# The Middle Snake River Watershed Management Plan

## Phase 1 TMDL
## Total Phosphorus

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**Food Processors**
**Municipalities (POTWs)**
**Irrigated Agriculture**
**Confined Animal Feeding Operations**
**Hydroelectric Power**

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The February 10, 1995 Mid-Snake Nutrient Management Plan draft document served as the template for the current Mid-Snake WMP. This group was formed on April 10, 1996 and consisted of the following individuals: Randy MacMillan, Ph.D., Director of R&D, Clear Springs Food Inc.; Gary Fornshell, Aquaculture Extension Educator, University of Idaho, Twin Falls; Regan Armstrong, Clear Lakes Trout Co., Inc., Buhl; Mark Harrison, Pristine Springs Fish Farm, Twin Falls, IAA member; Don Campbell, First Ascent Fish Farm, Buhl, IAA member; Jerry Zinn, IAA member, Buhl; Ryan Kenworthy, Manager, U.S. Fish & Wildlife Hatchery, Hagerman; Leigh Woodruff, Environmental Scientist, EPA-Boise; Carla Fromm, NPDES Permits Program, EPA-Boise; Jeri Williams, Fish and Wildlife Biologist, U.S. Fish & Wildlife Services, Boise; Ralph Myers, Limnologist, Enviornmental Affairs, Idaho Power Company, Boise; Larry Pennington, Citizen Representative, Idaho Conservation League, Jerome; John Keady, Project Manager, Operations Management International, Inc., Twin Falls; Chuck Brockway, P.E., University of Idaho, IWRRI, Kimberly R&E Center, Kimberly; Dean Falk, Extension Dairy Specialist, University of Idaho, Twin Falls; David Mead, Governor's Liaison to DEQ, Twin Falls Chamber of Commerce, Twin Falls; Balthasar B. Buhidar, Ph.D., Senior Water Quality Analyst, DEQ-TFRO; Don Essig, MS, Water Quality Analyst Senior, DEQ-Central Office; Darren Brandt, Water Quality Protection Supervisor, DEQ-TFRO; Clyde Lay, Antidegradation Officer, DEQ-TFRO; Robert Sharpnack, Aquaculture Specialist, DEQ-TFRO; Mike Etcheverry, CAFO Specialist, TFRO; Tom Miller, Ph.D., Senior Water Quality Analyst, DEQ-TFRO; Mike McMasters, Prevention and Certification Supervisor, DEQ-TFRO; and, Doug Howard, Regional Administrator, DEQ-TFRO.

Prior to this committee being formed, a Mid-Snake Nutrient Management Planning Team had drafted the February 10, 1995 Public Review Draft. This team consisted of Darren Brandt, Daren Carlisle, John Courtwright, Mike Etcheverry, Lynda Hyce, Dr. R. Tim Litke, Ph.D., Robert E. Lupton, Mike McMasters, Greg Misbach, Rob Sharpnack, Ross Spackman, and Vickie Traxler. Principle writers for this team were Brandt, Carlisle, Litke, and Traxler. Contributors included: John Carlson, Jeff Davis, Dr. Mike Falter, Ph.D., Dr. Rod Jenson, Ph.D., Dr. Wayne Minshall, Ph.D., Ruth Schellbach, Bill Graham, Mark Shumar, Steve Thomas, Dr. John Yearsley, Ph.D., as well as the committees for Confined Feeding Operations, Hydroelectric Industry, Idaho Aquaculture Association, South Central Idaho Food Processors, Mid-Snake Irrigation Water Quality Coordination Committee, and the Wastewater Treatement Industry.

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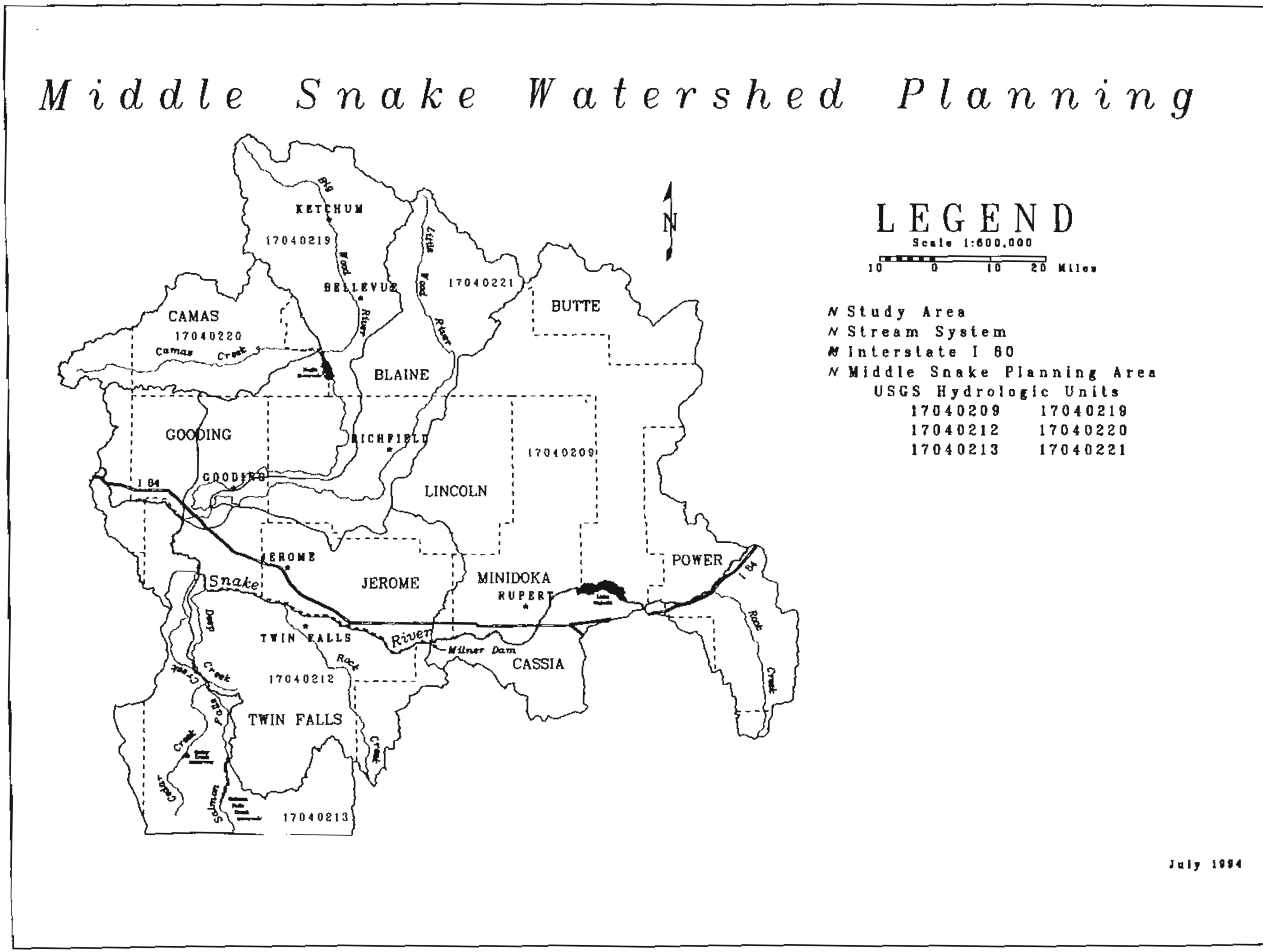
Middle Snake Watershed Planning
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Middle Snake Planning Area
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TWIN FALLS
Milner Dam
CASSIA
Deep Creek
17040212
TWIN FALLS
Rock Creek
Salmon Falls Creek
Cedar Creek
17040213
July 1994

# CHAPTER 1
# INTRODUCTION

## 1.00 PRELIMINARY

This chapter provides a general background on the Middle Snake River phased TMDL or Watershed Management Plan (WMP), including a background description of state and federal water quality laws, a description of the goals and strategy of the WMP, the planning process, and sustainable development within the watershed.

### 1.00.01 THE MID-SNAKE TMDL AS A PHASED TMDL

The Middle Snake River WMP is a phased plan to restore water quality conditions in the Middle Snake River watershed. The WMP will first focus upon phosphorus reduction and be implemented in phases. The phased approach is utilized because of the uncertainty associated with actual phosphorus loading from various sources (both from point and nonpoint sources) and in recognition that achieving water quality standards will require reduction of other pollutants to be addressed in subsequent phases in this WMP.

Water quality in the Middle Snake River is degraded as a result of cumulative impacts from nutrient-laden organic and inorganic material from point and nonpoint sources in the watershed. Altered flows, periodic regional drought conditions, nutrient inputs from upstream sources and the underlying aquifer contribute to the eutrophic conditions. Most notably, during the summer months the Middle Snake River exhibits eutrophic conditions, such as extensive growths of aquatic vegetation, low aquatic biological species diversity, fluctuating oxygen levels, and increased water temperatures.

The Middle Snake River WMP establishes an approach to improve water quality in the Middle Snake River. Fourteen segments of the Middle Snake River have been identified by Idaho as not complying with Idaho water quality standards. See **TABLE 1.** Specifically, designated beneficial uses, including aquatic life, fishing, swimming, and boating are impaired because of the eutrophic conditions. Total phosphorus (TP) loading from throughout the watershed has been identified as one of the principle excess nutrients causing existing conditions in conjunction with those contributing components identified above. The water quality of the Middle Snake River has been identified as impaired as specified under §303(d) list of the Clean Water Act (CWA). As required by §303(d) of the federal CWA, Idaho must identify state waters not achieving water quality standards in spite of application of technology-based controls in the National Pollutant Discharge Elimination System (NPDES) permits for point sources. Such waterbodies are known as **water quality limited segments** (WQLSs). Once a waterbody is identified as a WQLS, the state of Idaho is then required under the CWA and Idaho Code §39-3601 *et seq.* to develop a **total maximum daily load** (TMDL). If the state of Idaho does not develop management plans, or TMDLs, to achieve water quality standards, then the United States Environmental Protection Agency (USEPA or EPA) is required to develop TMDLs.

### 1.00.02 TOTAL MAXIMUM DAILY LOAD (TMDL)

The TMDL process is described in §303(d) of the CWA (40 CFR 130.7) and Idaho Code §39-3611. TMDLs are plans designed to direct management actions so that polluted waterbodies are restored to a level that achieves state water quality standards. Section 303(d) of the CWA establishes the TMDL process to provide for more stringent water quality-based controls when technology-based controls are inadequate to achieve state water quality standards. A TMDL is a mechanism for determining how much pollutant a waterbody can safely assimilate (the **loading capacity**) without violating state water quality standards. TMDLs account for both point and nonpoint pollution sources that contribute to a waterbody's impairment. An essential component of a TMDL is identifying the current volume and sources of pollutants each source may discharge (the allocations). Point sources of pollution, those discharges from discrete pipes or conveyances, will receive a **wasteload allocation** (WLA) which specifies how much pollutant each point source can release to the waterbody. Nonpoint sources of pollution, all other activities causing pollution in the Middle Snake River, will receive a **load allocation** (LA), which specifies how much pollutant can be released to a waterbody. Thus,

**TMDL = WLAs + LAs + Margin of Safety.**

Loading Capacity is established taking into account seasonal variations and a margin of safety. A **margin of safety** accounts for any lack of knowledge concerning the relationship between pollution control mechanisms and water quality. Calculating the exact pollutant load for pollutant running off the land (nonpoint sources) is difficult and often dependent on weather conditions. Therefore, a **Phased TMDL** is necessary which identifies interim load allocations, with further monitoring to gauge the success of management actions in achieving load reduction goals and the effect of actual load reductions on the water quality in the Middle Snake River.

This Middle Snake River WMP is intended to comply with state and federal requirements. Substantial funding since 1991 has been committed by Idaho to collect data to develop and implement this WMP. Local citizens and industries throughout the watershed have been instrumental in developing this WMP. A key component of this WMP is the implementation of industry management plans adopted at the local level.

## 1.01 BACKGROUND OF FEDERAL & STATE WATER QUALITY LAWS

The federal Water Pollution Control Act of 1972, as amended (33 U.S.C. §§ 1251 through 1371), commonly known as the CWA, comprehensively addresses water quality and pollution controls through the establishment of state and federal regulatory roles and responsibilities. The state's roles under the CWA include the development and enforcement of water quality standards, the control of nonpoint source activities to achieve attainment of water quality goals, the identification of WQLSs, and the development of TMDLs. The state agency principally responsible for the development, implementation, and enforcement of Idaho water quality standards and fulfilling Idaho's obligations under the CWA is the Idaho Department of Health and Welfare (IDHW), Division of Environmental Quality (DEQ). See generally Idaho Code §§ 39-105 and 39-3601 *et seq.*

The federal govenment's roles under the CWA include regulating the discharge of pollutants from point sources by establishing technology-based controls in point source permits known as National Pollutant Discharge Elimination System (NPDES) permits. The federal government, through the EPA, also oversees state obligations under the CWA, by approving state water quality standards, state WQLS lists, and state TMDLs.

### 1.01.01 § 303(d) LAWSUIT

In 1993, two Idaho environmental organizations filed a citizen suit authorized under the CWA in federal district court in Seattle against the EPA alleging that: (1) the EPA violated §303(d) of the CWA in approving Idaho's 1992 WQLS list because the list did not identify all impaired state waters; and, (2) the EPA should develop TMDLs for all Idaho WQLSs since Idaho had not developed enough TMDLs in the past.

While the lawsuit was pending, Idaho submitted its 1994 WQLS list to the EPA for approval which included 62 waterbodies. However, in April 1994 the court found that the submission of Idaho's prior WQLS list was "underinclusive" and ordered the EPA to publish a new list. The EPA published a final WQLS list for Idaho in October 1994, which included 962 waterbodies. Most of the 962 waterbodies have not been scientifically monitored to determine compliance with water quality standards. In May 1995, the court ordered the EPA to establish a reasonable and complete schedule with the state of Idaho to develop TMDLs on all WQLSs because the court was concerned about the pace of TMDL development in Idaho.

### 1.01.02 IDAHO WATER QUALITY LEGISLATION

The issues raised in the §303(d) lawsuit highlighted the need to: (1) develop a comprehensive statewide process to monitor water quality on all state waters; and, (2) develop TMDLs on those waterbodies that were not achieving water quality standards.

