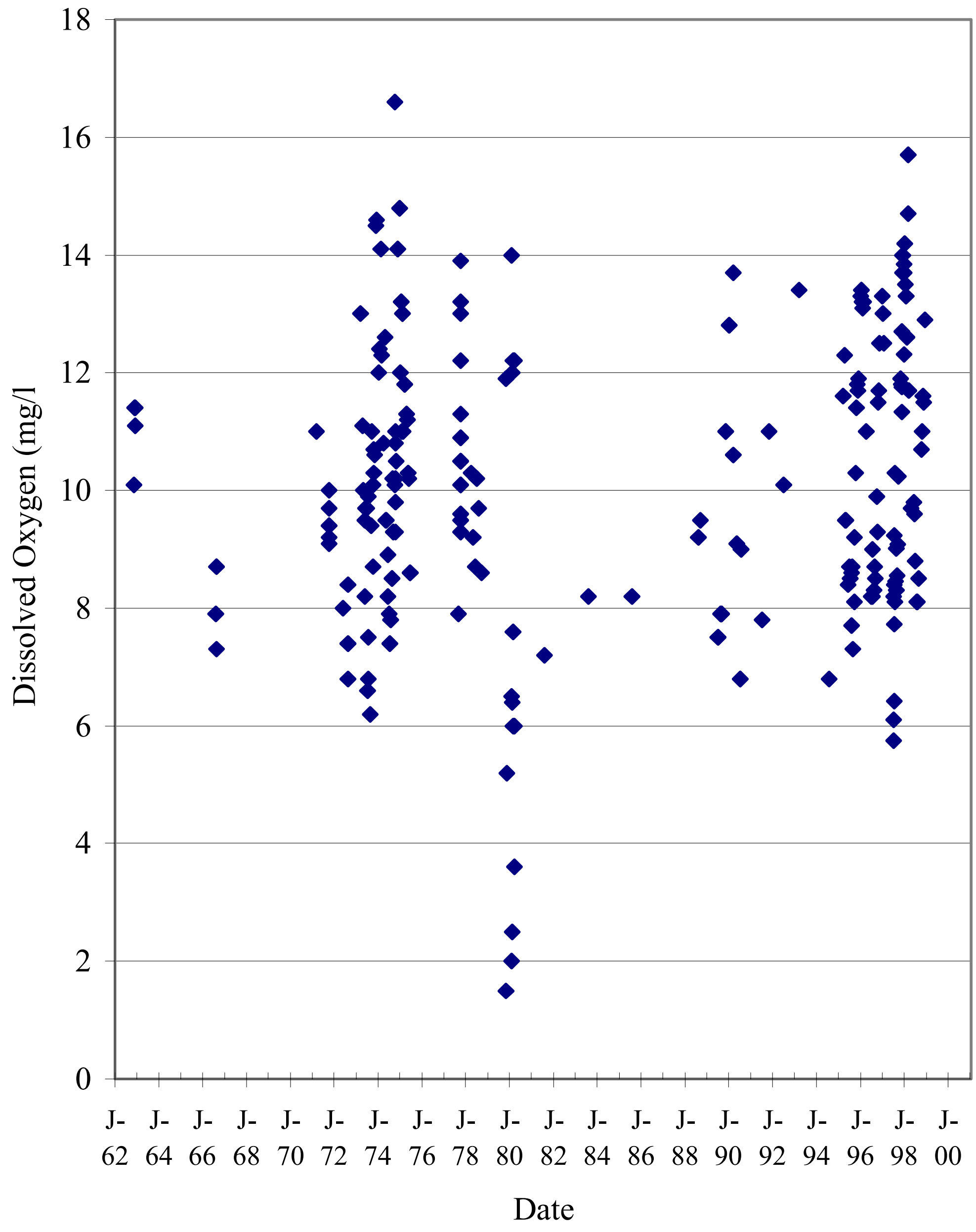


Figure 20. Dissolved Oxygen (mg/L) in the Minidoka Dam to Burley/Heyburn Bridge Area of the Milner Pool Segment

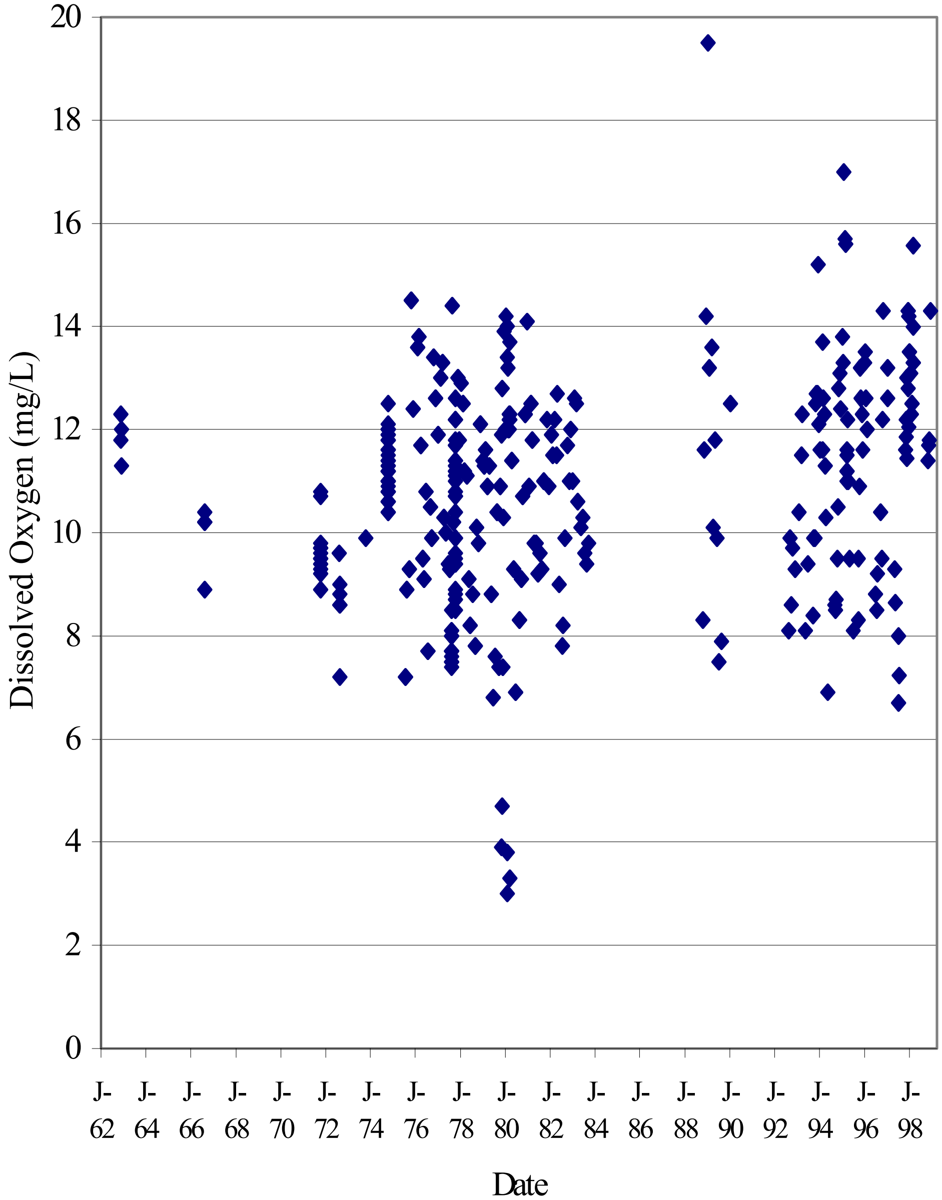


Figure 21. Dissolved Oxygen (mg/L) in the Burley/Heyburn Bridge to Milner Dam Area of the Milner Pool Segment

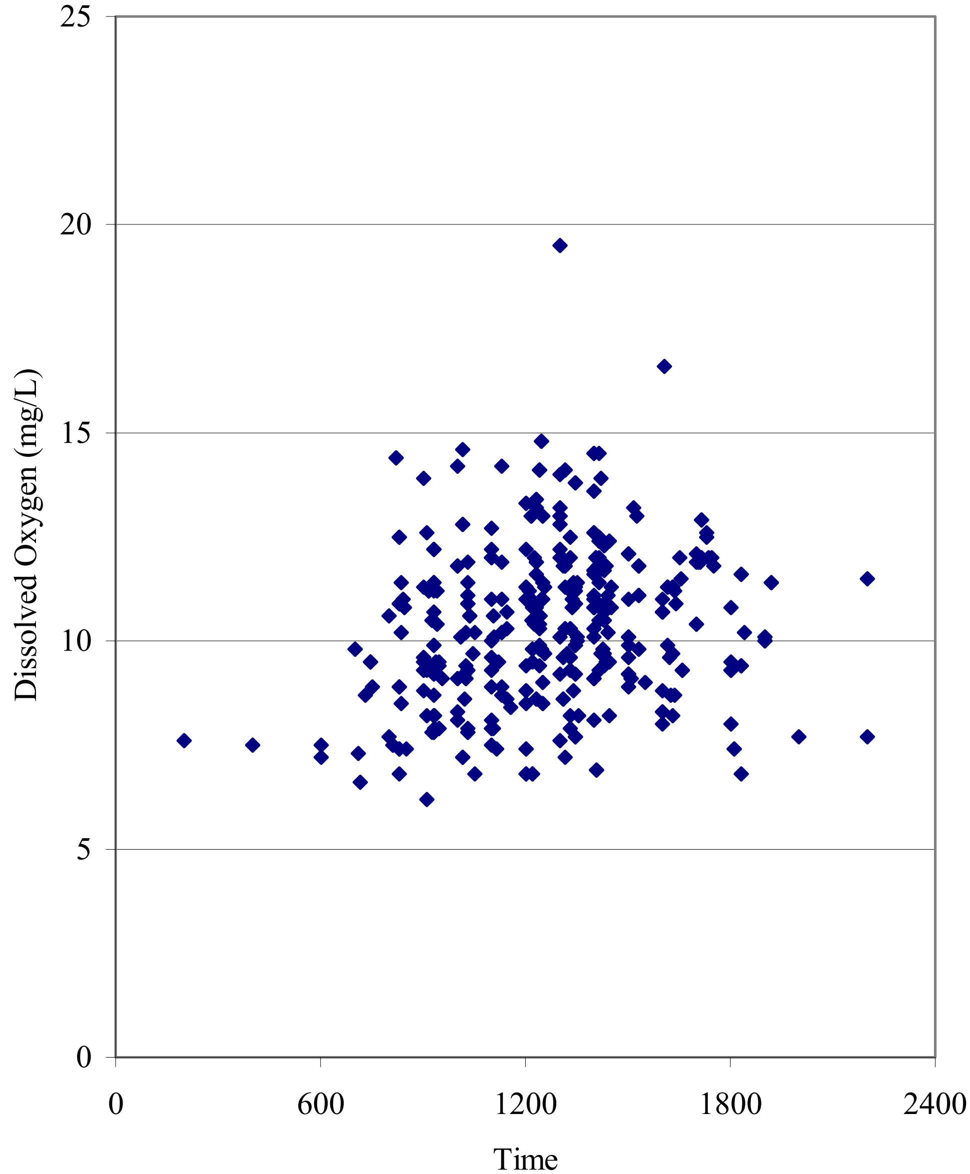


Figure 22. Dissolved Oxygen Levels Measured at Various Times of the Day in the Milner Pool. Note these samples were not taken on a single day or in a single year

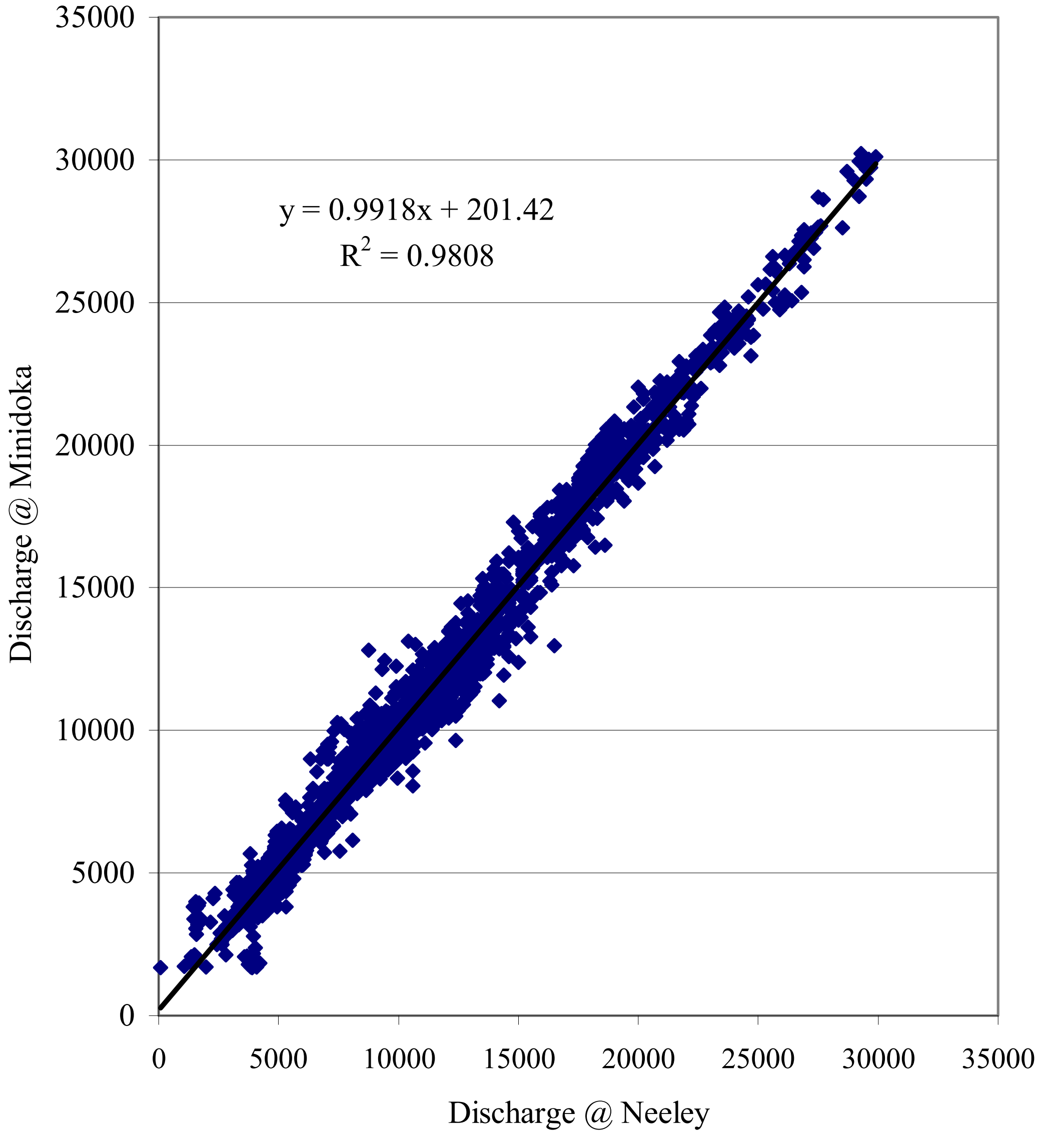


Figure 23. Flow Relationship Between Discharge at American Falls Dam and Minidoka Dam (Discharge measurements include water taken out in the various canals, and lift stations.)

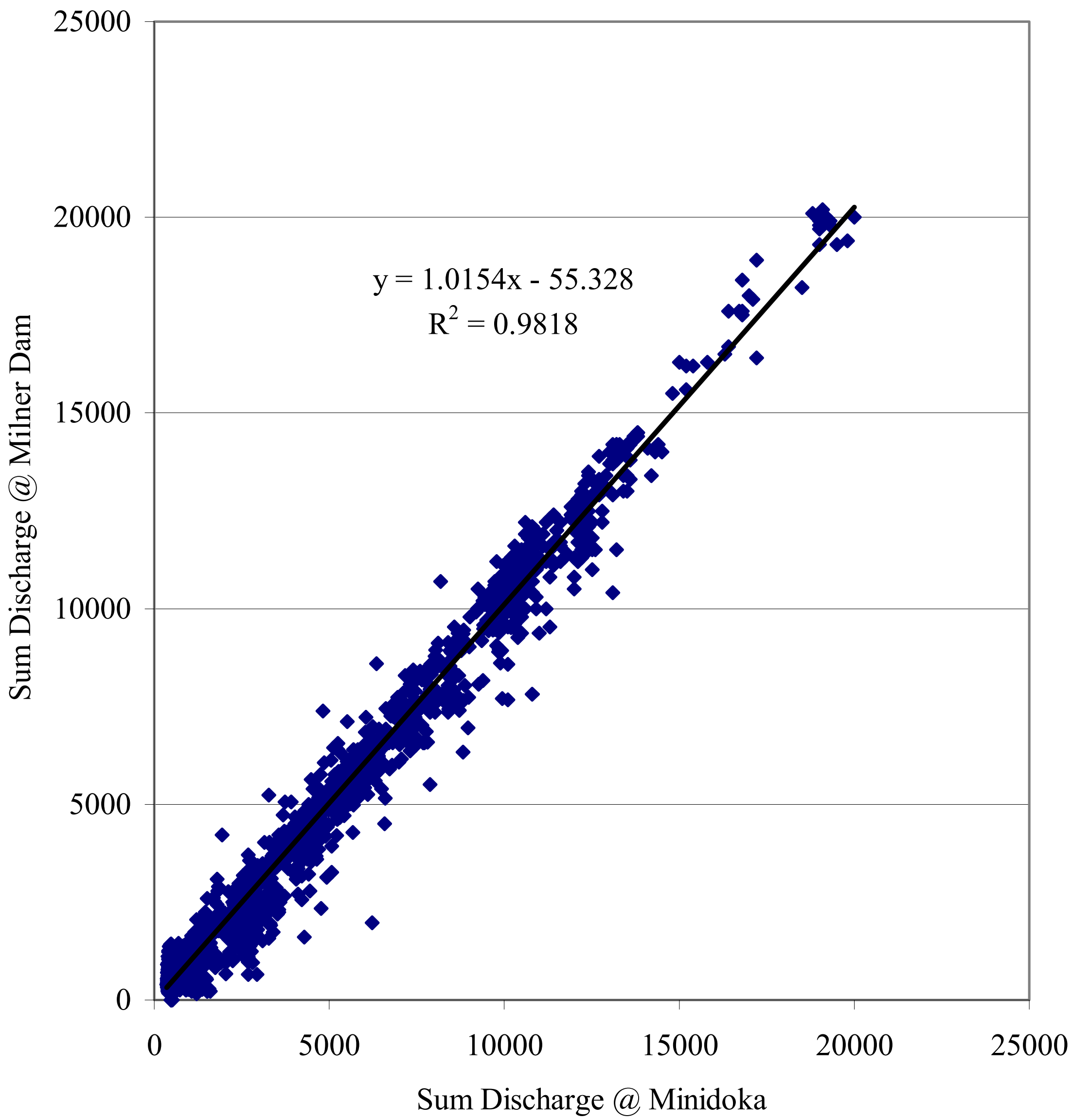


Figure 24. Flow Relationship Between Discharge at Minidoka Dam and Milner Dam (Discharge measurements include water taken out in the various canals, and lift stations.)

During the period of data collection and assessment of the Lake Walcott Subbasin, flows in the Snake River were sometimes at record high levels since construction of the large river dams early in the century. In the recent past, drought years made the minimum 300 cfs releases from American Falls of considerable importance, especially in the winter. Because of these widely different flow regimes and the common reoccurrence of drought conditions, the load capacity of the river and load allocations will be determined under similar flow regimes. Determination of flow regimes will be discussed in section 3.4 setting instream water quality targets and will be used in section 3.5 in the loading analysis model.

2.2.4.2 Agricultural drains and fecal coliform

The guidelines for an assessment of the impact of bacteria is based on the number of instantaneous samples that exceeded 500 colonies/ 100 mL for primary contact recreation, and 800 colonies/ 100 mL for secondary contact recreation (see IDAPA §16.01.02.100.03.a and §16.01.02.250.01.a for primary contact recreation, and IDAPA §16.01.02.100.03.b and §16.01.02.250.01.b for secondary contact recreation). Of twenty samples (Appendix B) for fecal coliform collected by IDEQ in 1997, the highest values were 90 colonies/ 100 mL, and for fecal streptococci 180 colonies/ 100 mL. Both high values were well below guidance thresholds. Fecal coliform bacteria data collected from all other sources also supports IDEQ's data although some exceedances occurred in the Snake River as late as 1985. Therefore, IDEQ concludes that fecal coliform bacteria contamination within the Snake River is not a concern in 1999.

Table 19. FECAL COLIFORM EXCEEDANCES AND DATES IN EACH SEGMENT OF THE SNAKE RIVER

American Falls to Massacre Rocks (Exceedances = 2.9 %)	
Date	**# Fecal Coliform Forming Units/100mL**
5/8/69	3,300
6/17/69	1,300
8/6/75	597
Massacre Rocks to Lake Walcott (Exceedances = 3.2%)	
7/17/75	2,000
Minidoka Dam To Burley/Heyburn Bridge (Exceedances = 0.8%)	
8/12/85	520
Burley/Heyburn Bridge to Milner Dam (Exceedances = 0%)	
None	None

Significant sources of bacteria, however, do exist in the Lake Walcott reach. Most notably these sources are the agricultural drains in and around the area of Burley. A significant amount of data concerning the drains exists in STORET, and that collected by Idaho Department of Agriculture (IDA) in 1996. The data indicate that the drains often exceed both primary and secondary contact recreation standards. In the study of drains conducted by IDA the percentage of exceedances ranged from 8 to 83% of the samples for primary contact and 0 to 75% for secondary contact recreation (Cambell 1997). STORET data, covering a longer period of time, suggest that the drains are above the standards 8.3% of the time for primary contact recreation and 10.6% of the time for secondary contact recreation. This suggests that the drains may be conduits of pathogens due to the land use practices and management of agriculture and grazing. Although these drains do act as sources of bacteria to the Snake River, the river itself has not exceeded any bacteria standard for the last decade due to dilution of the bacteria load in the river system. IDEQ suggests that until such time that the drains are shown not to exceed state standards for bacterial contamination, periodic bacteriological monitoring of the river and some of the drains take place. This will ensure that primary and secondary contact recreation standards are not exceeded in the river in the future.

2.2.4.3 Pesticides: Massacre Rocks to Lake Walcott

Pesticides are a listed pollutant in the Massacre Rocks to Lake Walcott segment of the Lake Walcott Reach. The listing agency that cited the problems in the 1992 э305(b) report was the United States Bureau of Land Management (USBLM). At the time it was felt that pesticides were entering the segment from irrigated cropland, nonirrigated cropland and rangeland. There are many data sources for pesticides in the Upper Snake River Basin. Sources within the segment, however, are rare. Because of the lack of data, assessment of the impacts of pesticides relied on a weight of evidence approach. If there were significant pesticide problem located around the listed segment then the inference would be that pesticides were potentially a problem within the segment. Additionally, IDEQ used the drinking water concentration limits for pesticides established by the USEPA and adopted by the State of Idaho (40 CFR э131.36(b)(1), Column D1) for the various pesticides detected in ground and surface water. For fish tissue, the NAS and NAE criterion (1Φg/g) for protection of aquatic wildlife was used. For bed sediments, the Sediment Quality Probable Effect Level established by the Canadian Government (Canadian Council of Ministers of the Environment 1995) was used. This conservative approach was needed in assessing the concentrations because most of the sampling was done outside of the segment.

From various studies it was found that pesticides are present in the Lake Walcott Subbasin. These levels, however, are usually at or near the minimum detection limits of the analytical tests. One pesticide was found, one time, that exceeded the drinking water criteria established by the USEPA and adopted by the State of Idaho. This sampling point was a well approximately 50 miles north of the river segment and its impact to the river segment is considered minimal. The majority of other pesticide detections around the segment occurred in the 1970's.

In addition to reviewing STORET data, a number of USGS reports were reviewed. Clark and Maret (1998) studied bed sediments and fish tissue in the lower Snake Basin. During this study, a sampling location was located below the Minidoka Dam. At this location, the pesticides detected were reported as below level established to protect wildlife that consume fish. Clark et al. (1998) in a study of the water quality of the Upper Snake Basin collected samples below American Falls Dam and Minidoka Dam. No samples exceeded USEPA drinking water standards. Clark (1997) reported that pesticides such as EPTC, atrazine, desethylatrazine, metolachlor, and alachlor were those most commonly detected in the upper Snake River, but were all at concentrations less than 1 Φg/L and therefore below water-quality criteria established by the EPA. Maret (1995) conducted a water-quality assessment in the Upper Snake Basin and found that the concentrations of pesticides were below the National Academy of Science and National Academy of Engineers guidelines. Clark (1994) assessed data collected in the late >70's from the Upper Snake River Basin and found the largest concentrations of DDT in fish tissue (10 Φg/kg) were at the mouth of the Henry's Fork River.

The conclusions that IDEQ draws from these and other studies and STORET data is that pesticides, while present in the Subbasin, are not in significant enough quantities that may impair beneficial uses.

2.2.4.4 Oil and grease

Oil and grease have been identified as pollutants for the Milner Pool. In other areas of the state oil and grease are recognized as major contaminants in municipal stormwater runoff. Oil and grease, petroleum hydrocarbons, affect aquatic life through asphyxiation of fish through coating of gill surface or macroinvertebrates when floating masses of oil and grease coat surface debris which settles on the bottom of the waterbody (EPA 1986). The biochemical oxygen demand from high levels of oil and grease can also kill fish if dissolved oxygen levels are already depressed.

The only information on oil and grease in the Milner Pool was found in STORET and from McCain Food USA's NPDES permit Discharge Monitoring Reports. No monitoring of the stormwater drains from the three municipalities in the area have been conducted. Although considerable sampling for water quality has been done in the Milner Pool, IDEQ has only sampled once (9/15/99) specifically for oil and grease. It is unknown at this time if other entities have sampled the Milner Pool for oil and grease. Therefore, the Lake Walcott WAG and IDEQ will continue to assess oil and grease impacts over the next five years to better quantify the oil and grease loads in the segment.

Oil and grease are commonly found in urban/suburban runoff (Horner et al. 1994) such as stormwater drains. Agricultural runoff can also be a source of petroleum hydrocarbons (Maguire 1997) which are used as pesticides, herbicides, parasiticides, or carriers for other agriculture-related chemicals (Farm Chemicals Handbook 1995).

The Milner Pool is the only segment in the Walcott subbasin that has oil and grease listed as a pollutant of concern. There was no information found as to the extent that oil and grease are affecting beneficial uses in the Milner Pool. In addition, other than the single NPDES permit, no other data was found which would indicate amounts of oil and grease being discharged into the Milner Pool from other sources.

To estimate the oil and grease contributed to the Milner Pool by the municipalities, land use information from Burley and the approximate acreage of the other cities was entered into a model based on stormwater pollutant information from urban areas throughout the United States (Table 20). The model estimated the annual total stormwater runoff of oil and grease at 130 pounds per day (23.7 tons per year). To estimate the oil and grease contributed to the Milner Pool by McCain Food, Discharge Monitoring Reports for the last five years were used. McCain Food averaged 99 pounds per day during this period (18.1 tons per year). The Burley Tank Farm currently has a zero discharge of oil and grease to the Snake River. If any noticeable sheen occurs in the river near the location of the tank farm, remediation occurs immediately and additional vapor-extraction wells are drilled to halt the petroleum hydrocarbons in the ground water from migrating to the river.

Table 20. ESTIMATED OIL AND GREASE LOADS FROM STORMWATER RUNOFF FROM THE BURLEY/RUPERT/HEYBURN URBAN AREA

Land Use Categories	Land Use Area acres	Percent Impervious	Runoff Coefficient Rv	Avg. Annual Precipitation in/yr	Fraction of Avg. Annual Precipitation Available for Runoff	Annual Storm Runoff Calculated Avg. Volume ft3/yr	Runoff Calculated cfs	Oil & Grease Event Mean Concentration mg/L	Oil & Grease Annual Pollutant Loads lbs./day
Residential									
Low density	859	20	0.23	10.0	0.90	9,289,959	0.29	1.7	2.70
Medium density	1,185	30	0.32	10.0	0.90	17,833,109	0.57	1.7	5.18
High density	55	60	0.59	10.0	0.90	1,527,943	0.05	1.7	0.44
Commercial	1,158	90	0.86	10.0	0.90	46,854,493	1.49	9.0	72.07
Industrial	678	80	0.77	10.0	0.90	24,570,333	0.78	3.0	12.60
Public	1,000	50	0.50	10.0	0.90	23,528,589	0.75	9.0	36.19
Recreation	537	20	0.38	10.0	0.90	9,602,816	0.30	0.1	0.16
Transportation	282	80	0.77	10.0	0.90	10,201,664	0.32	0.0	0.70
Total	5,754					143,408,907			130.00

Table 21. LAND USE INFORMATION FROM BURLEY CITY PLANNING AND ZONING

Land Use Type	Burley % Land Use	Total Acres of All Cities	Acreage of Each City	Cities
Residential			2,560	Burley
Low density	0.1491	859		
Medium density	0.2057	1,185	1,280	Heyburn
High density	0.0096	55	1,920	Rupert
Commercial	0.2011	1,158	5,760	total
Industrial	0.1178	678		
Public	0.1737	1,000		
Recreation	0.0933	537		
Transportation	0.0489	282		

2.2.4.5 Rock Creek stream segments

LaPoint's survey (1979) provides the best approximation of the conditions existing in the Rockland watershed. Both physical and biological water quality data were collected. The survey found that EPA limits on turbidity, suspended and total solids and organic nutrients were exceeded 11 months out of the 18. It was noted that Rock Creek invertebrate fauna was low in both diversity and evenness, and of all the stream segments, fish were found only in the East Fork of Rock Creek. Physical water quality was affected, particularly by sediment as detailed later, but nutrients were also high. Concentrations of nitrogen and phosphorus were positively correlated with discharge and with total and suspended solids. LaPoint noted:

> …this might be suspected in areas with large agricultural dry land farming practices. Rainfall and snowmelt which leach the soils and the particulates to which nutrients adsorb are transported into Rock Creek and from there, kept in suspension by the fast, turbulent water, enter the Snake River.

Both $NO_2 + NO_3$ and TP were well above the limits recommended by the EPA. LaPoint estimated that up to 300 pounds/day of TP were discharged into the Snake. LaPoint's summary was that:

> The primary source responsible for water quality degradation appears to be non-point aeolian and water-borne sediments from the dryland farming practices that predominate within the Rock Creek drainage basin.

Discharge from the NPDES permitted Rockland municipal treatment plant is insignificant during most of the year. An IDHW memo (1-2-85) discussed effluent flows during the 3-year period of 1982-84, noting the modal release in this period was 0.03 million gallons per day (mgd), or 0.05 cfs, with suspended solids concentrations of about 5 mg/L. The memo made no mention of nutrient levels.

The problems associated with erosion and sedimentation have been noted in Rockland Basin for decades (LaPoint 1979, and Williams and Young 1982). According to the Power Soil Conservation District (1980), and USDAFS the primary problem in this area is erosion of cropland topsoil and the associated sediment problems. In addition, water quality is well below the standards set by the State of Idaho. Sampling of total suspended sediment by IDEQ in 1997-98 at the mouth of Rock Creek and in the basin showed that these problems still persist.

There are a number of ephemeral streams that flow only during storm events and during the runoff season. LaPoint (1979) discusses:

> When dry, these beds collect a great deal of silt and sand that contribute to the large sediment load during peak runoff periods... These dry beds... contribute an enormous quantity of wind-deposited particulates. The ephemeral nature of the upper reaches of Rock Creek, and of many of its tributaries adds too much of the total solids pollution problem. These drainages lie dry among fallow fields for much (circa 8-10 months) of the year; when heavy rains fall and/or snows melt, the accumulated deposits are swept downstream with the rapid increase in velocity and discharge. An additional problem is the lack of levees and dikes on agricultural land that would retard the flow of water from ploughed fields into Rock Creek. (LaPoint, 1979)

Some of the TSS values measured at various sites along Rock Creek are surprisingly high: LaPoint (1979) measured *mean* values of 370-770 mg/L, which indicates far higher maximums in flood events. Williams and Young (op cit.) monitored just such an event:

> Overland runoff and subsequent channel erosion caused particularly high sediment yields during the storm of January 12-17, 1980... stream discharges were at a maximum, and numerous tributaries were at bankfull or overflow stage. Most of the stream channels had eroded their banks when the measurement sites were revisited in mid-June 1980.

The concentrations they measured were as high as 24,000 mg/L. IDEQ personnel collected a sample in March of 1997 at the mouth of Rock Creek with a concentration of 7,300 mg/L, showing that such problems still need to be resolved.

LaPoint (1979) gave estimates of mean daily sediment loads to the Snake River at the mouth of

Rock Creek as 52,000 pounds/day for base flow and up to 466,000 pounds/day for high flow (February, March, and April). He suggested that flow diversions in the summer months slowed the stream and encouraged deposition behind impoundments that would be flushed out in the high spring flood flows.

> Erosion is caused primarily by runoff from snowmelt and rainfall during the winter and early spring. Summer thunderstorms also contribute to the erosion problem. The average annual erosion in the Sublett Sub-watershed is estimated to be nearly 420,000 tons or an average of about 18 tons per acre of cropland.... Most of this is transported to Lake Walcott. (Power Soil Conservation District, and USDAFS 1980)

The figure given by Power SCD is higher than the estimate LaPoint derived from measured values; that may reflect values derived from export-coefficient-type equations as opposed to local data.

Williams and Young (op. cit.) attributed these losses to current land use practices.

> Concentrations of suspended sediment resulting from soil losses in a dominantly agricultural area are expected to be high when floods occur. Removal of protective vegetation and various land-surface disturbances by man's activities can cause increased erosion.

The Power Soil Conservation District saw long term consequences:

> Another effect of erosion is infertile overwash, the deposition of infertile limey soil in high producing soils...Infertile overwash reduces production about 10 percent for every inch deposited. Land deterioration over the past 50 years has reduced the production potential of the cropland by approximately 30 percent. Yields will be maintained or increased rather than declining as they are presently. If land treatment measures are not applied and yields are not maintained, production will eventually drop below the level of profitable farming... a land use change to dryland pasture for livestock would eventually become necessary, but then the resource would be depleted to the point that only marginal pasturage could be supported (Power Soil Conservation District, and USDAFS 1980).

In 1997-98, IDEQ personnel collected water quality data at 4 sites on Rock Creek (Figure 13a) and its tributaries (Appendix B). These data are summarized in Table 22, and discussed in the following sections.

Table 22. IDEQ SAMPLING 1997-98, ROCK CREEK (MEAN CONCENTRATIONS AND LOADINGS)

Site	Flow cfs	TSS mg/L	TSS Load pounds/day	Total P mg/L	TP Loads pounds/day
RC-01	31.8	151.0	26,000	0.190	31
RC02	23.9	107.0	13,400	0.150	19
RC03	10.4	127.0	7,100	0.160	9
RC04	31.8	6.6	1,122	0.030	5

RC-01= mouth of Rock Creek, RC-02=East Fork at Rockland, RC-03=South Fork at Rockland, RC-04=East Fork at source

A. East Fork of Rock Creek

IDEQ sampled this stream in 1997-98. At its spring source, TSS and nutrient loads are extremely low. By the time it has reached confluence with the South Fork about six miles away, mean levels of TP have increased in concentration (0.0290 to 0.150 mg/L), and TSS from 6.5 to 107.0 mg/L. Bacteria, ammonia, and nitrogen levels also increased over that reach. Dissolved load remained relatively unchanged, and total flow often decreased over the reach as a result of withdrawals for irrigation, indicating that the increases in solids and nutrients were not the result of inflow of tributary waters, but due to local factors in the stream environment.