In 1995, the Idaho legislature passed Idaho Code §39-3601 *et seq.* which restructured the administration of water quality laws in the state of Idaho. Idaho Code §39-3601 *et seq.* requires the DEQ to monitor all waterbodies throughout the state to determine compliance with water quality standards. On those waterbodies not complying with water quality standards, the DEQ is then required to develop TMDLs on a priority basis to ensure attainment of water quality standards. A critical component of Idaho's water quality legislation is the establishment of citizen advisory groups which advise the DEQ on the development of TMDLs and other pollution control strategies on WQLSs.

As required by order of the court, in May 1996, the state of Idaho and the EPA submitted a schedule to the court for short-term and long-term development of TMDLs. The schedule anticipates that all 962 WQLSs will be monitored by 1997, and thereafter TMDLs will be developed on those waterbodies which monitoring indicates do not comply with state water quality standards. On those waterbodies where monitoring has determined non-attainment of water quality standards, such as the Middle Snake River, the state has committed to the development of TMDLs on a short-term basis. Thus, on the following fourteen segments (see **TABLE 1**) of the Middle Snake River, the state has committed to the development of a TMDL to be submitted to the EPA for approval by December 31, 1996.

**TABLE 1. 1996 §303(d) PRIORITY LIST ON THE MIDDLE SNAKE RIVER. POLLUTANTS AND/OR STRESSORS ARE LISTED AS THEY APPEAR ON THE PUBLISHED LIST.**

| WATERBODY | STREAM SEGMENT HUC / PNRS | BOUNDARIES | POLLUTANTS AND/OR STRESSORS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | N | S | D | F | A | P | T | M |
| Snake River | 17040212 / 370 | Bliss Reservoir | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Snake River | 17040212 / NA | King Hill to Big Pilgrim Gulch | ✓ | ✓ | | | | | ✓ | |
| Snake River | 17040212 / NA | Cassia Gulch to Big Pilgrim Gulch | ✓ | ✓ | | | | | ✓ | |
| Snake River | 17040212 / 369 | Bliss Bridge to King Hill Dam | | ✓ | | | | | | |
| Snake River | 17040212 / 374.10 | Mud Creek to Clear Lakes Bridge | ✓ | ✓ | | | | | ✓ | |
| Snake River | 17040212 / 374.10 | Clear Lakes Bridge to Cedar Draw | ✓ | ✓ | | | | | ✓ | |

| WATERBODY | STREAM SEGMENT HUC / PNRS | BOUNDARIES | POLLUTANTS AND/OR STRESSORS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | N | S | D | F | A | P | T | M |
| Snake River | 17040212 / 374.10 | Deep Creek to Mud Creek | ✓ | ✓ | | | | | ✓ | |
| Snake River | 17040212 / 374.10 | Cedar Draw to Rock Creek | ✓ | ✓ | | | | | ✓ | |
| Snake River | 17040212 / 374.10 | Rock Creek to Shoshone Falls | ✓ | ✓ | | | | | ✓ | |
| Snake River | 17040212 / 377 | Murtaugh to Twin Falls Reservoir | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| Snake River | 17040212 / 378 | Milner Dam to Murtaugh | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ |
| Snake River | 17040212 / 375 | Shoshone Falls Reservoir | ✓ | ✓ | ✓ | ✓ | | | | |
| Snake River | 17040212 / 373.00 | Upper Salmon Falls Reservoir | ✓ | ✓ | ✓ | ✓ | | | | |
| Snake River | 17040212 / 372.00 | Lower Salmon Falls Reservoir | ✓ | ✓ | ✓ | ✓ | | | | |

HUC = Hydrologic Unit Code designation by USGS for Upper Snake Basin. PNRS = Pacific Northwest River Study designation number.
NA = Not Applicable. N = Nutrients S = Sediment D = Dissolved Oxygen
F = Flow Alteration A = Ammonia P = Pathogens T = Temperature
M = Thermal Modification

Prior to and during the § 303(d) lawsuit and passage of Idaho Code §39-3601 *et seq.*, the citizens of the Magic Valley in South Central Idaho, along with the DEQ and other state and federal agencies, were addressing water quality concerns on the Middle Snake River through development of a state nutrient management plan. The Idaho's Nutrient Management Act at Idaho Code § 39-105(3)(o) requires the DEQ to establish nutrient management plans on a hydrologic unit basis to comprehensively address the potential impacts of nutrients on water quality. Utilizing the citizen advisory processes developed under the Nutrient Management Act, citizen and technical advisory groups have advised the DEQ in developing the pollution control strategies set forth in this WMP. However, because of federal requirements under the CWA and the aforementioned §303(d) lawsuit, this WMP is being submitted to the EPA for approval as a phased TMDL. Therefore, this WMP is designed to be consistent with Idaho Code §39-3601 *et seq.*, §303(d) of the CWA, and Idaho's Nutrient Management Act.

## 1.02 ENFORCEMENT AUTHORITIES

The DEQ's regulatory and enforcement authorities are set forth in the Idaho Environmental Health and Protection Act (1972), as amended (Idaho Code §39-101 *et seq.*), Idaho Code §39-3601 *et seq.*, and §350 of the *Idaho Water Quality Standards and Wastewater Treatment Requirements*. The DEQ will rely on existing authorities to achieve the goals and objectives of the Mid-Snake WMP's initial phase and subsequent phases. The goals and objectives of this WMP will be used by the DEQ as guidelines to document compliance with Idaho water quality standards and reality with applicable laws. Attainment of water quality standards and restoration of designated beneficial uses for the Middle Snake River will require a significant long-term coordinated effort from all pollutant sources throughout the watershed.

For point source discharges of pollutants subject to NPDES permits, the DEQ will ensure achievement of water quality goals established in the Mid-Snake WMP through water quality certifications provided in Section 401 of the CWA.

For nonpoint sources, the feedback loop will be used to achieve water quality goals. If monitoring indicates a violation of standards despite use of approved BMPs (*§350, Idaho Water Quality Sandards and Wastewater Treatment Requirements*) or knowledgeable and reasonable efforts, then **best management practices** (BMPs) for the nonpoint source activity must be modified by the appropriate agency to ensure protection of beneficial uses (§350.02.b.ii). This process is known as the **feedback loop** in which BMPs or other efforts are periodically monitored and modified if necessary to ensure protection of beneficial uses. This process is further defined in section 5.03, Feedback Loop. For agricultural activities there are no enforceable BMPs. Therefore, agricultural activities must use knowledgeable and reasonable efforts to achieve water quality standards. The DEQ encourages the list of recommended BMP component practices developed by the Natural Resource Conservation Service (NRCS), which when selected for a specific site become a BMP, as published by the Idaho Agricultural Pollution Abatement Plan (1993). The DEQ, in cooperation with other agencies, will conduct monitoring to evaluate the effectiveness of site specific BMPs and other restoration projects in reducing TP loading. If the BMPs prove ineffective they will be modified to ensure effectiveness of existing and future projects. Modifications to required BMPs for forest practices will be subject to state rule-making requirements.

In the event that BMPs for nonpoint sources are not implemented adequately using a voluntary approach, the DEQ will use existing regulatory authorities to seek water quality improvements. Adequate implementation requires that enough reduction measures be installed and that they be properly maintained. Within the first three years of plan implementation the Middle Snake River Watershed Advisory Group (Mid-Snake WAG), the Irrigated Agricutural Industry, and the DEQ will develop criteria for critical and noncritical agricultural acres for determining adequate implementation. Under current existing authorities, the DEQ may investigate potential violations of the *Idaho Water Quality Standards and Wastewater Treatment Requirements* and if a violation has occurred, may pursue either administrative or civil enforcement actions. In general, though, the DEQ will incorporate pollution prevention into enforcement actions, since pollution prevention is the ultimate goal for protecting human health and the environment. In addition, the DEQ will work closely with the Mid-Snake WAG, resource agencies, and affected parties to review existing authorities and determine if additional regulatory requirements are necessary to achieve the goals of the Mid-Snake WMP.

## 1.03 GOALS AND OBJECTIVES OF THE MID-SNAKE WMP

**The overall goal of the Mid-Snake WMP is to improve water quality in the Middle Snake River by reducing pollution loadings from all sources including tributaries and agricultural returns so as to restore the beneficial uses of the Middle Snake River.**

The Mid-Snake TMDL utilizes a watershed approach to address water quality concerns since pollutant sources throughout the geographic area drain into the Middle Snake River and contribute to water quality problems. Pollution parameters or stressors of immediate concern are TP, sediment, nitrogen (such as nitrate + nitrite, total Kjedahl nitrogen, and ammonia), and altered flow. Consistent with Idaho Code §39-3601 *et seq.*, the Middle Snake River WAG will be advising the DEQ on priorities within the watershed and implementation of this phase and subsequent phases. **TABLE 2** summarizes the various phases of the Mid-Snake WMP. See section 1.04, Strategy of the Mid-Snake WMP.

**TABLE 2. PHASES OF THE MID-SNAKE WMP.**

<table>
<tr><th>Phase Prioritization</th><th>1996</th><th>1997</th><th>1998</th><th>1999</th><th>2000</th><th>2001</th><th>2002</th><th>2003</th><th>2004</th><th>2005</th></tr>
<tr><td>I. Total Phosphorus</td><td colspan="10">xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</td></tr>
<tr><td>II. Sediment</td><td colspan="2"></td><td colspan="8">xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</td></tr>
<tr><td>III. Nitrogen</td><td colspan="3"></td><td colspan="7">xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</td></tr>
<tr><td>IV. Flow</td><td colspan="4"></td><td colspan="6">xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</td></tr>
<tr><td>V. Other(s) as Needed</td><td colspan="5"></td><td colspan="5">xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx</td></tr>
</table>

Key objectives of the overall goal of the Mid-SnakeWMP include the following:

1. Attain state water quality standards for nuisance vegetation, dissolved oxygen (DO), and temperature for support of cold water biota within ten years of final plan approval.

2. Full implementation of industry nutrient and sediment reduction targets within five years of final plan approval, which will achieve the instream water quality goal of 0.075 mg/L TP by Year 10. (See section 3.01, Water Quality Target, for a fuller explanation.)

3. Review and prioritize emerging environmental concerns (such as endangered species, ground water contamination, and stormwater) that require a much longer evaluation process.

4. Develop an outreach plan within the first phase of plan implementation. Public involvement, information, and education are essential to a successful watershed plan. As part of this process, the DEQ recognizes that public outreach is a high priority and that cooperation through "partnerships" with those affected by the DEQ's decisions is critical to resolving conflicts in resource uses and environmental protection, and that an evaluation process is effective and necessary for public outreach efforts. The DEQ will develop this plan within the first phase.

5. Within the first phase of plan implementation, establish the latitude/longitude coordinates of all point sources within the Middle Snake River Planning Area.

6. Participate and coordinate with the Federal Energy Regulatory Commission (FERC) actions on the Middle Snake River for both proposed and existing projects. The DEQ will develop additional study requests, if necessary, that provide additional knowledge of the impacts by impoundments on the Middle Snake River.

7. Explore and integrate a focus on sustainable and responsible economic development with water quality projects on the Middle Snake River, which emphasize energy efficiency and maximum utilization of waste products.

8. Incorporate pollution prevention concepts where appropriate in administration and enforcement action of water quality standards.

9. Develop a pollution trading process among and between pollution sources that impact the Middle Snake River consistent with this WMP.

10. Ensure that management actions of this WMP are consistent with the Endangered Species Act. Additionally, the Snake River Aquatic Species Recovery Plan has raised the issue of ground water protection as a "priority one recovery action" due to the reliance of resident endangered/threatened species on high quality spring habitats. Key objective 11 (which follows) further discusses the creation of a Ground Water Task Force under the Middle Snake River WAG.

11. Develop a greater understanding of the hydrological conjunctive interaction between ground water and surface water and what impact this interaction may have on water quality and water quantity. Within Phase I of the Mid-Snake WMP, a Ground Water Task Force will be created by the Middle Snake River WAG from membership within the WAG, or from an established or newly established group which may already be focusing on ground water concerns in the Middle Snake River Watershed Mangement Area. Its purpose will be to assess what is already known on ground water and determine what additional work is necessary to prepare a comprehensive status report to advise the DEQ. As part of this effort, the task force will include specific target dates to address such issues related to ground water management as each of the succeeding phases of the Mid-Snake TMDL come into play over the initial five years of plan implementation.

## 1.04 STRATEGY OF THE MID-SNAKE WMP

The strategy of the Mid-Snake WMP is to ensure that the objectives of the overall goal are achieved. The strategy utilizes a watershed approach to address pollutant sources from throughout the Middle Snake River Watershed Planning Area. The watershed approach encourages community-based problem solving. The Mid-Snake WMP will have five phases. Although each phase appears to be segregated from the other, each phase is integrated with the preceeding and subsequent phases. The DEQ will address all phases with as much detail as has been done in Phase I and is currently involving public involvement in this process through the Middle Snake River WAG. Public comment and review will be used in subsequent phases.

### 1.04.01 PHASE I

The first phase of the Mid-Snake WMP focuses upon TP reductions. Proposed industry TP reductions (as described in **TABLE 3**) will be implemented within five years of plan acceptance and be maintained for an additional five years (a total of ten years) to reach an instream target of 0.075 mg/L TP at Gridley Bridge, Hagerman, Idaho.

**TABLE 3. PROPOSED INDUSTRY TP REDUCTIONS BY YEAR 5.**

| INDUSTRY | PROPOSED REDUCTION |
|---|---|
| **A. POINT SOURCES** | |
| Aquaculture | 40% |
| Food Processors | 20% |
| Municipalities | 34% |
| **B. NONPOINT SOURCES** | |
| Confined Feeding Operations[1] | 100% |
| Irrigated Agriculture | 10% |

| INDUSTRY | PROPOSED REDUCTION |
|---|---|
| Hydroelectric Power Industry[2] | 100% |

[1]These operations are defined as point sources based on their NPDES permits but are listed here as nonpoint sources because they are "zero discharge" to surface waters.
[2]The Hydroelectric Power Industry does not discharge additional nutrients to the Middle Snake River. The industry does alter stream flow which impacts the water quality of the Middle Snake River.

Within the first three years of the implementation of the first phase, the DEQ-TFRO will provide quarterly reports to the Middle Snake River WAG that review each industry's progress and goal attainment. In addition, the Middle Snake River WAG will develop a ground water task force and assess the research already developed in the Middle Snake River Watershed Management Area and present its findings to the WAG, who will then advise the DEQ on prioritization of ground water concerns.

### 1.04.02 PHASE II

The second phase of the Mid-Snake WMP will focus upon sediment reduction. This phase will commence in 1998 (or sooner) and will address the issues of excessive Total Suspended Solids (TSS), settable solids, and excessive bedload sediment reduction goals on the fourteen priority streams of the Middle Snake River, additional agricultural returns, tributaries, and from point sources. Other nonpoint source sediment concerns will also be addressed, such as precipitation and stormwater runoff.

The principle goals of this phase will be to detail and implement management tools that address agricultural nonpoint source pollution from nonirrigated cropland, irrigated cropland, grazing, riparian/wetlands, animal waste management, precipitation and stormwater runoff, as well as sediment from point sources. Specific to these goals are identification of water quality criteria, development of site-specific BMPs, application and monitoring of BMPs, and effectiveness evaluations of the BMPs. The Middle Snake River WAG will be instrumental in recommending site-specific BMP projects. As part of this phase, the Middle Snake River WAG and the Irrigated Agriculture Industry will advise the DEQ on the preservation of existing wetlands and in the development of constructed wetlands for the purpose of removing nutrients, sediments, and chemicals from return flows as well as providing valuable wildlife habitat.

### 1.04.03 PHASE III

The third phase of the Mid-Snake WMP will focus upon nitrogen reduction. This phase will commence in 1999 (or sooner) and will address the effect of nitrate + nitrite, ammonia, and total Kjeldahl nitrogen (TKN) loadings from various sources to water quality within the fourteen priority streams of the Middle Snake River. The only identified nitrogen pollutant on the Middle Snake River in the §303(d) list of segments is ammonia (see **Table 1**) as of this writing, although it is recognized that nitrogen in its many available forms may be function as an excess nutrient. Additional research may need to be done to determine if the various forms of nitrogen are pollutants of concern in the Middle Snake River. The Middle Snake River WAG will be instrumental in developing the components of this phase.

### 1.04.04 PHASE IV

The fourth phase of the Mid-Snake WMP will evaluate the impacts of altered flows upon water quality conditions on the Middle Snake River. Although this phase is scheduled to commence in the year 2000, the Middle Snake River WAG is currently in the process of establishing a working committee for determining flow requirements and/or flow augmentation needs. Because of the complexity of flow issues on the Middle Snake River, a significant amount of time may be required for the Middle Snake River WAG to develop its management strategies and to identify and bring together those parties in the watershed that may contribute to a resolution of this important watershed component.

In addition, as part of the DEQ's commitment to the development of an ecological risk assessment of the Middle Snake River, the DEQ will participate with the EPA in the development of an ecological risk analysis on the Middle Snake River. This ecological risk analysis will utilize measurements and models (such as the RBM10) to estimate the likelihood of deleterious alterations in the riverine abiotic and biotic systems for both the present and future river conditions. Elements of risk that will be identified shall include the variability in flow, water quality and quantity, outflow, meterorologic variability, and model uncertainty compared to the variability in the environmental requirements for indicator organisms. With the use of a geographic information system, results from the ecologic analysis can be linked to a planning model which will provide a framework of management options in the basin.

### 1.04.05 PHASE V

The fifth phase of the Mid-Snake WMP will focus upon other pollutants or stressors. This phase will commence in 2001 (or sooner) on additional pollutants or stressors of the fourteen priority streams of the Middle Snake River. As of this writing (as found in the §303(d) list of 1996; see **Table 1**), excess nutrients (as TP and nitrogen as ammonia), sediment, dissolved oxygen, pathogens, temperature, thermal modification, and flow alteration are the only pollutants and/or stressors that affect the Middle Snake River. However, according to the Irrigated Agriculture Industry (see Appendix A-5, Surface Water Concerns), the loads entering the Middle Snake River from irrigation are typically composed of sediment and nutrients. The fine soil particles have associated, in addition to the nutrients, pesticides attached to them. Also included in the return flow besides the dissolved nutrients are pesticides. Therefore, the DEQ and the Middle Snake River WAG will be reviewing this concern over the next five years.

Consistent with §303(d) of the CWA, the Idaho Nutrient Management Act, and Idaho Code §39-3601 *et seq.*, this WMP is a plan designed to direct management actions within the Middle Snake River Watershed Planning Area so that polluted waterbodies (the fourteen priority stream segments of the Middle Snake River) are restored to a level that achieves Idaho's state water quality standards. A critical component with this WMP is establishing the assimilative capacity of the Middle Snake River. The **assimilative capacity** is an estimate of the amount of pollutants that can be discharged to the Middle Snake River from all sources without violating state water quality standards. In order to achieve the restoration goals of this WMP, a phased approach is necessary to further define interim load allocations and to gauge success of management actions in achieving load reductions that reflect improvement in water quality conditions. Seasonal variation is also critical to successful implementation of this WMP. Additional data collection within the first three years of Phase I will more accurately assist in determining the assimilative capacity of the Middle Snake River and the accompanying pollution allocations.

## 1.05 THE PLANNING PROCESS

As a consequence of Idaho Code §39-3601 *et seq.*, the Mid-Snake WAG grew out of the Middle Snake River nutrient management planning effort. Its purpose is to advise the DEQ on prioritization of water quality issues relative to the Middle Snake River Watershed Planning Area. This includes the Mid-Snake WMP. In an effort to expedite the organizational process, the Upper Snake Basin Advisory Group (Upper Snake BAG) has participated in organizing the Mid-Snake WAG. The DEQ has been involved in this process and has supported both the Upper Snake BAG and the Mid-Snake WAG in this effort.

The main body of the Mid-Snake WMP was written beginning in March of 1996 by the DEQ and committee representatives of the Executive & Technical Advisory Committees (EAC/TAC) of the Mid-Snake Nutrient Management Plan (NMP) group. The process was coordinated by the DEQ with significant contributions from the committee representatives. The EPA and the United States Fish and Wildlife Service (USFWS) were also involved. The EPA provided the structure (or Table of Contents) to the watershed plan. The USFWS provided current information relative to the endangered species in the Middle Snake River and their Recovery Plan for the snails. This WMP incorporates the requirements of Idaho Code §39-3601 *et seq.* and the CWA's §303(d).

The planning process in developing the WLAs and LAs has been technically difficult. Most industries have begun some level of management reductions through their proposed industry plans. In order to provide a measure of accountability and credit, it was agreed that the 1991 year would be the baseline year for the plan. Because a large amount of data is still needed from many facilities within each industry, the WMP will be iterative and phased (as explained previously). Additional research will be conducted by the DEQ and other agencies to further evaluate the goal of 0.075 mg/L of water column TP. It may be that reduced plant abundance will occur at 0.10 mg/L TP or that something more stringent than 0.075 mg/L may ultimately prove necessary. Other WMPs may be developed as a consequence of this watershed management strategy as the Middle Snake River WAG prioritizes additional waterbodies in this multi-watershed planning area in the years to come. Where prioritization of additional waterbodies within the watershed occurs, the DEQ will provide technical assistance to the WAG.

A thirty-day public review period was conducted begining October 23, 1996 and ending November 23, 1996. Public comments have been incorporated, as appropriate, into this final plan. All public comments relative to the main portion of the watershed management plan are found in Appendix C of this document.

## 1.06 GROWTH AND RESPONSIBLE RESOURCE DEVELOPMENT

The Middle Snake River WMP has been developed as a long-range plan consistent with the concept of sustainability. This sustainable development strategy requires integrated economic, environmental, and social planning that extend beyond the current generation. Restoring and maintaining the water quality of the Middle Snake River and protecting existing beneficial uses are recognized as important factors influencing the future economic and social well-being of the region. Management actions support practices and recommend policies that lead towards sustainable and responsible development. These actions provide mechanisms for regional cooperation in developing long-term environmental, economic, and community sustainability plans. Each of the industry WMPs focuses on strategies that promote sustainable options. Soil, water, and energy conservation programs are emphasized. Waste minimization, pollution prevention, and waste recycling programs are central to the success of the Middle Snake River WMP. These concepts clearly demonstrate inter-relationships among the agriculturally-related industries in this region.

Agriculture is the economic backbone of the Magic Valley and a significant source of nonpoint source pollution to the Middle Snake River. (DEQ, 1991, *Upper Snake River Basin Status Report*) Pollutants of concern include sediment, bacteria, nutrients, organic enrichment, and pesticides. The four main groups that comprise the agriculture industry are: CFOs (livestock, dairy, fish production), irrigated agriculture, food processors (cheese factories, creameries, sugar refineries, meat packing houses, potato processors, sweet corn canneries), and the support/consumer group (equipment dealers and parts houses, veterinarians, construction companies, commodity transporters). The irrigated agriculture industry grows row and forage crops for human and animal consumption. Food processors convert the animal products and crops into consumer-usable forms. Finally, the support/consumer groups get the products to market and into the hands of consumers. Therefore, the sustainability of the Magic Valley depends upon each of these groups working together to minimize waste, prevent pollution, and maximize reuse and recycling. Waste streams are the byproducts of each of the major industrial user groups. Utilization of another industry's waste stream not only demonstrates wise stewardship and sustainability, but makes sound economic sense.

Many of the industry leaders along the Middle Snake River are developing innovative ideas for recycling other industries' waste stream. Irrigated agriculture, for example, supplies feed and grains for CFOs and food processors, respectively. Food processors use wastewater as a soil amendment and whey as an animal feed. Consumers provide services and operating capital for the agricultural suppliers. In turn, they receive quality products produced in abundant quantity. The DEQ will continue to participate in seminars and workshops with other agencies and regional organizations and address the concept of sustainable development strategy. The workshops and seminars will provide information on the use of waste materials generated by communities, food processors, and agriculture as sources of energy, crop nutrients, or saleable products. The DEQ will coordinate and provide information on development plans that enhance sustainable development options which protect Idaho's basic resources of soil, water, and air.

Resource development, environmental protection, and economic growth in the Middle Snake Watershed may be possible if waste streams are minimized and properly managed. Land application agronomic rates, reuse of agricultural and industrial byproducts, and recycling of materials provide the means for increasing economic development options. Implementation of the Middle Snake River WMP will allow for continued and balanced growth of the Middle Snake River Watershed's economy without compromising the region's resource base for future generations.

Economic and population growth has been a big factor since 1992 in the Middle Snake River Watershed Management Area and will continue in years to come. Growth brings about waste management concerns. Thus, the Middle Snake River WAG will advise the DEQ and other agencies on developing additional strategies for industry pollution reductions. More stringent laws and regulations may be required if the assimilative capacity to the Middle Snake River continues to increase due to community growth and development. However, before such actions occur, the WAG will explore zoning and planning ordinances in the various communities and provide city governments with options for effective planned growth development within the watershed.

# CHAPTER 2
# THE MIDDLE SNAKE RIVER WATER RESOURCE

## 2.00 PRELIMINARY

This chapter describes the Middle Snake River Multi-watershed Planning Area, the hydrologic system of the Middle Snake River, and the impacts to water quality degradation. The chapter also identifies pollutant sources and proposed pollutant control strategies.

## 2.01 DESCRIPTION OF THE WATERSHED

The Middle Snake River is a 94 mile reach of the Snake River located generally between Milner Dam and King Hill, Idaho. This stretch of the Snake River is impacted by return flows from irrigated agriculture, fish hatchery effluent, hydroelectric development, sewer treatment plant discharge, spring flows, and other factors. Below Milner Dam are five major hydroelectric impoundments: Twin Falls Dam, Shoshone Falls Dam, Upper Salmon Falls Dam, Lower Salmon Falls Dam, and Bliss Dam. The Middle Snake River receives discharge from over 75 commercial fish hatchery operations located in the reach. The source of water for hatcheries is generally from natural springs.

As described in Chapter 1 of this WMP, the Middle Snake River has fourteen segments that are listed as priority segments on the §303(d) list. See **TABLE 1**. The Middle Snake River Multi-watershed Planning Area includes six (6) watersheds, also known as Hydrologic Unit Codes (or HUCs, as described by the United States Geologic Survey (USGS)). These HUCs are 17040212, 17040213, 17040221, 17040219, 17040220, and 17040209. The management area that will be initially addressed in this WMP includes the geographic areas that drain into the Middle Snake River from Milner Dam to King Hill, Idaho. This includes HUCs 17040212 and 17040213.

The other management areas of the Middle Snake River Multi-watershed Planning Area include the Camas Creek/Wood River Watershed Management Area (HUCs 17040221, 17040219, and 17040220) and the Minidoka/Cassia Watershed Management Area (HUC 17040209). These two additional watershed management areas will be reviewed by the Middle Snake River WAG, and in conjuction with the Upper Snake BAG, determine their priority. It is expected that these WAGs will soon be established and preliminary planning will commence in 1996. **TABLE 4** identifies the three management areas within the Middle Snake River Multi-watershed planning area.

**TABLE 4. The Middle Snake River Multi-watershed Planning Area.**

| Management Area | HUCs | Strategic Planning |
|---|---|---|
| Middle Snake River Watershed | 17040212 and 17040213 | Mid-Snake WMP (1996) |
| Camas Creek/Wood River Watershed | 17040221, 17040219, and 17040220 | Preliminary Planning (1996) |
| Minidoka/Cassia Watershed | 17040209 | Preliminary Planning (1996) |

## 2.02 DESCRIPTION OF THE HYDROLOGIC SYSTEM

A large portion of the local economy and culture is dependent on water provided by the Middle Snake River and its tributaries. Water quantity is therefore crucial to the local economy. The Middle Snake River's hydrologic system is shaped by precipitation, the Middle Snake River itself, tributaries, irrigation return flows, Ground water flow, and geothermal sites. With the exception of precipitation, all of these sources receive nutrient inputs from human activities. Severely diminished instream flows have historically limited the Middle Snake River's ability to assimilate these nutrient-rich inputs. **TABLE 5** summarizes the general characteristics and conditions of the Middle Snake River hydrologic system.

**TABLE 5. THE MIDDLE SNAKE RIVER HYDROLOGIC SYSTEM (General Characteristics)**

| Hydrologic Characterization | General or Average Condition |
|---|---|
| Precipitation | 10 inches of rain annually |
| Middle Snake River | 200 - 1500 cfs summer flows<br>2000+ in surplus water years |
| Tributaries | 2300 cfs |
| 80 Irrigation Return Flows: Twin Falls Canal Company & North Side Canal Company | 250 cfs (TFCC)<br>169 cfs (NSCC) |
| Ground water/Springs | 5447 cfs |
| Geothermal Sites | 30 cfs |

Note: Diversion for irrigation is approximately 5000 cfs at Milner Dam.