The most visually apparent change is that of the loss of streamside vegetation, an increase in stream entrenchment with soil banks, and the use of the stream for cattle grazing. Even in the State-owned lands downstream of the spring, spikes in TSS and bacteria were noted when cattle had been present at the pen area upstream, or had grazed at the collection site. Disturbance of sediment was also noted when 4 wheel drive vehicles had been crossing the stream on the State lands. These effects were minimal, however, compared with the alteration downstream of the State lands and through the town of Rockland. During the spring snowmelt of 1997, IDEQ observed that the waters of the creek maintained some clarity into the cleared pasturelands downstream, but were dramatically effected by small amounts of turbid runoff from plowed bare fields on the surrounding benches.

B. South Fork Rock Creek

The perennial flow of the South Fork appears to be largely maintained by springs of the Deep Creek range 10 miles south of Rockland. These were on private land and were not accessed by IDEQ. Well and surface water data collected by Williams and Young (1982) indicate a slightly different source of groundwater than for East Fork, and higher in dissolved minerals. The sampling done by IDEQ did not coincide with any of the rain or snowmelt flood events that can occur in the larger catchment of the South Fork drainage.

Again, these waters emerge with virtually no load of TSS, and minimal nutrient levels (TP= 0.040 mg/L at Well 16ADD1). By the time they reach the confluence with the East Fork at Rockland, both of these properties have reached parity with the East Fork, and spot sampling showed high levels of bacteria (up to 1,260 cfu/100 mL fecal coliform and 2,300 cfu/100 mL fecal streptococcus). The total phosphorus concentration of 0.5 to 0.65 mg/L is twice that of the East Fork and thick growths of the *Potamogeton* macrophyte are visible.

The South Fork flows almost entirely through unvegetated agriculture and grazing lands, exhibiting cut banks, easily erodible in flood. Cattle were often observed on the surrounding land or in the stream itself. Turbid runoff from higher-lying plowed fields was observed entering the South Fork in the Spring of 1997. As Williams and Young (1982) noted:

> Concentrations of suspended sediment resulting from soil losses in a dominantly agricultural area are expected to be high when floods occur. Removal of protective vegetation and various land surface disturbances by man's activities can cause increased erosion.

C. Rock Creek Main Stem

Returns from irrigation canals and some intermittent and ephemeral tributaries boost the flow of Rock Creek by the time it reaches the Snake. The unvegetated banks of the creek and the character of these augmenting flows have substantially degraded the water quality, increasing the mean TSS concentration at the mouth to 151.0 mg/L and TP to 0.190 mg/L, far exceeding their presence at emergence in the source springs. As with the East and South forks, no temperature exceedances above 22°C (71.6 °F) were noted, and bacteria counts were below Idaho standards for primary contact recreation.

Nearly all permanent flow in the Rock Creek drainage emerges as spring water along the flanks of the Deep Creek Range. The range is on the east side of the Rockland Valley. It is of high quality at its emergence, but is rapidly degraded as it flows through the agricultural lands of the sub-basin. These changes are visually dramatic and so profound as to rapidly result in an inability of the main stem and tributaries to meet their designated uses. By the time Rock Creek empties into the Snake River near Register Rock, it is producing on average 20,000 to 30,000 pounds per day of TSS, and 30 pounds per day of TP. Although this loading is generally inconsequential to the Snake River (accounting for 4-7% of the load to the river), it can be significant in times of severe flash-flooding by Rock Creek, or very low flows of the Snake River in drought or winter.

As noted, high bacteria levels can also accompany these severe sediment and nutrient problems. The cold water biota native to the catchment has been severely impacted, and fish are restricted to one small area near the source of East Fork of Rock Creek. The Upper Snake Rock TMDL confirms that a synergism exists between sediment and fecal coliform bacteria. The effect of that synergism has been determined to be statistically significant. The synergism between sediment and bacteria will be further researched over the next 5 to 10 years through the trend monitoring programs of both the Lake Walcott and the Upper Snake Rock TMDLs.

2.2.4.6 Summary of existing water quality data

“Sediment” is listed as the major pollutant of concern for the Snake River in the Walcott Sub-basin, but for most of the reach, the suspended sediment concentrations are relatively low, especially given the large size of the river. This is as expected because of the settling effect of the numerous reservoirs and the limited opportunity of the river to erode its banks. Never the less, it is certain that in the future there will be drier water years and lower flows than that occurring recently. These low flow years will amplify the relative importance of other inputs to the river such as the frequently-turbid tributaries of Raft River and Rock Creek, and the irrigation return flows downstream of Burley.

One of the greatest effects could also be the high concentrations of TSS that could be introduced through operating decisions of the USBOR because of extreme drawdown of American Falls Reservoir during low water years. During a drawdown in 1994, following several drought years values of 156 mg/L TSS were reached in outflows from the dam when reservoir storage was dropped to 10% of maximum. The USBOR has noted that when the reservoir active storage was below 47,000 acre feet, sediment in the discharge increased rapidly. To this end however, the operational requirements of the reservoir include no minimum storage. Since 1994, water supplies have been average or above average and the reservoir storage has been maintained at or near 600,000 acre feet.

The most consequential annual effects of suspended sediment upon the Snake River in this reach are largely hidden because of the load that settles out in the reservoirs. Ultimately, these cumulative impacts will have significant effects, as noted by Power Soil Conservation District et al. (1980):

> Rock Creek enters Lake Walcott at an elevation where most of the sediment is deposited in this live storage pool. Therefore, irrigation water storage capacity is being lost at almost the same rate as sediment delivery... The present live storage loss from sediment is about 82 acre feet per year.

The effects of nutrients (total phosphorus) can be seen along the entire length of the Lake Walcott reach with locally dense mats of macrophytes along the margins of the river and in some shallow areas in the river channel. This was more apparent below the Burley/Heyburn Bridge where the nutrients become excessive. These dense mats of macrophytes existed in Milner Pool even following the highest peak flows in the system since construction of the American Falls Dam. The magnitude of the nutrient problem may have been effectively masked by the high flows of 1997-98. With normally lower flows-- or even much lower flows in dry years-- the problem may be amplified due to the decreased load capacity of the river at low flows and the relatively stable nutrient loading from industry, municipal, and agricultural sources. This could be expected to produce much greater degradation of the water quality. During some low flow years the relative contributions of these sources could equal that of the river annually and possibly exceed it in some seasons.

The water quality within the Snake River reachs is sufficient to provide for fully supported fisheries and support of other beneficial uses. TSS, and in most cases TP, concentrations are below levels associated with degraded water quality. TP concentrations, however, are higher in Milner Pool and recreational benficial uses may not be supported. Therefore it is recommended that TP reductions take place while maintaining TSS concentrations at or below current levels in the mainstem. In order to restore beneficial uses in the Rock Creek segments significant reductions in TSS must take place. These actions will rectify the current situations and improve water quality in the Rock Creek tributaries. These actions may further improve water quality in the Snake River. In addition, water quality limited waterbodies upstream of American Falls Dam are scheduled for TMDLs in the future. IDEQ staff in the Pocatello Region will begin the subbasin assessment process and subsequently the TMDL for American Falls Reservoir in 2003. The Portneuf subbasin assessment was completed in 1998 and the TMDL is scheduled for completion in 1999. The Blackfoot River subbasin assessment is scheduled for completion in 1999. Following implementation of these three scheduled TMDLs the water quality below American Falls Dam, in the Lake Walcott reach, may even improve above what could be expected following implementation of this TMDL.

2.2.5 Identification of data gaps

Within the Lake Walcott SBA and TMDL data gaps exist. As with most subbasin assessments and TMDLs undertaken due to the court imposed time line, data gathering, analysis, and monitoring time was very limited. When other agencies undertake large tasks they encounter similar data gaps, often times these gaps exist due to funding sources (or lack of funding sources). When various agencies are faced with funding constraints and time obstacles, they rely on statistical inferences to evaluate management objectives. In addition, when sufficient site-specific data does not exist they use their "best professional judgement and experience" to answer some questions. The Lake Walcott SBA and TMDL was no exception to this rule. Data gaps that need to be addressed to better describe the system include the following:

1. Diel pattern studies of oxygen and temperature are needed to evaluate the effects of nighttime oxygen sags due to aquatic plants.

2. Continuous temperature recordings are needed to better document and evaluate potential stress to the cold water biota from seasonal and daily temperature extremes.

3. Macrophyte community analysis to determine the extent, biomass, growth rates, and cellular N:P ratios. This would allow for a better understanding of the nuisance

aquatic vegetation standards, and, would allow IDEQ to determine limiting factors for more meaningful nutrient reductions.

4. Oil and grease sampling in Milner Pool to determine actual loads from the municipalities, tank farm, food processors, and others. This would also allow IDEQ to better develop instream targets and limits rather than relying on other states limits.

5. Pesticides monitoring in the sediments, water column, and fish tissues with in the Massacre Rocks to Lake Walcott segment.

6. Fisheries investigations to determine if other salmonid fishes, besides whitefish, spawn in the riverine environments of the Milner Pool reach. Intergravel dissolved oxygen, and depth fines measurements in the upper segment of Milner Pool to determine if other habitat requirements for salmonids spawning exist within in this reach. Escapement studies of salmonids into the canal system are needed to determine the cost/benefit of placing fish barriers on the system.

7. Reference locations need to be determined and monitored to better develop concentration limits and targets.

8. The Lake Walcott WAG, IDEQ, and the various industries need to develop a Trend Monitoring Plan to determine if the goals of the TMDL are being met.

2.3 Pollution Source Inventory

There are four categories of potential pollution inputs to the waters of the Walcott sub-basin: background; point sources within the sub-basin; and non-point sources both natural and human-induced. Over the past seven decades, the Snake River has discharged a mean annual flow of 7,400 cfs from American Falls Dam (13,800 cfs in the high precipitation water year of 1997). The sheer volume of the river makes it the greatest single source of pollutant loadings for the sub-basin. There are 14 permitted point sources in the basin, 8 of these discharge (food processors, municipal waste-water treatment, and aquaculture) the remainder land apply their waste. Although the total discharges are minimal, the high concentrations of pollutants can make the loadings significant, particularly at lower river flows. A variety of human activities have the potential to produce pollutants in the watershed: agriculture; grazing; human waste; feedlots (both CAFO and CFO for dairy and meat production); and forestry. Total surface discharges from these activities are minimal (with the exception of the growing season return flows from irrigated agriculture in the Burley area) and have relatively minor impacts on the Snake River. As noted, the region is arid, and most surface flow is intercepted and consumed in the agricultural process, evapo-transpired, or infiltrated to the subsurface. The individual tributaries to the Snake, however, can themselves be highly impacted locally by these endeavors (chiefly agriculture which operates on 25% of the land area).

The contributions of the nonpoint source impacts, however, are often integrated from the many entry sites into the larger discrete flows of the tributaries and drains. This integration often hides the magnitude of the impacts of single activities or sources. For example, home sewer systems and animal feedlots are legally forbidden to produce direct surface discharge. Manure from the latter activity is eventually spread on agricultural lands as fertilizer, and becomes inseparable from other nutrient production that results from application of chemical fertilizer in the agricultural process. The great majority of lands used exclusively for grazing in this arid area produce no surface runoff at all, although rangelands are half of the Subbasin's land use. Where grazing (post-harvest) occurs in combination with agriculture, effects of manure and trampling of riparian areas may be inseparable from, and concurrent with, the effects of fertilizer application and the plowing of stream sides.

Natural erosive processes by the streams in the sub-basin would include scour of stream banks and beds, overland sediment transport, and mass wasting (earth movement down-gradient). Lesser introduction of nutrients and sediment into the watershed would comprise those from migratory waterfowl, precipitation, and wind transportation. Most of these processes are also to some respect enhanced or accelerated by human alterations of the landscape (e.g. grazing and farming operations that effect riparian growth and stream side cover), often making specific attribution of pollutant production difficult.

2.3.1 Identification of Point and Nonpoint Sources

The following sections will discuss the point sources and major nonpoint sources within each segment of the Lake Walcott Reach.

2.3.1.1 American Falls to Eagle Rock

There are three point sources located within this segment of the reach. Additionally, there are operational procedures followed by the USBOR at the dam that influence water quality. Flow limits are in place which restrict minimum flow to greater than 300 cfs, although this limit is unofficial and voluntary. The flow limit is based on an agreement with the Governor of Idaho to prevent damage to the fishery below American Falls Dam. Another operational agreement concerning the dam is with Idaho Power. In this case, when dissolved oxygen falls below 6.0 mg/L in the discharge, aeration of the "effluent" will take place. A single municipality, the city of American Falls (NPDES ID-002075-3) discharges to the segment approximately 1/4 mile downstream of the dam. Permit limits for the municipality are: BOD 30 mg/L monthly average, 45 mg/L weekly average; TSS 30 mg/L monthly average, 45 mg/L weekly average; fecal coliform, May to September 50 cfu/100mL monthly average, 100 cfu/100mL weekly average, October to April these change to 100 and 200 cfu/100mL; and total chlorine residual daily maximum of 0.5 mg/L. A state of Idaho operated fish hatchery (1.4 miles downstream form the dam) also discharges to the segment (NPDES ID0001104). This facility falls under the newly release general aquaculture permit issued by the USEPA on 8/19/99 it becomes effective on 9/10/99 and covers the period until 9/10/2004. Permit limits for the fish hatchery are: dissolved oxygen greater than 6.0 mg/L; pH between 6.5 and 9.5; temperature not to exceed 22EC instantaneous maximum and 19EC maximum daily average; total suspended solids no more than 10 mg/L from raceways and 67 mg/L from offline settling ponds; phosphorus limits will be set following a three year monitoring period. Lamb Weston Inc. operates a potato processing plant on the Benches to the north of the river. They currently land apply all wastewater and do not discharge to the river.

This segment of the Lake Walcott reach falls wholly within the fifth field HUC of 1704020908. The land uses from GIS coverages indicate that 50.2 % of the watershed are dryland farms, 25.3 % are irrigated croplands, and 24.5 % are range lands. These are the major sources of nonpoint source pollution in the watershed. Of the irrigated lands, the majority is sprinkler irrigated. Along a two-mile wide corridor of the river segment only 0.3% of the irrigated croplands are gravity irrigated. The Main West Canal feeds water to these croplands. Water for this canal is pumped from the river near the dam to an aqueduct. Return flow may return through Ferry Hollow, Warm Creek, and Little Creek. These flows, however, are negligible, less than 1 cfs in total (Power County Soil Conservation District 1999). Additional sediment sources include unstable banks and reentrainment from the riverbed itself. However, quantification of these sources has not been completed. As of yet no confined animal feeding operations have been located within the watershed.

2.3.1.2 Eagle Rock to Massacre Rocks

The Eagle Rock to Massacre Rocks segment of the Lake Walcott reach is approximately four river miles in length. This segment also falls completely within watershed HUC 1704020908. No known point sources are located within this segment of the river. The land uses and nonpoint sources of the watershed are described in the proceeding segment of the river. No significant changes in the land form, or land use occurs within this segment in comparison with the upstream segment. The geology and land uses of the river in this segment, however, are very different from that of the following river segment.

2.3.1.3 Massacre Rocks to Lake Walcott

The upper portion of the Massacre Rocks segment of the river is very similar to the proceeding two segments. It is contained within the steep river gorge lined with basalt bluffs. Access to the river is still limited to a few draws and gullies. Although, as the river leaves the river gorge it enters an area that can be highly accessible to human activity. This increase in access to the area can be seen in the abandoned cabins and shacks, private boat docks, animal trails on the hill slopes, and the Massacre Rocks State Park. The Massacre Rocks segment flows through portions of two fifth field HUCs (1704020907 and 1704020906). The first of these (-07) is the watershed of Fall Creek. The second (-06) is the watershed overlaying the Snake River Plain Aquifer. As noted previously, little surface waters reach the Snake River from this watershed. The waters enter the aquifer and largely do not return until the Thousand Springs area in HUC 17040212. The Massacre Rocks segment of the Snake River, in addition to the two watersheds, receives water from the Rock Creek watersheds and the Raft River subbasin (HUC 17040210). The watersheds, although effecting the Massacre Rocks segment, will be discussed in a following section. The subbasin of Raft River will be addressed in a later Subbasin Assessment and TMDL.

There is one point source within the watersheds of the segment. This is an aquaculture facility previously operated by Rangen Inc. on Fall Creek (NPDES ID0026816). The facility is covered by the same general aquaculture permit as the state operated facility in the American Falls segment although it is currently not in operation. Fall Creek has not been э303(d) listed.

Sewage waste from the Massacre Rocks and Register Rocks State Parks are contained in vault-type outhouses and are periodically pumped and the waste shipped out of the area for disposal. The park headquarters are on a septic and drain field system with no discharge to the surface waters.

A river corridor approach was taken to determine the nonpoint sources within this segment and for future load allocations. The corridor approach was done due to the nature of the hydrology in watershed -06. Additionally most contributions of nonpoint source pollution may be limited to the area adjacent to the river due to the nature of the land use practices in the area.

The corridor consisted of a two mile wide (one mile on either side) transect along the river (Figure 25a. and Figure 25b.). It encompasses portions of the Fall Creek and Rock Creek watersheds and the Raft River subbasin. It also includes the areas adjacent to the river in the watershed that overlies the Snake River Plain aquifer and some overlap with the upper segment of the river and Lake Walcott. The river corridor ended at Smith Springs at the GIS coverage transition from “Snake River” to “Lake Walcott.”

According to the river corridor model, the land uses are: 24 % dryland agriculture, 0.3 % gravity irrigated crop lands, 15.3 % sprinkler irrigated crop lands 49.2 % rangeland, and 11.2 % water. Land ownership within the corridor are: 28.4% USBLM, 34.1 % private deeded property, 19.6 % USFWS and 17.9 % State owned. One confined animal feeding operation exists in the vicinity, however, this operation falls outside of the corridor in the Raft River Subbasin. There are no canals or diversions in the area. The irrigated croplands receive water from ground water pumping or from diversions higher up in the Raft River subbasin. Other sources of pollutants (sediment) include bank destabilization, and reentrainment of sediment from the riverbed.

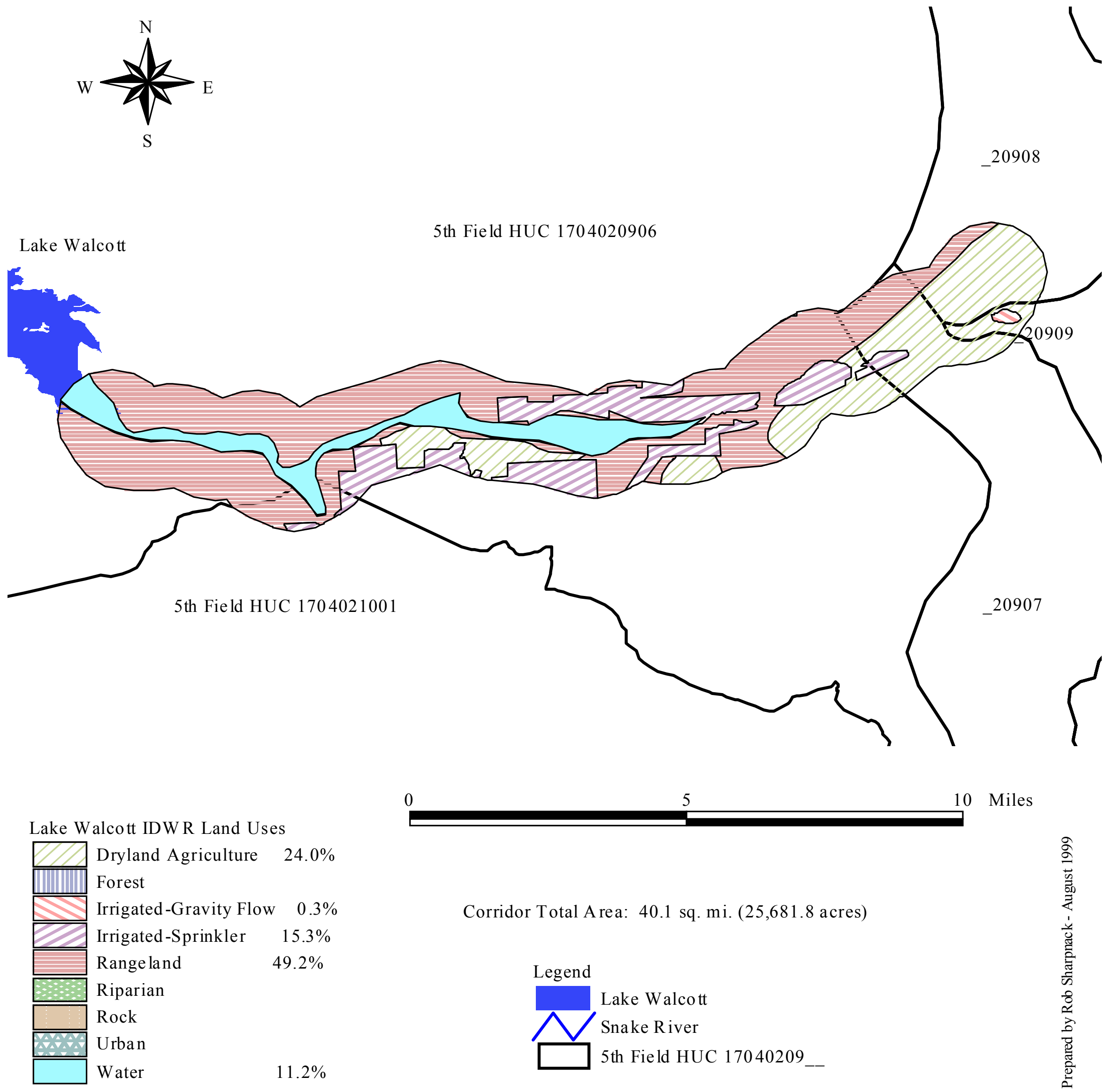


Figure 25a. Land Use Corridor for the Massacre Rocks to Lake Walcott Segment, showing the watersheds (5th field HUCs) and land use practices in the two-mile wide corridor.

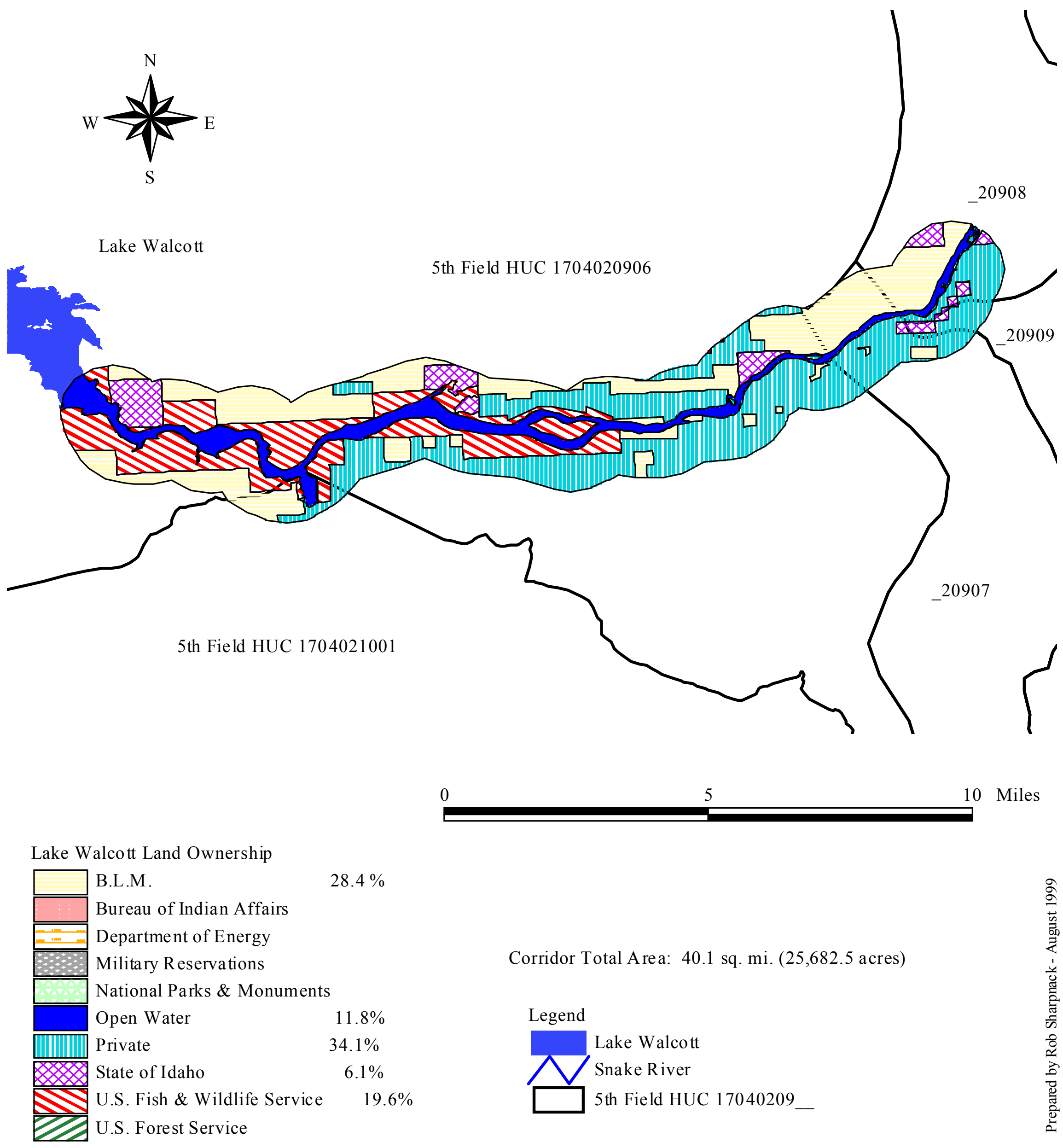


Figure 25b. Land Ownership Corridor for the Massacre Rocks to Lake Walcott Segment, showing the watersheds (5th field HUCs) and major landowners in the two-mile wide

2.3.1.4 Minidoka Dam to Milner Dam

Due to differences in designated beneficial uses and number of sources of pollutants, the Milner Pool will be discussed in two segments.

2.3.1.4.1 Minidoka Dam to Burley/Heyburn Bridge

This segment of the river begins at the outlet of Minidoka Dam. There are two outlets from the dam. The radial gates on the southern half of the dam spill water over a series of rapids before it is joined by water run through the turbines on the northern half of the dam. A USGS gage is located 0.2 miles downstream from this convergence. Water is diverted from the dam by two canals, the North Side canal which feeds portions of the Minidoka Irrigation District (MID) and the South Side canal which supplies water for the irrigated lands of the Burley Irrigation District (BID) and MID on the southern valley lands and river terraces. One point source is located in this segment of the Milner Pool. This is the Minidoka State Park and Power Plant (NPDES ID002682-4) which discharges at the dam (river mile 674.5). Effluent limitations are: pH shall not be less than 6.5 or greater than 9.0; no discharge of floating or visible foam other than trace amounts; BOD, 30 mg/L monthly average, 45 mg/L weekly average; TSS 30 mg/L monthly average, 45 mg/L weekly average; Fecal coliform maximum of 100 cfu/100 mL monthly average, 200 cfu/100mL weekly average; and total chlorine residual 0.5 mg/L monthly average.

This segment of the Lake Walcott reach transects the fifth field HUC of 1704020905 and 2 of 1704020902. The land uses from GIS coverages of watershed of -05 indicate that 1 % of the watershed are dry-land farms, 21.3 % are gravity irrigated croplands, 46.2 % are sprinkler irrigated croplands, 30.1 % are range lands, and 1.2% are riparian or water areas. Percentages of land use in the remaining fifth field HUC (-02) are reported for the whole watershed although only 2 of the segment is within this HUC. The land uses from GIS coverages of watershed of -02 indicate that 2.8 % of the watershed are dryland farms, 68.5 % are gravity irrigated croplands, 14.0 % are sprinkler irrigated croplands, 6.8 % are rangelands, and 7.9% are riparian or water areas. Agricultural wastewater return flow enters through as many as 28 drains, and tributaries. Many of these “tributaries”, however, are ephemeral channels that may only carry water during rain and snowmelt events. The IDA conducted a study of the major drains in the Milner Pool area in 1996. Of the drains studied, ten were in this segment. A combined flow from these drains during the irrigation season was approximately 113 cfs. They contributed approximately 5,450 pounds of TSS per day and 55 lbs. per day of total phosphorus. Additional sediment sources include unstable banks, eroding river islands, and reentrainment from the riverbed itself. However, quantification of these sources has not been completed. There are 147 confined animal feeding operations located in Minidoka County and 137 in Cassia County. Some of these are NPDES permitted and are zero dischargers.

2.3.1.4.2 Burley/Heyburn Bridge to Milner Dam

This segment of the river begins at the Burley/Heyburn Bridge and ends at the Milner Dam, the end of the Lake Walcott Reach. There are upwards of 10 outlets from this segment, most near Milner Dam (Table 23). Water diverted from up stream and from various pumping operations (ground water and from the river) supplies water for irrigation needs. Four point sources directly discharge to the river and 5 either land apply their wastes or discharge into the agriculture drains.

Table 23. NPDES PERMITED FACILITIES-BURLEY/HEYBURN TO MILNER DAM

Name	River Mile/ Location	River Flow Conditional Limits	Limits Monthly Average				
			TSS lbs/day	TP lbs/day	BOD lbs/day	Fecal Coliform cfu/100ml	O&G lbs/day
Heyburn City ID-002094-0	652.2	ALL	205		205	200	
Simplot Inc. ID-000066-3	652.2	> 1,100 cfs	8,780	750	8,701		
		500 to 1,100 cfs	8,780	750	7,470		
		< 500 cfs	8,780	750	4,000		
Burley City ID-002009-5	651.7	ALL	845		845	100	
McCain Foods USA ID-000061-2	648.8-649.2	> 1,100 cfs	8,200	770	8,200		#
		500 to 1,100 cfs	8,200	770	4,100		#
		< 500 cfs	8,200	770	3,000		#
Paul City LA-000009	1mi. west of Paul	1.04 mgd application, no run off to main drain, hydraulic load 1.5 inches per year					
Paul Housing Authority ID002526-7	canal 185	1/20 of canal flow			25 mg/L	5	>2 mg/L
Amalgamated Sugar- Paul. LA-000050-02		9.5 ac-in/ac-yr, 642 lbs./acre/year TDS, 50 pounds/ac/day COD (gs), nitrogen 300 pounds/acre/year					
Rupert City LA-000001	5 mi. N.E of Rupert	1.1 mgd application (400 million gal/year),					
Sun Valley Potatoes LA-000051		No permit on file					

This segment of the Lake Walcott reach transects 2 of the fifth field HUC 1704020902 and all of 1704020901. The land uses from GIS coverages of watershed -01 indicate that 1.2% of the watershed are riparian areas, 77.2% are gravity irrigated croplands, 5.6% are sprinkler irrigated croplands, and 14.2% are rangelands. Percentages of land use in the remaining fifth field HUC (-02) are reported for the whole watershed although only 2 of the segment is within this HUC. The land uses from GIS coverages of watershed of -02 indicate that 2.8% of the watershed are dryland farms, 68.5% are gravity irrigated croplands, 14.0% are sprinkler irrigated croplands, 6.8% are rangelands, and 7.9% are riparian or water areas. Agricultural wastewater return flow enters the Snake River through as many as 22 drains and tributaries, including the main drain which flows year-round. Many of these other tributaries, however, are ephemeral channels that may only carry water during rain and snowmelt events. The IDA conducted a study of the major drains in the Milner Pool area in 1996. Of the drains studied, 4 were in this segment. A combined flow from these drains during the irrigation season was approximately 53 cfs. They contributed approximately 7,357 pounds of TSS per day and 27 pounds per day of TP. Additional sediment sources include unstable banks, eroding river islands, and reentrainment from the riverbed itself. However, quantification of these sources has not been completed. There are 147 confined animal feeding operations located in Minidoka County and 137 in Cassia County. Some of these are NPDES permitted and are zero dischargers.

2.3.1.5 Rock Creek, East Fork, South Fork

The Rockland valley contains three э303(d) listed waterbodies. These three water bodies flow though the watersheds 1704020911, 1704020910, and 1704020909. There is one NPDES permitted facility located in these watersheds. The city of Rockland (NPDES ID-002207-7) is not permitted to discharge from May to October because of low flows in the receiving water Rock Creek. Discharges are approximately 0.046 cfs, and TSS is to be less than 70 mg/L. Land uses and land ownership is displayed in Tables 24 and 25.

Table 24. LAND USES IN THE ROCK CREEK WATERSHEDS

Watershed	% Dryland Ag.	% Forest	%Irrigated-Gravity Flow	% sprinkler irrigated	% Rangeland
1704020909	70.2	0.3	0.5	9.5	19.4
1704020910	50.5	32.1	0.0	8.3	9.0
1704020911	68.6	12.5	0.2	0.6	18.2

Table 25. LAND OWNERSHIP PERCENTAGES AND CATAGORIES IN THE ROCK CREEK WATERSHEDS

Watershed (HUC #)	%Private.	% USBLM	%State of Idaho	%USDAFS	% BIA
1704020909	88.0	10.8	1.2	0.0	0.0

1704020910	60.1	18.0	10.4	10.2	1.3
1704020911	60.0	17.0	1.7	21.4	0.0

2.3.1.6 Marsh Creek

Marsh Creek flows through the watershed of HUC #1704020912. There are no NPDES permitted dischargers in this watershed. The cities of Albion and Declo have total containment lagoons with land application of wastes. Land use within the watershed are: 4% dryland agriculture, 8.6% forest practices, 0.3% irrigated gravity flow, 12.5% sprinkler irrigated crop lands, 1% urban areas, and 73.2% rangeland. Land ownership is a mix of: 27.2% USBLM lands, 17.2% USDAFS administered lands, 50.9% private deeded ground, and 4.6% State land.

2.3.1.7 Other tributaries

The remaining watershed, with integrated channels, within the Subbasin is that of Fall Creek (HUC#1704020907). All other tributaries are covered within the watersheds that the Snake River flows though. As mentioned previously, Fall Creek has a fish hatchery on it and is not э303(d) listed. Land uses and ownership in the Fall Creek watershed are: 71.8% dryland agriculture lands; 15.8% are forested; 2.9% irrigated by sprinkler; and 9.5% are rangelands; 68.8% are privately owned; 28.7% are owned by the USBLM; 2.4% are State lands.

2.3.2 Characterization of Specific Pollutant Per Industry

The USEPA is in the process of rewriting and reissuing the NPDES permits for the municipalities and food processors in the Lake Walcott reach. These permits, for the food processors, were issued and became effective August 31, 1999. USEPA has just recently reissued the general permit for the aquaculture industry. This rewriting is being done in order to incorporate the wasteload allocation of the Mid-Snake TMDL and the Lake Walcott TMDL.

2.3.2.1 Hydroelectric impoundment for generation and agriculture

Hydroelectric projects do not supply pollutants to the Lake Walcott reach. The Milner Dam facility is governed by FERC permits and is scheduled for relicensing every 30 years. During the relicensing process water quality problems are usually addressed. The other facilities are federally owned and operated. These must undergo §401 certification prior to any changes being made in the structures. All are defined as nonpoint sources of pollution. They can however, add to the water quality problems within the reach. By altering the river's hydrology, the dams have altered the Lake Walcott reach in many ways. As previously discussed, the reservoirs act as large settling basins. Much of the TSS and possibly other pollutants contributed from the banks and tributaries are captured in each of the three upstream impoundments. Therefore, water quality is often improved below the facilities. By creating these large areas, however, higher water temperature and lower dissolved oxygen situations can result. Additionally, by removing extreme peak flow events flushing flows in the lower segments are diminished decreasing the amount of material usually flushed out during high flows. Because of these changes, the suitable habitats for rooted aquatic macrophytes are increased. Furthermore, irrigation withdrawals may change the annual hydrograph in other ways. Summer time flows may be increased to meet peak irrigation demand. In the fall and winter, however, after the irrigation season flows may dramatically decrease to increase storage for the next irrigation season.