### 2.02.01 PRECIPITATION

Local precipitation in the Milner to King Hill area is not a significant contributor to the water supply of the reach. Annual precipitation in the region averages 10 inches and has varied from a low of 4 inches to a high of 18 inches depending on location. November through January are the wettest months, whereas July and August are the driest. Excluding the tributaries, overland runoff into the Middle Snake River directly from snowmelt or precipitation is relatively small; however, individual runoff events such as rain-on-snow events contribute significant amounts of sediment and phosphorus to receiving streams.

### 2.02.02 THE MIDDLE SNAKE RIVER

The Snake River watershed upstream of King Hill, Idaho, is often referred to as the Upper Snake River Basin. The Upper Snake River Basin drains an area of 35,857 square miles in Idaho, Wyoming, Nevada, and Utah. In its upper reaches the Snake River constitutes a much larger river than what enters the planning reach at Milner. At Heise, upstream from nearly all irrigation uses, the average annual flow of the Snake River is about 6900 cfs. A significant amount of the river flow below Heise is lost to ground water and naturally recharges the Eastern Snake Plain Aquifer. The Henry's Fork and its principal tributaries add on an average 3100 cfs above diversions. These supplies, plus those of smaller tributaries, are reduced by irrigation diversions to an average flow of 3450 cfs at Milner. A portion of the water that is diverted for agriculture percolates into the aquifer. Some of this ground water returns to the Snake River in other reaches, such as the reach from Blackfoot to American Falls. A majority of the recharge to the aquifer above Milner Dam returns to the Snake River via the springs below Milner Dam.

Bypass flows through Milner Dam vary both annually and seasonally. (The term "bypass flows" is commonly used by boaters and water managers to describe the one mile stretch of river from Milner Dam down to where the Idaho Power powerplant discharges to the Snake River.) In the driest years, the upper Snake storage and diversions at Milner Dam fully determine instream bypass flows. Consequently, average summer bypass flows at Milner Dam may be less than 700 cfs and may occasionally be reduced to zero.

The Idaho State Water Plan states that the minimum release past Milner Dam, once irrigation demand exceeds natural flow, is to be zero. Under the FERC license for Milner Power Plant, a minimum flow of 200 cfs in the "bypass reach" is required when water is available. Once irrigation demands exceed natural flow, any water discharging to the Snake River from Milner Dam must come from storage accounts. In surplus water years summer flow at Milner can be several thousand cfs. But even in surplus water years the flow available for release below Milner Dam reaches zero by the middle of July when natural flow drops below irrigation demand. In the past, Idaho Power Company has released some of their own storage water or rented water from the Upper Snake River Rental Pool to provide releases past Milner Dam. In more recent years, the Bureau of Reclamation has rented water from the Upper Snake River Rental Pool, which was released past Milner Dam for augmentation flows. Flow in late fall and winter during dry years is largely composed of the minimum release rate at American Falls Reservoir (about 300 cfs) plus downstream gains. This results in flows of 400 to 900 cfs at Milner Dam. More typical late summer flows are generally in the range of 1000 to 2000 cfs. In the winter or spring, flows of 2000 to 10,000 cfs may occur if space in upstream reservoirs is vacated in anticipation of high springtime flows. The highest flow ever recorded at Milner occured in June 1918 (39,800 cfs). The average flows below Milner Dam are summarized in the following table:

**TABLE 6. APPROXIMATE FLOWS & CORRESPONDING DATES FOR MILNER DAM.**

| Season | Dry Years | | Surplus Water Years | |
|---|---|---|---|---|
| Irrigation season before demand exceeds natural flow | Apr 1 - May | *200 - 10,000 cfs | Apr 1 - Jul | 200 - 20,000 cfs |
| Irrigation season after demand exceeds natural flow | May - Oct 31 | *200 cfs (+ storage released for specific purposes) | Jul - Oct 31 | *200 cfs (+ storage released for specific purposes) |
| Winter releases | Nov 1 - Mar 31 | 400 - 900 cfs | Nov 1 - Jan | 1000 - 2000 cfs |
| | | | Jan - Mar 31 | 2000 - 10,000 cfs (if space is needed in upstream reservoirs) |

*Idaho Power Co. provides a minimum flow of 200 cfs in the "bypass reach" out of their storage account as part of their FERC license for the Milner powerplants. TABLE 6 was provided by the Bureau of Reclamation.

Downstream from Milner, flows increase substantially from ground water discharge, irrigation returns, and tributaries. Long term mean annual flows at USGS discharge gauges in the reach reflect these gains (USGS, 1979-1993) and are shown in the following table:

**TABLE 7. USGS GAUGES AT MILNER & DOWNSTREAM.**

| USGS Location | Discharge, cfs |
|---|---|
| At Milner Dam | 3430 |
| Near Kimberly | 3800 |
| Near Buhl | 5450 |
| Near Hagerman | 9280 |
| At King Hill | 11020 |

Average daily discharges from 1947 to 1991 as reported by five USGS gauges in the reach indicate that discharge patterns of the recent drought period are markedly different than normal. A lack of winter precipitation and snowpack caused the absence of higher flows in April, May, and June at all stations from the 1988-1991 record. The 1988-91 records show near zero flows at Milner for this period compared to long term average flows of nearly 5,000 cfs. The seasonal flow patterns for the drought period show continually receding flows at all stations after the irrigation season. The seasonal flow patterns for the Buhl gauge are representative of all gauging stations in the study reach and show the lack of higher early season flows and the declining winter-time flow. July through September flows are very similar for the two periods, reflecting the base flows supported primarily by ground water returns from the northside and southside springs. Flows in 1993 were closer to the long term mean, however, the spring freshet was shorter in duration than average (USGS, 1988-1993).

### 2.02.03 TRIBUTARIES

Tributaries of the Middle Snake River include numerous streams and springs of various sizes and range from artificial, highly turbid coulees to pristine springs. Most tributary streams also are impacted from irrigation return flows during the irrigation season. The four largest tributaries are Rock Creek, Salmon Falls Creek, Malad River, and Clover Creek. The Middle Snake River WAG in conjunction with the Upper Snake BAG will be reviewing these streams along with other streams of HUCs 17040212 and 17040213 for a determination of management pollution reduction strategies within the first three years of plan implementation. A summary of their flows is included in **TABLE 8**, followed by additional information.

**TABLE 8. AVERAGE FLOWS FOR MAJOR TRIBUTARIES OF THE MIDDLE SNAKE RIVER.**

| TRIBUTARY | AVERAGE FLOW, cfs |
|---|---|
| Rock Creek | 55 - 70 (affected by springs and return flows) |
| Salmon Falls Creek | 166 |
| Malad River | 262 (affected by springs) |
| Clover Creek | < 140 |
| Billingsley Creek, Deep Creek, Mud Creek, Cedar Draw Creek, Perrine Coulee System, Vinyard Creek | 1700 (average total for all) |
| TOTAL = | Approximately 2300 cfs |

#### ROCK CREEK

Rock Creek originates in mountains southeast of Twin Falls. Headwater runoff is about 55 to 70 cfs which is fully diverted in the summer time so that the total flow at the mouth is from ground water or surface return flow. There are no tributaries entering Rock Creek in the reach below the Highline Canal. At its mouth, the flow averages approximately 200 cfs as a result of inputs from numerous tributaries, springs, and irrigation returns. Rock Creek was recognized as one of the most severely degraded streams in the state. Consequently, the stream was selected as a Rural Clean Water Project (RCWP) from 1981-1991. The Rock Creek RCWP was a ten-year, interagency watershed project aimed at improving instream water quality through application of agricultural BMPs. As a result of RCWP implementation, significant reductions in sediment and phosphorus were achieved. Due to a lack of uniform and continual implementation of these BMPs in the mid-1990s, water quality analysis conducted by the DEQ indicates that Rock Creek is returning to a degraded stream.

#### SALMON FALLS CREEK

The flows of Salmon Falls Creek are fully regulated at a reservoir near Rogerson. Salmon Falls Creek contributes about 166 cfs to the Snake River as both surface water and subsurface return flow from irrigated areas. Water quality data provided by the DEQ indicate that this tributary is also degraded. This tributary will be reviewed by the Middle Snake River WAG, in consultation with the DEQ and be prioritized within the first year of the WAG's development.

### MALAD RIVER

The Malad River is the largest tributary in the reach. In dry years, flows are composed primarily of irrigation returns and Ground water discharge due to diversions on tributaries. Long term average annual flow of the Malad is about 262 cfs, as measured by the Gooding USGS gauge 13152500. Ground water discharge and irrigation return flow in the lower canyon adds nearly 1243 cfs to that amount. About 1174 cfs reaches the Snake River via Idaho Power's Malad power flume and power plant downstream from the mouth of the river.

### CLOVER CREEK

Clover Creek, which enters the Snake River one mile upstream from the King Hill gauge, has highly variable flow, but generally averages less than 140 cfs.

### ADDITIONAL TRIBUTARIES

There are several smaller tributaries to the Middle Snake which contribute significant loads of nutrients to the Middle Snake River. Billingsley Creek originates from numerous springs in the Hagerman area and discharges a significant nutrient load to the Middle Snake River. A TMDL was developed to address nutrient impacts on water quality within Billingsley Creek in 1993. (IDHW-DEQ, 1993a). Deep Creek and Mud Creek originate from springs and seeps near Buhl. Cedar Draw Creek originates near Filer. Excessive bacteria counts in Cedar Draw Creek impair primary contact recreation in this stream (IDHW-DEQ, 1991). The Perrine Coulee system consists of irrigation return flows augmented by springs and flows through urban areas in and near Twin Falls and is a source of sediments, nutrients, and bacteria to the Snake River (IDHW-DEQ, 1987). Vinyard Creek is a short, spring-fed tributary located on the north side of the Snake River Canyon. Water quality is good for most of its length, but an irrigation return enters the creek 300 yards above its confluence with the Snake River. From this point, water quality is substantially degraded (IDHW-DEQ, 1989). The total contribution of these additional tributaries to the Middle Snake River averages a total of 1700 cfs.

For purposes of the Mid-Snake WMP, the Billingsley Creek TMDL is considered a separate TMDL. In the RBM10, the Billingsley Creek load was not used in the original modeling effort (1992-1994) because the 42 river segments in the Middle Snake River were not extended downstream past Upper Salmon Falls. Thus, the Billingsley Creek load is not accounted for in the total load of the Middle Snake River for point and nonpoint sources. During subsequent phases of the Mid-Snake TMDL the RBM10 will be refined to include those river segments from Upper Salmon Falls through King Hill, Idaho.

## 2.02.04 IRRIGATION RETURN FLOW AND AGRICULTURAL DRAINS

Irrigation return flow enters the Snake River directly, from numerous conduits on both sides of the canyon, and indirectly via the tributaries. Many irrigation return streams contain significant portions of ground water and therefore flow year round. Return streams typically have highly variable flows reflecting daily and seasonal patterns in water use. It should be noted that in the Middle Snake River system, over 80 agricultural drains have been noted or reported on both north and south sides of the Snake River rim. These represent drains from irrigation canal companies and natural drains. The Twin Falls Canal Company estimates maximum flows of 250 cfs on the "south side." The South Side Canal Company estimates maximum flows of 169 cfs from the "north side."

## 2.02.05 GROUND WATER FLOW

Idaho's ground water supports and maintains surface water flows and surface water quality throughout the state. On the Middle Snake River in drought years, ground water flow may make up as much as 60% of the Middle Snake River flow. Therefore, the protection of ground water in the Middle Snake River Watershed Planning Area is necessary to ensure continued ground water and surface water uses.

1. **AQUIFERS IN THE MIDDLE SNAKE RIVER**

Three general types of aquifers have been identified in Idaho and each is characterized by distinctive geology. The principle types of aquifers are: (1) valley-fill aquifers, (2) basalt aquifers, and (3) sedimentary and volcanic aquifers. The Snake River in the Upper Snake Basin is characterized by the following: (1) the north rim portion is of basalt aquifer type, and (2) the south rim portion is valley-fill and sedimentary/volcanic type. Valley-fill aquifers consist of unconsolidated sediments filling the valleys between ridges of the mountainous portions of the state. Recharge to ground water in valley-fill aquifers is primarily from infiltration of precipitation and leakage from surface water. Basalt aquifers are characterized by numerous basalt flows and thin interbeds of sediment and/or pyroclastic volcanic rocks. Major sources of recharge to basalt aquifers are infiltration of precipitation, infiltration of irrigation water, and seepage from canals, streams, and rivers. Sedimentary and volcanic aquifers consist of unconsolidated sediments with basalt and rhyolitic rocks and interbedded shale and sandstone. Major sources of recharge are infiltration of irrigation water and seepage from canals or rivers.

The major aquifer in south central Idaho is the Eastern Snake River Plain Aquifer. Sedimentary and volcanic, and valley fill aquifers are present in most portions of this region. Regional ground water quality concerns have been oriented towards ground water protection through animal waste management. Current emphasis is on waste management system plan review and approvals, facility assessments and evaluations, and technical assistance to operators for animal waste management system design and operation.

The largest inflow to the Middle Snake reach is from the Snake River Plain Aquifer on the north and east sides of the Canyon. A second significant source is from the aquifer underlying the Twin Falls tract, which discharges about 500 cfs. Water in these aquifers is principally stored in and transmitted through fractures and permeable ash and soil interbeds deposited between ancient lava flows. The Snake River Plain Aquifer, one of the largest ground water systems in the United States, underlies the Snake River Plain from the vicinity of St. Anthony, Idaho, to the western terminus of the Middle Snake reach. Ground water moves through the aquifer in a southwesterly direction. The aquifer is recharged by seepage from the Snake River, streams entering or crossing the plain, the percolation of irrigation water, precipitation, and underflow from tributary basins.(*The 500 cfs estimate entering from the "south side" is an estimate from Luther Kjelstrom of the USGS. This was recently corroborated by University of Idaho in the ground water model development for the City of Twin Falls (1996).*)

In general, the basalt on the south side of the Middle Snake River is much less permeable than the basalt on the north. The original depth to water on the south side is estimated at 250 feet. Irrigation began on the south side in 1905, and the water table rose rapidly in some tracts. Waterlogged areas appeared by 1912, and many drains, tunnels, and drainage wells were constructed to alleviate seeped conditions (Mundorff et al.., 1964). As of 1994, the depth of ground water may be as little as 35 feet near Murtaugh or as great as 500 feet south of the Snake River near Bell Rapids. Depth to ground water varies on the north side from approximately 350 feet to less than 100 feet (Brockway et al.., 1992).

Ground water discharge in the Milner-King Hill reach has varied as recharge conditions changed. Elevated ground water discharges from 1902 to the early 1950s were likely the result of increased recharge in irrigation in areas north and east of the springs. Since the highest recorded flows in the mid-1950s, flows have been steadily declining. Withdrawals from the aquifer (i.e., from pumping for irrigation and commercial use) and increasing efficiencies in irrigation application by surface water users on the plain (a major recharge source) will likely perpetuate the decline of aquifer flows. When these stresses become moderate at some relatively fixed level in the future, aquifer outflows will begin to approach equilibrium with inputs and upstream withdrawals. Ground water discharges vary seasonally. The highest flows occur in the fall as a result of the cumulative effects of recharge by surface water irrigation. Low flows occur in April or May before the effects of the new irrigation season recharge become significant.

Discharge from the Snake River Plain Aquifer occurs throughout the Milner to King Hill reach, but the largest gains from this source are between the Buhl and Hagerman gauges. Springs issuing from the aquifer occur singly, in clusters, and in continuous zones along the Snake River Canyon. The larger springs or groups of springs are named, but innumerable smaller unnamed springs and seeps exist. Outflows from many of the springs fall almost directly into the Snake River. Others, like Billingsley Creek, form tributary streams before entering the River. One of the largest spring groups occurs in the Malad River Canyon. **TABLE 9** summarizes the 12 major springs (discharge of 100 cfs or more) in the middle Snake River for 38.9 miles from river mile 610.4 at Blue Lakes Spring to river mile 571.5 at Malad Springs. Currently (since 1990), spring discharges are down to near historic levels and are continuing to decline. On a seasonal basis, spring flows typically peak in November or early December and reach their seasonal low flow in April.

**TABLE 9. MAJOR SPRINGS (> 100 cfs) IN THE MIDDLE SNAKE RIVER.**

| **Name of Spring** (on Northside of Snake River rim) | **Discharge Range (cfs)** | **Average Discharge (cfs)** | **River Mile** |
|---|---|---|---|
| Blue Lakes Spring | 180 - 260 | 212 | 610.4 |
| Crystal Springs | 430 - 580 | 457 | 600.5 |
| Niagara Springs | 200 - 360 | 307 | 599.0 |
| Clear Lakes Springs | 470 - 540 | 494 | 593.0 |
| Briggs Creek Springs | 105 - 115 | 112 | 590.5 |
| Banbury Springs | 95 - 140 | 126 | 589.0 |
| Box Canyon Springs | 715 - 905 | 809 | 587.8 |
| Thousand Springs | 750 - 1430 | 1510 | 584.5 |
| Magic Springs | 85-115 | 100 | 582.0 |
| Big Springs | 90 - 140 | 125 | 574.0 |
| Malad Springs | 1220 - 1360 | 1195 | 571.5 |
| | TOTAL | 5447 | - |

## 2. SOURCES OF GROUND WATER CONTAMINATION

There is a significant lack of historical data on the quality of Idaho's ground water. Most studies have been conducted recently and are not yet consolidated into reports. Nevertheless, the limited data available show elevated levels of nitrates in ground water from several areas within the Middle Snake River system. These enriched waters enter the Middle Snake River either directly through springs or via agricultural returns, aquaculture facilities, or tributaries. Brockway et al.. (1992) as well as USGS (1995-1996) indicated that ground water in the Middle Snake River reach had elevated nitrate-nitrogen levels (0.6 - 3.7 mg/L). The area southwest of Jerome exhibited the highest concentrations of nitrate nitrogen. Brockway and USGS concluded that nitrate levels were related to land use southwest of the city of Jerome.

In 1971 and 1987 the USGS reported high nitrate levels in the ground water of the Middle Snake region (USGS, 1971; USGS, 1987). Furthermore, preliminary results from the National Agriculture Water Quality Assessment (NAWQA) studies support these results. Preliminary analysis suggested a southwesterly increase in nitrate levels from just east of Paul to west of Jerome (Rupert, M., per. comm. 1993). Additionally, low levels of organic chemicals were found in many of the ground water locations tested in 1993.

A ground water study was implemented in 1991 by the North Side Soil Conservation District (NSSCD) to determine the condition of ground water in a portion of Jerome County. Average nitrite + nitrate concentrations in ground water were reported as 1.96 to over 2.49 mg/L (USDA-SCS, 1994). The University of Idaho examined water quality in 16 undeveloped springs in 1991 and 1992. Preliminary results indicate that nitrite-nitrate nitrogen concentrations ranged from 0.7 to 6.7 mg/L, and total phosphorus was generally below 0.07 mg/L in sampled springs (Brockway, unpublished data).

Because of the concerns raised by several agencies on the issue of ground water, the DEQ, the Idaho Department of Agriculture (IDA), and Idaho Department of Water Resources (IDWR) have summarized the major sources of ground water contamination in Idaho. Some of these do not affect the Middle Snake River, but are included in the overall consideration for Idaho. For a more definitive review of the Middle Snake River, see part 4, Land Use Activities (in this section).

### a. AGRICULTURAL ACTIVITIES

Ag Chemical Facilities, Animal Feedlots, Drainage Wells, Fertilizer Applications, Irrigation Practices, Pesticide Applications

### b. STORAGE AND TREATMENT ACTIVITIES

Land Application, Material Stockpiles, Above Storage Tanks, Underground Tanks, Surface Impoundments, Waste Piles, Waste Tailings

### c. DISPOSAL ACTIVITIES

Deep Injection Wells, Landfills, Septic Systems, Shallow Injection Wells, Urban Runoff

d. **OTHER ACTIVITIES**

Hazardous Waste Generators, Hazardous Waste Sites, Industrial Facilities, Material Transfer Operations, Mining and Mine Drainage, Pipelines and Sewer Lines, Spills, Transportation of Materials

3. **LAND USE ACTIVITIES**

Land use activities may impact surface and subsurface water resources. Impacts to surface waters are generally more visible and may be more directly traced to specific sources or land use activities. Impacts to subsurface water resources are more difficult to trace and understand. Many unknown factors complicate the transport and dilution of contaminants within aquifers and their recharge zones.

Ground water is an important source of flow to the Middle Snake River. As described in Section 2.02.05, Ground Water Flow, spring flows from ground water discharge (from the north side of the Middle Snake River from Milner to King Hill) contributes approximately 5500 to 6800 cfs. Land use activities affecting ground water quality will ultimately affect the quality of spring water inflow to the Middle Snake River.

Injection wells are excavations or artificial openings into the ground that are used for the injection of fluids (IDWR, 1991). Their purpose is to eliminate surface water by moving it underground into subsurface geologic formations. The drilling and construction of injection wells is similar to water wells. These wells can provide a pathway directly into an aquifer with minimal filtering of contaminants. The quality of water transmitted by injection wells is highly variable, as are the surface conditions through which the water is transmitted and the geologic conditions into which the water is injected. Injection wells are of particular concern in shallow confined aquifer systems such as those in southeast Minidoka County. A study examining the effects of intensive irrigation disposal well use on the quality of domestic ground water supplies in Minidoka County indicated that localized degradation of the aquifer resulted from infiltration of deep-percolating irrigation water. The study also determined that levels of turbidity and total and fecal coliform bacteria in samples of the injected wastewater usually exceeded acceptable limits (IDWR, 1979).

Over-fertilization of soil and land application of animal wastes may also result in transport through the root zone of excess nitrogen. Nitrogen fixing properties of leguminous crops, such as alfalfa, are well documented. Traditional crop rotation patterns consist of growing beans following alfalfa. If beans are grown following alfalfa, nitrogen compounds in the topsoil may leach into the vadose zone and percolate to the ground water as the crop is irrigated (Robbins and Carter, 1980). Land application of animal wastes in excess of crop requirements has the potential to contaminate ground water. As the wastes are mineralized in the soil, excess nutrients may be leached by irrigation water and reach the ground water. Soil nutrient testing during the growing season when animal waste has been applied may determine the available nutrient levels at that particular time. Nutrient levels available to crops vary, dependent upon the decomposition rate of the animal waste. Other factors to consider when determining agronomic rates include soil type, soil depth, and the presence of exposed or fractured bedrock.

Although no documentation has been developed regarding the actual contamination of ground water from individual subsurface sewage disposal systems, there is a potential for increasing subsurface nitrate levels, especially in shallow aquifers. Approximately 40% of the region's population lives in unincorporated areas, presumably utilizing such systems for treatment of household wastes. By using census figures of unincorporated areas and typical outflows, the amount of phosphorus and nitrogen applied daily to the subsurface was calculated. From this limited data, it is estimated that all the septic tanks in South Central Region of Idaho dispose 506 lbs/day of phosphorus and 1456 lbs/day of nitrogen.

Several studies investigating ground water quality in the Middle Snake River Watershed have been conducted. A 1992 study evaluating specific shallow aquifer systems to determine present levels of indicator constituents (Brockway, et al.., 1992), reports that observed elevated nitrate nitrogen levels in an area southwest of the city of Jerome are a result of land use. However, the particular land use activity causing the elevated nitrogen levels is not identified. The area studied was down gradient from major irrigated areas, urbanized areas, and CFOs (Brockway, et al.., 1992). The Ground Water Vulnerability Mapping Project investigated relationships between physical characteristics (soils, depth-to-water, various land uses, etc.) to nitrate levels in western Jerome County. A positive statistical relationship was found between nitrate concentrations and distance to septic systems, which are widely distributed across the study area. No conclusions could be made about other relationships because of the insufficient distribution of nitrate observations in time and locations across the study area. (IDHW-DEQ, 1994)

The Final Planning Report for the Scott's Pond Water Quality Project indicates a trend toward increased nitrate concentrations in ground water and springs discharging to the Middle Snake River in the project watershed. As more dairies and feedlots move into the area, the potential exists for increased nitrate levels. Runoff and high application rates of animal waste to the land in excess of crop requirements may impact ground water. The report states that at some point in the future nitrate levels are expected to exceed drinking water standards (NSWCD, 1994).

Brockway, et al. (1992) also studied approximately 200 square miles of the aquifer system underlying the area north of the Interstate 84 freeway, between the cities of Rupert and Paul in Minidoka County. Previous studies indicated potential nitrate problems in shallow wells in the vicinity. This study indicated that the water quality in study area wells was dependent on the geology of the aquifer. The shallow alluvial system in that location is confined by basalt and consolidated formations which appear to retard ground water flow through and from the alluvium and to reduce dilution of nutrients contributed by overlying land uses (Brockway, et al.., 1992). Additionally, the Idaho Snake River Plain, United States Department of Agriculture (USDA) Water Quality Demonstration Project is evaluating agricultural land use activities and how these activities may affect ground water quality. The project will document potential water quality contamination from land use activities and develop information on BMPs for agricultural activities that will protect ground water quality (USDA, et al.., 1993). The Ground Water Monitoring Section of the IDWR administers the statewide ground water quality monitoring program. Ground water samples were collected from 401 monitoring sites in 1991. In the 1991 Status Report on Idaho's Statewide Ground Water Quality Monitoring Program, IDWR states that approximately

95% of the 129 sites exhibit impacted levels of nitrate (> 2.0 mg/L) and are located along the western and eastern Snake River Plain (IDWR, 1992).

Evidence indicates that trends in ground water quality should be carefully monitored. Past and current studies conclude that land use activities can and do influence water quality in underground aquifers. Degradation of underground aquifers not only potentially affects public health and uses of the ground- water, but these contaminants are ultimately discharged by springs to the Middle Snake River. Elevated levels of nutrients in spring water contributes to aquatic vegetation in the river. Land use activities should follow practices that minimize impacts to ground water.

## 4. GROUND WATER QUALITY STANDARDS

The state of Idaho Ground Water Quality Standards are found in IDAPA §16.01.02.299. Whenever attainable, ground waters of the state shall be protected for beneficial uses including potable water supplies (IDAPA §16.01.02.050.02.b). Ground waters existing at higher than potable water quality or ground waters which are highly vulnerable to contamination due to the geologic and hydrologic characteristics of areas overlying their occurrence, may be designated by the IDHW as special resource waters. Ground waters are designated according to the uses for which they are presently suitable or intended to become suitable. Ground water designated uses which are protected include but are not limited to the following:

### a. AGRICULTURAL WATER SUPPLIES

Ground waters which are suitable or intended to be made suitable for the irrigation of crops or as drinking water for livestock.

### b. DOMESTIC WATER SUPPLIES

Waters which are suitable or intended to be made suitable for drinking water supplies.

### c. INDUSTRIAL WATER SUPPLIES

All state ground waters are designated for the use of industrial water supply. Water quality criteria for this use will generally be satisfied by the general ground water quality criteria.

### d. POTABLE WATER SUPPLIES

Waters which are suitable or intended to be made suitable for potable water supplies.

Ground waters not specified in IDAPA §16.01.02.299.03.b are designated and protected for potable water supplies unless the existing ground water quality precludes the economic feasibility of use as a domestic source due to natural or man-made causes as determined by the IDHW. In those cases, the ground water will be protected for other existing beneficial uses, if any, as determined by the IDHW.

Ground water quality standards are currently “Under Revision,” and a Ground Water Classification System for the state is “Under Development.” Currently, ground water protection requirements exist within the state's *Water Quality Standards and Wastewater Treatment Requirements*. These standards are outdated and do not adequately protect the resource. The DEQ has worked on the development of a statewide ground water quality rule since the adoption of the Idaho Ground Water Quality Plan (adopted by the State Legislature in 1992). In August of 1995 a Ground Water Quality Rule Advisory Committee was formed to assist the DEQ in a negotiated rule making to develop these rules. As of this writing (December 1996), the rules have yet to be published.