2.3.2.2 Municipalities

Under the conditions of their NPDES permits, municipalities have permit limits on discharges of the following pollutants: BOD_5, total suspended solids, fecal coliform, total residual chlorine, pH, total phosphorus (as P), ammonia (as N), temperature, dissolved oxygen, total Kjeldahl nitrogen, and nitrate + nitrite (as N). The permitted facility is required to submit discharge monitoring reports monthly.

2.3.2.3 Food processors

Under the conditions of their NPDES permits, the two food processors have permit limits on discharges of the following pollutants: BOD5, total suspended solids, fecal coliform, total residual chlorine, pH, total phosphorus (as P), dissolved orthophosphate (as P) ammonia (as N), temperature, dissolved oxygen, total Kjeldahl nitrogen, nitrate + nitrite (as N), and oil and grease (McCain Foods USA only). The permitted facility is required to submit discharge monitoring reports monthly and annually reports which document their progress towards meeting the Mid-Snake TMDL phosphorus compliance level. Additionally, the food processors are required to conduct ambient water quality monitoring in the Milner Pool (November and August) each year that the permit is in place. Additional tests required in the NPDES permit include effluent toxicity tests (Chronic Biomonitoring) 4 times a year.

2.3.2.4 Aquaculture

Under the conditions of the general NPDES permit, aquaculture facilities have permit limits on discharges of: Total suspended solids, pH, total phosphorus, nutrients, temperature, dissolved oxygen, settable solids, disinfectants, feed supplements, and disease control chemicals.

2.3.2.5 Nonpoint sources

Nonpoint source pollutants are more difficult to control because they do not come from clearly identifiable sources. The primary pollutants from nonpoint sources are: sediment, nutrients, fecal coliform bacteria, organic enrichment, ammonia, oil and grease, pesticides, thermal modification, salt, and flow alteration.

Table 26. MAJOR SOURCES OF NONPOINT SOURCE POLLUTANT

Nonpoint sources	SEDIMENT	NUTRIENTS	BACTERIA	BOD_5	AMMONIA	OIL & GREASE	PESTICIDES	SALT	THERMAL	FLOW
Hydroelectric and Agricultural Dams									X	X
Agriculture	X	X	X	X	X	X	X	X	X	X
Confined Feeding Operations	X	X	X	X	X	X	X			
Grazing	X	X	X	X	X		X		X	X
Forest Practices	X	X	X	X	X		X		X	X
Recreation	X	X	X	X	X	X				
Urban Areas	X	X	X	X	X	X	X		X	X
Construction (roads, highways, bridges)	X	X				X			X	X
Industrial areas	X	X	X	X	X	X	X	X		
Suburban (includes construction)	X	X	X	X	X	X	X	X		

Table 27 displays the numbers of commercial domestic livestock and other animals held in confined operations in Minidoka, Cassia and Power counties.

Table 27. CONFINED FEEDING TYPES IN THE LAKE WALCOTT SUBBASIN

Animal Type (1997, 1998 Census USDA Numbers)	Power County (head)	Minidoka County (head)	Cassia County (head)
Cattle and Calves	29,000	34,500	141,500
Sheep and Lambs	1,400	30,000	10,000
Poultry (all types)	<100	<1030	<786
Swine	<147	2,197	3,582
Horses	694	973	1,766

Mink	0	0	15,850

Two sources estimated the daily load contributed to the Snake River from waterfowl. Buhidar (1999) estimated that in the Mid-Snake area, waterfowl contribute approximately 111 pounds/day of nitrogen and 48 pounds/day of phosphorus. While in the Lake Walcott reach Gianotto (1995) estimated that total waterfowl production of these two pollutants were 237 lb./day of Nitrogen and 74 pounds/day of TP. No estimates have been made concerning the amount of bacteria or suspended solids (Buhidar 1999 estimated that waterfowl contributed 1,085 pounds/day total solids in the Mid-Snake) contributed by waterfowl in the Lake Walcott reach.

Small-scale irrigation diversions on the tributaries are regulated through the IDWR. They also contribute to the degraded water quality of the tributaries. Although peak flows are not changed as with the large dams, dramatic changes in the annual hydrograph occur. In some instances, flow in the summer time is reduced to almost nothing to meet irrigation demands. Flow can be augmented in the fall, in some reaches, as irrigation return flow is rerouted from the canals and ditches to stream channels other than the ones from which the water was diverted.

2.3.3 Groundwater Concerns

The eastern Snake River Plain is underlain predominantly by a series of vesicular and broken basalt flows that has regional water flows that in the aquifer that move from northeast to southwest. Ground water is discharged from the eastern Snake River Plain aquifer as spring flow and seepage to the Snake River between Milner Dam and King Hill. Discharge to the entire reach was about 6,000 cfs in 1980 (USGS 1997). The average discharge specifically at Thousands Springs was about 4,000 cfs in the early 1900s and increased to almost 7,000 cfs in the 1950s. It has since decreased to about 5000 cfs (USBOR 1996-1997).

NO2+NO3 as N (or NOX) in ground water is a result of nitrogen input from many difference sources. The proportions of nitrogen supplied by the various sources depend on land use practices. For instance, most nitrogen in the A&B area of Burley-Rupert is from inorganic fertilizer and legume crops. In the Jerome-Gooding study area, a greater percentage of nitrogen is from cattle manure because of the large number of dairies, particularly in Gooding county (USGS 1997). USGS estimated the amount of nitrogen supplied by cattle manure, domestic septic systems, inorganic fertilizer, legume crops (alfalfa and beans), and precipitation for each county in the Upper Snake River Basin. They concluded that domestic septic systems provided minimal amounts of nitrogen input (less than 1%) and that precipitation provided only 6% of the nitrogen input to the basin as a whole. The remaining 93% were provided by cattle manure (29%), fertilizer (45%), and legume crops (19%). Additionally, the greatest amount of mean residual total nitrogen input of all 24 counties in the basin occurs in Cassia, Gooding, and Twin Falls Counties. Cassia County is in the Lake Walcott Reach (USGS 1996).

As previously noted in section 2.1, excessive aquatic plant growth in surface water is a major concern in the Lake Walcott reach, particularly during low flow/drought years. Ground water adds nitrogen and phosphorus to surface water where ground water discharges to the Lake Walcott reach. Water from more than 78% of the regional wells contained NOX concentrations higher than 0.3 mg/L, which is the critical limit for stimulation of aquatic plant growth in surface water in the presence of adequate phosphorus. According to USGS, this suggests that nitrogen is not a limiting factor for aquatic plant growth in most streams that receive ground water (USGS 1997).

2.4 Summary of Past/Present Pollution Control Efforts

The follow pollution control efforts/projects are described as point and nonpoint source efforts. Additionally, one civic group sponsored a clean up of the Snake River in the Lake Walcott reach, called the Dam to Dam Snake River clean up. On June 6, 1998, AmeriCorps sponsored a long-planned removal of trash along the banks of the Snake River from Minidoka Dam to the Burley/Heyburn Bridge. Sarah Wolcheski was the group coordinator. There were an estimated 120 participants, who provided their own watercraft. Information booths were also established by BLM and IDEQ (Archibald 1998).

2.4.1 Nonpoint Source Pollution Control Efforts

In 1979, as a part of a 208 Study conducted by IDEQ on the Snake River from the Idaho-Wyoming border to Weiser, it was stated that a “general increase in nutrient concentrations from upstream to downstream stations exceeded the recommended criteria over most of the river a majority of the time (IDHW 1979a).” It was stated that “in most Snake River segments and major tributaries, point sources are not major contributors of nutrients.” In fact, “the major reduction in nutrient loadings will come from nonpoint source controls (IDHW 1979a).” It was recommended at that time that the nutrient control plan for the Snake River should be implemented in two phases: Phase I would concentrate on control of phosphorus sources; and Phase II would focus on nitrogen sources. The nonpoint sources on both sides of the Snake River should be reduced by implementation of the Agriculture Pollution Abatement Plan (IDHW 1979). Since that time, the Idaho Agriculture Pollution Abatement Plan has been referenced in Idaho Code э39-3601 *et seq.* as the source of BMPs for agricultural sources. IDEQ anticipates that agriculture, as part of the nonpoint source portion of the TMDL, will adopt and implement those BMPs (where applicable) as defined in the Agriculture Pollution Abatement Plan. A feedback loop will be used to identify non-functioning BMPs and these will be modified so functional BMPs will be applied for the reduction of sediment and nutrients, as well as other parameters linked to the sediment. Precedence for this has been set by the Mid-Snake TMDL (IDEQ 1998) in which a portion of irrigated agriculture selected site-specific canal drains to apply BMPs for specific total phosphorus reductions. Still to be defined are: (1) upstream reduction efforts from future TMDLs; (2) grazing reduction efforts that need to be defined for public and private lands; and (3) additional agricultural drains in the Minidoka and Cassia

County area that may have significant impact to the receiving waterbody.

2.4.1.1 Water quality projects

The Idaho State Agricultural Water Quality Plan (or SAWQP) has undergone major revisions in its funding since it was developed as a partnership between the participant, the technical agency, the Soil Conservation District, and the IDEQ. There have been no SAWQP projects completed in the Lake Walcott. Although, there have been several PL-566 projects undertaken by the Soil Conservation Districts.

Table 28. PL-566 PROJECTS IN THE LAKE WALCOTT SUBBASIN

NAME Of PROJECT	ACREAGE AFFECTED	WATER QUALITY PROJECT TYPE & PROBLEM ASSESSMENT
Houtz Outlet		
Big Canyon/East Fork Rock Creek		
Roy East		
Summit		
Sublett		

2.4.1.2 э401 Water quality certification process

One of the issues for relicensing of the Idaho Power Company (IPC) and USBOR hydropower facilities (Milner Dam FERC No.2899-003) is э401 Water Quality Certification by IDEQ. IDEQ is the designated water quality agency for the State of Idaho and administratively issues э401 Water Quality Certification for FERC projects and replacement projects to meet state water quality standards.

The USBOR applied for э401 certification (No. 920200460) to replace the powerhouse below the existing Minidoka Dam. During this time a Biological Evaluation was conducted by the USBOR and reviewed by the USFWS. The endangered snail, Utah valvata, was found near the project site and mitigation measures were proposed. These include monitoring of flow, DO, and temperature during the irrigation and non-irrigation seasons, and characterizing the habitat requirements for the snail. Following the characterization and monitoring, USBOR would provide a plan to evaluate future operation impacts to the snail and remediation action necessary to maintain suitable snail habitats. з401 Water Quality Certification was given on October 13, 1992. In a letter dated September 5, 1996, the IDFG identified 4 actions as potential mitigation opportunities for the new powerhouse at Minidoka Dam. These included: fish screens for the two canals; riparian restoration and gravel rejuvenation in Rock and Fall Creeks; purchase of the fish hatchery on Fall Creek; and a long term commitment for stocking fingerling trout in Lake Walcott.

In November 1989, IPC submitted to FERC applications for relicensing for the hydropower facilities, IPC also submitted a request for federal Clean Water Act з401 Water Quality Certification January 29, 1990.

The IDEQ has conducted settlement discussions and negotiations with IPC concerning protection, mitigation, and enhancement measures and actions (PM&Es) that address water quality in the Lake Walcott reach. The terms and conditions that address water quality issues, concerns, measures, and actions to be taken by IPC to protect, mitigate, and enhance water quality in the Lake Walcott Reach were proposed as a result of з401 Water Quality Certification. These measures were then proposed by IPC in their license applications to FERC. These PM&Es were evaluated by IDEQ and are included as specific actions or activities by IPC and considered as mitigation for water quality impacts. The physical characteristics (such as dam design and impoundments), as well as the operations of the individual hydropower facility, make it very difficult to protect, mitigate, or enhance water quality short of removal of the dams and returning the river to its natural free-flowing state. The ability of IPC to incorporate operational changes is limited and IDEQ included specific activities, which would result in improving water quality and enhancing the beneficial uses of the Lake Walcott Reach.

IDEQ measures and actions include: completion of a whitewater study and plan; additional recreation site construction in conjunction with BLM, US Park Service, and the Whitewater Association; construction of 23.5 acres of riparian and wetlands constructed on the south side of the Twin Falls Main Canal; artificial habitat construction within the reservoir; warmwater fish stocking; continuous water quality monitoring for temperature and dissolved oxygen; and minimum flow in the Snake River below American Falls and Milner Dams. The goal of the з401 Water Quality Certification action is to ensure that water quality values affected by the hydropower facilities' operations result in appropriate PM&Es for the benefits of the State of Idaho as well as maintaining the facilities as cost-effective power generators and electric suppliers for the State.

2.4.1.3 Idaho Department of Lands (IDL)

On April 17, 1998, a memorandum was jointly signed by IDEQ and IDL, which attempted to clarify roles and ensure coordination of efforts in development of TMDLs for forested portions of TMDLs. As previously described, only 4% of the land use in the Lake Walcott reach is forested making the overall effects from forested ground minimal (see section 2.1.1.1). At this time, forestry is not included as a major component of the TMDL process for the Lake Walcott reach since its land use comprises a smaller fraction when compared to rangeland and agriculture. At a future date, forestry will be addressed if necessary.

2.4.1.4 Irrigation community pollution control efforts

The Department of Agriculture has conducted water quality monitoring of the agricultural drains. As part of their industry plan, the agricultural community is beginning to monitor the Rockland area. An industry plan will need to be developed for other segments of the Walcott Subbasin including agricultural return drains.

2.4.1.5 §319 Projects

Only one project was funded through the 319 Program in the Lake Walcott Reach. It was the Confined Animal Feeding Operation (CAFO) position at IDEQ-TFRO. The project was funded in 1993, 1995, and 1996, and was instrumental in developing a database that located dairies and feedlots in the region. Additionally, it was beneficial for inspection of CAFOs, prevention of discharges, and providing technical assistance to operators.

2.4.1.6 §104(b) Projects

Two 104(b) projects were funded by USEPA at the IDEQ-TFRO. The first was an aquaculture basic research study on offline settling ponds for the development of BMPs in 1995-1998. The second was a CAFO study used to develop a database of all CAFOs in the IDEQ-TFRO region in 1994-1995.

2.4.1.7 Groundwater

Ground water in the Lake Walcott reach may be impacted by a variety of sources. Much of the drinking water and irrigation water for some areas comes from the Eastern Snake River Plain aquifer. Sources of contamination to this aquifer include: injection wells, uncased or poorly cased production wells, and leaking underground storage tanks. The cracked basalt nature of the lithology overlying the aquifer can result in impacts to the ground water by nonpoint source activities as well. Poorly lined waste lagoons and over application of irrigation water can lead to pollutants infiltrating into the aquifer from many locations.

The following table contains information concerning the number of underground storage tanks located within the various cities of the subbasin, the number of tanks closed, the number of leaking underground storage tanks, and the number of leaking underground storage tanks that still require cleanup.

Table 29. UNDERGROUND AND LEAKING UNDERGROUND STORAGE TANKS

City	Underground Tanks	Closed	Leaking	Incomplete Cleanups
Burley	118	90	25	2
Rupert	54	40	17	3
Heyburn	17	7	4	1
Albion	6	5	1	0
Declo	12	8	1	0
Paul	24	17	5	0
Minidoka	4	4	0	0
Rockland	5	3	0	0

Currently in the A & B Irrigation District, north of Paul and Acequia, there are 62 active injection wells. The A&B Irrigation District and the USBOR are actively closing may of these injection wells in this area (see section 2.1.3.3). For example, as of 1995, there were 81 wells in this same area. The A&B Irrigation District is the area were most of the injection wells occur. Outside of the irrigation district there are much fewer injection wells.

2.4.2. Point Source Pollution Control Efforts

The food processors and aquaculture permits have undergone public comment for their individual permits. These permits have been issued by the USEPA.

2.4.2.1. Aquaculture general permit

Aquaculture facilities had their public comment period from April 10, 1998 to June 9, 1998 on a proposed general NPDES permit (No. ID-G13-0000). The general NPDES permit contains technology-based limitations for sediment based upon the same effluent guidelines as previous NPDES permits for Idaho=s aquaculture industry.

The aquaculture facilities authorized to discharge under this general permit raise fish: rainbow trout, steelhead trout, Chinook salmon, catfish, tilapia, and other fish. These fish are produced for market as food products or for the enhancement of salmonid populations. They discharge rearing wastewater containing fish excreta, excess fish feed, dissolved and suspended solid biological pollutants, oxygen demanding materials, nutrients, and residual disease control chemicals or therapeutics. The aquaculture facilities are required to develop BMPs plans supported by mass balance assessments of their operations and to restrict their discharges below specific technology-based limitations on total suspended solids and specific water quality-based limitations on total phosphorus, dissolved oxygen, and pH.

The previous permit required monitoring of TSS, settable solids, and flow. There were no BMPs requirements for water quality-based limitations. There were no limitations on discharge of total phosphorus, and the TSS limit was 5.0 mg/L for raceway discharges.

2.4.2.2. Food processors NPDES permits

The food processors have individual NPDES permits that had a public comment period from September 24, 1997 to November 10, 1997. These permits reflect J.R. Simplot Company (which is a permit modification) and McCain Food service, Inc. (which is a permit modification) to incorporate the conditions of total phosphorus limits established by the Mid-Snake TMDL (1997b) and the Lake Walcott TMDL.

The J.R. Simplot Company processes raw potatoes into frozen potato products (french fries) and dehydrofrozen potato products. Final effluent is discharged into the Snake River at river mile 652.2. The proposed permit modification will retain the 1994 permit conditions and further improve water quality by reducing total phosphorus loads to the Lake Walcott Reach which will in turn reduce eutrophication. The 1994 permit established both ambient, Chronic Biomonitoring and effluent monitoring of nutrients including total phosphorus and dissolved ortho-phosphate (USEPA 1997).

The McCain Food Service, Inc. food processor processes raw potatoes, manufacturing frozen potato products. Process wastewater is treated prior to discharge into the Snake River (mid-channel) at river mile 648.8. The proposed permit modification will retain the 1994 permit conditions and further improve water quality by reducing total phosphorus loads to the Lake Walcott reach which will in turn reduce eutrophication. Effluent monitoring is done at a weekly frequency, ambient monitoring is required twice per year, and Chronic Biomonitoring 4 times a year (USEPA 1997).

2.4.2.3 Municipality NPDES permits

The cities of Burley and Heyburn have individual NPDES permits. Currently the municipalities are operating under administratively extended NPDES permits issued in 1994 and 1989 respectively. Modification and reissuance of the existing permits will be required in order to incorporate the wasteload allocations of the Lake Walcott TMDL.

2.4.2.4 Mid-Snake phosphorus TMDL

The USEPA accepted the Mid-Snake TMDL (IDEQ 1998) on April 25, 1997 as a TMDL for total phosphorus for both point and nonpoint sources in the Upper Snake Rock watershed. Although the TMDL does not bring new enforcement authority, it does provide wasteload allocations for total phosphorus limits for point source permits for food processors, municipalities, and aquaculture. Specific commitments have been entered into by nonpoint source industries relative to BMPs. Violation of state water quality standards and BMPs by any industry on the Middle Snake River (to which all tributaries in Upper Snake Rock discharge) would be inconsistent with the Mid-Snake TMDL and therefore could result in statutory enforcement by IDEQ, specifically IDAPA э16.01.02.080, where Ano pollutant shall be discharged from a single source or in combination with pollutants discharged from other sources in concentrations or in a manner that will or can be expected to result in violation of water quality standards applicable to the receiving water body or downstream waters; or will injure designated or existing beneficial uses; or is not authorized by the appropriate authorizing agency for those discharges that require authorization;" and, Idaho Code э39-3603, where "the existing instream beneficial uses of each water body and the level of water quality necessary to protect those uses shall be maintained and protected." See also the Mid-Snake TMDL (IDEQ 1998) for a summary of industry reduction goals, management actions, compliance actions, and implementation.

2.4.2.5 The Portneuf, American Falls and Black Foot TMDLs

Three Subbasins with water quality limited waterbodies upstream of the Lake Walcott Reach are scheduled for TMDLs in the future. IDEQ staff in the Pocatello Region will begin the subbasin assessment process in 2003 and subsequently the TMDL for American Falls Reservoir in 2004. The Portneuf subbasin assessment was completed in 1998 and the TMDL is scheduled for completion in 1999. The Blackfoot River subbasin assessment is scheduled for completion in 1999 and TMDL in 2000.

2.4.3 Monitoring in the Lake Walcott Reach

Monitoring of Lake Walcott tributaries and the Snake River in the Lake Walcott reach will continue to occur with the resources from various agencies, organizations, and groups. Monitoring by IDEQ-TFRO on the various tributaries and additional sites on the Lake Walcott reach of the Snake River will be incorporated as funds become more available.

2.4.3.1 Soil Conservation District monitoring

Two water quality monitoring plans have been developed by the SCD=s in the Lake Walcott Subbasin. The first of these is a monitoring project to determine TMDL compliance in the Rock Creek watershed and to identify major source areas of sediment to the stream channels for BMP implementation. The second, project, while not directly in the subbasin will have implications to the Lake Walcott TMDL. This project is the Raft River and Almo Watershed water quality monitoring project.

2.4.3.2 NPDES ambient water quality monitoring

To determine the impact to the receiving water quality, two food processors are required (either jointly or separately), in their NPDES permit, to conduct ambient water quality monitoring. This monitoring is to be conducted twice per year, in the months of November and August. Six water quality monitoring stations have been established throughout the Milner Pool. Monitoring requirements include: temperature; pH; specific conductivity; alkalinity; nitrate + nitrite nitrogen as N; DO; five day Biochemical oxygen demand; total suspended solids; TP; total Kjeldahl nitrogen; and fecal coliform bacteria monitoring at four stations.

2.4.3.3 BURP monitoring

BURP monitoring will continue annually within the subbasin to verify if beneficial use support status has been changed or achieved as necessary. For wadable streams, large rivers, lakes and reservoirs, the following parameters in Table 30 may be used to decide assessment of their beneficial uses. These reflect the minimum number of parameters needed to adequately surmise the level of beneficial use support status (either as full support or not full support). It is highly unlikely that any one parameter will have sufficient sensitivity to be useful in all circumstances.

Table 30. BURP MONITORING PARAMETERS

PARAMETER	WADABLE STREAMS	LARGE RIVERS	LAKES & RESERVOIRS
PHYSICAL/CHEMICAL PARAMETERS			
Bathymetry or Depth			X
Canopy Closure (Shade)	X		
Channel Alterations		X	
Conductivity		X	X
Discharge	X	X	
Dissolved Oxygen		X	X

PARAMETER	WADABLE STREAMS	LARGE RIVERS	LAKES & RESERVOIRS
Floodplain Disturbance		X	
Habitat Distribution	X	X	
pH		X	X
Large Organic Debris	X		
Nutrients			X
Photo Documentation & Diagrammatic Mapping	X	X	X
Pool Quality	X		
Riparian Vegetation		X	
Stream-Channel Classification	X		
Streambank Condition & Material Types	X	X	
Substrate and Embeddedness	X	X	X
Temperature	X	X	X
Water Clarity		X	X
Width and Depth	X	X	
BIOLOGICAL PARAMETERS			
Aquatic Macrophytes		X	X
Fecal Coliform		X	X
Fish	X	X	X
Macroinvertebrates	X	X	X
Periphyton		X	X
Phytoplankton/Chlorophyll *a*		X	

2.4.4 No-Net Increase Policy on TMDLs

On May 7, 1998, a No-Net Increase (NNI) Policy was made effective by IDEQ. When a stream is designated as not fully meeting its designated or existing beneficial uses, an interim of time exits until the stream has a TMDL developed or the stream is delisted because its beneficial uses have returned to full support. During that interim of time, the NNI Policy (IDEQ Policy Memorandum, *PM98-2*, May 7, 1998), the provisions of IDAPA э16.01.02.054.04 (High Priority Provision) and IDAPA э16.02.02.054.05 (Medium and Low Priority Provisions) are to be utilized. The NNI Policy may not be interpreted as requiring BMPs for nonpoint source operations unless they are voluntary or unless they are outlined in applicable federal or state statutes. For agriculture, the source for BMPs for the control of nonpoint sources of pollution is referenced in the *Idaho Agriculture Pollution Abatement Plan* (IDAPA э16.01.02.054.07). These BMPs are those recognized as actions a farmer or land management agency may voluntarily implement. Although, the policy does not generally pertain to accidental spills or unauthorized releases that may occur on listed waters. IDEQ then has the authority to ensure that human health along with the appropriate beneficial uses are protected in the case of accidental spills or unauthorized releases, and could, depending on the spill or release, require clean up. Provisions of the NNI Policy include nonpoint source, point source, and general provisions.

2.4.4.1 Nonpoint source provision of NNI policy

It is the responsibility of the designated agency to ensure that cost effective BMPs or knowledgeable and reasonable control measures, including pollution trading, have been or are properly implemented for all nonpoint source activities on federal, state, or private lands.

1. Where approved BMPs do not exist, the landowner should be assisted by the designated agency in using knowledgeable and reasonable control measures to ensure no further impairments of beneficial uses on low and medium priority waters, and that the load remains constant or decreases on high priority waters.

2. IDEQ recommends monitoring as a component of application of BMPs or other control measures.

3. If monitoring indicates that approved BMPs or other control measures are not maintaining or protecting beneficial uses then additional restrictions or modified control measures may be imposed.

2.4.4.2 Point source (NPDES) provision of NNI policy

The Clean Water Act requires all point source dischargers to have an NPDES permit. In the event that USEPA cannot or does not issue a permit on a э303(d) listed water body, IDEQ will notify the discharger of the applicable provisions specified in the High Priority Provision

(IDAPA э16.01.02.054.04), the Medium and Low Priority Provision (IDAPA э16.01.02.054.05), and the Violation of Water Quality Standards (IDAPA э16.01.02.080). Additionally,

1. A facility will be allowed to discharge to its existing maximum NPDES permit limit without being considered in violation of the High Priority and the Medium and Low Priority Provisions. Dischargers of listed pollutants to э303(d) waters, however, should be aware that interim increases in existing loads may result in the need for greater load reduction once a TMDL is developed and implemented.

2. A facility operating within its permitted discharge limits will not have to change its discharge limit while the TMDL is being developed. The NPDES permit and associated discharge limit will be examined and modified, if necessary, by USEPA at the time of permit reissuance.

3. When reviewing and approving plans under IC э39-118 including facility plans and specifications, written or verbal communication to the facility should emphasize that additional load reductions from the facility may be likely or required once the TMDL has been developed.

4. When meeting the provisions of the NNI policy, an NPDES permittee should address new or increased discharge of listed pollutants in terms of mass per unit time, toxicity, or other appropriate measures. IDAPA э16.01.02.054.04, however, specifies that for high priority waters, the total load must remain constant or decrease within the watershed.

5. To write a TMDL, IDEQ will establish loads based upon available information. Where information is lacking, however, facilities will be allowed to establish baseline data for the listed pollutants using standard analytical methods. IDEQ regions shall issue a letter to each facility detailing that if baseline information is not established by the discharger by a certain date, IDEQ will proceed to establish baseline information necessary for the development of a TMDL.

6. In situations where dischargers apply to exceed their maximum permit limits, provisions of IDAPA э16.01.02.054 shall apply. For high priority waters, new or increased discharge of pollutants of concern above permitted limits may be allowed if the total load to the watershed remains constant or decreases. For medium and low priority waters, IDEQ may require changes in loads and/or concentrations of pollutants of concern that prevent further impairment of beneficial uses. In either case, it is incumbent on the facility to provide loading calculations based on sound and accepted engineering practices which

demonstrate the applicable provisions of IDAPA э16.01.02.054. Dischargers of listed pollutants to э303(d) waters, however, should be aware that interim increases in existing loads may result in the need for greater load reduction once a TMDL is developed and implemented.

7. Unpermitted facilities wishing to expand their facility operations will be required to acquire an NPDES permit from USEPA and meet all applicable provisions of IDAPA э16.01.02.054.04 or IDAPA э16.01.02.054.05.

2.4.4.3 General provision of NNI policy

The following general provisions apply on the NNI Policy:

1. If IDEQ determines, based on reliable and verifiable water quality information, that a specific listed pollutant is not impairing the э303(d) water body, then delisting will be recommended and a TMDL will not be developed for that pollutant and water body.

2. Any facility or operation implementing control measures after the WAG (if applicable) or BAG (in the absence of a WAG) review of the subbasin assessment, and before USEPA=s approval of the TMDL that results in a verifiable reduction of listed pollutant(s) to a э303(d) water quality limited water body, will be credited with the appropriate load reduction during the allocation phase of the TMDL. This does not guarantee, however, that additional load reductions by the facility will not be required in order to meet water quality goals necessary to obtain beneficial uses.

3. All activities related to stream channel alteration permit applications must comply with IDWR=s Rules and Minimum Standards for Stream Channels Alteration. IDEQ shall give IDWR written notice if a э303(d) stream will be impacted, and caution that additional measures may need to be taken to later address water quality once the immediate threat has passed. In any situation, stream alteration activities shall not violate Idaho Water Quality Standards except as outlined in IDAPA э167.01.02.080.02 (Short Term Activity Exemptions).

In order to ensure that water quality is protected, the following conditions may be included by IDEQ in the final stream channel alteration permit:

a. Construction shall be conducted in such a manner to minimize turbidity and comply with the Idaho Water Quality Standards and Wastewater Treatment Requirements.

b. Work shall be conducted during low flows and heavy equipment shall operate from the bank.

c. All fuel, oil and other hazardous materials, shall be stored and equipment refueled and serviced away from the stream to ensure that a spill cannot enter the waterway.

d. All areas subject to erosion because of the construction shall be protected with rock riprap or other suitable methods of erosion protection meeting IDWR minimum standards.

e. Disturbed areas shall be revegetated and/or seeded with perennial vegetation.

f. All temporary structures, excavated material or construction debris resulting from the construction shall be disposed of out of the stream channel so it cannot reenter at high flows.

g. Materials excavated from the construction site shall be discharged in an upland area so it cannot reenter the stream channel at high flows.

h. Sand bags or other methods of coffer damming shall be utilized to minimize working in the flowing water.

Provided that these inclusions and IDWR minimum construction standards are included in the final permit, water quality impacts should be minimal.

Additionally, for suction dredging operations in Idaho, USEPA provides the following guidelines (USEPA 1998c) if an NPDES permit strategy was developed:

a. For new large-scale commercial operations, individual NPDES permits would be required prior to beginning operations.

b. For moderately sized operations (with intakes greater than 5 inches and over 15 horse power), consideration would be given to issuing a general NPDES permit. The state of Idaho would have the flexibility, through their 401 certification program, to determine which stream segments would be off limits to dredging due to water quality concerns (such as segments on the §303(d) list).

c. For small-scale, recreational dredging operations which are adequately regulated under state programs (such as the one stop permit), or other federal programs (by the Corps of Engineers CWA 404 program), the USEPA could consider either a general permit or, with respect to unpermitted discharges, enforcement discretion if the discharges did not result in violations of state water quality standards.

4. All National Environmental Policy Act (NEPA) related activities are subject to compliance with all applicable rules and regulations. During the formal NEPA public comment period, IDEQ shall notify the designated agency when activities may impact a listed water. It is incumbent on the designated agency to demonstrate that the activity under consideration will result in no further impairments of the beneficial uses on low and medium priority waters, and that the total load of listed pollutants remains constant or decreases on high priority waters.

5. IDEQ has the authority to review storm water pollution prevention plans for adequacy and compliance with the provisions of IDAPA э16.01.02.054. Should these plans be deemed inadequate, IDEQ will notify USEPA who is responsible for enforcement and/or corrective actions.

2.4.5 Pollution Prevention

The U.S. Pollution Prevention Act of 1990 defines source reduction as any practice that reduces the amount of any hazardous substance, pollutant or contaminant entering any waste stream or otherwise released into the environment prior to recycle, treatment or disposal. Pollution prevention includes reduction of pollution at the source (source reduction), and increased efficiency in the use of raw materials and natural resources, such that the emphasis on end-of-pipe control (for point sources) as a continuing exclusive reliance by regulatory agencies for realizing environmental goals is de-emphasized by augmenting attention to reducing the sources of environmental pollution through changes in processes, operations and the use of materials; placing the focus for identifying opportunities for such changes on the owners and managers of commercial, transportation, agricultural and industrial operations who best know and understand them; and, encouraging an emphasis not just on achieving regulatory compliance, but on achieving the best possible environmental results which will often substantially surpass compliance requirements and generally yield economic benefits. IDEQ and USEPA promote and support this change of emphasis and are working with other stakeholder state and federal agencies to develop a range of incentives and recognition programs for companies, farmers, or other entities to improve their environmental performance by focusing generally on environmental improvements or targeting on particular environmental problems (IDEQ 1998a). At the present time, IDEQ is in the process of building a framework for an Idaho Pollution Prevention Incentive program. When this program is in place, IDEQ will promote and support it by encouraging superior environmental management and beyond-compliance environmental performance with appropriate stakeholders.

2.5 Public Participation

An integral part of the Subbasin assessment and TMDL development process is public participation. The public has been invited to participate throughout the process in different forums. These include the Lake Walcott Watershed Advisory Group (LWWAG), the Upper Snake Basin Advisory Group (USBAG), the Mid-Snake Watershed Advisory Group (MSWAG), and planned public release of draft documents for review and comments.

2.5.1 Upper Snake Basin Advisory Group

The Upper Snake Basin Advisory Group, are stewards of water quality in specific basins. The State of Idaho Legislative body in э39-3601 *et seq.* codified this stewardship role. The USBAG provides direction, advice and guidance to local WAGs within the Upper Snake Basin, and IDEQ. Review and comments on the Lake Walcott TMDL were a part of the USBAG's water quality stewardship. The results of the lake Walcott TMDL were presented to the USBAG on October the 6, 1999.

2.5.2 The Lake Walcott Watershed Advisory Group

The Lake Walcott Watershed Advisory Group has been the major vehicle for public participation concerning the Lake Walcott TMDL. The WAG has met every other month for three years. During this time the methods and results of various stages of the assessment and TMDL development processes have been presented to the group. Methods and results of the Subbasin Assessment and TMDL were presented most recently on September 22, 1999. A draft document was made available to the LWWAG on October 30, 1999 with comments solicited.

2.5.3 Public Notice

Although no official public comments were solicited by IDEQ concerning the Subbasin Assessment phase of the TMDL development, comments were received and incorporated into the draft Subbasin Assessment and TMDL. An official 30-day public notice and comment period for the Draft Subbasin Assessment and TMDL commenced on November 2, 1999. The document will be finalized and presented to USEPA December 31, 1999.

3.1 Intream Water Quality Targets

Instream water quality targets were chosen from a variety of sources. Principally, the Idaho water quality standards were used to set instream targets. When the water quality standards related beneficial use impairment to a narrative standard, however, (*e.g. IDAPA* §*16.01.02.200.03...surface waters shall be free from deleterious materials in concentrations that impair beneficial uses.*) other sources were consulted to determine appropriate instream water quality targets. Other sources used to determine appropriate instream water quality targets were: the Clean Water Act; the Code of Federal Regulations; USEPA recommendations and guidelines; other states water quality standards; other TMDLs written by the State of Idaho and submitted to or approved by USEPA; and scientific papers from refereed journals. Instream water quality targets developed from sources other than the State of Idaho=s water quality standards will be reviewed at such time that numeric standards are adopted and codified by the State of Idaho following negotiated rule making.

3.1.1 American Falls Dam To Massacre Rocks

American Falls Dam to Massacre Rocks encompasses two э303(d) listed segments of the Snake River. Both of which are listed for a single pollutant, sediment. These segments will be assigned a load allocation for sediment in accordance with the State of Idaho=s antidegradation water quality standards.

3.1.1.1 Sediment

The antidegradation policy for the State of Idaho (IDAPA 16.01.02.051(01) indicates that the existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. The river segment from American Falls Dam to Massacre Rocks appears to be meeting its narrative standard for sediment although it is listed for sediments in the 1996 э303(d) list. Because of this higher water quality for sediment this segment will be considered for application of an antidegradation TMDL for protection of current existing conditions. Degradation of the water quality beyond these conditions shall not occur but shall be maintained at or below these levels through year 10 of plan implementation. The American Falls Dam to Massacre Rocks TMDL will establish a limit on the quantity of sediment that may enter the Snake River from sources in the watershed of HUC #1704020908. The sediment limit, in this segment of the Snake River, will be set at a level such that the river will not exceed the estimated load capacity supportive of a good to excellent fishery, and, will not allow the water quality to degrade worse than current levels. This target shall be a monthly average of <25 mg/L of TSS with a daily maximum of 40 mg/L to allow for natural variability. The average monthly target is within the range identified by the European Inland Fisheries Advisory Commission (EIFAC 1965) and the Committee on Water Quality Criteria from the Environmental Studies Board of the National Academy of Science and National Academy of Engineers (NAS/NAE 1973) as supporting a good fishery. TSS values <25 mg/L does not imply that degradation by TSS may occur up to 25 mg/L. Rather, TSS values should be < 25 mg/L on an average monthly basis, which will allow for some exceedances of the instream standard to account for seasonal and daily variation. However, it is IDEQ's administrative policy under IDAPA 16.01.02.050.01 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 through any of the interstate compacts or court decrees, or to interfere with the rights of Idaho appropriators, either now of in the future, in the utilization of the water appropriations which have been granted to them under the statutory procedure. Yet, э16.01.02.50.02.a states: Wherever attainable, surface waters of the state shall be protected for beneficial uses which for surface waters includes all recreational use in and on the water surface and the preservation and propagation of desirable species of aquatic biota. The existing and designated beneficial uses of this segment of the Snake River will be protected through the antidegradation as previously described. Acts of God and or uncontrollable flood/drought events will be exempt during the period of impact until such time that the impact is stabilized and the imminent and substantial danger to the public health or environment (IDAPA 16.01.02.350.02.a) is minimized so that the activity may be conducted in compliance with approved BMPs…to fully protect the beneficial uses (IDAPA 16.01.02.350.02.b.ii. (2)). Other activities that may cause degradation but which are outside the scope of IDAPA 16.01.02.050.01 and which there is foreknowledge of the event's occurrence will require a formal written letter from the individual, organization, or agency to IDEQ-TFRO about the nature of the potential event. If the activity violates IDAPA 16.01.02.350.02.b.i, such that it will occur in a manner not in accordance with approved BMPs, or in a manner which does not demonstrate a knowledgeable and reasonable effort to minimize the resulting adverse water quality impacts then IDEQ-TFRO will seek intervention by the Administrator of IDEQ for preparation of a compliance schedule (as provided in Idaho Code 39-116). IDEQ may also institute administrative or civil proceedings including injunctive relief as provided in Idaho Code 39-108.

3.1.2 Massacre Rocks To Lake Walcott

Massacre Rocks to Lake Walcott includes only one э303(d) listed segment of the Snake River. This segment is listed for sediment, low dissolved oxygen, and pesticides. This segment will be assigned a load allocation for sediment following the antidegradation TMDL procedures outlined in previous sections of the Subbasin Assessment and in accordance with the State of Idaho=s antidegradation water quality standards. No load allocations will be assigned for dissolved oxygen and pesticides due to the lack of any evidence that these two constituents are a problem. (A more detailed discussion of these can be found in sections 2.2.4.1 and 2.2.4.4. respectively).

3.1.2.1 Sediment

The Massacre Rocks to Lake Walcott TMDL will establish a limit on the quantity of sediment which may enter the Snake River from sources in a one mile corridor on either side of the river in portions of the watersheds HUC #s1704020906, 1704020907, 1704020908, and 1704021001. The sediment limit, in this segment of the Snake River, will be set at a level such that the river will not exceed the estimated load capacity supportive of a good to excellent fishery, and will not allow the water quality to degrade worse than current levels. This target shall be a monthly average of <25 mg/L TSS with a daily maximum of 40 mg/L to allow for natural variability. The average monthly target is within the range identified by EIFAC (1964) and NAS and NAE (1973) as supporting a good fishery.

3.1.2.2 Dissolved oxygen/organic enrichment

Concentration limits for dissolved oxygen established by the State of Idaho (dissolved oxygen exceeding 6 mg/L at all times, IDAPA §16.01.02.250.02(c)(I)) shall apply to the Massacre Rocks to Lake Walcott Reach of the Snake River.

3.1.2.3 Pesticides

Drinking water concentration limits for pesticides established by the USEPA (40 CFR э131.36(b)(1) and adopted by the State of Idaho (IDAPA §16.01.02.250.07 (a) shall apply to the surface waters of the Massacre Rocks to Lake Walcott Reach. Fish tissue criteria established by the NAS and NAE (1973) for the protection of aquatic wildlife (1Φg/g), and the Sediment Quality Probable Effect Level established by the Canadian Government (Canadian Council of Ministers of the Environment, 1995) will be used in the future as guidance in assessing potential pesticide contamination concerns. Exceedances of these guidelines and criteria will not constitute a water quality violation in this segment of the Snake River. If exceedances of these guidelines occur, monitoring to determine beneficial use impairment will be conducted. If it is determined that beneficial uses are impaired by pesticides, following exceedances of the guidelines, then IDEQ, the Lake Walcott WAG, and the land management agencies will develop a monitoring plan and investigate appropriate BMPs to reduce the impacts of pesticides to the beneficial uses in the Massacre Rock to Lake Walcott segment.

3.1.3 Minidoka Dam To Milner Dam

Minidoka Dam to the Milner Dam is the final segment э303(d) listed of the Snake River in the Lake Walcott Subbasin. This segment is listed for sediment, low dissolved oxygen, nutrients, oil and grease, and flow alteration. The upstream portion of the segment is different from the remainder of the э303(d) listed segment in that the designated beneficial uses are cold water biota, and salmonid spawning, while the lower portion of the segment's designated beneficial uses are warm water biota. This segment will be assigned a load allocation for sediment and oil and grease following the antidegradation TMDL procedures outlined in previous sections of the subbasin assessment and in accordance with the State of Idaho=s antidegradation water quality standards. No load allocations will be assigned for dissolved oxygen as a result of findings discussed in the subbasin assessment (see section 2.2.4.1). Flow alteration will be addressed at such time that the State of Idaho has developed a TMDL policy concerning flow alteration as a pollutant. Nutrients, the final listed pollutant in this segment of the Lake Walcott reach will be assigned a wasteload allocation and a load allocation following normal TMDL procedures.

3.1.3.1 Sediment

The Minidoka Dam to the Milner Dam TMDL will establish a limit on the quantity of sediment that may enter the Snake River from sources in the watersheds of HUC #s 1704020905, 1704020902, and 1704020901. The sediment limit, in this segment of the Snake River, will be set at a level such that the river will not exceed the estimated load capacity supportive of a good to excellent fishery, and will not allow the water quality to degrade worse than current levels. This target shall be a monthly average of 25 mg/L TSS with a daily maximum of 40 mg/L to allow for natural variability. The average monthly target is within the range identified by EIFAC

(1964) and NAS and NAE (1973) as supporting a good fishery.

3.1.3.2 Oil and grease

The Minidoka Dam to Milner Dam TMDL will establish a limit on the quantity of oil and grease which may enter the Snake River from sources in the watersheds of HUC #s1704020905, 1704020902, and 1704020901. The oil and grease limit, in this segment of the Snake River, will be set at a level such that the river will not exceed the estimated load capacity developed from the numeric oil and grease water quality standard of the State of Wyoming (Department of Environmental Quality), and will not allow the water quality to degrade worse than current levels. This target shall be no more than 5 mg/L of oil and grease at any time.

3.1.3.3 Dissolved oxygen/organic enrichment

Concentration limits for dissolved oxygen established by the State of Idaho (dissolved oxygen exceeding 6 mg/L at all times, IDAPA §16.01.02.250.02(c)(I)) shall apply to the Minidoka Dam to the Burley/Heyburn Bridge Reach of the Snake River. Concentration limits for dissolved oxygen established by the State of Idaho (dissolved oxygen exceeding 5 mg/L at all times, IDAPA §16.01.02.250.02(b)(I)) shall apply to the Burley/Heyburn Bridge to Milner Dam Reach of the Snake River.

3.1.3.4 Flow alteration

Currently the State of Idaho and IDEQ's position is that while flow alteration may adversely affect beneficial uses, it is not suitable for TMDL development under э303(d) of the Clean Water Act. Because there are no Idaho water quality standards or criteria for flow, no load capacity or allocations, either wasteload or load, can be made. Furthermore, IDEQ does not retain jurisdiction over stream flow.

3.1.3.5 Nutrients

The Minidoka Dam to the Milner Dam TMDL will establish a limit on the quantity of TP (as P) which may enter the Snake River from sources in the watersheds of HUC #s1704020905, 1704020902, and 1704020901. The phosphorus limit, in this segment of the Snake River, will be set at a level such that TP will not exceed the estimated load capacity developed following USEPA guidance for phosphorus concentrations in free-flowing rivers (0.100 mg/L); a statistically significant ($p< 0.05$) reduction in phosphorus concentration will be seen; and will not allow the water quality to degrade worse than current levels. This target shall be a yearly average of 0.080 mg/L of TP (as P) with a maximum of 0.128 mg/L TP (as P) to allow for natural variability.

3.1.5 Rock Creek

Rock Creek is one of four tributaries that are э303(d) listed in the Lake Walcott Subbasin. The Rock Creek segment, from the confluence of the East and South Forks of Rock Creek, is listed for sediment. A wasteload allocation and a load allocation following normal TMDL procedures will be developed.

3.1.5.1 Sediment

The Rock Creek TMDL will establish a limit on the quantity of sediment that may enter the Snake River from sources in the watershed of HUC #1704020909. The sediment limit, in this tributary of the Snake River, will be set at a level such that the creek will not exceed the estimated load capacity supportive of a good fishery. This target shall be a monthly average of 50 mg/L TSS with a daily maximum of 80 mg/L to allow for natural variability. The average monthly target is within the range identified by EIFAC (1964) and NAS and NAE (1973) as supporting a moderate fishery.

3.1.6 East Fork Rock Creek

East Fork of Rock Creek is one of four tributaries that are э303(d) listed in the Lake Walcott Subbasin. The East Fork of Rock Creek, from the headwaters to the confluence of Rock Creek, is listed for sediment. A load allocation following normal TMDL procedures will be developed.

3.1.6.1 Sediment

The East Fork of Rock Creek TMDL will establish a limit on the quantity of sediment that may enter the tributary from sources in that portion of the watershed of HUC #1704020910 that the East Fork of Rock Creek flows through. The sediment limit, in this tributary of Rock Creek, will be set at a level such that the tributary will not exceed the estimated load capacity supportive of a moderate fishery. This target shall be a monthly average of 50 mg/L TSS with a daily maximum of 80 mg/L to allow for natural variability. The average monthly target is within the range identified by EIFAC (1964) and NAS and NAE (1973) as supporting a moderate fishery.

3.1.7 South Fork Rock Creek

The South Fork of Rock Creek is one of four tributaries that are э303(d) listed in the Lake Walcott Subbasin. The South Fork of Rock Creek, from the headwaters to the confluence of Rock Creek, is listed for unknown pollutants. As a result of the other tributaries in the Lake Walcott Subbasin being listed for sediment, a load allocation following normal TMDL procedures will be developed for sediment at this time. Following implementation of the Sediment TMDL in the South Fork of Rock Creek, periodic BURP and pollutant identification monitoring will be conducted to determine the support status of the beneficial uses and if other pollutants may be impacting the South Fork of Rock Creek. Following the identification of other pollutants, a TMDL will be developed for the South Fork of Rock Creek in 2006.

3.1.7.1 Sediment

The South Fork of Rock Creek TMDL will establish a limit on the quantity of sediment which may enter the tributary from sources in remaining portion of the watershed of HUC #1704020910, and the watershed of HUC #1704020911. The sediment limit, in this tributary of Rock Creek, will be set at a level such that the tributary will not exceed the estimated load capacity supportive of a moderate fishery. This target shall be a monthly average of 50 mg/L TSS with a daily maximum of 80 mg/L to allow for natural variability. The average monthly target is within the range identified by EIFAC (1964) and NAS and NAE (1973) as supporting a moderate fishery.

3.2 **Estimate Of Existing Pollutant Wasteloads From Point Sources**

This section describes the pollutant loads from the various point sources located within each segment. Estimates from the various sources were calculated from Discharge Monitoring Reports provided under the specific facilities NPDES permit. In some cases, the wasteloads were estimated from design capacity and permit limits where data was not available.

3.2.1 American Falls to Massacre Rocks

Table 31. EXISTING POINT SOURCE POLLUTANT LOADS AMERICAN FALLS TO MASSACRE ROCKS

Facility	Discharge (cfs) from Gianotto (1995)	Monthly Average Concentration Limit mg/L TSS (Permit Limit)	Wasteload pounds/day
American Falls WWTP	2	30	324
IDFG Fish Hatchery	19	5	512
Lamb-Weston	Land Application	0	0
Total	21	N/A	836

3.2.2 Massacre Rocks to Lake Walcott

There are no point sources located within this segment.

3.2.3 Minidoka Dam to the Burley-Heyburn Bridge

Table 32. EXISTING POINT SOURCE POLLUTANT LOADS MINIDOKA DAM TO BURLEY/HEYBURN BRIDGE

Facility	Design Capacity Discharge cfs	Monthly Average Concentration Limit mg/L			Wasteload pounds/day		
		TSS	TP (as P)	OIL & GREASE			
Minidoka State Park	0.06[#]	30	*	*	10	*	*
# The park is shut down during winter months resulting in zero discharge. Wastewater Treatment facility has rarely discharged since 1990, therefore wasteload was based on design capacity of facility. * No monitoring for discharges of oil and grease or TP have been conducted							

3.2.4 Burley-Heyburn Bridge to Milner Dam

Table 33. EXISTING POINT SOURCE POLLUTANT LOADS BURLEY/HEYBURN BRIDGE TO MILNER DAM

Name	River Mile/ Location	Discharge cfs 1990-97 DMRs	Monthly Average Wasteload pounds/day		
			TSS 1990-97 DMRs	TP 1991-96 DMRs	O&G (max from 1994-99 DMRs)
Heyburn City ID-002094-0	652.2	0.85	31	8	
Simplot Inc. ID-000066-3	652.2	3.29	1,358	573	
Burley City ID-002009-5	651.7	3.48	166	63	

McCain Foods USA ID-000061-2	648.8-649.2	5.68	1,838	637	1,642
Paul City LA-000009	1 mi. west of Paul	0	0	0	
Paul Housing Authority ID002526-7	Canal 185	1/20 of canal flow	0	0	
Amalgamated Sugar-Paul. LA-000050-02		0	0	0	
Rupert City LA-000001	5 mi. N.E of Rupert	0	0	0	
Sun Valley Potatoes LA-000051		No permit on file	0	0	
Total		13.3	4890.0	1281.1	1642.0

3.2.5 Rock Creek

Table 34. EXISTING POINT SOURCE POLLUTANT LOADS ROCK CREEK: FROM EAST FORK/SOUTH FORK CONFLUENCE TO SNAKE RIVER

Facility	Discharge cfs (Stewart 1985)	Monthly Average Concentration Limit TSS mg/L (permit limit)	Wasteload pounds/day
The City of Rockland 002204-7	0.046#	70	18
# The city cannot discharge during summer months (may-Oct) resulting in zero discharge.			

3.2.6 East Fork Rock Creek

There are no point sources located within this segment.

3.2.7 South Fork Rock Creek

There are no point sources located within this segment.

3.3 Estimate Of Existing Loads From Nonpoint Sources

Estimates of existing nonpoint source pollutants were based on the best available data at the time of this writing. In many instances the land use percentages defined by IDWR GIS coverages for

ArcView using fifth field HUCs or stream corridor model were used to determine loads. These percentages were applied to estimated loads developed from sediment rating curves and flow in the various segments and tributaries. Additionally a stormwater discharge model, developed by IDEQ, was used to estimate oil and grease loads from the cities surrounding the Milner Pool. Loads measured by IDA in irrigation drains were used to estimate loads in the other irrigation drains.

3.3.1 American Falls to Massacre Rocks

Table 35. EXISTING NONPOINT SOURCE SEDIMENT LOAD IN THE AMERICAN FALLS TO MASSACRE ROCKS SEGMENT

Land Use watershed approach	% Use	Estimated Sediment from Sediment Rating Curve and Design Flows (Q) (tons/day)
Dryland Agriculture	50.2	14.35
Irrigated Agriculture	25.3	7.23
Range Land	24.5	7.00
Total	100.0	28.58

3.3.2 Massacre Rocks to Lake Walcott

Table 36. EXISTING NONPOINT SOURCE SEDIMENT LOAD IN THE MASSACRE ROCKS TO LAKE WALCOTT SEGMENT

Land Use- River corridor approach	% Use	Estimated Sediment from Sediment Rating Curve and Design Flows (Q) (tons/day)
Dryland Agriculture	24.0	36.24
Irrigated Agriculture	15.6	23.56
Range Land	49.2	74.29
Other	11.2	16.91
Total	100.0	151.00

3.3.3 Minidoka Dam to Milner Dam

3.3.3.1 Sediment

Table 37. EXISTING NONPOINT SOURCE SEDIMENT LOAD IN THE MINIDOKA DAM TO MILNER DAM SEGMENT

Land Use- Watershed approach	% Use	Estimated Sediment from Sediment Rating Curve and Average Monthly Design Flows (Q) (tons/day)
Dryland Agriculture	2.4	2.96
Irrigated Gravity	57.4	70.77
Irrigated Sprinkler	21.1	26.02
Range Land	13.7	16.89
Riparian	2.6	3.21
Urban	2.9	3.58
Total	100.0	123.47

3.3.3.2 Oil and grease

Table 38. EXISTING NONPOINT SOURCE OIL AND GREASE LOAD IN THE MINIDOKA DAM TO MILNER DAM SEGMENT

CONTRIBUTORS	Estimated Daily Load (tons/day)	Estimated Load After a 60 Day Drought (tons/day)
Storm Water Runoff	0.066	3.96
Burley Tank Farm	0.000	0.00
Background	34.000	34.00

TOTAL	34.066	37.96

3.3.3.3 Total phosphorus

Table 39. EXISTING BACKGROUND, NONPOINT SOURCE, AND TOTAL MONTHLY TOTAL PHOSPHORUS LOAD IN THE MINIDOKA DAM TO MILNER DAM SEGMENT

Month	**Back Ground pounds/day**	**Nonpoint Sources pounds/day**	**Total Estimated Load pounds/day**	**Total Measured Load pounds/day**
	Measured at Minidoka Dam	STORET and 1996 IDA study	sum	Measured at Milner Dam
Jan	1038.35	302.50	1340.850	2498.650
Feb	917.69	302.50	1220.190	2587.910
Mar	1143.34	302.50	1445.840	4659.390
Apr	1734.18	605.00	2339.180	4159.570
May	2329.37	605.00	2934.370	4071.710
Jun	3694.88	605.00	4299.880	4523.860
Jul	4089.17	605.00	4694.170	4235.740
Aug	3814.95	605.00	4419.950	4777.520
Sep	3540.73	605.00	4145.730	4588.140
Oct	1851.60	302.50	2154.100	2819.250
Nov	1244.02	302.50	1546.520	2790.160
Dec	805.69	302.50	1108.190	2538.900
Average	2183.66	453.75	2637.414	3687.567

3.3.4 Rock Creek

Table 40 EXISTING MONTHLY NONPOINT SOURCE SEDIMENT LOADS IN THE THREE ROCK CREEK WATERSHEDS.

Watershed HUC#	% of Load	Estimated Sediment from Sediment Rating Curve and Average Monthly Flows (Q) (tons/day)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1704020909	18	16.66	40.92	11.15	1.33	0.19	0.06	0.02	0.04	0.06	0.71	4.53	5.29
1704020910	43	39.79	97.75	26.63	3.17	0.46	0.14	0.05	0.10	0.14	1.70	10.82	12.63
1704020911	39	36.09	88.66	24.15	2.87	0.41	0.12	0.05	0.09	0.12	1.54	9.81	11.46
Total	100	92.54	227.33	61.93	7.37	1.06	0.32	0.12	0.24	0.32	3.96	25.16	29.38

Table 41. EXISTING MONTHLY NONPOINT SOURCE SEDIMENT LOADS IN THE ROCK CREEK WATERSHED

Land Use-watershed approach	% Use	Estimated Sediment from Sediment Rating Curve and Average Monthly Flows (Q) (tons/day)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dryland Agriculture	70.20	11.69	28.73	7.83	0.93	0.13	0.04	0.02	0.03	0.04	0.50	3.18	3.71
Irrigated Agriculture	10.00	1.67	4.09	1.11	0.13	0.02	0.01	0	0	0.01	0.07	0.45	0.53
Range Land	19.40	3.23	7.94	2.16	0.26	0.04	0.01	0	0.01	0.01	0.14	0.88	1.03
Forest	0.004	0.07	0.16	0.04	0.01	0	0	0	0	0	0	0.02	0.02

Land Use-watershed approach	% Use	Estimated Sediment from Sediment Rating Curve and Average Monthly Flows (Q) (tons/day)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Practices													
Total	100	16.66	40.92	11.15	1.33	0.19	0.06	0.02	0.04	0.06	0.71	4.53	5.29

3.3.5 East Fork Rock Creek

Table 42. EXISTING MONTHLY NONPOINT SOURCE SEDIMENT LOADS IN THE EAST FORK ROCK CREEK WATERSHED

Land Use-Watershed approach	% Use	Estimated Sediment from Sediment Rating Curve and Average Monthly Flows (Q) (tons/day)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dryland Agriculture	43.4	5.29	13	3.54	0.42	0.06	0.02	0.01	0.01	0.02	0.23	1.44	1.68
Irrigated Agriculture	7.9	0.96	2.37	0.64	0.08	0.01	0	0	0	0	0.04	0.26	0.31
Range Land	2.1	0.26	0.63	0.17	0.02	0	0	0	0	0	0.01	0.07	0.08
Forest Practices	46.5	5.67	13.93	3.80	0.45	0.06	0.02	0.01	0.01	0.02	0.24	1.54	1.80
Total	100	12.2	29.96	8.16	0.97	0.14	0.04	0.02	0.03	0.04	0.52	3.32	3.87

3.3.6 South Fork Rock Creek

Table 43. EXISTING MONTHLY NONPOINT SOURCE SEDIMENT LOADS IN THE SOUTH FORK ROCK CREEK WATERSHED

Land Use-Watershed approach	% Use	Estimated Sediment from Sediment Rating Curve and Average Monthly Flows (Q) (ton/day)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dryland Agriculture	61	39.58	97.22	26.49	3.15	0.45	0.14	0.05	0.10	0.14	1.69	10.76	12.57
Irrigated Agriculture	19	2.61	6.40	1.74	0.21	0.03	0.01	0	0.01	0.01	0.11	0.71	0.83
Range Land	5	9.91	24.34	6.63	0.79	0.11	0.03	0.01	0.03	0.03	0.42	2.69	3.15
Forest Practices	15	11.60	28.50	7.77	0.92	0.13	0.04	0.02	0.03	0.04	0.50	3.15	3.68
Total	100	63.69	156.47	42.63	5.07	0.73	0.22	0.08	0.17	0.22	2.73	17.32	20.22

3.4 Load Capacity And Margin Of Safety

The Clean Water Act requires that a TMDL be developed from a load capacity. A load capacity is the greatest amount of load that a waterbody can carry without violating water quality standards. In those instances where there are numeric water quality standards the load capacity of a waterbody for different pollutants are very straight forward. Those pollutants in the Lake Walcott TMDL, however, do not apply to numeric water quality standards; rather they apply to the narrative standards (*e.g.. IDAPA§ 16.01.02.200.03...surface waters shall be free from deleterious materials in concentrations that impair beneficial uses*) as referenced in section 3.1 of this document. As a result, the load capacity of the various segments and tributaries in the Lake Walcott Subbasin, were estimated from the flow records available from USGS or reconstructed by IDEQ, and a variety of sources relating concentrations of pollutant to effects on “beneficial uses” or aquatic communities. Other sources used for concentrations were: the Clean Water Act; the Code of Federal Regulations; USEPA recommendations and guidelines; other states water quality standards; other TMDLs written by the State of Idaho and submitted to or approved by USEPA; and scientific papers from refereed journals. Load capacities developed from sources other than the State of Idaho=s water quality standards will be reviewed at such time that numeric standards are adopted and codified by the State of Idaho following negotiated rule making.

In addition to estimation of a load capacity a given water body can carry, the Clean Water Act includes statutory requirements for a margin of safety in a TMDL. The margin of safety is intended to account for uncertainties in available data or in the actual effect controls will have on load reductions and the receiving waterbody's water quality. The margin of safety may be implicit, as in the conservative assumptions used in calculation of the loading capacity, wasteload allocations, and load allocations for total phosphorus in the Lake Walcott TMDL. Otherwise a margin of safety must be clearly defined, as with the sediment, and oil and grease portion of the Lake Walcott TMDL.

3.4.1 Sediment

Since excess sediment is a narrative water quality standard, TSS load capacities were based on protection of salmonids, other fish, and aquatic communities as suggested by the European Inland Fisheries Advisory Commission (EIFAC 1965) and the Committee on Water Quality Criteria from the Environmental Studies Board of the National Academy of Science and National Academy of Engineers (NAS/NAE 1973). These suggested levels would provide protection for both cold and warm water biota as well as salmonid spawning. The recommendations are as follow:

Table 44. SUGGESTED TSS CONCENTRATION GUIDELINES; EFFECTS AND PROTECTION LEVELS

TSS Range (mg/L)	EIFAC Fisheries Effect	NAS/NAE Protection Level	Beneficial Use Effect
> 400	Poor	Very Low	Unsupported
80-400	Significantly Reduced	Low	Threatened
25-80	Slight	Moderate	Supported
<25	None	High	Supported

Following these recommendations, 25 mg/L is the load capacity (dependant on flow for load calculations) for any river segment in the Lake Walcott subbasin. The instream water quality target of 25 mg/L monthly average and 40 mg/L daily maximum for the river segments maintains high protection levels for the fisheries located within the reaches. By setting the instream target so conservatively, an implicit margin of safety is incorporated. The instream water quality targets for sediment in the tributaries is 50 mg/L TSS on a monthly average with an 80 mg/L TSS daily maximum. These levels allow for moderate protection of the fisheries. These in stream targets are designed to restore fisheries in the tributaries rather than provide high levels of protection to already existing fisheries in the river segments. The margin of safety for the tributaries is also implicitly designed into the target by the conservative use of a TSS value less than the mid-point of moderate protection.

Other implicit conservative assumptions include:

Flow design analysis was based initially on three flow regimes. These flow regimes were meant to estimate load capacity during high flow water years, low flow water years and average flow water years. Final load capacity was determined to be the lowest load capacity from this analysis. At this capacity water quality targets would not be exceeded in a worst case basis. Actual daily flow records were used to incorporate day-to-day and seasonal variation in load capacity for the low and high flow regimes. Daily averages from 1927-1998 were used to calculate the average flow regime. The low flow regime was chosen from those water years that the annual peak flow had a recurrence interval (RI) of less than 1.5 years. A recurrence interval of 1.5 years corresponds with the bankfull discharge or average annual flooding in a system. Therefore, years with RIs less than bankfull were considered low flow years. By taking the average of these peak flows, a single year could be chosen. The year 1941, was the closest to this average low flow condition. The high flow regime was chosen from the recurrence intervals and annual peak flows as well. A recurrence interval of 25 was chosen to determine the hydrograph for high flow design flows. The year 1983, corresponded to the 25 year flood event (Figures 26-28).

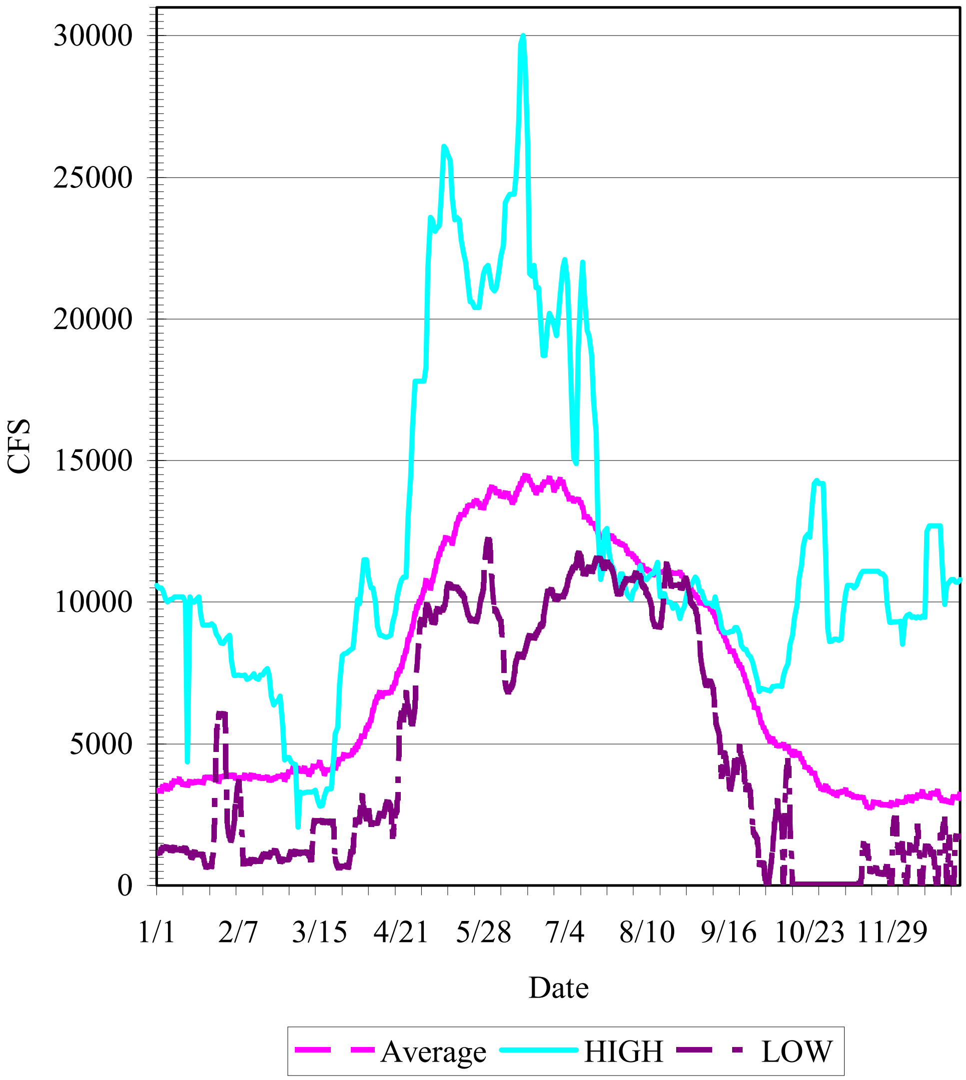


Figure 26. Design Flow Hydrographs from the American Falls Dam to Massacre Rocks Segment, showing 1983-high flow, average of period of record, and 1941-low flow.

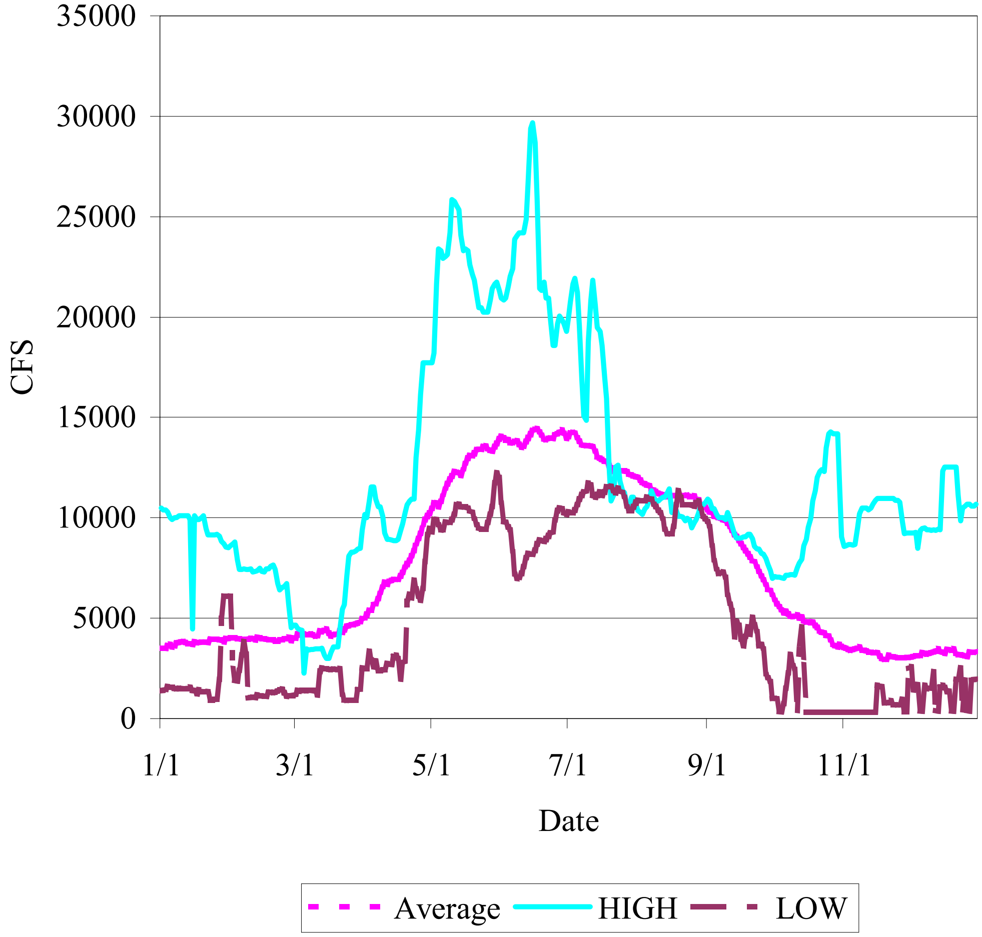


Figure 27. Design Flow Hydrographs from the Massacre Rocks to Lake Walcott Segment, showing 1983-high flow, average of period of record, and 1941-low flow.