5. **THE EASTERN SNAKE RIVER PLAIN AQUIFER**

Pursuant to §1424(e) of the federal Safe Drinking Water Act, the Region 10 Administrator of the EPA has designated the Eastern Snake River Plain Aquifer as a sole source aquifer. (See CFR, Part IV, October 7, 1991, Vol. 56, No. 194, *Sole Source Designation of the Eastern Snake River Plain Aquifer, Southern Idaho; Final Determination.*) As a result of this determination, federal financially-assisted projects proposed in the project review area will be subject to the EPA review to ensure that these projects are designated and constructed to protect water quality. The groundwater flow regime beneath the eastern Snake River Plain is an important factor in determining the potential for ground water contamination, and for predicting the movement of contaminants that reach the ground water system. Ground water movement under the plain is determined from water levels measured in the "regional aquifer system" in 1980 during the USGS Regional Aquifer Study and Analysis. This "system" includes all aquifers except those considered perched or parts of small, shallow systems, and is representative of the regional flow in the sole source aquifer. Ground water moves generally horizontally near the center of the plain, and vertically in regions of recharge and discharge. Horizontal movement of ground water in the aquifer is from northeast to southwest, with deviations along gaining reaches of the Snake River and its tributary basins. (EPA Support Document *For the EPA Designation of the Eastern Snake River Plain Aquifer as a Sole Source Aquifer*, 910/9-90-020, August 1990.)

### 2.02.06 GEOTHERMAL SITES

Geothermal flow also occurs in the area. Developed uses total about 30 cfs in the Twin Falls and Banbury areas. Most of this developed water is discharged to the Middle Snake River after use. Some thermal water may leak upward into overlying cold water aquifers and is discharged to the Middle Snake River as part of those sources. The geothermal resource of the Twin Falls-Banbury system is characterized by temperatures between 30° and 70°C (86° to 158°F) and shut-in well pressures of 14 to 250 pounds/square inch.

The thermal water occurs in rhyolitic ash-flow tuffs and lava flows of the Tertiary Idavada Volcanic Group. Permeability of the reservoir rocks results from tectonic and cooling fractures, intergranular porosity of the non-welded tuffs, and voids left between successive flows. The system is recharged by rain and snow falling on the Cassia Mountains to the south. Northward dipping volcanic strata channel the water toward the center of the Snake River Plain and into northwest-trending structure zones which cross the area from Hollister to Banbury Hot Springs (Chapman and Ralston, 1970).

## 2.03 IMPACTS TO WATER QUALITY IN THE MIDDLE SNAKE RIVER

In order to understand the impacts to water quality degradation on the Middle Snake River, it is important to describe the documented exceedences of state water quality standards on the priority stream segments of the Middle Snake River. The IDHW is charged with the supervision and administration of safeguarding the quality of the state's waters. Accordingly, IDHW has adopted water quality standards (IDAPA 16, Title 01, Chapter 02). The water quality standards consists of designated beneficial uses, general and numerical water quality criteria necessary to protect designated uses, and an antidegradation policy which protects existing beneficial uses and high quality waters.

Idaho water quality standards prohibit discharge of pollutants from a single source or in combination of pollutants discharged from other sources that will violate water quality standards unless they are authorized. See IDAPA §16.01.02080. A violation of water quality standards occurs when a single source or combination of sources (1) will or can be expected to result in a violation of water quality standards applicable to the receiving waters or downstream waters, or (2) will injure designated or existing beneficial uses. As noted, the Idaho water quality standards designate a use or uses for Idaho's waters and establish water quality criteria necessary to protect the designated use. The designated uses established for the Middle Snake River are (1) agricultural water supply, (2) cold water biota, (3) salmonid spawning, and (4) primary and secondary contact recreation. The standards include numerical and narrative criteria necessary to protect the designated uses for the Middle Snake River.

**TABLE 10A** summarizes Idaho's beneficial uses and criteria for its waterbodies. The Middle Snake River WMP will be implemented to improve water quality in all of the WQLSs and tributaries of the Middle Snake River.

**TABLE 10A. IDAHO's BENEFICIAL USES AND CRITERIA FOR ITS WATERBODIES.**

| 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 18°C. (IDAPA 16.01.02.100.02.a) Numeric criteria are establsihed 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 18°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 establsihed for fecal coliform bacteria applied between May 1 and September 30 (recreation season). (IDAPA 16.01.02.250.01.a) |

| BENEFICIAL USES | APPLICABLE CRITERIA |
|---|---|
| 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) |
| 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 which 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.)

Under the state water quality standards, the state of Idaho is divided into six separate hydrologic basins. Within each basin, the major rivers, lakes, and creeks are identified as to their designated uses. These designated uses for selected water bodies for HUCs 17040212 and 17040213 are identified in **TABLE 10B** as statutorily defined in IDAPA 16.01.02.150. For the Middle Snake River, the designations from Milner Dam to Buhl and from Buhl to King Hill are the same (AWS, CWB, SS, PCR, and SCR).

**TABLE 10B. DESIGNATED USES OF SELECTED WATER BODIES ON THE MIDDLE SNAKE RIVER.**

| WATER BODY | DWS | AWS | CWB | WWB | SS | PCR | SCR | SRW |
|---|---|---|---|---|---|---|---|---|
| **SNAKE RIVER - MILNER DAM TO BUHL** | | X | X | | X | X | X | |
| Mud Creek to Clear Lakes Bridge | | X | X | | X | X | X | |
| Clear Lakes Bridge to Cedar Draw | | X | X | | X | X | X | |
| Deep Creek to Mud Creek | | X | X | | X | X | X | |
| Cedar Draw to Rock Creek | | X | X | | X | X | X | |
| Rock Creek to Shoshone Falls | | X | X | | X | X | X | |
| Murtaugh to Twin Falls Reservoir | | X | X | | X | X | X | |
| Milner Dam to Murtaugh | | X | X | | X | X | X | |
| Shoshone Falls Reservoir | | X | X | | X | X | X | |

| WATER BODY | DWS | AWS | CWB | WWB | SS | PCR | SCR | SRW |
|---|---|---|---|---|---|---|---|---|
| **SNAKE RIVER - BUHL TO KING HILL** | | X | X | | X | X | X | |
| Bliss Reservoir | | X | X | | X | X | X | |
| King Hill to Big Pilgrim Gulch | | X | X | | X | X | X | |
| Cassia Gulch to Big Pilgrim Gulch | | X | X | | X | X | X | |
| Bliss Bridge to King Hill Dam | | X | X | | X | X | X | |
| Upper Salmon Falls Reservoir | | X | X | | X | X | X | |
| Lower Salmon Falls Reservoir | | X | X | | X | X | X | |

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

Additional stream segments in HUCs 17040212 and 17040213 which are identified in the Idaho water quality standards (but not part of the Middle Snake River segments) include Dry Creek (from source to mouth in Twin Falls County), Rock Creek (from source to Rock Creek City in Twin Falls County), Rock Creek (from Rock Creek City to mouth in Twin Falls County), Cedar Draw (from source to mouth in Twin Falls County), Mud Creek (from Deep Creek Road to mouth in Twin Falls County), Deep Creek (from source to mouth in Twin Falls County), Salmon Falls Creek (from the Idaho-Nevada border to mouth in Twin Falls County), Riley Creek (from source to mouth in Gooding County), Billingsley Creek (from source to mouth in Gooding County), and Clover Creek (from source to mouth in Gooding County). These are defined in IDAPA 16.01.02.150.

Currently, the state of Idaho has classified all the major rivers and reservoirs with specific designated uses. Most tributaries to these waterbodies are not classified. Unclassified waters are automatically designated for primary contact recreation unless the physical characteristics of the waterbody prevent primary contact recreation. In those cases, the waterbody is designated for secondary contact recreation. Existing uses of waters that are not designated are also protected. Both federal and state rules protect existing uses through the antidegradation policy (Idaho Code §39-3603 and IDAPA 16.01.02.051). Existing uses are best protected through application of numerical and narrative criteria intended to protect designated uses.

## 2.03.01 VIOLATIONS OF NARRATIVE WATER QUALITY CRITERIA

Narrative criteria applicable to the Middle Snake River include: deleterious materials; floating, suspended, or submerged matter; excess nutrients; and, oxygen-demanding materials. The Middle Snake River currently exceeds these criteria as a result of existing point and nonpoint activities.

1. **DELETERIOUS MATERIALS**
   Surface waters of the state shall be free from deleterious materials in concentrations that impair designated or protected beneficial uses. See IDAPA §16.01.02003,07. "Deleterious material" includes "any substance which may cause the...reduction of the usability of water without causing physical injury to water users." See IDAPA §16.01.02003.07. The water quality criteria, provides that surface waters of the state shall be free from deleterious materials in concentrations that impair designated or protected beneficial uses. See IDAPA

§16.01.02200,02. The widespread aquatic plant growth throughout the Middle Snake River, including rooted and uprooted macrophytes, epiphytic algae, filamentuous algae, and phytoplankton blooms are all substances which may cause and, in fact, do cause the reduction of the usability of the waters of the Middle Snake River without causing physical injury to water users. These aquatic plants, phytoplankton blooms, and algal blooms are deleterious materials which appear in the Middle Snake River in concentrations which impair designated uses.

2. **FLOATING, SUSPENDED, OR SUBMERGED MATTER**

Surface waters of the state shall be free from floating, suspended or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may adversely affect designated beneficial uses. See IDAPA §16.01.02200,04. Nuisance is defined as anything which is injurious to the public health or an obstruction to the free use, in the customary manner, of any waters of the state. Throughout the Middle Snake River, there are concentrations of macrophytes, algae, and organic solids discharged which constitute floating, suspended, or submerged matter in concentrations causing nuisance and objectionable conditions which adversely effect its designated beneficial uses.

3. **EXCESS NUTRIENTS**

Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated or protected beneficial uses. The receiving waters of the Middle Snake River contain excess nutrients resulting in visible slime growths and other nuisance aquatic growths that impair protected beneficial uses established for this reach of the Snake River.

The principle nutrients limiting aquatic plant growth in the Middle Snake River are nitrogen and TP. TP is the primary limiting nutrient in the Middle Snake River since there are adequate levels of nitrogen already entering from springs and other sources generally. Nitrogen may be a limiting factor at certain times if there is substantial depletion of nitrogen in sediments due to uptake by rooted macrophyte beds. Dissolved nutrients, particularly orthophosphate, are rapidly taken up by aquatic plants. If sufficient nutrients are available in either the sediments or the water column, aquatic plants will take up and store an abundance of such nutrients in excess of the plant's actual need, a chemical phenonmenon known as **luxury consumption**. During the life of the aquatic plant, whether macrophyte or algae, it will continue to store phosphorus in its tissue in quantities far in excess of the plant's immediate need. At the death of the plant, the tissue will decay in the water column and the nutrients stored within the plant biomass will be either restored to the water column or become incorporated into the river sediment. As a result of this process, nutrients (including orthophosphate) that are initially discharged into the water column in a dissolved form will eventually become incorporated into the river bottom sediment. Once such nutrients are incorporated into the river sediment, they are available once again for uptake by yet another life cycle of rooted aquatic macrophytes and other aquatic plants.

Rooted aquatic plants are able to uptake nutrients, including TP, through both roots embedded in the sediment and through plant tissue taking nutrients directly from the water column. These plants, again, will exhibit luxury consumption when sufficient nutrients are present in order to store such nutrients within the tissue of the plant. As the plant senesces, the stored nutrients are again released into the water column and into the sediments. In both rooted plants and non-rooted aquatic plants, the deposit and redeposit of nutrients from the water column, into the plant tissue, back into the sediment and then reused for successive generations of plants is known as **nutrient spiraling** or **nutrient cycling**. Within this spiraling, nutrients (including orthophosphate) which enter the Middle Snake River are used and reused successively to foster and allow later and greater plant growth in higher concentrations down stream. Nutrient concentrations into the Middle Snake River have caused visible slime growths and other nuisance aquatic growths impairing designated or protected beneficial uses. Nutrient concentrations in the Middle Snake River therefore exceed the present assimilative capacity.

4. **OXYGEN-DEMANDING MATERIALS**
Surface waters of the state shall be free from oxygen-demanding materials in concentrations that would result in an anaerobic water condition. Those portions of the Middle Snake River experiencing anaerobic sediment conditions release TP directly back into the water column to become available for increased algal and macrophyte production in the immediate area and downstream of such anaerobic locations. These anaerobic sediments, which exist on the Middle Snake River at the outfall of fish hatcheries, have dissolved oxygen (DO) concentrations that are by definition zero and remain below the State established minimum standards in the water column for some distance off the river bottom. Phosphorus from these anaerobic sediments is released directly back into the water column to become available for increased algal and macrophyte production in the immediate area and downstream of such anaerobic conditions. (*Recommended Findings of Fact, Conclusions of Law and Order*, Docket No. 0102-91-24, January 8, 1993, Idaho State Board of Health and Welfare.)

5. **SEDIMENT (IDAPA 16.01.02.200,08)**
Sediment shall not exceed quantities specified in IDAPA §16.01.02.250, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in IDAPA subsection 350,02,b. As previously described, sediment will be addressed in Phase II of the Mid-Snake WMP. IDAPA §16.01.02.003.97 defines sediment as "suspended sediment" or "organic and inorganic particulate matter which has been removed from its site of origin and measured while suspended in surface water." Bedload and settable solids are additional concerns that the Middle Snake River WAG will be addressing within the first year of plan implementation.

### 2.03.02 EXCEEDING NUMERICAL WATER QUALITY CRITERIA
The numerical water quality criteria will be discussed relative to the beneficial use: water supply (domestic, agricultural, industrial), aquatic life (general, warm water biota, cold water biota, salmonid spawning), recreation (primary contact, secondary contact), wildlife habitat, and aesthetics.

1. **WATER SUPPLY (IDAPA 16.01.02.100,01)**
For purposes of the Mid-Snake WMP, the domestic, agricultural, and industrial water supply beneficial uses have not been shown to violate water quality standards or impair these beneficial uses on the Middle Snake River. **TABLE 11** summarizes the beneficial uses in this catergory along with their appropriate criteria.

**TABLE 11. SURFACE WATER QUALITY WATER SUPPLY BENEFICIAL USE & CRITERIA**

| Beneficial Uses | Toxic Substances | Turbidity | Radioactivity | Narrative |
|---|---|---|---|---|
| Domestic | 24 Toxic Criteria | 5 NTU increase when < 50 NTU; 10% increase when > 50 NTU | Drinking Water Rules, IDAPA 16.01.08 | |
| Agricultural | | | | EPA Bluebook, §200 |
| Industrial | | | | EPA Bluebook, §200 |

2. **AQUATIC LIFE (IDAPA 16.01.02.100,02)**

The following aquatic life beneficial uses (see **TABLE 12**) have been established for the Middle Snake River: cold water biota and salmonid spawning. Cold water biota aquatic life include waters 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 18°C. Salmonid spawning aquatic life include waters which provide or could provide a habitat for active self-propagating populations of salmonid fishes. Warm water biota criteria is include for information purposes only.