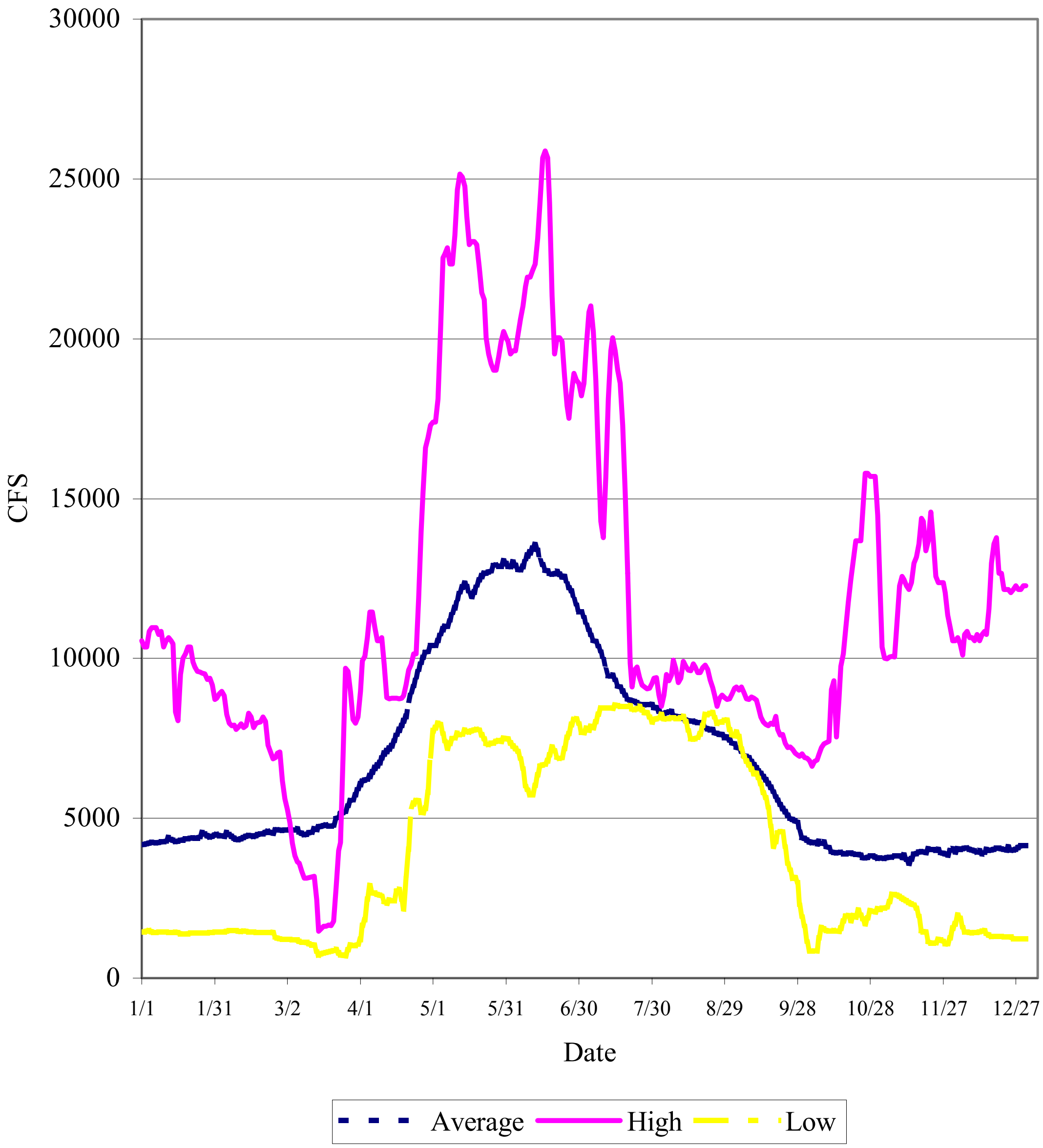


Figure 28. Design Flow Hydrographs from the Minidoka Dam to Milner Dam Segment, showing 1983-high flow, average of period of record, and 1941-low flow.

Assimilative capacity of the river is unknown at this time. No assimilation of pollutants was calculated into the load allocations or waste load allocations. Therefore, this conservation of pollutants may overestimate the actual load carried in the segment from the allocations. Therefore, load allocations are more conservative since we are assuming no in river processing of pollutants.

3.4.2 Oil and Grease

Oil and grease also are regulated by narrative water quality standards. As a result, an approach similar to sediment was taken in determining the load capacity of the Milner Pool for oil and grease. A limited search for water quality standards or targets for oil and greases yielded a water quality standard of 10 mg/L from the State of Wyoming (Department of Environmental Quality, State of Wyoming, Internet communication). This water quality standard and the 3 design flow regimes were used to estimate load capacity. To allow for a margin of safety, the Wyoming standard was decreased by half (5 mg/L) to account for lack of data on effects of oil and grease on beneficial uses. Similar conservative assumptions were made for oil and grease as for TSS (See section 3.4.1 (1-2)) adding an implicit component to the margin of safety.

3.4.3 Total Phosphorus

There are no water quality standards that regulate the TP concentration in a waterbody. Excess nutrients, however, are regulated by narrative water quality standards. Estimation of the load capacity was made following USEPA "Blue Book" recommendations, the Mid-Snake phosphorus TMDL and the River Basin Model-10 years (RBM10 model). USEPA recommends that concentrations of total phosphorus be less than 0.1 mg/L for free flowing rivers and 0.025 mg/L for reservoirs and lakes. Given the run of the river nature of the Milner Pool it behaves more like a river than a lake. The RBM10 model predicts, for the Mid-Snake, an assimilative capacity (load capacity) of 0.0728 mg/L. The Mid-Snake TMDL also set instream targets for that stretch of the river below Milner Dam to King Hill. The operational nature of the river in that area also consists of many run-of-the-river reservoirs. The Mid-Snake load capacity was determined to be 0.075 mg/L TP. Given theses 3 estimates of concentrations, the load capacity of the Milner pool is some where between 0.1 and 0.0728 mg/L (flow dependant). Additionally, quantification of nuisance aquatic vegetation levels does not exist for the Milner Pool. Therefore, until instream concentrations of TP and nuisance aquatic vegetation levels are understood, the Lake Walcott TMDL will use the 3 design flows and a mass balance approach to estimate the load capacity of Milner Pool. The margin of safety will be implicitly defined in the target and will include conservation of pollutants through mass balance calculations. The resulting target is 0.08 mg/L TP (as P) for the Milner Pool.

3.5 Loading Analysis Model and TMDL

The following sections describe the basic mass balance model used in the loading analysis. The approach will be to consider all ∋303(d) listed segments on a segment by segment and pollutant by pollutant basis. These segments are:

Segment 1:	American Falls to Massacre Rocks
Segment 2:	Massacre Rocks to Lake Walcott
Segment 3:	Minidoka Dam to Milner Dam
Segment 4:	Rock Creek- East Fork and South Fork confluence to confluence with the Snake River
Segment 5:	East Fork Rock Creek- Headwaters to confluence with South Fork Rock Creek
Segment 6:	South Fork Rock Creek- Headwaters to confluence with East Fork Rock Creek

3.5.1 Sediment

The sediment loading analysis model for the various segments was derived from mass balance spreadsheets and sediment rating curves developed from linear regression of monitoring data and flow. These linear regressions used to develop the sediment rating curves were all statistically significant ($p < 0.05$). In order to normalize the flow data and TSS data log transformations were required. Additionally, two sediment rating curves were developed in the first segment to better capture changes in flow. Links to the water quality targets and beneficial uses were drawn from meta-analysis found within the scientific literature, and other TMDLs completed by the State of Idaho.

Sediment Rating Curves

American Falls to Massacre Rocks

$$\text{Log TSS} = -0.994\ (\text{Log Q}) + 3.771$$

$$\text{Log TSS} = -0.306\ (\text{Log Q}) + 2.217$$

Massacre Rocks to Lake Walcott

$$\text{Log TSS} = -0.525\ (\text{Log Q}) + 3.212$$

Milner Pool

$$\text{Log TSS} = 0.163\ (\text{Log Q}) = 0.676$$

Rock Creek

$$\text{Log TSS} = 2.410\ (\text{log Q}) - 1.600$$

3.5.2 Oil and Grease

The oil and grease loading analysis model for the Milner Pool segments was derived from: mass balance spreadsheets; load capacity determination under the 3 design flows previously identified;

an urban runoff model; and historical monitoring data and flow. Links to the water quality targets and beneficial uses were drawn from the State of Wyoming Water Quality Standards, and other TMDLs completed by the State of Idaho.

3.5.3 Total Phosphorus

The Total phosphorus loading analysis model for the Milner Pool was derived from: a mass balance approach of monitoring data; upstream monitoring; downstream monitoring; source monitoring and estimations of loads from that data. Links to the water quality targets and beneficial uses were drawn from other TMDLs completed by the State of Idaho; The RBM-10 model; USEPA guidelines and recommendations; and scientific literature sources.

3.6 Total Maximum Daily Loads

The following tables are the load capacity, background, wasteload allocations, load allocations, and unallocated loads for each segment and pollutants in the Lake Walcott Subbasin.

3.6.1 American Falls to Massacre Rocks TMDL

Table 45. SEDIMENT LOAD CAPACITY, BACKGROUND, WASTELOAD, LOAD ALLOCATION AND UNALLOCATED LOAD; AMERICAN FALLS TO MASSACRE ROCKS SEGMENT

Sediment (tons/day)					
Facility	**Load Capacity**	**Background**	**Waste Load Allocation**	**Load Allocation**	**Unallocated Load for Future Growth**
American Falls WWTP			0.162		
IDFG Hatchery			0.256		
CAFOs			0		
Land Applicators			0		
Total	318	110	0.418	28.582	179

3.6.2 Massacre Rocks to Lake Walcott TMDL

Table 46. SEDIMENT LOAD CAPACITY, BACKGROUND, WASTELOAD, LOAD ALLOCATION, AND UNALLOCATED LOAD; MASSACRE ROCKS TO LAKE WALCOTT SEGMENT

Sediment (tons/day)					
Facility	**Load Capacity**	**Background**	**Waste Load Allocation**	**Load Allocation**	**Unallocated Load for Future Growth**
CAFOs			0		
Land Applicators			0		
Total	329	76	0	151	102

3.6.3 Minidoka Dam to Milner Dam TMDL

Table 47a. SEDIMENT. LOAD CAPACITIES, BACKGROUND, WASTELOAD ALLOCATIONS, LOAD ALLOCATIONS, AND UNALLOCATED LOADS; MINIDOKA DAM TO MILNER DAM SEGMENT

Sediment (tons/day)					
Facility	**Load Capacity**	**Background**	**Waste Load Allocation**	**Load Allocation**	**Unallocated Load for Future Growth**
Minidoka State Park			0.005		
Simplot			0.679		
Heyburn City			0.015		
Burley City			0.083		
McCain			0.919		
CAFOs			0		
Land Applicators			0		
Total	272	84	1.701	123.3	63

Table 47b. OIL AND GREASE. LOAD CAPACITIES, BACKGROUND, WASTELOAD

ALLOCATIONS, LOAD ALLOCATIONS, AND UNALLOCATED LOADS; MINIDOKA DAM TO MILNER DAM SEGMENT

OIL AND GREASE (tons/day)					
Facility	**Load Capacity**	**Background**	**Waste Load Allocation**	**Load Allocation**	**Unallocated Load for Future Growth**
McCain			1		
Total	54	34	1	4	15

Table 47c. TOTAL PHOSPHORUS. LOAD CAPACITIES, BACKGROUND, WASTELOAD ALOCATIONS, LOAD ALLOCATIONS, AND UNALLOCATED LOADS; MINIDOKA DAM TO MILNER DAM SEGMENT

TOTAL PHOSPHORUS (pounds/day)					
Facility	**Load Capacity**	**Background**	**Waste Load Allocation**	**Load Allocation**	**Unallocated Load for Future Growth**
Minidoka State Park			0		
Simplot			359		
Heyburn City			5		
Burley City			39		
McCain			399		
CAFOs			0		
Land Applicators			0		
Total	2452	1366	802	284	0

3.6.4 Rock Creek System TMDL

Table 48. SEDIMENT LOAD CAPACITIY, WASTELOAD ALLOCATION, LOAD ALLOCATION, AND UNALLOCATED LOAD; ROCK CREEK WATERSHEDS

Sediment (tons/day)				
Facility/Watershed	**Load Capacity**	**Waste Load Allocation**	**Load Allocation**	**Unallocated load for Future Growth**
Rockland City		0.01		
Rock Creek Watershed			0.82	
East Fork Rock Creek Watershed			0.59	
South Fork Rock Creek Watershed			3.13	
CAFOs		0		
Total	4.55	0.01	4.54	0

3.7 Reasonable Assurances And Implementation Schedule

The objective of the Lake Walcott TMDL is to allocate allowable loads among different pollutant sources so that the appropriate control actions can be taken and water quality standards achieved. The total pollutant load to a waterbody is derived from point, nonpoint, and background sources. The Lake Walcott TMDL has attempted to consider the effect of all activities or processes that cause or contribute to the water quality limited conditions of not just the waterbodies listed on the 1996 §303(d) list, but rather all potential sources. Control measures to implement this TMDL are not limited to NPDES authorities, but are based on the reasonable assurance that State and local authorities and actions to reduce nonpoint source pollution will also occur. AThere must be assurances that nonpoint source control measures will achieve expected load reductions in order to allocate a wasteload to a point source with a TMDL that also allocates expected nonpoint source load reductions (USEPA 1991a).≅ The Lake Walcott TMDL has load allocations and wasteload allocations calculated with margins of safety to meet water quality standards. The allocations, however, are based on estimates that have used available data and information. Therefore, monitoring for the collection of new data is necessary and required. For the Lake Walcott TMDL the reasonable assurance that it will meet its goal of water quality standards is based on three components: 1) point source NPDES permits that will require monitoring for the generation of new data that will be used for wasteload allocation concerns; 2) nonpoint source implementation of BMPs based on land management agency's assurance that reductions will occur; and 3) trend monitoring that will be used to document relative changes in various aquatic organism populations, and in physical and chemical water quality parameters over a 10-year period in conjunction with data from various agencies, organizations, and water user industries that will assess overall progress towards attainment of water quality standards and its related beneficial uses.

3.7.1 Point Source

"Both technology-based and water quality-based controls are implemented through the NPDES permitting process. Permit limits based on TMDLs are called water quality-based limits. Wasteload allocations establish the level of effluent quality necessary to protect water quality in the receiving water and ensure attainment of water quality standards. Once allowable loadings have been developed through wasteload allocations for specific pollution sources, limits are incorporated into NPDES permits (USEPA 1991a)."

For the Lake Walcott Subbasin, the following table describes the short-term and long-term goals that are prescribed for point source industries and IDEQ-TFRO that will insure reasonable assurance that point sources will comply with their reduction plans per pollutant.

Table 49. SHORT- AND LONG-TERM GOALS FOR POINT SOURCES AND IDEQ-TFRO ON A POLLUTANT BASIS

<table>
<tr><th>Pollutant</th><th>Industry</th><th>Year 1 (2000)</th><th>Year 3 (2002)</th><th>Year 5 (2004)</th><th>Year 8 (2007)</th><th>Year 10 (2009)</th></tr>
<tr><td rowspan="5">TP</td><td>Aquaculture</td><td>Permit Issued 9/10/99</td><td rowspan="3">Allocation of TP loads per industry per facility under Mid-Snake TMDL</td><td rowspan="3">Meet 20% target reductions of Mid-Snake TMDL</td><td rowspan="3">Permit Review based on Lake Walcott TMDL and additional data</td><td rowspan="3">Meet additional target reductions (17%) under Lake Walcott TMDL</td></tr>
<tr><td>Food Processors</td><td>Permit Issued 8/31/99</td></tr>
<tr><td>Municipalities</td><td>Permit Issued 8/31/99</td></tr>
<tr><td>Industrials</td><td colspan="5">LA & NPDES Permits maintained & reviewed by IDEQ</td></tr>
<tr><td>IDEQ</td><td>Maintain data base; review LA and NPDES permits</td><td>Allocates TP loads to industry</td><td>Reviews all reductions & determines if on target</td><td>Commences intensive study for possible re-allocation</td><td>Re-allocates TP loads to industry based on new data</td></tr>
<tr><td rowspan="5">TSS
Oil & Grease</td><td>Aquaculture</td><td>Permit Issued</td><td colspan="4">TMDL will be based on maintaining permit effluent limits</td></tr>
<tr><td>Food Processors</td><td>Permit Issued</td><td colspan="4">TMDL will be based on maintaining permit effluent limits</td></tr>
<tr><td>Municipalities</td><td>Permit Issued</td><td colspan="4">TMDL will be based on maintaining permit effluent limits</td></tr>
<tr><td>Industrials</td><td colspan="5">LA & NPDES Permits maintained & reviewed by IDEQ</td></tr>
<tr><td>IDEQ</td><td colspan="5">Maintain data base; review LA and NPDES permits</td></tr>
<tr><td>Pesticides
DO</td><td colspan="6">A TMDL is not anticipated.
Pesticide sampling at Massacre Rocks will occur in 1999 and 2000 to further validate removal of pesticide as pollutant.</td></tr>
<tr><td>Temperature</td><td colspan="6">Re-evaluation of temperature criteria via project study by IDEQ-State Office</td></tr>
<tr><td>Flow</td><td colspan="6">No Flow TMDL; Conservation flows encouraged</td></tr>
</table>

Industry Plans	Each industry will be responsible for the development of an annual summary review of assessment of water quality goals and targets for the Lake Walcott Subbasin. Plans developed under the Mid-Snake TMDL will be revised and applied on the Lake Walcott TMDL specific for the water quality limited segment Milner Pool.

3.7.2 Nonpoint Source

AWhen establishing permits for point sources in the watershed, the record should show that in the case of any credit for future nonpoint source reductions: 1) there is reasonable assurance that nonpoint source controls will be implemented and maintained; or 2) that nonpoint source reductions are demonstrated through an effective monitoring program (USEPA 1991a).≅ Essentially, reasonable assurance for nonpoint sources means that nonenforceable actions will result in the load allocations for nonpoint sources required by the Lake Walcott TMDL. At a minimum, this includes:

1. ADemonstration of the availability of funds to implement the nonenforceable actions (USEPA 1998d).≅ Funding sources currently available include: э319, SAWQP, EQIP (USDA-NRCS), and CRP (USDA-NRCS-Farm Service Agency). э319 funding as a consequence of the §303(d) list process has taken on a more focused approach in screening TMDL implementation. For example, it is quite possible that linkage to a TMDL within a project area would carry a more favorable view particularly if it were linked to its TMDL implementation activity. The implementation of BMPs from a holistic resource management system approach that addressed all pollutant sources could be considered important as well. In addition, the support from an existing watershed advisory group could carry some weight in the project being considered. SAWQP, on the other hand, is currently undergoing revision via Senate Bill 1135 that considers “Program Neutral Planning” or implementation planning. A 3-tier approach, much like the stream corridor model, is used to consider the riparian corridor, the adjacent lands, and the uplands. 1996 USDA Farm Bill Conservation Provisions, EQIP (or Environmental Quality Incentives Program) became promulgated as a final rule on May 22, 1997. The purposes of the program are achieved through the implementation of a conservation plan that includes structural, vegetative, and land management practices on eligible land on 5- to 10-year contracts. Finally, the Conservation Reserve Program (CRP) is aimed at reducing soil erosion, reducing sedimentation into streams and lakes, and protecting food and fiber, and thus improves water quality through establishment of wildlife habitat and enhancing forest and wetland resources. Through cost sharing, farmers are encouraged to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, wildlife plantings, trees, filter strips, or riparian buffers. According to NRCS, each acre under CRP contract reduces erosion by an average of 19 tons of top soil per year. Additional funding sources are available. Therefore, the Lake Walcott WAG will upon acceptance of the Lake Walcott

TMDL, seek after such available funds with the express purpose of funding implementation projects that strive to clean up the water quality listed streams.

2. ADescription of the process for entering into any necessary agreements (such as with various federal, state, and local agencies/entities, private landowners, others) to carry out such nonenforceable actions and the probability of success in achieving such agreements (USEPA 1998d).≅ IDEQ-TFRO is prepared to discuss with any federal, state, or local agency/entity, private landowners, the possibility of carrying out such nonenforceable actions through the signing of necessary agreements to achieve success on the water quality limited water bodies. Such agreements will be pertinent to the restoration of beneficial uses and water quality standards and may include water quality monitoring. Additionally, IDEQ-TFRO supports the *Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters* (USFS, USBLM, USEPA 1999) which is to "protect and maintain water quality where standards are met or surpassed, and restore water-quality-limited waterbodies within their jurisdiction to conditions that meet or surpass standards for designated beneficial uses."

3. AAn assessment of the likelihood of continuation of governmental programs (e.g. Conservation Reserve Program) that are planned to assist in implementation (USEPA 1998d).≅ According to the most recent survey by the U.S. Department of Commerce on the availability of funds over the next 15-20 years that consider environmental issues, it is estimated that 10-15% of the national budget will be increased from the current 5-10%. State funding in Idaho is already ongoing due to Idaho Code ∍39-3601 *et seq.* and all that relates to this for point and nonpoint source industries. Current programs, like CRP and EQIP, will continue to be funded so long as they meet the full purposes for which they were funded. No funding program, however, is long-lived and is highly dependent on changes in administrative opinion.

4. AAn analysis of the anticipated effectiveness of the management measures (a demonstration of how, if implemented, they will actually lead to desired reductions; an evaluation of the success of existing/prior programs calling for similar controls in the watershed or a similar watershed may be used in this analysis) (USEPA 1998d).≅ CRP is not a new program, and as previously noted, has an erosion reduction potential of 19 tons/acre/year. Its viability is dependent on the number of new highly erodible acres that are available in the area of concern. EQIP, on the other hand, is a new program and is evolving yearly to include new acreages that are directed at water quality limited stream segments. Currently, the SCC, NRCS, in conjunction with local SCDs are looking at funding

sources for BMP development on several water quality limited stream segments.

5. AAn estimate of the time required to attain applicable water quality standards and a demonstration that the standards will be met as expeditiously as practicable (USEPA 1998d).≅ It is expected that management actions and control actions called for to implement the Lake Walcott TMDL will begin immediately after approval of the TMDL submittal to USEPA. Some industries, however, have taken a more proactive approach by already beginning their management actions and control actions as part of the Mid-Snake TMDL. The Lake Walcott TMDL is designed with the goal of expeditiously attaining compliance with water quality standards, particularly in defining and repairing water quality impairments through the stream corridor approach. It is the belief of IDEQ-TFRO that attainment of water quality standards and beneficial uses will be met as expeditiously as practicable within the 10-year allotted time frame with implementation of management and control actions. In the event that beneficial uses are not attained, then the feedback loop as a component of adaptive management in conjunction with monitoring will be used for re-evaluation for implementation of more stringent measures if needed. The following describes the proposed phased-approach at achieving beneficial uses and State water quality standards:

PHASE 1

Year 1-5

In the first phase, watershed and stream corridor (within the 2 miles) would be reviewed over a 5 year period for the development of critical acres that directly impact the segment. These critical acres would be defined by the land management agency during the implementation phase of the TMDL. Critical acres could include acreages outside the stream corridor if a portion of the area included the stream corridor. Within the first 5 years, all water quality limited stream segments would have land management plans developed that specifically targeted the reduction of listed pollutants. These land management plans become the critical focus of the implementation plan for nonpoint sources. Monitoring would be specifically defined to determine if BMPs were functional and the overall goals of the Lake Walcott TMDL were met.

Year 3

In year 3, a preliminary evaluation of the water quality limited stream segments for BMP implementation via funding will be conducted by the land management agencies and IDEQ so that the goals of the Lake Walcott TMDL are being met.

Year 5

In year 5, the land management agencies and IDEQ will conduct a re-evaluation of the land management plans and their funding, so those goals of the Lake Walcott TMDL are in compliance and being met.

PHASE 2

Years 5-10

In the second phase, or in years 5-10, critical acres would be defined for acres outside the stream corridor but within the 5th field HUC watersheds-of-concern that affect the water quality limited stream segments. These critical acres would be defined similarly as in the first phase and according to the engineering design(s) of the land management agencies. Critical acres could include acreages within the stream corridor if a portion of the acres were included outside the stream corridor. Land management plans would also be developed and included as addendums to the particular water quality limited stream segment.

Year 8

In year 8, the land management agencies and IDEQ will conduct a preliminary evaluation of additional segments in the watersheds-of-concern for compliance with the Lake Walcott TMDL.

Year 10

In year 10, the land management agencies and IDEQ will conduct a re-evaluation of the land management plans and their funding. Under the provisions of the Lake Walcott TMDL, the Lake Walcott WAG in conjunction with IDEQ would review the land management plans and the monitoring data to ascertain if beneficial uses and water quality standards have been met.

Years 10-15

If it is ascertained in year 10 that beneficial uses and water quality standards are met, then the Lake Walcott TMDL will be maintained for an additional 5 years. If at the end of the additional 5 years beneficial uses and water quality standards are met by any or all water quality limited stream segments, then IDEQ with support of the industries will maintain the nonlisted status of those streams (assuming that imposed measures are continued and maintained). If it is determined in year 10 that beneficial uses and water quality standards are not met, then a re-evaluation and re-allocation of more stringent permit limits for point sources will be conducted by USEPA and IDEQ, and more effective BMPs will be sought, defined, and implemented in the defined critical acres or in those areas that are causing the most damage to water quality by nonpoint sources.

6. Measurable milestones for determining whether the implementation plan is being properly executed, and for determining whether applicable water quality standards are being achieved (USEPA 1998d). Short-term and long-term milestones are defined for point sources (Table 49) and nonpoint sources (see Table 50) and are sufficient to demonstrate adherence to the implementation plan. The measurable milestones include maintaining and meeting target reductions as defined in effluent permit limits for point sources, and maintaining and meeting target best management plans as defined by the land management agencies and the industry. Quantification of goals will be defined in an overall trend monitoring plan developed by IDEQ and the Lake Walcott WAG. Additionally, the previous sub-section (5.) includes the phased-approach over a 10-year period for attainment of beneficial uses and State water quality standards by nonpoint source industries.

7. In accordance with э319 (a)(1)(C) of the Clean Water Act, IDEQ in conjunction with land management agencies is prepared to identify additional BMPs and measures to control nonpoint sources causing or contributing to nonattainment of water quality standards, and provide for these sources to reduce, to the maximum extent practicable, the level of pollution they contribute (USEPA 1993d). In conjunction with this provision, IDEQ with land management agencies shall:

a. Review the BMPs and measures that were identified for nonpoint sources and revise them as necessary to assure that they continue to produce the maximum practicable pollution reduction;

b. Identify any additional nonpoint sources (or classes of nonpoint sources) that should participate in achieving the goals of the Lake Walcott TMDL;

c. Identify any additional management measures and/or controls that, to the maximum extent practicable, will reduce the pollution of concern from nonpoint sources in the effected water; and,

d. Exercise or seek after any additional legal authorities to address nonpoint sources, as necessary, beyond those defined in the Idaho Agricultural Pollution Abatement Plan for irrigated agriculture, or the specific best management plans defined for rangeland, forestry, CFOs, and/or stormwater.

For the Lake Walcott subbasin, the following table describes the short-term and long-term goals that are prescribed for nonpoint source industries and IDEQ-TFRO that will insure reasonable assurance that point sources will comply with their reduction plans per pollutant.

Table 50. SHORT- AND LONG-TERM GOALS FOR NONPOINT SOURCES AND IDEQ-TFRO ON A POLLUTANT BASIS

Pollutant	*Industry*	*Year 1 (2000)*	*Year 3 (2002)*	*Year 5 (2004)*	*Year 8 (2007)*	*Year 10 (2009)*
TP	CFOs	Zero Discharge		Evaluation	Zero Discharge	Re-evaluation
	Agriculture	Develop management plan and identify critical acres		Meet target BMP reductions	Maintain for 5 more years	Re-evaluation
	Grazing	Starting BMPs	Review target BMP reductions	Meet target BMP reductions	Maintain for 5 more years	Re-evaluation
	Stormwater (Burley-Heyburn)	Evaluate need for Stormwater Management Plan				Re-evaluation
	IDEQ & Land Mgmt Agency	Maintain data base; review NPS efficacy data; seek funding		Review target BMP reductions	Review BMP maintenance	Review & evaluate BMPs
TSS Oil & Grease	CFOs	Zero Discharge		Evaluation	Zero Discharge	Re-evaluation
	Agriculture	BMP Implementation along with some efficacy monitoring		Evaluation	Maintain for 5 more years	Re-evaluation
	Grazing	Starting BMPs	Review target BMP reductions	Evaluation	Maintain for 5 more years	Re-evaluation
	Stormwater (Burley-Heyburn)	Evaluate need for Stormwater Management Plan				Re-evaluation
	IDEQ & Land Mgmt Agency	Maintain data base; review NPS efficacy data; seek funding		Review target BMP reductions	Review BMP maintenance	Review & evaluate BMPs
Pesticides DO	A TMDL is not anticipated for any of the nonpoint source industries. Pesticide sampling at Massacre Rocks will occur in 2000 to further validate removal of pesticides as a pollutant. DO monitoring will continue to occur in the various segments to further validate removal and to fill data gaps.					
Temperature	Re-evaluation of temperature criteria via project study by IDEQ-State Office					
Flow	No Flow TMDL; Conservation flows encouraged					
Industry Plans	Each industry will be responsible for the development of an annual summary review of assessment of water quality goals and targets for the Lake Walcott Subbasin. Plans developed under the Mid-Snake TMDL will be revised and applied on the Lake Walcott TMDL specific for the water quality limited segment Milner Pool.					

3.7.3 Trend Monitoring Plan Goal

Idaho Code 39-3621 provides that the designated agencies, in cooperation with the appropriate land management agency and the IDEQ shall ensure BMPs are monitored for their effect on water quality. The monitoring results shall be presented to the IDEQ on a schedule agreed to between the designated agency and the IDEQ. Where no monitoring program exits, or where additional assessments are needed, it is necessary for States to design and implement a monitoring plan. The objectives of monitoring include the assessment of water quality standards attainment, verification of pollution source allocations, calibration or modification of selected models, calculation of dilutions and pollutant mass balances, and evaluation of point and nonpoint source control effectiveness. In their monitoring programs, States should include a description of data collection methodologies and quality assurance/quality control procedures, a review of current discharger monitoring reports, and be integrated with volunteer and cooperative monitoring programs where possible. The monitoring program will result in a sufficient data base for assessment of water quality standard attainment and additional predictive modeling if necessary (USEPA 1991a). In effect, monitoring provides the information needed to evaluate management. Implementation of BMPs and trend monitoring will be used to determine which management measures and BMPs are being implemented, whether management measures and BMPs are being implemented as designed, and the need for increased efforts to promote or induce use of management measures and BMPs. It may be necessary to modify current or proposed monitoring programs to those that are more in line with an adaptive management style for the watershed. See section 3.7.6 on Feedback Loop and Adaptive Management. Data from implementation monitoring, used in combination with trend monitoring, will be useful in meeting the following objectives:

1. To evaluate best management practice effectiveness for protecting soil and water resources. The plan will assess whether management measures or control actions are being implemented as planned and if they are effective. This is critical to the efficacy monitoring that will be conducted by all industries, IDEQ, and the trend monitoring plan, so as to meet the goals and demands of the Lake Walcott TMDL in meeting beneficial uses and water quality standards. Idaho Code 39-3603 provides that "the existing instream beneficial uses of each water body and the level of water quality necessary to protect those uses shall be maintained and protected." Only through water quality monitoring and BURP assessment can achievement of water quality goals be determined.

2. To identify areas in need of further investigation.

3. To establish a reference point of overall compliance with BMPs.
Efficacy monitoring will be the responsibility of all industries and IDEQ. The establishment of a reference point to bring about comparison statistics is critical to the

success of the trend monitoring plan, or any monitoring plan that supports the Lake Walcott TMDL. Such compliance points on the Lake Walcott Reach of the Snake River will include the following: Milner Dam, Minidoka Dam, Massacre Rocks, Register Rocks, Roper Lane, the confluence of East Fork Rock Creek with Rock Creek, and the confluence of South Fork Rock Creek with East Fork Rock Creek. Compliance points for all tributaries and irrigation return flows will be at the confluence where they discharge to the Snake River, or where any stream or irrigation return flow discharges to a water quality limited stream segment.

4. To determine whether farmers are aware of BMPs.
Farmers includes farm sites (irrigated and non-irrigated) and ranchers (grazing). Understanding and applying the correct BMPs is not only the responsibility of the farmer, but the land management agency. Only those BMPs described as "authorized BMPs" will be considered, unless the land management agency promotes and supports a BMP that is not listed or authorized. IDEQ will support BMPs that are defined in the Idaho Agricultural Pollution Abatement Plan according to the NRCS, SCC, and the IDL; as well as, grazing BMPs that are defined by NRCS, USBLM, USFS, and IDL.

5. To identify any BMP implementation problems specific to a category of farm.
This is critical to the flexibility of BMPs. If a BMP is found to be inadequate for the purposes of the Lake Walcott TMDL, then the land management agency has the right to encourage the farmer to modify the practice for one that is more effective. It is the responsibility of the farmer to make the change, as long as it is voluntary, economically feasible, and still flexible to allow for additional changes if necessary.

6. To evaluate whether any agricultural practices cause environmental damage.
Time constraints were previously identified in section 3.7.1 (point sources) and section 3.7.2 (nonpoint sources). The Lake Walcott TMDL will not support any nonpoint source practice causing damage to the environment.

7. To compare the effectiveness of alternative BMPs.
This will come about as various facilities, ranches, and farms are compared according to the type of BMP applied and the results of such applications. Such comparisons will be submitted to the authorizing land management agency for their approval and comment.

8. To assess whether allocations are sufficient to attain water quality standards and beneficial uses.

9. To assess if short-term and long-term milestones are being met.
This assessment will have oversight by IDEQ for all industries.

10. To describe whom will carry out and finance the monitoring activities.

Each industry will be responsible for its own level of compliance monitoring that defends their short-term and long-term goal attainment these will include but not limited to: IDEQ monitoring for water quality in the various segments; the trend monitoring plan to be developed by the Lake Walcott WAG; the Rock Creek Water Quality Monitoring Plan developed by Power County SCD; and the NPDES required ambient water quality monitoring conducted in Milner Pool by the food processors. The Lake Walcott WAG, in its trend monitoring plan, may also be require other industries to develop compliance monitoring plans.

3.7.4 Legal Authorities that Defend Control and Management Actions

For point sources, IDEQ operates under the auspices of the NPDES federal permit program that is under the primacy of USEPA for aquaculture, food processors, and municipalities. USEPA operates and enforces the permit, while IDEQ assists with inspections, compliance monitoring, and technical assistance. IDEQ, however, has statutory rights over the NPDES permits through its э401 Water Quality Certification for specific parameters. Under this certification, IDEQ can impose more stringent limits or monitoring requirements than what USEPA would request. For FERC licensed facilities, FERC has primacy for its permits. IDEQ provides technical assistance. Like the NPDES program, however, IDEQ has э401, э402, and э404 Water Quality Certification for specific parameters, design modifications, or stream alterations that the FERC facility may require or request.

For nonpoint source CFOs (or CAFOs by USEPA), an NPDES stormwater permit is secured by facilities that allows for discharge on a once per 24-hours every 25-years. For cases of inspection for dairy operations, the Idaho Dairy Pollution Prevention Initiative Memorandum of Understanding signed by ISDA, IDEQ, IDA, and USEPA allows ISDA to conduct the inspections. ISDA has the statutory authority to revoke milk permits for recalcitrant operators. Feedlots are not part of the Idaho MOU and so are administered to by IDEQ.

For nonpoint sources like agriculture and grazing, no NPDES permits are required for discharging to canals, waters of the State, or waters of the United States. BMPs are supported and encouraged by IDEQ according to the recognized land management agencies that provide guidance and technical assistance.