Elevated water temperature may be a stressor of the Middle Snake River system. In addition to nutrient loading, sedimentation, and organic solids deposition, elevated water temperature negatively impacts the beneficial uses of cold water biota and salmonid spawning. Elevated water temperature also has a pronounced positive impact on aquatic plant growth rate. Factors responsible for the elevated temperatures may include impoundments (with low water velocity and increased retention times), and irrigation returns (directly to the Middle Snake River or by its tributaries).

**TABLE 12. SURFACE WATER QUALITY AQUATIC LIFE BENEFICIAL USE & CRITERIA**

| Beneficial Uses | pH | Total Dissolved Gas | Total Chlorine | Toxic Sub-stances | DO | Inter-gravel DO | Temp. | NH3 | Turb. |
|---|---|---|---|---|---|---|---|---|---|
| General (for all aquatic life uses) | 6.5 - 9.5 | 110% | 19 µg/L acute; 11 µg/L chronic | There are 127 Toxic Criteria | | | | | |
| Warm Water Biota | | | | | 5 mg/L except lake bottom | | 33°C instant; 29°C max. daily | Varies with pH & temp. See IDAPA 16.01.02 | |
| Cold Water Biota | | | | | 6 mg/L except lake bottom | | 22°C instant; 19°C max. daily | Varies with pH & temp. See IDAPA 16.01.02 | 50 NTU instant.; 25 NTU 10 days above back-ground |

| Beneficial Uses | pH | Total Dissolved Gas | Total Chlorine | Toxic Sub-stances | DO | Inter-gravel DO | Temp. | NH3 | Turb. |
|---|---|---|---|---|---|---|---|---|---|
| Salmonid Spawning | | | | | 6 mg/L or 90% saturation | 5 mg/L (1 day min.); 6 mg/L (7 day avg) | 13°C instant; 9°C max. daily. | Varies with pH & temp. See IDAPA 16.01.02 | |

a. **COLD WATER BIOTA**

Cold water biota beneficial use are for waters 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 18°C. DO and temperature are exceeded, particularly during the summer. Turbidity criteria are also exceeded in discreet areas on the Middle Snake River. Adversely affected populations of cold water biota in the Middle Snake River are largely restricted to areas under direct influence of the clean and cold natural spring flows. The presence of cold water biota decreases gradually across the Middle Snake River channel. Cold water biota (such as amphipods, fresh water shrimp or scuds, cold water snails, burrowing mayflies, caddis flies) disappear as one moves across the channel away from a spring source.

In terms of biological diversity of cold water biota, the Middle Snake River system is becoming a very simple system with a marked reduction of pollution intolerant species. Based upon an assessment of the cold water biota, the aquatic ecosystem of the Middle Snake River is clearly stressed. The causes of the decline in native cold water biota and a reduction in the cold water biota diversity are nutrient loading, sedimentation, and organic solids being deposited into the Middle Snake River.

b. **SALMONID SPAWNING**

DO and temperature criteria exceed water quality standards on the Middle Snake River especially during the summer. Intergravel DO also exceeds water quality standards. Salmonid spawning has been virtually eliminated throughout much of the main stem of the Middle Snake River. Trout spawning is largely now confined to the cold, clear, and well-oxygenated spring areas. A combination of organic loadings, dense macrophyte beds, low oxygen, and sedimentation has eliminated most of the bottom substrate of the Middle Snake River in terms of its availability for spawning. There are existing violations of the 6.0 mg/L DO criteria within the deeper pools and within dense macrophyte beds in the Middle Snake River.

### 2.03.03 IMPAIRMENT TO THE OTHER DESIGNATED USES

Primary contact and secondary contact recreation have been impaired on the Middle Snake River. (See IDAPA 16.01.02.100,03, Recreation.) Fecal Coliform bacteria has been shown to violate water quality criteria, especially at specific locations at the confluence of an exceeding tributary or agricultural return.

**TABLE 13. SURFACE WATER QUALITY RECREATION BENEFICIAL USE & CRITERIA**

| Beneficial Uses | Toxic Substances | Fecal Coliform |
|---|---|---|
| Primary Contact | 90 Toxic Criteria | 500/100 mL anytime; 200/100 mL 10% 30 days; 50/100 mL geo. mean 5 sample-30 days |
| Secondary Contact | 90 Toxic Criteria | 800/100 mL anytime; 400/100 mL 10% 30 days; 200/100 mL geo. mean 5 sample-30 days |

a. **IMPAIRMENT TO PRIMARY CONTACT RECREATION**

Primary contact recreation, one of the designated beneficial uses of the Middle Snake River, is considered to include swimming and waterskiing. Throughout the Middle Snake River, extensive plant growth consisting of rooted macrophytes, attached algae, phytoplankton, and other plant growth has significantly impaired swimming and water skiing recreation throughout this reach of the Snake River. These extensive plant aquatic growths throughout the Middle Snake River have rendered the river unsuitable for swimming and generally undesirable to swimming enthusiasts. As to skiing, boating throughout the Middle Snake River has become difficult due to the tremendous accumulation of rooted macrophyte beds and extensive algal mats impairing boat travel. Therefore, the designated beneficial uses of primary contact recreation are not being supported by water quality conditions in the Middle Snake River.

b. **IMPAIRMENT TO SECONDARY CONTACT RECREATION**

Secondary contact recreation, one of the designated beneficial uses of the Middle Snake River, is considered to include boating and fishing. Throughout the Middle Snake River, extensive plant growth has significantly and negatively impaired secondary contact recreation. Excessive plant growth throughout the Middle Snake River has prevented a boat's ability to navigate in the river channel or to keep the propellars moving. As to fishing, there has been a gradual and general deterioration of sport fishing or desirable fish species on the Middle Snake River. Over the past 12 years, the desirable fish kinds and quantities in the Middle Snake River have deteriorated and there has developed a corresponding increase of undesirable pollution tolerant fish species including suckers and carp. Therefore, the designated beneficial uses of secondary contact recreation are not being supported by water quality conditions in the Middle Snake River.

### 2.03.04 WILDLIFE HABITATS AND AESTHETICS

See IDAPA 16.01.02.100,04 for wildlife habitats and IDAPA 16.01.02.100,05 for aesthetics. For purposes of the Middle Snake River WMP, wildlife habitat will include those waters which are suitable or intended to be made suitable for wildlife habitats. This use applies to all surface waters of the state. For purposes of the Middle Snake River WMP, the aesthetics use applies to all surface waters of the state.

**TABLE 14. SURFACE WATER QUALITY WILDLIFE & AESTHETICS BENEFICIAL USE & CRITERIA**

| Beneficial Uses | Narrative |
|---|---|
| WILDLIFE | EPA Bluebook, §200 |
| AESTHETICS | EPA Bluebook, §200 |

a. **WILDLIFE BENEFICIAL USE**
The wildlife beneficial use is not fully supported on the Middle Snake River due to reduced dissolved oxygen, elevated temperatures, excess sediment, excess nutrients, and floating, suspended or submerged matter. See section 5.01.01, **Table 37**, Impaired Beneficial Uses and State Water Quality Standards.

b. **AESTHETICS BENEFICIAL USE**
Impairment of aesthetics beneficial uses is recognized as a public concern on the Middle Snake River. Problems normally characteristic of the Middle Snake River include: materials that settle to form objectional deposits; floating debris, "oil-like" substances, scum, and other matter; substances producing objectionable color, odor, taste, or turbidity; and, substances and conditions or combinations thereof in concentrations which produce undesirable aquatic life. Violations in primary and secondary contact recreation, as discussed previously, have reduced the aesthetic appeal of the Middle Snake River. Bad odorous smells have been attributed to these places on the Middle Snake River, making it unpleasant to be around, much less swim, waterski, boat, or fish.

## 2.03.05 HISTORICAL LIMNOLOGICAL AND WATER QUALITY STUDIES

Several evaluations of water quality conditions in the Middle Snake River system have been undertaken since the early 1970s, a synopsis of which follows. For the most part, these studies evaluated existing information from USGS stations or focused on limited areas. As a whole, the studies document the eutrophic condition of the Middle Snake River and its tributaries and those pollution impacts coming from the watershed.

1. **EARLY EPA 1974 REPORT**
An overall review of the Upper Snake River, which included the collection of new data, was undertaken by the EPA from May 1973 to May 1974. The purpose of the study was to determine the dynamics of incoming nutrients in the upper Snake reservoir system and to trace the flow of those nutrients through the upper and central Snake River (USEPA, 1974). The only station monitored in the Middle Snake River was located at Milner Dam.

2. **1975 EPA SNAKE RIVER BASIN REPORT**
In 1975, EPA prepared a river basin water quality status report for the Upper/Middle Snake River Basin. This work was a compilation and analysis of existing data. EPA reported that nutrient concentrations in tributaries to the Snake River above King Hill exceeded algal bloom potential levels. At King Hill, total phosphorus levels exhibited an increasing trend during much of the year and ground water inflow in the Hagerman Valley reach was a significant source of nitrogen to the river (nitrite and nitrate) (USEPA, 1975).

3. **1976 EPA STUDY ON NONPOINT SOURCES**
A study conducted by the EPA in 1976 focused on nonpoint sources of pollution to the Middle Snake River. EPA concluded that phosphorus, nitrogen, and bacteria levels between Milner and King Hill exceeded acceptable levels. Pesticides, high turbidity, silt, low dissolved oxygen, and low flows contributed to the problem. Blue-green and diatom

blooms during the spring, summer, and fall were also excessive. The recreational status was deemed objectionable due to low "aesthetic value", fluctuating flows, and inaccessibility.

4. **1979 PARAMETRIX/TETRA TECH STUDY**

A study was performed in 1979 by Parametrix, Inc. and Tetra Tech, Inc. for the DEQ as a Statewide 208 planning project. The major objective of this study was to identify, quantify, and assess the importance of the sources of nitrogen and phosphorus affecting the Snake River, including nine major tributaries in the reach. The researchers assumed a total inflow from Milner to King Hill of 7,400 cfs, based on 1910-1966 averages. Of this, 5900 cfs are from springs on the north side of the Snake River and 1500 cfs are from springs and surface returns on the south side (these figures do not include Big Wood River). The researchers concluded that within the last 69 miles of the Milner Dam to King Hill segment, nitrate inputs from springs contributed approximately 40,000 lbs/day to the river (Parametrix, Inc., 1979). As a part of this study, Parametrix, Inc. (1979) calculated the proportional contributions of each source based on the loadings presented above. The springs contributed 74% of the nitrate within this reach. The three major tributaries (Rock Creek, Salmon Falls, and Big Wood River) contributed about 9%, and about 14% originated from above Milner Dam. Contributions of nitrate from the five municipal sources were insignificant. The springs contributed about 20% of the total phosphorous in the Snake, with upstream sources contributing 60% (or 32% when the agricultural diversions are accounted for). The three tributaries contributed 11%, and municipal sources about 7% of total phosphorous (Parametrix, Inc., 1979). The study also presented concentrations of total nitrogen, nitrate nitrogen, and total phosphorus for the period of record through water year 1976. The overall seasonal mean concentration of total phosphorus, total nitrogen, and nitrate nitrogen are shown in **Table 15** for the mainstem stations and the major tributaries.

**TABLE 15. SEASONAL MEAN NUTRIENT CONCENTRATIONS (mg/L) DURING WATER YEAR 1976.**

| Station | Total P | Total N | Nitrate-N |
|---|---|---|---|
| Milner Dam | 0.108 | 0.698 | 0.257 |
| King Hill | 0.083 | 0.698 | 0.753 |
| Rock Creek | 0.249 | - | 1.550 |
| Salmon Falls Creek | 0.140 | - | 2.070 |
| Big Wood River | 0.140 | - | 0.418 |

5. **1975 TO 1989 USGS TREND STUDY**

Water quality monitoring of the Snake River from 1975 until 1989 was limited to trend data collected by the USGS. Recently, a water quality assessment was made with data collected at stations from King Hill to the headwaters of the Snake River (Clark, 1994). The data indicate that sediment and nutrient concentrations increase in a downstream direction along the Snake River. Although no long-term trend in nutrients was evident at King Hill, Clark (1994) concludes that most of the sediment and nutrient load at this site is generated in the Middle Snake River watershed.

6. **1990 DEQ WATER QUALITY MONITORING STUDY**

Additional water development has been proposed for the river and its watershed, which has the potential to exacerbate current conditions. As a result, the DEQ initiated a water quality monitoring study in 1990 to evaluate the cumulative impacts of existing and proposed activities in the watershed.

7. **1992 BROCKWAY AND ROBISON STUDY (PHASE 1)**
Brockway and Robison (1992) collected water quality data at 55 stations along the Middle Snake River. These stations included 13 instream sites, 10 aquaculture effluents, 19 irrigation return flow streams, and 13 tributary streams. Their study concluded that water quality in the Middle Snake River is impacted by high nutrient and sediment inflows. Additionally, they indicated that flow was an important component to the water quality problem in the Middle Snake River. Their data showed a considerable increase in the loads of sediment, phosphorus, and nitrates transported by the river from Milner to King Hill (see **TABLE 16**). TP increased from 60 to 615 tons/year from Murtaugh to King Hill (a 555 ton/year increase) through the reach. Nitrogen increased from 370 to 10,900 tons/year (a 10,530 ton/year increase) through the reach. And, Total Suspended Solids increased from 3,367 to 70,342 tons/year (a 66975 ton/year increase) through the reach.

**TABLE 16. INCREASE IN SEDIMENT AND NUTRIENT LOADS IN THE MIDDLE SNAKE RIVER FOR 1991 (Brockway and Robison, 1992).**

| Parameter Load | Murtaugh | King Hill |
|---|---|---|
| Total Phosphorus (tons/year) | 60 | 615 |
| Nitrate + Nitrite N (tons/year) | 370 | 10,900 |
| Total Suspended solids (tons/year) | 3,367 | 70,342 |

8. **1991 DON CHAPMAN CONSULTANTS' STUDY**
Don Chapman Consultants Inc. (1991) conducted a water quality study on the Middle Snake River during 1989-1991. Their study was limited to sections of the River immediately adjacent to three proposed hydropower facilities: Kanaka Rapids, Empire Rapids, and Boulder Rapids. Following is a summary of the pertinent water quality information:

a. Point and nonpoint nutrients and sediments, as well as low flows, combined to cause chemical stratification in pools of the Middle Snake, especially pools > 11 meters in depth. Additionally, temperature, DO, pH, and conductivity were inversely related to current velocity.

b. Extreme DO fluctuations (1.0-12.0 mg/L) were found in macrophyte beds throughout the study reach and the rapids provide a valuable area for reaeration, however, the macrophyte beds depletion of DO exceeds the ability of two of the three rapids studied to reaerate the water.

c. Fine sediments are found in over 70% of the main channel. Reductions in sediments from irrigation returns and hatcheries will be required to achieve long term increases in the amount of bedrock/boulder substrate in the Middle Snake River.

d. Macrophytes covered 20% of the 806 acres mapped. The study indicated that mean current velocities of >1 m/s would result in reduction of macrophyte densities.

e. Water quality conditions and poor habitat have a deleterious effect on fish populations in the sampled areas.