Table 51. RECOGNIZED LAND MANAGEMENT AGENCIES IN TMDL PROCESS

Nonpoint Source Activity/BMPs	Land Management Agency	Code/Regulations
Grazing with approved BMPs	Idaho Soil Conservation Commission; Idaho Board of Land Commissioners	IC э39-3602; IDAPA э16.01.02.003.72; IDAPA э16.01.02.350.03
Grazing for development, implementation, and revision of allotment management plan	Idaho Department of Agriculture	Grazing MOU (USFS, USBLM, U of I, IDA); Executive Order 98-09 (Allotment Management Plan on Public Lands)

Crop production with BMPs from Idaho Agriculture Pollution Abatement Plan	Idaho Soil Conservation Commission	IC э39-3602; IDAPA э16.01.02.003.72; IDAPA э16.01.02.350.03; IDAPA э16.01.02.054.07.
Silviculture with approved BMPs	Idaho Department of Lands; Idaho Board of Land Commissioners	IC э39-3602; IDAPA э16.01.02.003.72; IDAPA э16.01.02.350.03
Construction sites with approved BMPs	Idaho Department of Transportation	IC э39-3602; IDAPA э16.01.02.003.72; IDAPA э16.01.02.350.03
Septic tank disposal fields with approved BMPs	Idaho Department of Health & Welfare (District Health)	IC э39-3602; IDAPA э16.01.02.003.72; IDAPA э16.01.02.350.03
Mining with approved BMPs	Idaho Department of Lands; Idaho Board of Land Commissioners	IC э39-3602; IDAPA э16.01.02.003.72; IDAPA э16.01.02.350.03
Dairy Operations	Idaho Department of Agriculture	Dairy MOU of 1995 (ISDA, IDEQ, USEPA, and IDA)
"Other NPDES activities" (aquaculture)	Idaho Department of Agriculture	IC э39-3602; IDAPA э16.01.02.003.72; IDAPA э16.01.02.350.03

It is evident from a historical perspective that to some extent nonpoint source pollution is the result of activities essential to the economic and social welfare of the state. It is recognized that the real extent of most nonpoint source activities prevents the practical application of conventional wastewater treatment technologies. However, nonpoint source pollution management, including BMPs, is a process for protecting the designated beneficial uses and ambient water quality. BMPs should be designed, implemented and maintained to provide full protection or maintenance of beneficial uses. Violations of water quality standards that occur in spite of implementation of BMPs will not be subject to enforcement action. However, if subsequent water quality monitoring and surveillance by IDEQ based on the criteria listed in э200 and э250, indicate water quality standards are not met due to nonpoint source impacts, even with the use of current BMPs, the practices will be evaluated and modified as necessary by the appropriate agencies in accordance with the provisions of the Administrative Procedures Act. If necessary, injunctive or other judicial relief may be initiated against the operator of a nonpoint source activity in accordance with the Administrator of IDEQ's authorities provided in э39-108 Idaho Code. In certain cases, revision of the water quality standards may be appropriate (IDAPA э16.01.02.350.01.a).

So long as a nonpoint source activity "is being conducted in accordance with applicable rules, regulations and BMPs ... or in the absence of referenced applicable BMPs, conducted in a manner that demonstrates a knowledgeable and reasonable effort to minimize resulting adverse water quality impacts, the activity will not be subject to conditions or legal actions ... In all cases, if it is determined by the" Administrator of IDEQ "that imminent and substantial danger to the public health or environment is occurring, or may occur as a result of a nonpoint source by itself or in combination with other point or nonpoint source activities, then the" Administrator of IDEQ "may seek immediate injunctive relief to stop or prevent that danger as provided in э39-

108 Idaho Code" (IDAPA э16.01.02.350.02.a). Other pertinent nonpoint source restrictions may be found in IDAPA э16.01.02.350.02 & 03.

3.7.5 Connectivity Effect

Pollution reduction management actions and control actions that occur in the Lake Walcott Subbasin over the next 10 years will have a direct effect on subbasins downstream of Milner Dam. In like fashion, subbasins upstream of American Falls Dam will have a direct effect on the Lake Walcott subbasin. This connectivity effect of a subbasin upon its downstream neighbor subbasins, as well as from its upstream neighbors, is a hydrological linkage that TMDLs do not normally address.

The Lake Walcott subbasin instream targets for the Snake River will have a direct effect on subbasins draining into the Lake Walcott reach of the Snake River; namely, the Raft River Subbasin and the Goose Creek Subbasin. These drainages will not be addressed for TMDLs until the year 2002, streams added to subsequent э303(d) lists will be addressed for TMDLs in 2006 and beyond as time permits.

Connectivity is an issue that has been discussed by the Mid-Snake TAC, particularly as to what effect loadings from the Milner Pool have on downstream segments in the Upper-Snake Rock Subbasin. On February 17, 1999, the Mid-Snake TAC recommended that a letter be drafted to the Upper Snake BAG that would address the concerns of the Mid-Snake WAG on this issue, but in particular as it affected the most immediate subbasins both upstream and downstream of the subbasin.

3.7.6 Feedback Loop and Adaptive Management

The feedback loop is a component of the Lake Walcott TMDL strategy that provides for accountability of plan goals for various pollutants. As part of the TMDL process, the Lake Walcott TMDL will use adaptive management as a style and process whereby management of the watershed is initiated by the State, federal agencies, and the water user industries; then, an evaluation process will ascertain the direction in which the reductions are progressing; and, based on monitoring information collected from various agencies, organizations, and water users refine the goals, targets, and BMPs based on short-term and long-term objectives for ecosystem management of the Lake Walcott watershed. Past management experiences may be used to evaluate both success and failure and to explore new management options where necessary. By learning from both successes and failures, the Lake Walcott TMDL will be iterative to allow implementation of those techniques which may be most useful and helpful, as well as gain insights into which practices best promote recovery for restoration of beneficial uses and State water quality standards (Williams et al. 1997).

For the Lake Walcott Subbasin the main goal is to reach the preliminary instream water quality target of 50 mg/L TSS for all tributary and irrigation return flows and to maintain the 25 mg/L TSS annual mean value already existing in the Snake River. Additionally, for the Lake Walcott Subbasin an additional main goal is to reach the preliminary instream water quality target of 0.100 mg/L TP for tributary and irrigation return flows. The Lake Walcott reach of the Snake River also has a preliminary instream water quality target of 0.080 mg/L TP. These preliminary targets are set up in this way to allow for modifications in the targets over the next 10-15 years to attain beneficial uses and State water quality standards.

In order for the feedback loop to be successful in the Lake Walcott TMDL, a concrete mechanism has to be designed with short-term and long-term goals for the IDEQ-TFRO, industries, and the Lake Walcott WAG to regularly review progress on implementation, with regular review of monitoring results, regular evaluation of plan effectiveness, and sufficient flexibility in management plans to allow for corrections in management strategies that may not be effective in achieving beneficial uses or State water quality standards. Both point and nonpoint source industries will follow the feedback loop under the following provisions: 1) identification of critical water quality parameter(s); 2) development of site-specific BMPs; 3) application and monitoring of BMPs; and 4) effectiveness evaluations of BMPs by comparing established water quality standards and then modifying the BMPs where needed to achieve water quality goals.

The IDEQ-TFRO will review all monitoring results for point and nonpoint sources, and will provide an opportunity for the Lake Walcott WAG and USEPA to review and comment on an annual basis. Each industry will provide summary review/reports to the IDEQ-TFRO on its monitoring efforts, strategies, and on-going reduction mechanisms. Each industry will provide its own data in their reports. Based on these reports and other data, the Lake Walcott TMDL will be revised accordingly as an iterative plan. All industry plans will also be iterative and further developed through adaptive management as new knowledge and technology is discovered for pollution reduction efforts.

Additionally, because of the diverse nature of the partnerships and commitments within the Lake Walcott WAG from various agencies, organizations, and water users; and, because adaptive management is inherently a characteristic of the Lake Walcott TMDL, both restoration and education efforts will be guided by IDEQ-TFRO via the WAG. The WAG will take advantage of partner technical knowledge, experience, existing management plans, and resources in determining which types of activities are appropriate for continued implementation of the Lake Walcott TMDL. The Lake Walcott WAG will continue to meet as prescribed in their bylaws and ensure good communication with its partners though minutes of their meetings. A technical advisory committee (TAC) has been or is in the process of development and through the TAC, the WAG will have available to it the technical expertise of biologists, hydrologists, range conservationists, foresters, and other water quality and watershed specialists. Monitoring done by the various agencies, organizations, and water users will be evaluated by IDEQ-TFRO and the

TAC and WAG as a feedback mechanism that is science based, and, through adaptive management allow such scientific knowledge to be adapted to the task of watershed restoration almost immediately.

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5.0 APPENDIX A. RIVER MILE INDEX

River Mile

714.0	American Falls Dam
713.9	Union Pacific Rail Road Bridge
713.8	Overhead Transmission Line, Idaho Power Company
713.5	Neeley Gauging Station
713.4	State Fish Hatchery
711.2	Warm Creek
709.0	Eagle Rock Dam Site
706.0	Beaver Island
705.8	Goat Island
701.5	Rock Creek
698.4	Little Warm Creek
697.3	Fall Creek
693.4	Tule Island
688.7	Raft River
680.4	Bird Island
674.5	Minidoka Dam
673.7	Overhead Transmission Line, Bonneville Power Administration
673.5	Minidoka Gauging Station
669.7	Jackson Bridge
667.2	U.S. Highway Bridge
663.9	State Highway 25 Bridge
663.0	Interstate 80 Bridge
659.3	Marsh Creek
658.2	Spring Creek
658.2	Parees Island
657.8	Duck Creek
656.0	Overhead Transmission Line, Bonneville Power Administration
654.3	Crow Island
654.0	Goat Island
653.8	Goose/Snipe Creek
653.7	Burley/Heyburn (Highway 30) Bridge
653.4	Union Pacific Rail Road Bridge
652.2	Hog Island
651.7	State Highway 27 Bridge
650.3	Custer Island
642.9	Rock Island
642.9	Milner North Side Pumping Plant

641.5	Milner Pumping Plant Site
641.3	PA Lateral Pumping Station
639.2	Milner Gooding Canal
639.1	Milner Dam
638.7	Bridge Crossing Snake River
638.7	Snake River Gauging station

6.0 APPENDIX B. SNAKE RIVER IDEQ DATA

Segment Name	Locator	303DSEG	Total Day	Temp (C)	TurbNTU	Secchi(m)	SC	DOmg/L	pH	TSSmg/L	NH3mg/L	TKNmg/L	NO2+NO3	TPmg/L	DOP	F. COLI	RedoxmV	TDSg/L	%DOSat	HP	Fixed Solids
River mile 638.7--Outfall of Milner Dam (USGS 13088000).	SR08	23592	05/13/1996	13.8	25.8	0.75	398	10.25	8.39	15	0.021	0.41	0.018	0.058	0.0025		405	0.251	92.5		
River mile 638.7--Outfall of Milner Dam (USGS 13088000).	SR08	23592	01/29/1997	0.81	13.1	0.67	466	13.68	8.12								452	0.311			
River mile 638.7--Outfall of Milner Dam (USGS 13088000).	SR08	23592	02/04/1997	1.21	14.5	0.68	470	13.55	8.1								421	0.313			
River mile 638.7--Outfall of Milner Dam (USGS 13088000).	SR08	23592	02/18/1997	2.15	4.4	1.05	488	13.29	7.95								411	0.32			
River mile 638.7--Outfall of Milner Dam (USGS 13088000).	SR08	23592	03/05/1997	2.08	16.4	0.69	426	13.1	7.92								413	0.31			
River mile 638.7--Outfall of Milner Dam (USGS 13088000).	SR08	23592	03/17/1997	6.22	18.6	0.72	437	12.46	8.1								390	0.29			
River mile 638.7--Outfall of Milner Dam (USGS 13088000).	SR08	23592	03/24/1997	7.56	19.4	0.74	420	12.05	8.26								371	0.281			
River mile 638.7--Outfall of Milner Dam (USGS 13088000).	SR08	23592	04/04/1997	6.88	18.7	0.7	413	11.79	8.4								383	0.268			

River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).
SR08	SR08	SR08	SR08	SR08	SR08	SR08	SR08	SR08	SR08
23592	23592	23592	23592	23592	23592	23592	23592	23592	23592
08/11/1997	07/29/1997	07/15/1997	07/01/1997	06/17/1997	06/02/1997	05/21/1997	05/05/1997	04/21/1997	04/07/1997
20.37	20.94	19.24	19.62	17.38	17.4	14.4	10.69	9.16	5.5
19	10.6	12	33.7	25.9	13.7	29	24.1	24.4	15.8
0.6	0.9	0.77	0.48	0.52	0.85	0.75	0.75	0.7	0.7
316	309	314	289	319	344	377	419	400	402
8.62	7.99	6.56	6.88	7.87	10.11	9.34	10.48	10.09	11.98
8.83	8.64	8.37	7.92	8.12	8.43	8.41	8.51	8.28	8.61
23	15	12	19	25	18	8	25	36	28
0.016	0.013	0.011	0.018	0.036	0.009	0.019	0.018	0.01	0.021
0.68	0.42	0.37	0.34	0.31	0.29	0.23	0.38	0.41	0.46
0.043	0.12	0.122	0.183	0.194	0.096	0.09	0.122	0.104	0.146
0.101	0.088	0.095	0.094	0.108	0.053	0.074	0.069	0.091	0.066
									0.0025
30	0.5								
372	399	384	410	396	383	411	396	469	408
0.202	0.198	0.201	0.184	0.204	0.22	0.237	0.269	0.256	0.257
93.9	90	68.9	81.3	83.5	102.9	89.8	95.3	88.3	99
									0.077
									24

River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).
SR08	SR08	SR08	SR08	SR08	SR08	SR08	SR08	SR08	SR08
23592	23592	23592	23592	23592	23592	23592	23592	23592	23592
04/14/1998	03/09/1998	12/29/1997	11/24/1997	12/15/1997	11/20/1997	10/06/1997	09/24/1997	09/08/1997	08/27/1997
7.13	1.69	0.19	2.61	2.08	2.61	13.09	15.96	20.67	21.08
12	5		5.2	1.7	5.2	4.1	19.5	12	27.1
0.68				0.98	1.03	1.09	0.59	0.77	0.52
386	397	432	424	459	424	349	326	319	320
11.67	13.99	12.05	11.86	12.28	11.86	9.23	11.34	9.6	8.74
8.4	8.23	7.74	8.04	8.1	8.14	8.65	8.31	8.68	8.59
17	11	3			4	17	19	21	26
0.024	0.013	0.031			0.04	0.018	0.015	0.025	0.008
0.52	0.68	0.23			0.32	0.65	0.65	0.58	0.44
0.117	0.338	0.519			0.375	0.12	0.099	0.02	0.026
0.062	0.099	0.061			0.104	0.084	0.132	0.109	0.124
								40	70
420				399	350	451	221	127	147
0.247	0.254	0.276	0.256	0.276	0.256	0.223	0.208	0.204	0.205
97.7	102.5	99.6	89.3		89.3	87.9	112	105.5	100

Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).	River mile 638.7--Outfall of Milner Dam (USGS 13088000).
SR09	SR09	SR09	SR09	SR09	SR09	SR08	SR08	SR08	SR08
23592	23592	23592	23592	23592	23592	23592	23592	23592	23592
06/03/1997	05/21/1997	05/06/1997	04/22/1997	04/08/1997	03/25/1997	05/24/1999	04/20/1999	01/19/1999	03/08/1999
17.42	14.41	10.95	9.34	5.65	5.37	15.54	9.44	1.18	2.64
8.7	12.7	18.1	140	18	13.2		0	6.8	6.3
0.9	1	0.8	0.75	0.75	0.65				
345	389	422	400	404	398	391	381	410	399
8.83	8.64	10.95	10.45	12.68	11.34	9.63	10.77	12.57	12.85
8.57	8.5	8.57	8.39	8.68	8.36	8.48	7.63	8.3	8.2
15	3	12	24	19	16		22	1	6
0.011	0.014	0.012	0.012	0.02			0.013	0.011	0.01
0.33	0.28	0.39	0.42	0.43	0.42		0.43	0.26	0.28
0.133	0.116	0.134	0.064	0.197	0.267		0.173	0.583	0.554
0.091	0.056	0.078	0.05	0.067	0.129		0.078	0.069	0.082
				0.01	0.024				
			440		505	136			147
0.22	0.249	0.27	0.256	0.259	0.255	0.25	0.244	0.263	0.255
89.8	82.6	98.6	92	95.2	90.2	95.5	95	92.3	94.3
				0.062					
				15					

Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island
SR09	SR09	SR09	SR09	SR09	SR09	SR09	SR09	SR09	SR09
23592	23592	23592	23592	23592	23592	23592	23592	23592	23592
11/24/1997	10/06/1997	09/22/1997	09/09/1997	08/26/1997	08/12/1997	07/29/1997	07/14/1997	06/30/1997	06/16/1997
3.11	12.39	15.94	20.77	21.35	19.68	20.93	19.54	19.64	17.4
6.1		11.5	14.1	20.5	11	6.3	11.2	17.1	19.2
1.25		1.1	1	1.2	0.8	1.1			
398	355	327	319	319	314	307	314	289	318
11.45	9.24	10.35	9.25	8.74	8.21	7.23	6.7	7.23	7.73
8.42	8.64	8.4	8.7	8.27	8.89	8.56	8.44	7.82	8.2
4	19	12	12	27	16	8	10	14	18
0.039	0.02	0.01	0.007	0.012	0.012	0.011	0.006	0.017	0.04
0.3	0.59	0.6	0.49	0.44	0.63	0.34	0.35	0.31	0.28
0.465	0.196	0.2	0.06	0.042	0.143	0.151	0.157	0.174	0.215
0.123	0.074	0.116	0.091	0.099	0.065	0.078	0.082	0.068	0.101
				90	50	20			
	348	201	128	53					
0.255	0.226	0.21	0.204	0.204	0.201	0.197	0.201	0.185	0.204
83.1	86.6	101.4	102	98.4	88.9	79.9	72.4	76.7	76.9

Above Burley at Power Line	Above Burley at Power Line	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island	Below Burley at Rock Island
SR10	SR10	SR09	SR09	SR09	SR09	SR09	SR09	SR09	SR09
23591	23591	23592	23592	23592	23592	23592	23592	23592	23592
04/08/1997	03/25/1997	06/15/1999	05/25/1999	04/20/1999	01/19/1999	03/08/1999	04/15/1998	03/09/1998	11/24/1997
5	5.41		15.1	9.64	0.98	2.92	6.58	1.18	3.11
7.9	11.1		14.6			0.2	12.7	12.4	6.1
0.8	0.64		1.3				0.7	0.9	1.25
399	397		388	380	406	398	387	405	398
11.37	11.55		9.5	10.54	12.93	13.05	11.58	15.57	11.45
8.67	8.36		8.55	8.2	8.3	8.19	8.36	8.4	8.42
15	14	7		20	1	5		11	
0.01		0.008		0.014	0.056	0.007		0.011	
0.38	0.42	0.35		0.43	0.29	0.24		0.56	
0.108	0.194	0.079		0.175	0.579	0.553		0.585	
0.06	0.084	0.06		0.074	0.066	0.066		0.131	
0.0025	0.0025								
	514		167			138	419		
0.255	0.254		0.248	0.243	0.26	0.255	0.248	0.259	0.255
87.7	92.4		94.2	96.1	92.8	97.1	96.9	109.5	86.1
0.036									
11									

Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line
SR10	SR10	SR10	SR10	SR10	SR10	SR10	SR10	SR10	SR10
23591	23591	23591	23591	23591	23591	23591	23591	23591	23591
08/26/1997	08/12/1997	07/29/1997	07/14/1997	06/30/1997	06/16/1997	06/03/1997	05/21/1997	05/06/1997	04/22/1997
20.67	19.29	20.39	18.98	16.93	17.25	16.45	14.17	9.89	8.62
14.3	10.1	3.5	5.8	14.6	44.9	3.8	11.2	15.1	10.4
1.42	0.9	1.42				1.1	1.1	0.95	0.7
314	305	299	305	297	325	338	385	415	395
7.52	7.56	6.42	5.75	7	6.87	10.27	8.53	10.56	10.92
8.41	8.27	8.62	8.21	7.88	8.02	8.36	8.48	8.55	8.43
12	15	7	8	21	26	11	147	8	18
0.012	0.015	0.012	0.01	0.031	0.047	0.008	0.02	0.011	0.011
0.39	0.6	0.36	0.34	0.37	0.41	0.29	0.26	0.31	0.37
0.026	0.0025	0.027	0.065	0.209	0.23	0.078	0.067	0.046	0.046
0.094	0.059	0.087	0.063	0.087	0.111	0.053	0.043	0.038	0.054
50	10	0.5							
69									447
0.201	0.195	0.191	0.195	0.19	0.208	0.216	0.246	0.266	0.253
80.1	82.4	78.8	63.2	75.6	72.7	105.9	82.9	91.5	90.9

Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line
SR10	SR10	SR10	SR10	SR10	SR10	SR10	SR10	SR10	SR10
23591	23591	23591	23591	23591	23591	23591	23591	23591	23591
01/20/1999	03/08/1999	04/15/1998	12/29/1997	11/24/1997	11/24/1997	10/07/1997	10/06/1997	09/22/1997	09/09/1997
0.81	1.96	6.2	0.13	2.81	2.81		12.51	15.76	20.11
23	15.9	13.7	1	6.7	6.7		5.4	9.5	11.8
1.9	1	0.75		0.9	0.9		1.25	1.15	1.1
406	389	385	427	394	394		345	324	314
12.43	12.64	11.07	12.31	11.33	11.33		8.52	8.64	8.06
7.73	8.13	8.39	7.92	8.19	8.19		8.57	8.24	8.69
1	6	14	3		6	11		10	10
0.014	0.008	0.02	0.015		0.051	0.014		0.01	0.006
0.22	0.2	0.5	0.19		0.32	0.6		0.61	0.45
0.51	0.453	0.037	0.877		0.29	0.054		0.082	0.01
0.06	0.038	0.053	0.028		0.068	0.106		0.098	0.062
	143	417					347	103	131
0.26	0.249	0.247	0.273	0.252	0.252		0.221	0.207	0.201
93.1	90.5	90.5	82.5	83.3	83.3		82.4	89.5	85.8

Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Above Burley at Power Line	Above Burley at Power Line	Above Burley at Power Line
SR11	SR11	SR11	SR11	SR11	SR11	SR11	SR10	SR10	SR10
23591	23591	23591	23591	23591	23591	23591	23591	23591	23591
06/09/1997	05/28/1997	05/14/1997	04/29/1997	04/22/1997	04/08/1997	03/26/1997	06/15/1999	05/25/1999	04/21/1999
16.74	14.19	13.13		9.38	6	7.11		13.84	7.78
5		5		6.2	31.7	10.8		12.5	13.2
				0.75	0.75	1.05		1.5	0.8
309	395	393		398	401	412		385	375
9.43	12.24	10.56		10.78	11.34	10.67		9.26	10.09
8.36	8.16	8.49		8.51	8.64	8.48		8.49	8.38
10	7	22	19	14	13	11	5		15
0.02	0.018	0.012	0.023	0.013	0.016		0.011		0.007
0.3	0.27	0.3	0.38	0.36	0.47	0.45	0.34		0.32
0.086	0.086	0.014	0.074	0.033	0.085	0.152	0.032		0.129
0.061	0.045	0.035	0.05	0.06	0.06	0.07	0.038		0.043
					0.0025	0.005			
	473	473		475		480		185	
0.198	0.252	0.251		0.255	0.256	0.26		0.246	0.239
94.6	113.1	100.7		94	93.6	90.9		89.7	85
					0.038				
					10				

Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott
SR11	SR11	SR11	SR11	SR11	SR11	SR11	SR11	SR11	SR11
23591	23591	23591	23591	23591	23591	23591	23591	23591	23591
11/24/1997	10/06/1997	09/22/1997	09/09/1997	08/26/1997	08/12/1997	07/29/1997	07/23/1997	07/08/1997	06/23/1997
4.24	13.49	16.49	20.27	21.21	20.77	20.54	20.67	18.7	17.28
0	0	0		12.3	9.4	2.7	25	10	22.5
						1.38			
397	351	325	319	328	305	299	324	287	298
11.76	10.24	9.08	8.55	9.01	8.46	7.73	9.24	6.1	8.24
8.42	8.51	8.24	8.68	8.31	8.87	8.6	8.67	8.02	8.18
4	9	6	7	5	8	3	5	7	14
0.055	0.02	0.023	0.016	0.025	0.022	0.013	0.032	0.02	0.055
0.32	0.46	0.51	0.45	0.31	0.52	0.33	0.33	0.37	0.35
0.281	0.066	0.076	0.016	0.059	0.027	0.014	0.06	0.035	0.159
0.082	0.08	0.1	0.059	0.076	0.072	0.064	0.069	0.077	0.09
					10	0.5			
	362	110	132	64					
0.254	0.224	0.208	0.204	0.21	0.195	0.191	0.207	0.184	0.19
91.1	91.1	89.8	94.9	100.3	93.9	85.8	102.4	65.4	85.3

Below Rock Creek (Power County) Confluence with Snake River	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott	Below Minidoka Dam at Lake Walcott
SR12	SR11	SR11	SR11	SR11	SR11	SR11	SR11	SR11	SR11
2362	23591	23591	23591	23591	23591	23591	23591	23591	23591
03/25/1997	06/15/1999	05/25/1999	04/21/1999	01/20/1999	03/09/1999	04/15/1998	03/09/1998	12/29/1997	11/24/1997
4.4		13.15	8.4	1.46	2	7.16	2.33	0.83	4.24
7.5		10.6	0	0	7.6	16.5	3	13	0
1.15						0.65			
394		382	376	415	389	386	291	403	397
12.43		10.02	10.3	12.03	12.35	11.55	14.7	13.84	11.76
8.4		8.46	8.3	8.34	8	8.37	8.41	8.01	8.42
9	6		12	1	4	12	10	2	
	0.017		0.012	0.02	0.014	0.015	0.014	0.024	
0.31	0.29		0.3	0.24	0.19	0.44	0.6	0.22	
0.235	0.076		0.115	0.536	0.462	0.045	0.154	0.418	
0.054	0.039		0.058	0.051	0.038	0.051	0.043	0.029	
0.005									
507		188			177	419			
0.252		0.245	0.24	0.265	0.248	0.248	0.251	0.257	0.254
97		95.7	87.6	90.1	89.7	96.1	110	87.9	91.1

Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River
SR12	SR12	SR12	SR12	SR12	SR12	SR12	SR12	SR12	SR12
2362	2362	2362	2362	2362	2362	2362	2362	2362	2362
08/12/1997	07/29/1997	07/14/1997	06/30/1997	06/16/1997	06/03/1997	05/21/1997	05/06/1997	04/22/1997	04/08/1997
19.46	20.35	17.64	18.94	17.83	15.2	13.55	9.2	7.44	5.79
3.7	1.4	2.1	5.4	26.8	5.4	4.7	12.3	31.5	11.3
2.45	1.92				1.5	2.4	1.15	0.8	0.8
312	306	302	281	309	313	370	403	414	397
6.27	7.16		7.22	8.03	9.36	8.34	10.67	11.12	12.11
8.4	8.48	7.63	7.73	8.03	8.24	8.29	8.57	8.55	8.56
3	3	3	6	38	8	10	6	13	11
0.05	0.021	0.018	0.069	0.07	0.043	0.045	0.016	0.018	0.02
0.42	0.29	0.23	0.26	0.31	0.31	0.27	0.32	0.41	0.33
0.129	0.038	0.1	0.127	0.154	0.14	0.131	0.1	0.122	0.176
0.078	0.036	0.052	0.081	0.111	0.079	0.039	0.034	0.05	0.05
									0.006
10	0.5								
								455	
0.199	0.196	0.193	0.175	0.198	0.2	0.237	0.258	0.265	0.255
68	79.6	61.6	77.3	82.8	93.4	81.6	85.5	92.5	97.6
									0.038
									10

Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River
SR12	SR12	SR12	SR12	SR12	SR12	SR12	SR12	SR12	SR12
2362	2362	2362	2362	2362	2362	2362	2362	2362	2362
04/15/1998	03/09/1998	12/29/1997	11/24/1997	11/24/1997	10/23/1997	10/07/1997	09/22/1997	09/09/1997	08/26/1997
5.95	4.25	0.74	3.54	3.54	9.18	13.39	16.96	20.14	19.82
5.1		2.6	5.9	5.9	0.8	3.8	13	10	11.4
1.2			0.85	0.85		0.9	1.05	1.2	2.13
386	409	414	390	390	370	348	326	315	314
10.61	12.27	10.15	10.15	10.15	8.32	8.41	9.14	7.28	8.15
8.35	8.26	8.22	8.41	8.41	8.12	8.73	8.45	8.63	8.43
10	10	3		4		9	9	9	6
0.022	0.023	0.023		0.05		0.018	0.018	0.028	0.017
0.38	0.56	0.22		0.35		0.51	0.66	0.91	0.31
0.15	0.255	0.433		0.346		0.029	0.028	0.059	0.056
0.031	0.046	0.032		0.089		0.057	0.106	0.07	0.073
								30	
420						349	108	133	69
0.247	0.261	0.264	0.25	0.25	0.237	0.224	0.209	0.202	0.21
85.6	96	79.7	76.5	76.5	76.8	80.9	90.9	79.3	86.1

Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River	Below Rock Creek (Power County) Confluence with Snake River
SR13	SR13	SR13	SR13	SR13	SR12	SR12	SR12	SR12	SR12
6363	6363	6363	6363	6363	2362	2362	2362	2362	2362
05/13/1997	04/30/1997	04/22/1997	04/08/1997	03/25/1997	06/15/1999	05/25/1999	04/21/1999	01/20/1999	03/09/1999
11.37	8.53	7.14	5.37	4.4		12.56	5.82	2.08	1.92
2.4	3.5	4.9	12.8	5.2		9.2	13.2	4.8	0
		0.85	0.85			2.5	1		
382	413	400	397	390		366	387	458	391
9.9	10.22	11.48	12.48	12.98		9.71	11.75	11.51	11.9
8.32	8.3	8.33	7.62	8.37		8.38	8.29	8.07	7.94
2	16	10	8	6	0.5		19	10	6
0.042	0.038	0.018	0.023		0.029		0.031	0.063	0.017
0.36	0.31	0.36	0.33	0.34	0.3		0.29	0.28	0.18
0.118	0.071	0.085	0.166	0.116	0.128		0.174	0.76	0.519
0.031	0.032	0.043	0.047	0.038	0.044		0.045	0.1	0.048
			0.0025	0.0025					
		484		515		183			179
0.244	0.265	0.256	0.254	0.249		0.234	0.248	0.293	0.25
92.5	88.9	95.5	99.8	99.7		91.5	93	86.7	96.1
			0.027						
			5						

Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam
SR13	SR13	SR13	SR13	SR13	SR13	SR13	SR13	SR13	SR13
6363	6363	6363	6363	6363	6363	6363	6363	6363	6363
10/06/1997	09/22/1997	09/09/1997	08/26/1997	08/12/1997	07/29/1997	07/15/1997	06/30/1997	06/16/1997	06/03/1997
14.08	17.7	20.89	20.39	20.55	20.53	18.74	18.15	16.9	15.53
5.5	16.8	13	12.5	1.3	0	2.3	10.4	6.3	3.6
					1.98				1.45
344	317	309	310	303	297	298	276	307	310
8.64	10.87	8.71	8.26	7.5	7.93		7.49	8.16	9.86
8.61	8.48	8.77	8.56	8.61	8.61	8.03	7.81	8.23	7.44
10	16	21	7	4	32	4	3	3	8
0.014	0.012	0.029	0.033	0.043	0.029	0.03	0.072	0.083	0.059
0.55	1.52	1.4	0.38	0.54	0.34	0.29	0.27	0.25	0.31
0.011	0.0025	0.007	0.023	0.076	0.011	0.072	0.094	0.134	0.129
0.057	0.153	0.099	0.058	0.057	0.036	0.063	0.077	0.058	0.062
			10	10	0.5				
354	129	149	94						
0.22	0.203	0.198	0.198	0.193	0.19	0.19	0.177	0.196	0.198
85.4	106.2	96.4	89.6	77.6	878	60.9	80	85	97.3

Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam
SR13	SR13	SR13	SR13	SR13	SR13	SR13	SR13	SR13	SR13
6363	6363	6363	6363	6363	6363	6363	6363	6363	6363
08/12/1992	07/29/1992	07/07/1992	06/24/1992	06/11/1992	04/15/1998	03/09/1998	12/29/1997	11/24/1997	11/24/1997
22.4	19.7	19.1	17.2	19	6.35	1.73	0.54	3.67	3.67
					5.3			4.5	4.5
					1.25				
431	445	460	461	390	383	393	403	383	383
7.3	6	5.5	8.8	9	10.84	13.12	9.59	10.59	10.59
8.3	8.2	8.1	8.4	8.7	8.32	8.2	8.34	8.3	8.3
					8	12	3		4
					0.023	0.021	0.033		0.061
					0.37	0.52	0.2		0.34
					0.127	0.256	0.419		0.308
					0.026	0.043	0.033		0.072
					417				
280	289	299	300	254	0.245	0.251	0.256	0.245	0.245
					88.3	99.3	64.7	78.9	78.9

Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam	Snake River below American Falls Dam
SR13	SR13	SR13	SR13	SR13	SR13	SR13	SR13	SR13	SR13
6363	6363	6363	6363	6363	6363	6363	6363	6363	6363
05/07/1993	04/10/1993	03/13/1993	02/15/1993	01/29/1993	12/17/1992	11/05/1992	10/09/1992	09/11/1992	08/28/1992
2	0.5	3.7	0.1	2.4	1.4	8.2	10.7	15.3	16.7
500	550	565	550	550	550	505	493	446	454
9.5	11.3	10	11.5	11	12.1	9.8	8.4	7.9	7
8.3	8.4	8.3	8.5	8.4	8.6	8.6	8.4	8.3	
325	358	367	358	358	358	328	320	290	295

Snake River @ GPS 086 UTM 12 328934E 4721394N	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Below American Falls Dam	Snake River below American Falls Dam
SR90	SR13	SR13	SR13	SR13	SR13	SR13
23592	6363	6363	6363	6363	6363	6363
03/09/1998	06/15/1999	05/25/1999	04/21/1999	03/09/1999	01/20/1999	06/11/1993
0.83		12.48	5.95	1.16	1.8	14.5
10.2		8.2	6.6	24.6	5.3	
0.8		3.9				
395		361	373	372	446	480
14.68		9.16	10.4	12.17	10.96	8.9
8.53		8.33	8.1	7.96	8.1	8.3
10	2		6	4	1	
0.014	0.07		0.028	0.025	0.059	
0.52	0.38		0.35	0.16	0.27	
0.238	0.238		0.148	0.501	0.696	
0.036	0.074		0.028	0.044	0.074	
		203		168		
0.253		0.231	0.238	0.239	0.285	312
102.2		87.2	82.1	85.2	82.8	

7.0 APPENDIX C. TREND MONITORING PLAN (TO BE DEVELOPED BY THE LAKE WALCOTT WAG)

8.0 PUBLIC COMMENT RESPONSES

The official public comment period for the Lake Walcott Subbasin Assessment and TMDL began on November 3, 1999. All comments received within the 30 day period were evaluated and incorporated into the final document. Those comments received after the period ended on December 3, 1999 were evaluated and incorporated as time allowed. Comments provided by the public are summarized in this section with appropriate responses from IDEQ-TFRO. Comments are listed in the following table. Comments are divided into several areas: those comments requiring a response from IDEQ-TFRO; those who conveyed knowledge, sentiments, or feelings that IDEQ-TFRO felt did not require a response; and those comments that were received after the public comment period had ended.

Name Used as Source	Date Received	Source Identification
Jay B. Ulrich	November 16, 1999	McCain Foods USA
Randy Bingham	November 18, 1999	Burley Irrigation District
Jerrold D. Gregg	December 3, 1999	USBOR-Snake River Area
Howard K. Kestie	December 3, 1999	IDL-South Central Idaho Area
Carl H. Nellis	December 8, 1999	IDFG-Magic Valley Region
Leigh Woodruff	December, 10, 1999	USEPA-Idaho Operations Office

A. Public Comments that require a response from IDEQ-TFRO and received before December 3, 1999.

Source	Question	IDEQ-TFRO Response
Jay Ulrich	Pg 101, 2.2.2 -The first sentence should read that the Food Processors have been issued NPDES permits effective August 31, 1999	Add "These permits, for the food processors, were issued and became effective August 31, 1999.
Jay Ulrich	Pg 102, 2.3.2.3 -The narrative should include that the food industries are required to do Chronic Biomonitoring (WET Testing), four times per year	Chronic Biomonitoring four times per year added to narrative.
Jay Ulrich	Pg 141, 3.6.3 -table 47, Minidoka Dam to Milner Dam TMDL. We assume all data is in tons/day units, Monthly average. If so we are unsure of the data presented for TP and request that DEQ revisit the numerical values for this parameter. At this time we believe the TP to be in Lb./day units and that the correct TMDL for McCain should be 415 lbs./day, monthly Average (not 399.11 lbs/day)	Table 47 was split into three portions to better clarify the TMDLs for the specific pollutants. TP is shown in pounds per day units. The waste load allocation for McCain is 399 pounds per day of TP as a monthly average following the 37% reduction of TP. TP data was based on 1991-1996 DMRs and as agreed to in the Mid-Snake Phosphorus TMDL.

Jay Ulrich	The listed TMDL value for McCain for sediment is 0.919 tons/day. We believe the numerical data should represent our current NPDES limit of 2.05 tons/day (4100 lbs./day). Also, a narrative description or definition for sediment should be included in the document. We assume that sediment is determined by the standard Total Suspended (filterable Residue) Solids test method.	The listed value 0.919 ton/day was the reported load from the 1991-1996 DMRs for McCain foods. The value was changed for all point sources to reflect the current NPDES permit limits for Total Suspended Solids. A narrative was included to clarify TSS as Total Suspended Solids.
Jay Ulrich	Pg 143, 3.7.1 -Reasonable Assurances and Implementation Schedules, Table 49 year 1 Column should indicate that Food Processors permits were issued effective August 31, 1999. Does the year 5 (2004) narrative imply that NPDES Permits for Food Processors will be reissued or modified to incorporate additional TMDL reductions for TP, TSS, Oil and Grease, and Temperature?	Permit effective dates included into Table 49 for Food Processors, aquaculture and Municipalities. Year 5 narrative changed to better clarify that reductions required under Mid-Snake TMDL will be met, and in year eight permit review and additional TMDL required reductions will be assessed.
Jay Ulrich	The process must address all inputs into the Walcott system and allocate load reductions in an equitable method.	The Lake Walcott TMDL has set wasteload and load allocations for point and nonpoint sources. These allocations require a 20% for both point and nonpoint sources by year 2004. After further monitoring of Milner Pool and attainment of the Mid-Snake Goals, a further reduction of 17% may be required if nuisance aquatic vegetation is not reduced. This reduction includes both point and nonpoint sources. All sources will be required to submit trend monitoring plans and BMPs showing they are meeting the goals of the TMDL. See tables 49 and 50.
Randy Bingham	Pg 1, par 3-Change Upper Snake Rock to River	The Upper Snake Rock is the official designation of HUC #17040212
Randy Bingham	Pg 2 ,par 2 sent. 5- insert dams	The word dams was inserted
Randy Bingham	Pg 32, full Par 3. Last sentence- the J canal does not return flows to Marsh Creek nor do any BID canals.	References to j canal returning flow into Marsh Creek were removed.
Randy Bingham	Pg 33, full par. 3 add- The Bureau of Reclamation in connection with BID and MID have continued to sample and test since 1996 these drains monthly during the irrigation season.	Reference to the continued monitoring program was added.

Randy Bingham	Pg 37-There has been a lot of cement ditch, sprinkler, pipeline and BMP put into helping control erosion by farmers and ASCS not to be given any credit	The reference to improved water quality from pollution control management by point sources was from a cited source. Credit for work done by nonpoint sources has been given throughout the document.
Randy Bingham	Pg 49,-Add reference to aquifer recharge channel.	Reference to a recharge project was made concerning excess water from the Goose Creek Reservoir.
Randy Bingham	Pg 54, par 2.2.3.5- you have not given any credit to agriculture for the Millions of dollars spent to help stop soil erosion. You need to add: and soil conservation projects mainly cement ditches, pipe lines and sprinkler irrigation implemented since 1970.	Sentence modified to include agriculture contribution.
Randy Bingham	Pg 60, full par 3-There are a less number of return flows now than 20 years ago. Point source contributes most of the increases	The sediment analysis completed by IDEQ-TFRO indicates that both point and nonpoint sources contribute to the TSS increases in the area. However, the increases do not result in excess sediment and impairment of beneficial uses. Both point and nonpoint sources will be required to meet the <25 mg/l monthly average target in the Snake River established in the TMDL but no reductions in current loadings will be required by the TMDL.
Randy Bingham	Pg 92, Par 2.3-You have not used most of the work done by Campbell and non of the work done by BOR, MID, BID and you keep leading to the fact that agriculture is to blame. If you are going to imply this you need to show all the data that is available to you. This data shows small problems but they have relatively minor impacts on the Snake River.	IDEQ-TFRO used all of the Campbell data available at the time of the SBA-TMDL. This data was used to determine the nonpoint source contribution of sediment and TP in the Milner Pool. Subsequent to the public comment draft, BID released some data to IDEQ-TFRO. That data supported the conclusions drawn in the public comment draft. No load reductions in TSS are being required in this TMDL and agriculture is not being selected out as a major contributor.
Randy Bingham	Pg 93, par 2.3.1.1-The American Falls Dam does not have a restricted minimum flow limit.	As stated in the sentence the flow limit is unofficial and voluntary.
Randy Bingham	Pg 98, par. 2.3.1.4.1-A&B diversions are west of Burley from the Milner Pool. They have no water coming from Minidoka Dam.	Changes were made as suggested.

Randy Bingham	Pg 100, par.1-All the data related to sprinkler irrigation and gravity irrigation are in error. On the North side of the river MID and A&B are 76% sprinkler. On the South side BID is over 70% and South West Irrigation District is 90% sprinkler. Therefore Minidoka and Cassia County irrigated land in the WAG area have over 75% of the Land sprinkled.	The percent sprinkler irrigated were derived from the most current land use data IDEQ-TFRO had in possession at the time of the SBA-TMDL. We recognize that more up to date information may be in existence. Once we receive the reports, the information in the SBA-TMDL will be updated. The land use information was used for gross TP load allocations to the different nonpoint sources (e.g. irrigated agriculture). During the implementation phase of the TMDL, the WAG will develop fine scale allocations for Nonpoint sources such as sprinkler vs. gravity irrigation.
Randy Bingham	Pg102, par 2.3.2.1-Minidoka power plant is not governed by FERC. It is a federal facility and is not licensed nor will it be.	IDEQ_TFRO recognizes that Minidoka is not FERC licensed. However, §401 certification is still required for any changes to the facility. This point was clarified to reflect the certification.
Randy Bingham	Pg 105, par.1-A&B is not the only Irrigation District in the Burley-Rupert area. Is this really the only one you mean?	The A&B Irrigation District was used as an example of the nitrogen sources as they related to land use. This was not meant to imply that it was the only irrigation district in the area just as dairies are not the only land use in the Gooding County area.
Randy Bingham	Pg 105, par.1-this looks like a manipulation of the numbers to say what you want. This may be true but the numbers are not presented in the paper nor are there any reference where they are found.	The references to the data are found within the paragraph in question. These numbers were given as background and as a potential cause of the excessive aquatic vegetation growth.
Randy Bingham	Pg 129, Table 37-I question the Irrigated by gravity and sprinkler numbers. I believe them to be in error.	See previous response concerning irrigated agriculture land use percentages.

Jerrold D. Gregg	General comment-Lack of explanation of how continued operation of American Falls Reservoir relates to meeting the TMDL goals. It is unclear under the anti-degradation TMDL how the TSS concentration of the water released below American falls is to be managed. Does the anti-degradation TMDL assume that existing or historic river management activities are considered background or base condition and therefore limits may be exceeded if the mode of operation remains the same? Does the TMDL propose to change upstream river management to meet the limits presented? The TSS TMDL for American Falls Dam to Massacre Rocks reach needs to include specific language that would recognize the pre-existence of American Falls Reservoir operations and waive TMDL requirements when American Falls Reservoir contents reach low levels.	We have reviewed State water quality standards in regards to your general comments and have clarified the antidegradation TMDL narratives in sections 2.2.3 and 3.1.1.
Jerrold D. Gregg	Pg 3, Par 1/ Sent 7-Please define "background sources" more fully.	Those point, nonpoint, and natural sources located upriver from Minidoka Dam.
Jerrold D. Gregg	Pg 10, 2.1.1/ Par 4/ Sent 4-"a total volume of 5,800" should be change to "a total discharge of 5,800"	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 11-12-Cross-hatching patterns are difficult to see especially in black and white	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 12-Bureau of Reclamation owns some lands north of Rupert. It is hard to tell but it looks like those parcels are shown as Bureau of Land Management.	IDEQ-TFRO GIS coverage may contain errors as seen in previous coverages. These will be rectified during the Implementation phase of the TMDL, or as new GIS coverages are developed.
Jerrold D. Gregg	Pg 13, 2.1.1.2/ Par 3/ last Sent.-Reconstruction of Milner Dam and the addition of the Lower Milner Powerplant did change the operation to keep a full pool year round but the maximum pool and the irrigation season operation did not change.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 23, 2.1.3.2/ Par 2-It should be noted that power generation by Idaho Power Company at American Falls Dam is incidental to releases for flood control and irrigation. Idaho Power has 44,274 acre-feet of storage space in American Falls that they can control for releases through the powerplant, usually for delivery at Milner.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 23, 2.1.3.2/ Par 2/ Sent 6-The 300 cfs minimum winter release is an unofficial minimum based on an agreement with the Governor of Idaho to prevent damage to the fishery below American Falls Dam.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 23, 2.1.3.2/ Par 3-It should be noted that power generation is incidental to releases for flood control and irrigation, therefore; no water is released specifically to generate power.	We have made the appropriate changes to reflect your comments.

Jerrold D. Gregg	Pg 23-24, 2.1.3.2/ Par 3/last Sent-The original five units out of the seven existing units were retired in 1994. The two remaining units were rebuilt along with the construction of the replacement powerplant containing the two 10 megawatt turbines. Renovation of Walcott State Park proceeded the powerplant construction and was not part of the powerplant project.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 24, 2.1.3.2/ Par 4-Milner Dam is owned by Milner Dam Inc. Twin Falls Canal Company is a principle owner of the corporation, along with the Northside Canal Company.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 24, 2.1.3.3/ Par 1/ Sent 2-Reclamation's estimate of reach gains of 250-350 cfs is based on the difference between the measured flow at the Neeley gage and the computed inflow to Lake Walcott. Tributaries in this reach are not measured. Inflow to Lake Walcott is the sum of change in storage, measured discharge to the river and measured diversions of two canals.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 24, 2.1.3.3/ Par 1-Please reference the data available and explain how the reach gain analysis made by IDEQ was performed for the reaches American Falls Dam to Minidoka Dam and Minidoka Dam to Milner Dam. For Figure 9 river gains/losses should equal surface inputs plus groundwater gains/losses; unless, diversion by small pumping plants and evaporation accounts for the difference.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 25, 2.1.3.3/ Par 2/ Sent 5-The injection wells are owned by the Bureau of Reclamation but managed by the A&B Irrigation District. It should also be mentioned here that A&B Irrigation District and Reclamation have been working to close as many of the injection wells as possible. Recent efforts include the construction of collection systems and pump back systems to reuse the water or to move the drain water to constructed wetlands where the water is allowed to evaporate, to be used by wetland plants, or to return to the aquifer by infiltration.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 25, 2.1.3.3/ Par 3-"part of Minidoka near" should be "part of Minidoka County, near"	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 33, 2.1.3.5/ Par 1/ Sent 3-Kjelstrom data is cited which estimates that during the irrigation season 940 cfs is "used" on the north side and 780 cfs on the south side. Does the term "used" refer to consumptively used or is this the total amount that is diverted?	We have made the appropriate changes to reflect your comments.

Jerrold D. Gregg	Pg 33, 2.1.3.5/ Par 2/ Sent 3-The flow leaving Lake Walcott is measured a few hundred yards below the south side canal headgates. In the reach between this gage and the first lift pumping plant water is delivered to farm turnouts and laterals of the Minidoka Irrigation District. The amount of water pumped at the first lift pumping station is also recorded. Is the 650 cfs reported the average discharge at the gage below the dam or at the first lift pumping plant? Does the 79.4 cfs return flow include water returned to the river in what is called the "F-waste spill" which is just before the first lift pumping plant? Clarification is needed about where this accounting takes place.	See Campbell 1997 for clarification of locations. The 650 cfs is from A-1 lift, return flows are the sum of discharges from drains located on the south side of the Snake River in Campbell 1997. Any further descriptions of location should be referred to Campbell 1997.
Jerrold D. Gregg	Pg 36, 2.1.4.1/ Par 3-BOD should be biochemical oxygen demand rather than biological oxygen demand.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 59, 2.2.4.1/ Par 2/ Sent 2-A XY plot of TSS versus the discharge data and the values for the correlation would be helpful here. Also, what is meant by "normalization of the data"?	One of the assumptions of parametric statistics is that the distribution of the population is a normal frequency distribution. Transformation of the data by mathematical functions are sometimes used to effect a normal distribution of nonnormally distributed data. Such was the case with the TSS and discharge in the segments of the Lake Walcott TMDL. A logarithmic function was needed to change the shape of the relationship to a normal distribution. This process is what is referred to by normalization of the data. Because of this transformation, IDEQ felt that most readers would be confused by XY plots of nontransformed data and the apparent lack of a relationship. Additionally, IDEQ felt that XY plots of the transformed data would further confuse most readers as the transformed data would not be simple to back transform. Therefore, for the clarity of most readers, a narrative approach was taken to describe the TSS/discharge relationship. Additionally, the values for these correlations can be found in section 3.5.1.
Jerrold D. Gregg	Pg 60, 2.2.4.1/ Par 7-Table 25 is referenced for a list of major pollutant sources in the watershed. Should this be referencing table 10 or table 26?	Yes, reference was to Tables 10 and 26.

Jerrold D. Gregg	Pg 60, 2.2.4.1/ Par 9/ Sent 3-Since reconstruction of Milner Dam in the early 1990s the pool has been held full year round instead of lowering it during the winter. However, there is a misconception that Milner pool has been maintained at higher levels during the spring and early summer than prior to the reconstruction of Milner Dam. This is simply not true.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 60, 2.2.4.1/ Par 10-Generally, phosphorus tends to adsorb to soil. Most often, if a reduction in TSS is observed, there will also be a reduction in TP concentration. In some cases, a reduction TP can be seen without a reduction in TSS. In the last sentence of the 4th paragraph, the logic of the TSS - TP relationship appears to be reversed.	TP reductions will be required in the Milner Pool segment of the Snake River. The point of the narrative was that a reduction in TSS may be the most effective means by which to get this TP reduction for nonpoint sources and therefore reductions in TSS could be realized in this segment. This clarification will be made.
Jerrold D. Gregg	Pg 64-66-In tables 12 through 15, one of the parameters is noted as "Fecal Coli". Should this be fecal coliform?	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 78, Table 18-Since 1996 USGS gage 13088000 is the combined flow of the river at USGS gage 13087995 and the discharge of the Lower Milner Powerplant.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 81-The first sentence in section 2.2.4.2 should include clarification that the numerical guidelines are for instantaneous fecal coliform samples.	The sentence indicates that the samples were assessed using the instantaneous criteria.
Jerrold D. Gregg	Pg 90, 2.2.4.6/ Par 2-Some of the information in the paragraph based on (BOR, 1996) is incorrect and was probably based on an early draft copy which was later corrected. The drawndown of American Falls Reservoir in 1994 was part of normal operations during a sequence of dry years. Reclamation did sample the releases to determine sediment concentrations. Below about 47,000 acre-feet sediment in the discharge increased rapidly. However, there is no minimum storage requirement. The last sentence is also incorrect. Since 1994 water supplies have been average or above and the reservoir has not been below 600,000 acre-feet. Thus, minimum storage has not been maintained at or near 200,000 acre-feet.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 93, 2.3.1.1/ Par 1-The 300 cfs minimum winter release is an unofficial limit based on an agreement with the Governor of Idaho to prevent damage to the fishery below American Falls Dam.	The sentence states that this is an unofficial and voluntary agreement. Further clarification has been added.
Jerrold D. Gregg	Pg 98, 2.3.1.4.1/ Par 1/ Sent 5-Water diverted at Minidoka Dam into the north side canal feeds Minidoka Irrigation District (Minidoka Project, Gravity Division.) Water in the south side canal feeds a small section of the Minidoka Irrigation District and the entire Burley Irrigation District (Minidoka Project, Pump Division.)	We have made the appropriate changes to reflect your comments.

Jerrold D. Gregg	Pg 99, 2.3.1.4.2/ Par 1-In the first paragraph, table 17 is referenced, should that be table 18? Include units (i.e. lbs/day) for the limits presented in table 23.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 106-Table 28 needs to be completed.	
Jerrold D. Gregg	Pg 108, 2.4.1.2/ Par 5-Idaho Power Company's ability to provide minimum flows below Milner Dam and American Falls Dam is limited to their primary storage of 44,274 acre-feet in American Falls Reservoir and possible rentals from the Upper Snake Rental Pool. However, in dry years when minimum flows would be called for, there may not be water available in the rental pool to rent.	IDEQ is uncertain what clarifications are needed.
Jerrold D. Gregg	Pg 110, 2.4.1.7/ Par 3-The majority of the injection wells closed in the A&B Irrigation District have been closed due to efforts of the District and Reclamation to reduce the threat of groundwater contamination. These wells have been closed by building drainage collection and pumpback systems which either reuse the water or discharge into constructed wetlands where the water either evaporates, is used by wetland plants, or infiltrates into the aquifer.	We have made the appropriate changes to reflect your comments.
Jerrold D. Gregg	Pg 121-125-Check points need to be identified for each reach of the Snake River with identified instream targets.	The Lake Walcott WAG and IDEQ-TFRO will determine appropriate compliance points for the TMDLs during the Implementation Plan Phase.
Jerrold D. Gregg	Pg 121, 3.1.1.1/ Par 1-There needs to be specific language in this paragraph to define how and under what legal authority this TMDL proposes to limit the TSS concentration in the discharge from American Falls Dam. Does the anti-degradation TMDL assume that existing or historic river management activities are considered "background" or "base condition" and therefore limits may be exceeded if the mode of operation stays the same? Does the TMDL propose to change upstream river management to meet the limits presented? Limits placed on American Falls Dam releases may in some years restrict flood control operations or limit Reclamation's ability to meet contractual obligations to deliver storage water. There could also be a direct conflict with the ability to deliver storage water or regulate to meet Endangered Species Act requirements.	See response to USBOR general comments.
Jerrold D. Gregg	Pg 124, 3.1.5.1/ Par 1-Should "good fishery" be "moderate fishery". Looks like terminology is different in this paragraph as compared to 3.1.6.1.	We have made the appropriate changes to reflect your comments.

Howard K. Kestie	It seems our participation in this process would be through cooperative grazing management plans with adjoining private and/or federal land managers.	The state lands in the Lake Walcott Subbasin have a load allocation for sediment in the Rockland watersheds and for TP in the Milner Pool area. The IDL will be responsible for meeting those load reductions and to meet the water quality targets for those water bodies. If this can be accomplished through cooperative grazing management plans with other entities then you are correct. If the reductions cannot be met through these plans IDL will need to take a more active role. In the following year, the Lake Walcott WAG will address implementation of the TMDL. It is suggested that all parties with a waste load or load allocations participate in the implementation phase.

B. Public comments received by IDEQ-TFRO after December 3, 1999.

Carl H Nellis	Overall, considerably more detail and information have been included in this draft- which provides much more support for the conclusions. We are however, still concerned with the lack of formation of an active technical group for the WAG and writing of this assessment. IDFG personnel presented comments critical of IDEQs portrayal of fish and wildlife issues in our letter of December 14, 1998 and we still see some of the same lack of understanding in this draft. We feel much of the misunderstandings in this draft could have been cleared-up through a technical advisory group.	The Lake Walcott WAG was presented with a proposal to form a TAC group on December 9, 1998 by IDEQ. Subsequent to that meeting, a subcommittee was formed to develop a TAC for the WAG. IDFG personnel were included as persons to be asked to sit on the TAC. January 27, 1999 the subcommittee had finalized a list of TAC members and the WAG accepted their recommendations. The subcommittee has met on a semi-regular basis since that time. IDEQ is uncertain at this time if the TAC subcommittee has contacted IDFG. Furthermore, IDEQ has presented portions of the Lake Walcott SBA and TMDL to the Mid-Snake TAC of which IDFG are participants. In addition, IDEQ is concerned that IDFG has failed to attend most of the Lake Walcott WAG meetings in light of the strong concerns voiced in their comments. Attendance at the WAG meetings would have kept IDFG up to breast on the development of the Lake Walcott SBA and TMDL.
Carl H Nellis	The word “waterfowl” is one word. We noticed it written as either one or two words throughout the document.	The word waterfowl was found incorrectly spelled 2 out of 17 times in the document. The change was made as suggested.
Carl H Nellis	The Executive Summary is very misleading. As previously pointed out to DEQ personnel, the water quality data used for the assessment was collected during a period of abnormally high flow conditions and only during daylight hours – which provides a very limited data set. To characterize water quality “as very good” is also not supported by the dialogue found throughout the document - especially for sediment. This broad generalization based on very limited water quality sampling also seems inconsistent with the Environmental Protection Agencies labeling of the reach as “water quality limited”.	Water quality data presented in this SBA and TMDL included data outside of high flow conditions and collected in evening and early morning hours (see section 2.2.4 and 2.2.4.1). All applicable STORET data was included. STORET data included collections as early as 1962 to present. The broad generalization referred to was based on an extensive collection of water quality data. IDFG is also aware of other rivers in the state that may have been listed erroneously as water quality limited such as the headwaters of the Big Wood River.

Carl H Nellis	To categorize the fishery within the reach as “improving” is also inaccurate. Because of poor water quality (sediment, dissolved oxygen, temperature), dams, etc. the current fish communities of this reach are dominated by more pollution tolerant, non-native species than were historically present. Currently, gamefish populations in this reach are supported solely through artificial propagation programs because of water quality impacts on critical habitats. Native fish populations are virtually non-existent with Yellowstone cutthroat, whitefish, and species such as leatherside chub having been mostly expatriated from the watershed. There is no fish sampling data presented to support an “improving” trend for the entire fish community of the WSBA area.	The data does not support IDFGs contention of poor water quality. IDEQ can not assess the water quality of a system based on the presence of non-native salmonids rather than native salmonids. The conclusions drawn in the SBA-TMDL were based on the limited fisheries data and the extensive water quality data. In a letter sent to IDEQ from the IDFG, it was stated that it could be assumed, because of a lack of fisheries data, that if water quality decreased so then would the fishery. If this is the case then if water quality should improve then an improving trend in a fishery could also be expected. As was demonstrated by the SBA-TMDL, water quality has improved in the Subbasin over the last two decades.

Carl H Nellis	We also disagree with the assertion that "the three dams in the reach have had any positive effect on salmonid populations within the Snake River". Impacts associated with the dams include: spawning and seasonal migrations barriers, creating homogenous habitat, increasing water temperatures, and creating nutrient "sinks" which negatively influence dissolved oxygen levels. In addition, they alter the natural hydrograph which eliminates scouring flows needed to rejuvenate riparian communities, alters sediment transport dynamics both upstream and downstream of the dams which reduces gravel deposition and rejuvenation, and alters the time of year fine sediment is entrained in the water column. The result of fine sediment deposition during the late summer/fall is a loss of interstitial spaces in streambed substrate, which are critical winter habitat for fish and habitat for macroinvertebrates. The most devastating impact to native fish communities is that more water is allocated for diversion by these dams than exists in the Snake River during irrigation season (see page 14).	The assertion that the three dams have had any positive effects on the salmonid populations was derived from the fact that while water quality was at its poorest, in the late 1970s and early 1980s, a sport fishery was still maintained below the dams. To this date, sport fisheries exist below the dams. These populations may be the result of stocking programs of the IDFG, However, IDFG personnel have noted that no records of naturally spawning salmonids exist on the Snake River segments and that historically spawning was doubtful. As a result of the construction of the dams, as far back as 1927, a put and take fishery is the best that could be hoped for in the river segments of the Walcott Subbasin unless access to the tributary spawning grounds are restored via removal of the dams. To this end, we agree that the dams have blocked the seasonal migration of salmonids in the Walcott Subbasin and have altered the natural hydrograph, and habitat dynamics of the system. However, the data presented in the SBA-TMDL indicates that water quality parameters are with acceptable limits for cold water biota and salmonid spawning in the Snake River segments.

Carl H Nellis	Section 2.1.4.1 FISHERIES: This section contains a considerable amount of text and personal quotes attributed to IDFG that are taken out of the context for which they were intended to be used. By no means should they be used to portray fishery conditions within the entire WSBA area. Granted, there are some isolated areas where beneficial uses related to fish are being met by reproducing populations of coldwater salmonids, but we consider these areas exceptions rather than the "norm".	On several occasions IDFG personnel were contacted to provide answers to issues in the SBA-TMDL. The personal quotes in question were from several very specific questions posed to the IDFG biologists and managers. At that time they were informed that their answers would be used in the SBA-TMDL to fill in needed information due to the lack of fisheries data. IDEQ does not feel that the quotations were taken out of context. Additionally, the aforementioned quotations were supported by the water quality data in IDEQs possession. Furthermore, These comments were not used to portray conditions in the entire Subbasin, simply thoses э303(d) listed waterbodies. IDEQ will add other waterbodies in the Subbasin to the э303(d) list and develop TMDLs for them following data gathered or supplied to IDEQ showing the beneficial uses are not supported.
Carl H Nellis	We disagree with the statement that, "A comparison of the watershed's designated uses with fishery assessments will provide linkage for meeting beneficial uses." It is our assertion that, basin-wide, beneficial uses are not being met. We suggest you look at 1) why coldwater salmonids are still found within the watershed and 2) changes in range and distribution of native coldwater salmonids within the WSBA area.	The beneficial uses in question are specific to the Snake River segments and tributaries, they should not be interpreted to apply to the watershed. These designated uses can be found in section 2.2.3.1. In this Subbasin, and in the Snake River, salmonid spawning is only designated in the upper segment of Milner Pool. Cold water biota criteria should be used to assess the other upstream segments of the Snake River in the Subbasin. Additionally, Warm water biota is the designated beneficial use in the lower segment of Milner Pool. Additionally, salmonid spawning includes non-native salmonids and whitefish. IDEQ will list any water body shown to have had an existing population of salmonids that currently does not have such a population. IDEQ has invited IDFG to supply this data for other 303(d) listing cycles.

Carl H Nellis	To address 1) above, you need to look at your references for this section. All references to fishing and quality of the fishery are on artificially propagated fish populations. They also refer to a very small geographic area – not the entire region covered in the WSBA. For instance, the fishery below American Falls Dam is on fish stocked in American Falls Reservoir and entrained through the dam, Lake Walcott fishery is based solely on fish stocked annually by IDFG, Milner Lake fishery is supported by stocking programs paid for by IDFG and Idaho Power Company. The reason self sustaining fisheries no longer exist are related to water quality. In IDFG's Fisheries Management Plan 1996 – 2000 , page 6 states, "Maintaining self-perpetuating populations of fish and wildlife will receive priority over stocking programs." The reason our agency has resorted to stocking large numbers of non-native fish in the watershed is because habitat conditions no longer allow for harvestable, self-sustaining populations of native fish. We consider the loss of native fish habitat capable of supporting these populations tied directly to water quality degradation within the watershed.	See comment response from above. IDEQ disagrees with IDFGs assessment that the reason self sustaining fish populations do not exit is solely related to water quality problems. The data presented in the SBA-TMDL refute this assertion. Additionally, IDFG biologists have stated that escapement into the canal system in the Milner Pool area may be a significant reason for the lack of a better fishery. Additionally cited reports from IDFG indicate that fishing mortality may be a significant factor.
Carl H Nellis	As for 2), dealing with distribution within the Subbasin we suggest our agencies jointly develop a map showing historic versus present distribution of native fish species. Historically, the native species were found throughout the WSBA area. Leatherside chub and Yellowstone cutthroat were found in all tributaries and the main Snake River. Now, these once widely distributed fish are only found in isolated headwater areas with no connectivity between remnant populations.	IDEQ agrees that a map showing historic versus present distribution of native fishes would be a worthwhile endeavor for our agencies. However, the comment may emphasize the misunderstanding IDFG has concerning beneficial uses. The criteria are designed to protect the water quality capable of supporting populations of salmonids. In no way does this imply native salmonids only. Additionally, those segments designated for cold water biota only do not require that naturally reproducing populations of salmonids exist. Cold water biota may be fully supported with a put, grow, and take fishery.

Carl H Nellis	We disagree with the "conclusion that the current native assemblage of fishes is similar to those historically found in the Lake Walcott Reach." The Walcott Reach of the Snake River was historically a "riverine" type environment with a narrow riparian fringe. Antidotal (*sic*) information suggests that native coldwater species were prevalent throughout the reach. The majority of the area is now an impoundment supporting pollution tolerant warmwater species.	Data supplied to IDEQ by IDFG and anecdotal information from local fishermen indicates that native salmonids are occasionally found within the Snake River in the Walcott Subbasin. However, the conclusions of the section were that pollution tolerant species assemblages were similar to the present assemblage and that the number of pollution tolerant species have not increased dramatically.IDEQ did not mean to infer any abundance changes have occurred in the segments.
Carl H Nellis	To summarize our recommendation for this section – our agencies need to get together and re-write this section to accurately convey conditions within the WSBA area.	IDEQ feels that it accurately conveyed the conditions within the 303(d) listed segments of the Lake Walcott Subbasin. Further review of new or additional fisheries and water quality data will be conducted by IDEQ during the implementation phase of the TMDL. During this time, IDFG can provide a written biological assessment of the fisheries data for evaluation by IDEQ and inclusion in future iterations or phases of the TMDL.
Carl H Nellis	<u>2.2.2 WATER LIMITED SEGMENTS IN THE SUBBASIN</u>: IDFG is listed as the information source for several segments. You need to cite the document or letter this information is taken from.	The information requested was cited in the SBA-TMDL as the 1992 305(b) report. This information can be found in: the 1992 Idaho Water Quality Status Report. In Appendix D column 5, various agencies submitted rivers or streams for inclusion in the report. We have made the appropriate changes to reflect your comments.
Carl H Nellis	<u>3.0 SEDIMENT AND SETTALABLE SOLIDS</u>: In listing impacts on fish populations you should also reference loss of juvenile rearing and over-wintering habitat. As water temperatures decline in the winter, juvenile salmonids seek interstitial spaces in the substrate where they become torpid. When sediment fills the interstitial spaces, it leaves the juvenile fish with no cover during this period of inactivity and makes them more vulnerable to predation.	We have made the appropriate changes to reflect your comments.
Carl H Nellis	… are the levels shown (e.g. 25 mg/l, etc.) instantaneous maximums or averaged over some period of time?	The 25 mg/L TSS target is a monthly average. The 40 mg/L TSS is a daily maximum.

Carl H Nellis	There are tributaries that enter the Walcott reach from the south side of the Snake River which are spring-fed and display a relatively "flat" hydrograph. Consequently, these systems have a reduced capacity to assimilate large inputs of sediment – either from man-caused sources or catastrophic natural events. To address this issue we recommend an additional data need would be a reconnaissance of the spring-fed streams to identify: 1) potential for substrate to support spawning and juvenile rearing of salmonids; and 2) restoration measures necessary to rejuvenate affected habitats once water quality targets are met. Measuring cobble embededness would be the most logical way to assess sediment/substrate interaction as it relates to aquatic organisms.	At this time the SBA-TMDL is addressing those waterbodies that were on the 1996 э303(d) list. Following BURP and waterbody assessment these other streams will be added to the э303(d) list and TMDLs developed for them if it is demonstrated by the data that their beneficial uses are not supported.
Carl H Nellis	We also encourage you to incorporate substrate goals with the sediment targets.	At this time IDEQ feels that the restrictive TSS targets developed for the river and stream segments are stringent enough to restore the beneficial uses to the streams and maintain the beneficial use support of the river segments. Substrate targets may be developed in the future if it is determined this is not the case. As currently written the SBA-TMDL will reassess the instream water quality following five years of target attainment. Additionally, substrate information was indicated in the SBA-TMDL as a data gap that needed to be filled in future iterations.

Carl H Nellis	2.2.3.5 FISHERIES CONCERN ON 303(d) LISTED WATER BODIES: Our assessment of the following quote is that not all of the Subbasin is meeting beneficial use designations: The water quality in the Lake Walcott reach has improved over the past one to two decades due mainly to reissuance of NPDES permits in the area, and self and FERC imposed operational limits of the hydroelectric facilities. As a result of the improvement of water quality, the fishery could be assumed to have improved as well. Although the proposed TMDL for the Lake Walcott reach does not propose to restore water quality to historical levels (pre-dams), but rather to levels where water quality is sufficient to protect beneficial uses and provide water quality capable of supporting self-sustaining populations of aquatic biota. This does not mean that viable populations will exist in the reach following implementation of the TMDL, but, that the water quality will be sufficient such that the population could exist. Other factors that may limit the populations, such as high escapement into canal systems or limited access to tributary spawning grounds due to development and dam construction may have to be assessed in other forums. These factors may have altered the system to the extent that a put and take fishery is the only option even if water quality in the reach were to be restored to pre-dam levels. This appears contrary to comments in Section 2.1.4.1 FISHERIES and the Executive Summary.	It appears that the IDFG may have misunderstood the SBA-TMDL for the Lake Walcott Subbasin. This SBA-TMDL deals with those waterbodies on the 1996 э303(d) list not the whole Subbasin. Other waterbodies may be added in the future as they are determined to be not meeting their beneficial uses. Additionally, the TMDL is meant to restore and protect the existing and designated beneficial uses. Those beneficial uses can be found in section 2.2.3.1. Additionally, Salmonid spawning, as a beneficial use, does not imply native salmonids only.
Carl H Nellis	Waterfowl are cited (Gianotto) as contributing 62.7 lbs. of P per day – roughly 1% of the outflow of Milner. How much of this load attributed to waterfowl is new versus re-suspended P? There is also a solids load attributed to waterfowl. How is re-suspension of material already in the water column considered in calculations? We suggest you judge inputs from waterfowl as “background” within the watershed.	The contribution of waterfowl were cited as one of the sources of TP and solids in the system. By no means does IDEQ imply that loadings from waterfowl are to be reduced or are anything but natural background.

Carl H Nellis	Tables 12 - 15 STATISTICAL RELATIONS OF WATER QUALITY PARAMETERS OF THE SNAKE RIVER: We disagree with the portion of the narrative which reads, "The data properties of pH, SpC, ammonia (NH3), and nitrogen are listed in Table 9-13-15, but are well below levels causing concern." As a general rule, unionized ammonia (NH3) is considered at the upper tolerance limit for continuous exposure at levels of greater than 0.0125 mg/l (Piper, et.al. 1986. Fish Hatchery Management. USFWS pp14) for coldwater salmonids. Piper also notes that chronic effects on coldwater fish depends on other variables such as temperature, pH, and length of exposure. Chronic effects of temperature should also be discussed in relation to length of exposure and availability of microhabitats during extreme events.	IDEQ felt that a discussion of unionized ammonia was not needed as the levels of total ammonia presented were below levels causing concern. On average, the calculated unionized fraction of total ammonia were an order of magnitude less (e.g. 0.00121 mg/L) than the tolerance limit suggested by IDFG. In addition, the length of exposure to extreme temperature events were discussed in section 2.2.4.1.
Carl H Nellis	2.4.1.2 401 WATER QUALITY CERTIFICATION PROCESS : BOR projects are federal projects and therefore do not go through a relicensing process. Reference to such needs to be removed.	We have made the appropriate changes to reflect your comments.
Carl H Nellis	Table 45 and 46 need more explanation on how the nutrient load was derived and what its future implications are. One of the primary questions we have is if beneficial uses are not currently being met, how can you have an unallocated load for future growth?	The nutrient load was derived from DMRs and monitoring studies conducted by IDEQ and IDA. These derivations were described in sections 3.2 through 3.5.3. The table in question (Table 47) is a consolidation of the information found in those section intended to simplify the TMDL for the reader. The future implications are that a 37% reduction in TP will occur in the Milner Pool from both point source and nonpoint sources. There is no unallocated load for future growth for TP. The unallocated TSS load indicates that the beneficial uses are not impaired by TSS (as demonstrated by the SBA-TMDL) and that currently the TSS loads from point and nonpoint sources are below the load capacity of the river segment.

Carl H Nellis	Table 51: When you discuss agency management responsibilities, you should list Idaho Dept. of Fish and Game as having sole management over fish and wildlife in the State of Idaho as defined in §36-103 of the Idaho Code. It is also worth noting that, although we have management authority over fish and wildlife, we have no management authority over the habitat needed to support sustainable populations.	Table 51 included only those agencies with land management responsibilities. IDEQ recognizes that IDFG is the sole manager of the fish and wildlife in the sate. However, to implement the needed reductions in a TMDL these other agencies were identified and the Idaho code that empowered them to develop BMPs were cited. As IDFG noted in its response "we have no management authority over the habitat needed to support sustainable populations." It was for this reason IDFG was not included in the table.
Carl H Nellis	To summarize our comments, this draft of the document provides a more complete description of conditions within the assessment area and of water quality targets. There are still, however a number of errors and inconsistencies in references to fish and wildlife. To remedy these problems, representatives of our agencies need to meet and rectify presented issues. Please contact Dave Parrish, Environmental Staff Biologist at this office to coordinate the participation.	Because of the iterative approach taken with the Lake Walcott SBA-TMDL, IDEQ would appreciate the opportunity to meet with the IDFG. At that time, discussion of future changes in the document in regards to fish and wildlife issues could be made. Following submittal to USEPA, IDEQ plans to enter the implementation phase of the TMDL. The presence of IDFG personnel at WAG meetings during this phase would facilities changes in the document and allow for better implementation of the water quality targets proposed in the TMDL.

Leigh Woodruff 1	p. 53 The discussion of sediment and "settleable solids" focuses on suspended sediment, and levels of TSS protective of fisheries and other aquatic organisms, and ignores bedload and substrate conditions. We believe this leaves a significant gap in the TMDL.	It is IDEQs assertion that bedload and substrate conditions were not ignored throughout the SBA-TMDL. Rather, these components do not play a large role in the Snake River segments as discussed at length throughout the SBA-TMDL. In the tributary stream segments, however, the magnitude of the observed TSS problem far outweighs the bedload and substrate issues. It was felt that until major reductions in TSS would occur substrate targets and bedload targets would be meaningless. Sufficient data on TSS also existed to determine the TSS load capacity of the tributary streams. No information existed to begin estimating a bedload load capacity or suitable target. Furthermore, substrate and salmonid issues were identified as a data gap to be filled in the future.

Leigh Woodruff 2	TMDLs are required to be established at levels which meet water quality standards, including full support of beneficial uses, and achieving all applicable water quality criteria for those uses. The Snake River segments and tributaries evaluated in your document are not fully supporting their cold water biota and salmonid spawning designated uses.	IDEQ agrees that the beneficial uses in the Rockland tributaries are not fully supported as evidenced by BURP data and TSS data. In the Snake River segments the assertion that beneficial uses are not supported is not supported by the water quality and fisheries data presented in the SBA-TMDL. The lone exemption to this is that recreational uses are not supported in the Milner Pool due to excessive nuisance vegetation which inturn is caused by excessive nutrients (TP). In this segment it was demonstrated in the SBA-TMDL that salmonid spawning and cold water biota were supported. As a result of the beneficial uses not being supported in the Rockland tributaries, load reductions in TSS were proposed to meet water quality targets recommended to restore fully supported beneficial uses. These targets were developed by a variety of sources including a collaborative effort by IDEQ and USEPA (Rowe et al. 1998). The Rowe et al. (1998) reference indicates that both cold water biota and salmonid spawning would be fully supported at the chosen targets. At this time it is unclear to IDEQ how one can maintain good to moderate fisheries, as the target chosen indicates would happen, without salmonid spawning being supported. In addition, IDEQ has set water quality targets in the SBA-TMDL that establish levels at which water quality standards will be achieved.
Leigh Woodruff 3	while the TSS target may be sufficient to provide protection for cold water biota (see discussion below), it does not necessarily protect salmonid spawning, which is affected both by substrate conditions and water column conditions.	See response to Leigh Woodruff 2. In addition, the cited sources for the chosen TSS targets indicate that these levels would provide high protection of salmonid spawning, in the case of the 25 mg/L target, and good to moderate protection of salmonid spawning in the case of the 50 mg/L target.

Leigh Woodruff 4	the TMDL must provide assurance that all affected uses will be protected by the established target	See comments to Leigh Woodruff 2 and 3., In addition, the criteria for salmonid spawning are more restrictive than for cold or warm water biota. If the target is protective of salmonid spawning then IDEQ has assumed that it would also be supportive of cold and warm water biota.
Leigh Woodruff 5	the TMDL does not clearly link the cause of impairment of salmonid spawning to the instream target nor beneficial use support. The TMDL is incomplete without such a linkage.	This question is not clear to IDEQ. The water quality and fisheries data presented in the SBA-TMDL indicate that salmonid spawning and cold water biota beneficial uses are not impaired by TSS in the Milner Pool. The current levels of TSS in the Rockland tributaries indicate that salmonid spawning could not be supported. The Rowe et al. (1998) paper summarized literature sources that link TSS levels greater than 400 mg/L and no protection of salmonid spawning. The paper provides further sources that state "direct acute effects of suspended sediment on adult fish are generally not observed until concentrations reach tens of thousands to a hundred thousand or more mg/L." IDEQ has presented data in the SBA that TSS levels in the Rockland tributaries have been measured in excess of 1000 mg/L unlike the Snake River segments. From this data IDEQ has made the link that salmonid spawning and cold water biota are not supported in the Rockland tributaries due to TSS. Furthermore, the literature reviewed indicates that at 50 mg/L TSS salmonid spawning and cold water biota would be supported. Hence, the link to the target, impairment, and future support of the beneficial uses is made by the chosen target.

Leigh Woodruff 6	how will the TSS target ensure that substrate conditions will improve such that they are conducive to salmonid spawning. For example, interstitial spaces in gravels are not clogged, dissolved oxygen concentrations in gravels are adequate, etc.	The TSS target will ensure that salmonid spawning and cold water biota are not impaired by TSS. Again the magnitude of the TSS problem in the Rockland tributaries is almost self evident. By including other substrate targets at this time IDEQ feels that restoring fully supported beneficial uses will be greatly delayed. More time and effort will be needed to justify uncertain substrate targets and developing methods in which to measure the effects and compliance with these other targets. Additionally the data needed to set such targets in completely lacking in this area (as identified in the data gaps section of the SBA-TMDL), while reasonable amounts of TSS data exists which points to impairment of the beneficial uses by TSS. If after the TSS target is met and beneficial uses are still not supported, then IDEQ will evaluate appropriate substrate targets and include them in future iterations of this TMDL.
Leigh Woodruff 7	On p. 56 it is indicated that bedload is ignored because "..dams and reservoirs effectively interupt transport of this component of sediment..". We agree that reservoirs act to trap bedload, but effects of bedload in tributaries (e.g. Rock Cr.) and sections of the Snake R. upstream of the reservoirs are not addressed in the document.	Please see responses to comments from Leigh Woodruff 1-6.

Leigh Woodruff 8	The IDEQ draft *Sediment Targets Used or Proposed for TMDLS* (Rowe, Essig, and Fitzgerald, 1999) describes a target for embeddedness: subsurface sediment of <0.85mm should not exceed 10%. This is one example of an interim target which could be used until more data can be collected to link TSS loads to substrate conditions and until we all have a better understanding of how salmonid spawning is affected by substrate and TSS in this system. Load allocations could still be based on the TSS target, since we are not aware of any means to establish a quantitative link between TSS and substrate conditions. We recommend that substrate be monitored periodically at selected locations to ensure that the TSS reductions were resulting in the substrate sediment target being met. Such monitoring sites could be potential salmonid spawning habitat and other coldwater biota rearing habitat.	It is IDEQs interpretation of the narrative water quality standards that the targets chosen in this SBA-TMDL will provide for fully supported beneficial uses, including salmonid spawning. IDEQ-TFRO feels that the water column targets will provide for continued support of beneficial uses in those cases where TSS targets are 25/40 mg/L and that the 50/80 mg/L target will achieve full support of SS. No bedload targets will be addressed in the TMDL at this time. Please see responses to comments from Leigh Woodruff 1-6.
Leigh Woodruff 9	p. 133, 134 We recommend moving all or most of this discussion to the section on targets, as it really provides the basis for the targets.	These sections are reiterations of information found in the sections concerning targets.
Leigh Woodruff 10	25/40 mg/l - *"...maintains high protection levels for the fisheries located within the reaches.."* These levels appear to be above current concentrations in the Snake River based on data summarized in the document. In light of the existing sediment impairment, the increased loading of TSS this TMDL would allow does not appear to lead to attainment of water quality standards. Given such an increase, its also not clear how these targets provide a margin of safety	The water quality and fisheries data presented in the SBA-TMDL indicate that beneficial uses are not impaired by sediment. The targets were chosen to protect the current level of water quality in the Snake River segments, which are meeting their water quality standards for sediment. Additionally, the TMDL does not allow for further degradation of water quality. It was determined that the targets and load capacity was such that the water quality standards would continue to be met. Please see responses to comments from Leigh Woodruff 1-9.

Leigh Woodruff 11	50/80 mg/l - We believe these are reasonable interim water column TSS targets where current concentrations exceed these levels, e.g. tributaries. However, Miller's (1998) review of the literature identified studies which show adverse effects from TSS concentrations well below 50 mg/l in some cases. Due to these uncertainties, IDEQ and EPA are collaborating on a study in the Boise River to evaluate the toxic effects of TSS on key fish species. IDEQ has committed to consider these results as they become available, and revise the TSS targets in the Lower Boise TMDL if appropriate. We believe a similar commitment to evaluate new information, such as results of this upcoming study, and revise the targets (and hence allocations) over time is necessary given the uncertainty in the protectiveness of proposed targets. Also given the uncertainties in the targets, we do not believe they provide a margin of safety.	The SBA-TMDL was intended to be iterative, as seen in section 3.7-3.7.6. IDEQ-TFRO will revise the TSS targets as better information is developed. For margin of safety response, please see responses to comments from Leigh Woodruff 1-9.
Leigh Woodruff 12	p. 90 "The most consequential annual effects of suspended sediment upon the Snake River in this reach are largely hidden because of the load that settles out in the reservoirs. Ultimately, these cumulative effects will have significant effects, as noted by Power Soil Conservation District et.al...." How will the TSS targets address these concerns?	These concerns were based on the potential accelerated TSS loads entering the reservoirs and TSS loads entering the segment from Subbasins with scheduled TMDL. The TSS targets will limit the amount of sediment entering the reservoirs prolonging the "life" of the reservoirs. Future TMDLs in the Raft River Subbasin will further alleviate these concerns.
Leigh Woodruff 13	p. 54 We recognize that dam construction and access to tributary spawning grounds are limiting factors in the Lake Walcott reach which are likely beyond the scope of the TMDL. However, sediment's effects on salmonid spawning in areas designated for this use, including Minikoda Dam to Burley Bridge in the Snake River, Rock Cr., and EF Rock Cr., must still be addressed by the TMDL. We believe more specific discussion of sediments effects in these areas is warranted, in addition to setting substrate targets to protect this use, as described above.	See response to Leigh Woodruff comments 1-12.

Leigh Woodruff 14	p. 82, 87 The discussion of bacteria monitoring indicates that primary and secondary contact recreation criteria have been exceeded a significant percentage of the time in both agricultural return drains and S.F. Rock Cr. We agree that periodic bacteria monitoring should continue until state standards are met in these waters. We also believe that both the ag return drains and S.F. Rock Cr. are waters of the U.S., and the data provides evidence that these waters should be added to the next 303(d) list for bacteria, and that they be scheduled for TMDL development.	As stated in the SBA-TMDL for the South Fork of Rock Creek, as other pollutants are discovered to be impairing beneficial uses TMDLs would be scheduled for later development. Sediment was the only pollutant addressed for this stream as it could be easily inferred as a major pollutant. The inference was drawn from the fact that the other listed streams in the general area were listed for sediment. A bacteria TMDL is scheduled for the South Fork Rock Creek in 2006. However, IDEQ will not propose to list agricultural return drains for impairment of primary or secondary recreational use impairment. If it is determined that the Snake River or other natural waterbodies is impaired by these sources TMDLs will be developed and subsequently the drains will receive load allocations. This decision, however, will be reviewed by the IDEQ State office for further clarification of State policy concerning man-made waterbodies.
Leigh Woodruff 15	p. 82, 122 Although you make it clear that there is limited pesticide monitoring data available, in concluding that pesticides are not currently a concern in this reach, it is not clear why water column data were not also compared to the applicable water quality criteria for protection of freshwater aquatic life; column B, 40 CFR 131.(36)(b)(1).	The comparison was made to the more restrictive drinking water criteria which are incorporated into the state water quality standards by inference.
Leigh Woodruff 16	On p. 122 you indicate that exceedances of these criteria in the future *"...will not constitute a water quality violation in this segment of the Snake River..."*, but will be a basis for further monitoring to establish whether beneficial uses are impaired. We are not clear why exceedances of pesticides criteria would not be considered violations of the water quality standards, and also be a basis for listing/relisting the segment for pesticides. Please explain.	The State does not have sediment or fish tissue standards for pesticides. The criteria used in the pesticides comparison were developed by Canada and as guidelines from EPA. It was felt that until such time that the State developed its own water quality standards for fish tissue and sediments we would not list a water body unless we could link beneficial use impairment with the pesticide levels in either sediment or fish tissue.

Leigh Woodruff 17	Regarding fish tissue concentrations, the document compares the fish tissue data to concentrations intended to protect wildlife which consume fish. We believe it is also necessary to evaluate the risk to human health since water quality criteria for pesticides are also intended to protect human health. For this purpose we recommend using risk assessment assumptions (fish consumption rates, exposure duration, etc.) and procedures used in deriving water quality criteria (see Federal Register 45 FR 79318, Appendix C; November 28, 1980). The Winchester Lake TMDL includes such an analysis.	The comparisons made between the state water quality standards, sediment contamination levels, and fish tissue levels indicated that pesticides in the surrounding areas were not impairing the beneficial uses. Additionally these were the comparisons made by the authors of the various cited sources. IDEQ-TFRO felt that the expertise of these authors, in regards to pesticide monitoring and assessment, was sufficient to base our conclusions on their results. Therefore, IDEQ-TFRO does not feel further comparisons are warranted.
Leigh Woodruff 18	p. 95 A two mile corridor along the Snake River was used to identify what type of nonpoint sources contributed to pollutant loading in this segment. Figure 25a suggests that the corridor did not extend up tributaries, such as Rock Cr. and Fall Cr. Discussion by LaPointe cited on p. 88 suggests not only that tributaries may be significant sources during runoff periods, but that ephemeral streams are an important component of the load. It would appear that land uses along ephemeral and perennial tributaries should also be considered in source identification and load allocation.	The river corridor did not extend up these non 303(d) listed waterbodies as they are meeting their beneficial uses. At such time that one of these waterbodies is shown to not be meeting water quality standards then a separate TMDL will be developed for that water body. For example, the river corridor did not include Rock Creek because a TMDL was completed for that waterbody in this SBA-TMDL. The Rock Creek TMDL already contained allocations which would have been duplicated had the corridor been extended to include Rock Creek.
Leigh Woodruff 19	p. 134 Choosing the lowest load capacity from the high, average and low flow year analysis would incorporate a margin of safety, assuming it is used to set allocations which apply to all flow years. However, high loading and TSS concentrations during late winter/spring runoff appear to not have been considered in the loading analysis. We believe these are critical conditions which must be addressed by the TMDL, and will likely drive the need for much greater percent reductions than are currently estimated in order to meet the Snake River and tributary average monthly and instantaneous targets. Currently the load capacity does not consider critical conditions, and hence underestimates sediment problems, so we do not believe the load capacity is a MOS.	The low flow load capacity was used to set the allocations for all flow years as outlined in the SBA-TMDL. In addition, the load capacity was developed from a real hydrograph. Consequently, it includes both seasonal as well as daily variations. IDEQ-TFRO feels that this analysis did address the critical conditions and therefore does not underestimate the sediment problems.

Leigh Woodruff 20	The following statements are made regarding nutrient effects in the Lake Walcott reach: p. 90 *"...The effects of excess nutrients (total phosphorous) can be seen <u>along the entire length</u> [emphasis added] of the Lake Walcott reach with locally dense mats of macrophytes along the margins of the river and in some shallow areas in the river channel..."* p. 90 *"...The magnitude of the nutrient problem may have been effectively masked by the high flows of 1997-1998..."* p. 90 *"...it is recommended that TP reductions take place while maintaining TSS concentrations at or below current levels in the mainstem.."* p. 105 *"..As previously noted in Section 2.1, excessive aquatic plant growth in surface water is a major concern in the Lake Walcott Reach, particularly during low flow/drought years..."* Given these statements, we would agree that TP reductions should take place, but this document does not propose any reductions other than for Milner Reservoir. Given that a nutrient TMDL is not proposed for the upper portion of this reach, our conclusion is that it should be added to the Idaho 303(d) list for nutrients and scheduled for TMDL development. Does IDEQ plan to list these segments for nutrients and develop a TMDL at a later time?	It was not demonstrated in the SBA-TMDL that the macrophytes in the upper reaches of the Walcott reach were at nuisance levels. Nor has any data been given to IDEQ-TFRO to indicate that the current levels are in exceedance of state water quality standards. As a result, IDEQ-TFRO does not propose to list them or complete a nutrient TMDL
Leigh Woodruff 21	p. 138 The rationale for selecting 0.080 mg/l total phosphorus as a target for the Milner Reservoir TMDL is not clear. On p. 61 it is indicated that concentrations in the upper portions of the Lake Walcott reach average 0.058 to 0.061 mg/l TP, and that effects of excess nutrients can be seen along its entire length. Given these findings, we do not understand how a target of 0.080 mg/l could solve the excess nutrient problem and achieve water quality standards. .	Further explanation of the target choice have been made.
Leigh Woodruff 22	critical conditions must be considered when establishing load capacities. Per the discussion above, it does not appear that critical conditions of seasonally high loading and TSS concentrations have been fully considered, and it appears that TSS targets would not be met under these conditions,	See response to Leigh Woodruff comment 19.

Leigh Woodruff 23	since the load allocation tables do not show tributaries, drains, bank erosion etc., how does the loading analysis account for these sources?	The load allocations were based on land uses of the different watersheds. As a result, they include these sources.
Leigh Woodruff 24	load allocations are identified for nonpoint sources as a general category at 3 points on the Snake River, and at the mouth of Rock Cr., EF Rock Cr., and SF Rock Cr. We recommend developing more specific allocations either by tributary, land use, or preferably both, for example using land use information generated through the corridor approach described on p. 95 to make allocations land use specific by river segment. How do you envision nonpoint source implementation occurring without providing more specific load allocations and percent reduction targets?	The load allocations were based on land uses of the different watersheds. Therefore, they include these sources.
Leigh Woodruff 25	Wasteload allocations must be included in each TMDL for each point source contributing the pollutant in question. Wasteload allocations for CAFO's may be listed as a category rather than individually (e.g. 0 WLA indicating no discharge). In addition to the mass loading figures presented, we recommend that wasteload allocations include a concentration limit and averaging period for each pollutant. TMDLs essentially provide instructions for the next revision of NPDES permits. Adding this specificity will greatly clarify, both for EPA and the permittees, the limits which should be included in the next NPDES permit revision.	Categorical waste load allocations for CAFOs and land application permitted facilities were added to the document. These categories were given a 0 waste load allocation. The document included averaging periods and concentration limits for each pollutant.
Leigh Woodruff 26	p. 142 The discussion here provides a good explanation of the steps which will be take to ensure that nonpoint source reductions will take place, and that data will be collected over time to evaluate water quality and BMP implementation. The detail provided regarding subsequent phases is particularly valuable in clarifying how the TMDL implementation process will be carried out.	

June 22, 2000

Randall Smith, Director
Office of Water
U.S. Environmental Protection Agency-Region 10
1200 Sixth Avenue
Seattle, WA 98101

RE: Amendment to Lake Walcott subbasin (Hydrologic Unit Code 17040209) TMDL submittal

Dear Randy:

We want to thank Christine Psyk, Donna Walsh, and Leigh Woodruff for their review of the Lake Walcott total maximum daily load (TMDL). As discussed with them during an April 7, 2000 conference call, the Idaho Department of Environmental Quality (IDEQ) is providing answers to review questions to clarify the previously submitted TMDL. Donna and Leigh have already been informed of our response. This letter is being provided to you for the administrative record, as an addendum to the TMDL.

The following are the issues that were identified as needing further clarification and our response to those issues.

- Issue 1. Loading capacity. How was the 0.08 mg/ TP chosen as the loading capacity and how is it protective of water quality standards? Load capacity calculations.

The principal reason the water quality targets are different between the Mid-Snake segments and the Milner Pool segment is that the morphology of the Milner Pool is much different than the Mid Snake area. In the segment of concern, the river has been confined and deepened. Consequently, the available habitat for aquatic macrophytes is much smaller in the Milner Pool than in much of the Mid-Snake. Therefore, it was determined that the target could be higher in the Milner Pool area and still protect beneficial uses and meet state water quality standards.

A brief history of the Target and load capacity will provide clarification of this issue as well. Determining the target and load capacity for the Miner pool included discussions between personnel in IDEQ Twin Falls Regional Office and USEPA. During these discussions, IDEQ proposed that an appropriate target for the Milner Pool area was 0.096 mg/L total phosphorus (TP). Given uncertainties in the level of nuisance aquatic growths and TP concentrations, this target would have resulted in a statistically significant ($p = 0.05$) decrease in the current TP concentrations. In conjunction with this statistically significant reduction, it was agreed to include a feed back loop and adaptive management in this approach. However, as this target was much higher than the Mid-Snake target a more stringent method was eventually adopted by IDEQ. Instead of the 0.096 mg/L target, the monthly target was determined from the current mean (0.111 mg/L) minus the standard deviation (0.032 mg/L). This resulted in a target of 0.08 mg/l. Furthermore, the feed back loop and adaptive management steps developed for the less stringent 0.096 mg/l target were retained to provide for a method to reassess the target and resulting load capacity in the future.

The Milner Pool is also a run-of-the-river pool. As such, it behaves much more like a river than as a reservoir. The IDEQ protocols for Lake BURP indicate that if the residence time of a waterbody is greater than 14 days then lake and reservoir sampling and assessment protocols would apply. In the Milner Pool, residence times vary between one and seven days. In effect, the Milner Dam has created a deep spot in the river. Therefore, it was determined that the USEPA gold book recommendation of 0.05 mg/L TP would not be appropriate to the Milner Pool.

Although the Milner Pool is not reservoir like, it is also not entirely river like. Because of this, it was determined that the gold book recommendations for rivers (0.1 mg/L TP) would also not be appropriate.

The State of Idaho water quality standards for excessive nutrients reads that the waters shall be free of excessive nutrients that can cause… nuisance aquatic growths impairing designated beneficial uses. The Milner Pool target was chosen to protect designated uses in the Milner Pool Area. In the upper half of the pool the designated uses are cold water biota, salmonid spawning, and primary contact recreation. In this area there are few nonpoint source inputs. Additionally, none of the four point sources discharge into this upper segment. In the lower half of Milner Pool warm water biota and primary contact recreation are the designated uses. The difference in designated beneficial uses makes the Milner Pool a somewhat difficult reach to manage. The uses in the Mid-Snake area are similar to the upper segment of the pool but carry more stringent criteria than the warm water biota use in the lower segment of the pool. To facilitate the management of the Milner Pool from a TMDL perspective, the compliance point for the Milner Pool area was set at the Milner Dam area. By doing this a target could be set at the low end that was stringent enough to preclude TP concentrations greater than the Mid-Snake target of 0.075 in the upper end yet flexible enough to allow for the difference in the designated uses in the lower end. It was determined that if the Milner Pool TP target was similar to the Mid Snake target then water quality standards would be met in the both segments of Milner Pool. For this reason the 0.08 mg/L target was determined to be protective of both of these different designated uses.

- Issue 2. Load Allocations. How was the Load Allocation derived? Why is it appropriate to have a single allocation? How will compliance be measured? How will the 37 % reduction be phased in?

Load allocations were estimated for all drains, tributaries and other sources entering the Milner Pool area. These sources were identified from 1:24K scale USGS maps of the area. A list of these sources was generated by identifying and counting any drain, tributary or draw shown to contain water from the 1:24K scale maps (see figure 1). This list includes numerous unknown and unnamed sources as well as many named drains and tributaries. The second step in determining the load allocation was to gather data on as many of these waterbodies as was available during the writing of the TMDL. Sources for this data included a study by the Idaho Department of Agriculture and from EPA's STORET database. Most of this data was collected during the irrigation season. Some data, however, was collected year-round.

From the monitored sites, an average TP load was calculated (11.43 pounds per day). This average was applied to the balance of unmonitored sources. The load from all monitored sources and the load from sources to which the average was applied summed to 605 pounds per day for the irrigation season. The limited nonirrigation season information available indicated that the TP load is reduced to approximately half in the nonirrigation season. The average annual nonpoint source load was based upon this information. The monthly and average annual load information can be seen in table 39 of the TMDL.

A statistical check on the validity of the two assumptions (applying the average load to the unmonitored sites and cutting the non-irrigation season load in half) was needed. For this check, a t-test was preformed between the measured monthly TP load and the calculated load at Milner Dam. The calculated load consists of the background load measured at Minidoka Dam, plus estimated non-point source load, plus the known point source load. This calculated load incorporates two sources of uncertainty. The first of these is the estimated nonpoint source load, while the second is the natural assimilation of TP along the course of the river. We conservatively assumed that the assimilation was 0.0 pounds, thus adding to our calculations for a margin of safety. This assimilation might be assumed to be the difference in the calculated and measured loads. We found that average measured and calculated load were not statistically different ($p=0.177$). Although the two loads were not significantly different, the calculated load exceeds or over estimates the measured load by approximately 230 pounds per day. Because it would be more conservative, and because of the statistical check, we applied the calculated nonpoint source load in the TMDL.

In order to meet the load capacity all sources would need to be reduced by approximately 37 %. Thus, the nonpoint source load allocation was 284 pounds per day (a 37.4 percent reduction from the existing load in table 39). This also includes a reduction in the background levels entering the subbasin. This background load allocation (Table 47c) will be achieved through reductions in the TP load from upstream TMDLs such as Raft River, and American Falls Reservoir.

The single or gross allocation to non-point sources along the Milner Pool was deemed appropriate due to the methods by which this load was estimated and to facilitate timely and cost effective implementation of the necessary reductions for the TMDL. In discussions with the

SCC and the irrigation districts, it was determined that if each drain or source were to receive a load allocation implementation would likely not occur or occur at a much slower pace with greater costs in the long run. As we don't know current loading for most drains or sources, we could end up miss-directing reductions, directing monies where little improvement can be made. Overall reductions would be less for the dollars spent and it would take longer and more money to reach the final goal. With a single allocation, implementation of nonpoint source reductions remains flexible and more likely to occur as irrigation districts can focus on the worst problems. They may get the needed reductions, i.e. removal of 170 pounds/day, from those drains only. In addition, one of methods for meeting the reductions includes elimination of drains and sources entirely. With a multiple allocation scheme, this would not make financial sense, because once a source is below its allocation no credit is given for further reductions overall. In effect, this allocation method builds a pollution trading aspect into the TMDL, which will be further defined after an appropriate level of monitoring is conducted.

Compliance with the load allocation will be assessed through monitoring of the drains and sources by the irrigation districts and the USBOR. Load reductions or additions can be calculated from the current monitoring information and the baseline data and estimates that were made for the TMDL and load allocation. Additionally, monitoring locations at Milner Dam and Minidoka Dam (Jackson Bridge) will provide the end load and background loads used in the previous check of the load allocation methods. Furthermore, NPDES permitted facilities will continue to supply DMR information. Therefore, the estimated nonpoint source contributions can still be back calculated as was done originally. Consequently, if, through the continued monitoring of the drains and tributary sources and the back calculation, it is discovered that the needed reduction in the load to the Snake River is not being met then the adaptive management and feedback loops in the TMDL will provide a means for reassessment of all the allocations.

Therefore, the 284 pound/day allocation is required to meet the 37.4 percent total reduction for nonpoint sources. The phases and management objectives in question can be found in section 3.7.2 and 3.7.3 on pages 145 through 153. In summary, a 20 percent reduction will be met by year five and the final reduction to 284 pounds per day by year ten. Throughout this ten-year period, reevaluation of the allocation will be made and further reductions may be required if appropriate.

- Issue 3. Wasteload Allocations. How do the Waste load allocations in this TMDL relate to the WLAs in the Mid-Snake TMDL?

The four facilities covered in the Mid-Snake TMDL are also covered in the Lake Walcott TMDL. The Wasteload allocation in the Lake Walcott TMDL will result in an approximately 37 percent reduction in the Baseline (1991-1996) load from these facilities in year 2009. The WLA in the Mid Snake, for these same facilities, requires a 20 percent reduction by 2004. Additionally, the Lake Walcott TMDL interim goal is a 20 percent reduction from the baseline load by year 2004.

This goal is identical to the Mid Snake TMDLs final wasteload allocation (see table 49 in Lake Walcott TMDL).

Table 1. Wasteload allocations from Mid-Snake and Lake Walcott TMDLs.

Facility	Baseline load Pounds/day TP (1991-1996)	Mid-Snake Waste Load Pounds/day TP year 2004	Lake Walcott Waste Load Pounds/day TP Year 2004 Interim 20% Red.	Lake Walcott Waste Load Pounds/day TP Year 2009 Final 37% Red.
McCains	620	496	496	399
Simplot	572	458	458	359
Burley	62.5	45.5	45.5	39.1
Heyburn	7.7	5.1	5.1	4.8
Total	1262.2	1004.65	1004.65	801.9

- Issue 4. Critical Conditions. What Critical conditions were considered in this TMDL? What conservative assumptions were used in the TMDL?

Throughout the TMDL, seasonal and annual critical conditions were considered. This is most evident in the load capacities developed for sediment and oil and grease. For these TMDLs, low flow conditions were the basis for the load capacities. The design flow was determined following methods described in section 3.4.1. A low flow regime was chosen as those water years that the annual peak flow had a recurrence interval (RI) of less than 1.5 years. A recurrence interval of 1.5 years corresponds with the bankfull discharge or average annual flooding in a system. Therefore, years with RIs less than bankfull were considered low flow years. By taking the average of these years, a representative low flow year could be chosen. The year 1941, was the closest to this average low flow condition. Using the average low flow year (1941) results in approximately 41 percent reduction in load in comparison with the period of record average flow. By using 1941 flow as the basis for the load capacities, annual (year to year) critical conditions were considered. Approximately 93 percent of the years in the period of record experienced flow greater than the average low flow year chosen. A measure of how conservative the design flow is.

Seasonal considerations were also considered in the load capacity of the different segments. Impacts from sediment, and excess nutrients were more clearly noted during the warm months of the year. These months also corresponded with the runoff and irrigation seasons. In order to simplify the TMDL and the various allocations, the average annual discharge from the year 1941 was used to develop the load capacities. By doing this the load capacity would be more conservative, in those months when the increases in sediment and TP were seen, than would be so using a average monthly flow and developing the load capacities for each month. Therefore, the current load capacity takes into account both annual and seasonal critical conditions.

In order to maintain consistency with the Mid-Snake TMDL, the design flow for Milner Pool reflected the baseline conditions to which the Mid-Snake allocations were made. As stated in issue 4, the baseline from which WLAs were based, in both TMDLs, were the average loads from 1991-1996 DMRs. Therefore, the load capacity was based on the average annual discharge from 1991-1996. It was felt that this design flow incorporated annual critical conditions in that it was an average of the last five years of a drought cycle. Thus, it would be more conservative than using the average or high design flows mentioned in section 3.4.1 of the TMDL. Following this method results in approximately a 17 percent greater reduction in load in comparison with period of record average conditions. Furthermore, by using the average annual flow from the period it would provide a similar consideration of the seasonal conditions as stated previously. Additionally, nearly 61 percent of the annual average flows in the period of record were greater than this design flow.

Many conservative assumptions were used in the TMDL as can be see in the discussion above. Other conservative assumptions include conservation of constituents. In all cases, the pollutant of concern was considered a conservative constituent with no assimilation being incorporated into subsequent calculations. Additionally, where there was uncertainty in the target chosen, as was the case with both the sediment and oil and grease targets, the targets were reduced by 50 percent. For example, the Wyoming standard for oil and grease (10 mg/L) was used for the oil and grease target. However, the target was reduced by 50 percent in order to provide a very conservative margin of safety. Also, several other TMDLs in Idaho have set TSS targets at 50-52 mg/L. Those targets were determined to be protective of the beneficial uses (both cold water biota and salmonid spawning). In the Lake Walcott TMDL the TSS target was set at 25 mg/L to provide for a very conservative margin of safety. In addition, the TP target for the warm water segment of the Milner Pool, as stated in Issue 1, is a more conservative approach than the Mid-Snake TMDL target. Load capacity calculations follow on the next page.

Thank you for the opportunity to provide these clarifications to the TMDL. As agreed to in the conference call, please incorporate this letter into the Lake Walcott TMDL as an addendum. At this time, IDEQ feels that we have fully answered the questions and needs outlined in discussions with the TMDL reviewers. We look forward to the final approval of the Lake Walcott TMDL.

Sincerely,

Dave Mabe
State Water Quality Program Administrator

cc: Christine Psyk, USEPA Reg 10
Donna Walsh, USEPA Reg 10
Leigh Woodruff, USEPA IOO
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Load Capacity Calculations

American Falls to Massacre Rocks Sediment:

Design Q (average Q 1941)		Target	Constant			lbs./ton		Load Capacity
4719	X	25 mg/L	X	5.39	)	2000	=	317.9 tons/day

Massacre Rocks to Lake Walcott Sediment

Design Q (average Q 1941)		Target	Constant			lbs./ton		
4883	X	25 mg/L	X	5.39	)	2000	=	328.9 tons/day

Minidoka Dam to Milner Dam Sediment

Design Q (average Q 1941)		Target	Constant			lbs./ton		
4031	X	25 mg/L	X	5.39	)	2000	=	271.5 tons/day

Minidoka Dam to Milner Dam Oil and Grease

Design Q (average Q 1941)		Target	Constant			lbs./ton		
4031	X	5 mg/L	X	5.39	)	2000	=	54.3 tons/day

Minidoka Dam to Milner Dam Total Phosphorus

Design Q (ave. Q 1992-1996)		TargetConstant						
5686	X	0.08 mg/L	X	5.39			=	2452 lbs/day