9. **1991 CLEAR SPRINGS FOODS STUDY**

Clear Springs Foods initiated a water quality study in 1991. Their study indicated that water chemistry in the Middle Snake River varied seasonally and spatially and that the highest nutrient concentrations occurred in the winter. High nutrient concentrations were found above Shoshone Falls and increased below Twin Falls Sewage Treatment Plant (STP). A general trend of decreasing nutrient concentrations in downstream sampling locations was found. Additionally, they reported "considerable" concentrations of nutrients in sampled springs (MacMillan, 1992).

10. **1986-1996 DEQ TRIBUTARY STUDIES / 1995-1996 SNAKE RIVER STUDIES**

The DEQ has collected water quality data in major tributaries of the Middle Snake River as well as from the Middle Snake River and prepared reports from these data (IDHW-DEQ, 1986-1995). Conditions of the tributaries are summarized in **TABLE 17.** In all cases, excessive nutrients and sediments impaired the water quality.

**TABLE 17. WATER QUALITY CONDITIONS OF TRIBUTARIES ENTERING THE MIDDLE SNAKE RIVER (DEQ, 1986-1995) BASED ON WATER QUALITY STATUS REPORTS AND AVAILABLE UNPUBLISHED DEQ MONITORING DATA.**

| Water Quality Report | Year | Conclusions |
|---|---|---|
| Vinyard Creek Water Quality Status Report (WQSR) #83 | 1988 | Downstream from a major irrigation return flow confluence, water quality is degraded. |
| Perrine Coulee WQSR #73 | 1988 | Source of sediment, nutrients and bacteria to the Middle Snake River. |
| Rock Creek: RCWP Final Report | 1991 | High levels of sediments, phosphate, organic nitrogen, suspended solids, turbidity, bacteria, and toxic chemicals |
| Cedar Draw WQSR #100 | 1991 | Nutrients exceeded criteria established to prevent eutrophication and bacteria levels impaired primary contact recreation |
| Deep Creek and Mud Creek WQSR #81 | 1988 | Excessive sediments, nutrients, & bacteria impacting designated uses. |
| Billingsley Creek WQSR #64 | 1986-95 | Excessive nutrient loading. |
| Malad River | 1991 | Excessive sediment & nutrients. |
| Clear Lakes Outlet | 1995 | Excessive nutrients. |
| Deep Creek | 1991-96 | Excessive sediments, nutrients, & bacteria. |
| Salmon Falls Creek | 1991-96 | Excessive sediments and nutrients. |
| Blind Canyon Creek | 1991 | Excessive sediments. |
| Intermittent streams converted to ag drains | 1988-96 | Excessive sediments, nutrients, & bacteria. |

Based on surface water quality sampling done by the DEQ in 1995, TP values ran from 0.070 mg/L to 0.180 mg/L at Gridley Bridge, Hagerman, Idaho. In 21 samples taken from 3/4/1995 to 12/11/1995, 16 of the samples were greater than 0.075 mg/L, and 5 were less than 0.075 mg/L. The DEQ is in the process of developing a water quality status report on its 1995 and 1996 sampling for the Middle Snake River WAG.

11. **PHASE 2, UNPUBLISHED BROCKWAY AND ROBISON STUDY (1992-1993)**
This study is unpublished and ongoing and a continuation of the Phase 1 Study but expands more on the impact from agricultural drains, aquaculture facilities, and monitoring on the Middle Snake River.

12. **UNIVERSITY OF IDAHO AT MOSCOW, IDAHO**
The research conducted by the U of I during 1992-1993 was designed to quantify current water quality conditions and the primary productivity occurring in the Middle Snake River from Perrine Bridge in the Twin Falls area downstream to Upper Salmon Falls Dam (RM 615 to RM 581). The first year of research took a broad approach, studying large sections of river in the Crystal Springs, Box Canyon, and Thousand Springs areas. Of these areas or reaches, the Crystal Springs Reach was identified as one of the more heavily impacted sections of the river. 1993 research focused on the Crystal Springs Reach.

U of I research concurred with previous investigations that the overall water quality of the Middle Snake River is impaired. The U of I identified and documented the Middle Snake River as "highly productive" (i.e., "degraded") based on several important physical and chemical water quality criteria. This classification was based on, but not limited to, water transparency, concentrations of dissolved nitrogen and phosphorus, algae productivity, and aquatic plant densities. Aquatic plant density was two to three times levels typically considered to be in the highly productive range. Concentrations of organic nitrogen and phosphorus in weedbed sediments were also extremely high, with nitrogen levels up to ten times those typical of sediments in highly productive aquatic systems (Falter and Carlson, 1994).

Presently, the most obvious water quality problem detailed by the U of I in this section of the Middle Snake River is the dense rooted aquatic plant growth and associated filamentous algae. This mix of aquatic plants and algae form extensive weedbeds which, during the peak of the growing season, are so thick as to preclude most primary and secondary water uses. The plant densities in the Middle Snake River are in excess of plant densities in the Pend Oreille River. Those densities were determined to be at nuisance levels by the Washington Department of Ecology (Coots & Williams, 1991). The dense weedbeds in the Middle Snake River persisted even through the higher flows of Water Year 1993 (Falter and Carlson, 1994).

The dense weedbeds that are so common throughout this portion of the river are only one of the more visible signs of a much larger problem associated with productivity in the Middle Snake River. Sedimentation, nutrient enrichment, and the accumulation of nutrient-rich organic debris are major factors contributing to the aquatic productivity in the river. The rooted aquatic plant community is dependent on the sediments for suitable substrate and important nutrients. Recent years of low flow have permitted increased sedimentation and subsequent weedbed formation. The research conducted by the U of I has indicated a link between the productivity of the rooted aquatic plant community and the concentration of organic nitrogen content of the sediments. There appears to be a threshold at which plant growth is either inhibited or enhanced. Accordingly, the reduction of nutrient-rich sediments should lead to reduced aquatic plant production in the Middle Snake River. This could perhaps be accomplished by reducing the sediment entering the river from point and non-point sources. It is also likely that higher sustained flows would increase scouring within this reach and accelerate the reduction of accumulated sediments (Falter and Carlson, 1994).

There are also several physical characteristics of the Middle Snake River that contribute to the present levels of high aquatic plant productivity and sedimentation. The Middle Snake River, being a cool-water system, provides excellent growing temperatures for the native plant species in the river. The shallow nature of the river also allows large areas of the river bottom to be exposed to adequate sunlight for plant growth. A third factor that has contributed significantly to high productivity is the low flows that have persisted for the past seven years. The drought conditions have provided flows that enhance plant growth by facilitating nutrient circulation. These factors, in concert, have provided an ideal habitat for aquatic plant and attached algae growth (Falter and Carlson, 1994).

The research conducted by the U of I has provided valuable information concerning the relationship between aquatic plant density and nutrients in the river. Presently, the U of I is investigating the bedload of the river, characterizing sediments, and estimating macrophyte nutrient content. This information will be important in developing sound management guidelines for the Middle Snake River.

13. **IDAHO STATE UNIVERSITY (ISU AT POCATELLO, IDAHO)**

Idaho State University (ISU) investigated water quality in the Middle Snake in 1992. The study was designed to identify spatial and temporal trends in water quality, sestonic and benthic algae concentration, and benthic macroinvertebrate communities at nine sites along the Middle Snake River from Pillar Falls to Upper Salmon Falls dam. Water quality measures were collected biweekly, benthic algae monthly, and benthic macroinvertebrates twice between May 1992 and October 1992. In general, sites between Pigeon Cove and below Kanaka Rapids exhibited degraded water quality, with sites from upstream of Salmon Falls to below upper Salmon Falls dam being less severely impaired. Further, a decrease in water quality was observed over the summer at all sites. Benthic algal levels decreased after mid-August because overlying algal mats inhibited adequate lighting. Benthic macroinvertebrates species richness was low at all sites, dominated at downriver sites by the exotic snail *Potamopyrgus* (Minshall and Robinson, 1994).

Research initiated in July of 1993 estimated the influence of point and nonpoint sources of nutrients on community metabolism and carbon spiraling in the Middle Reach of the Snake River. ISU's research in 1993 represented a step beyond monitoring in understanding the nutrient dynamics of this complex ecosystem.

Research from 1993 generated several conclusions about the productivity of the Middle-Snake River. First, estimates of Gross Primary Productivity (GPP) and Community

Respiration in 24 hours ($CR_{24}$) in this study were higher than most comparable values reported in the literature for other rivers . Second, the research indicates that the Middle Reach of the Snake River is autotrophic during the summer months. Third, there is a general increase in productivity below Twin Falls, especially in reference to GPP and $CR_{24}$. Finally, since nutrient concentrations were above biological saturation levels listed in the literature (and nutrient limitation was not displayed in the nutrient diffusing substrate experiment), changes in community metabolism will be a function of light and temperature until nutrient concentrations are markedly reduced (Minshall and Robinson, 1994).

This information substantially advances our understanding of the dynamics of the Snake River between Pillar Falls and Gridley Bridge. Experimental techniques are being refined and expanded in 1994 to include respiration estimation for each component of the ecosystem.

14. **1996 DEQ CONTRACT RESEARCH**

The DEQ in conjunction with various environmental contractors are currently studying the impacts from sediment on the Middle Snake River and from the impoundments. Additional studies include additional primary productivity, underground springs, tributaries impact, and bathymetric survey of several impoundments. Data from these studies won't be available till the fall of 1996 or early 1997.

15. **IDAHO POWER COMPANY RESEARCH**

As a consequence of the FERC relicensing process and due to the many concerns raised by environmental groups and citizens, the Idaho Power Company is conducting additional study requests as part of their relicensing effort on the Bliss, Lower Salmon Falls, and Upper Salmon Falls dams. This research will target the impact of these impoundments on sediment. Data from these studies won't be available till the fall of 1996 or early 1997.

## 2.03.06 BIOLOGICAL COMMUNITIES ON THE MIDDLE SNAKE RIVER

The Middle Snake River provides habitat for numerous species and significantly adds to the wildlife diversity of this area. The river itself, adjacent riparian areas, and the canyon created by it, support a host of species otherwise absent from the surrounding arid landscape. The aquatic biota are perhaps the best indicators of the river's condition. This community includes six threatened and endangered species, numerous exotic species, and few species that are indicative of undisturbed conditions.

1. **FISH COMMUNITIES**

The Middle Snake River has a fish community indicative of a both river and lake habitats. **TABLE 18** illustrates the common species on the Middle Snake River and which are endangered, proposed, or candidate. Of the 18 species found in the Middle Snake River, only one is a candidate species (Shoshone Sculpin). The remainder are unlisted.

**TABLE 18. FISH SPECIES OF THE MIDDLE SNAKE RIVER.**

| COMMON NAME | SCIENTIFIC NAME | USFWS CLASSIFICATION |
|---|---|---|
| Largescale Sucker | *Catostomus macrocheilus* | |
| Speckled Dace | *Rhinichthys osculus* | |
| Chislemouth | *Acrocheilus alutaceus* | |

| COMMON NAME | SCIENTIFIC NAME | USFWS CLASSIFICATION |
|---|---|---|
| Redside Shiner | *Richardsonius balteatus* | |
| Mottled Sculpin | *Cottus bairdi* | |
| Common Carp | *Cyprinus carpio* | |
| Utah Chub | *Gila atraria* | |
| Bridgelip Sucker | *Catostomus columbianus* | |
| Rainbow Trout | *Oncorynchus mykiss* | |
| Cutthroat Trout | *Oncorynchus clarki* | |
| Rainbow-Cutthroat hybrid | *O. mykiss x O. clarki* | |
| Channel Catfish | *Ictalurus punctatus* | |
| Smallmouth Bass | *Micropterus dolomieui* | |
| Largemouth Bass | *Micropterus salmoides* | |
| Yellow Perch | *Perca flavescens* | |
| Mountain Whitefish | *Prosopium williamsoni* | |
| White Sturgeon | *Acipenser transmontanus* Richardson | Sensitive Species |
| Shoshone Sculpin | *Cottus greenei* | Candidate Species |

The most abundant species is the largescale sucker (IDFG, 1994). Other species include the speckled dace, chislemouth, redside shiner, mottled sculpin, common carp, Utah chub, and bridgelip sucker. Popular warm and coldwater sportfishes include rainbow trout, cutthroat trout, rainbow-cutthroat hybrid, channel catfish, smallmouth bass, largemouth bass, yellow perch, and mountain whitefish. White sturgeon is a native species Natural reproduction of sportfish species is limited to largemouth bass and perch in the reservoirs and isolated trout and whitefish in the river (IDFG, 1994). The tributaries of the Middle Snake River also contain a variety of fish species. The most abundant game species are rainbow and brown trout. Many of the tributaries contain good trout habitat and support healthy populations of wild trout and the Shoshone Sculpin. Some of the streams and springs are important spawning grounds for the salmonids present in the Middle Snake River (IDFG, 1991a). IDFG reports that trout habitat in the river is poor throughout most of the Middle Snake River reach due to water quality degradation (Parrish, 1993). Additionally, natural reproduction in the river is limited by fluctuating water levels, lack of spawning gravels, heavy siltation, plant growth, and areas of poor water quality (FERC, 1990).

## 2. AQUATIC MACROINVERTEBRATE COMMUNITIES

Our understanding of the macroinvertebrate community of the Middle Snake River is limited. Nevertheless, recent investigations provide insight into the composition and structure of this component of the river's ecosystem. The Idaho Power Company (IPC) compared benthic invertebrate populations of a riverine reach to a nearby reservoir. The river community was significantly higher in species richness and overall abundance than the reservoir (IPC, 1981). This may reflect greater habitat diversity in rivers relative to lakes, which would facilitate more species. Monitoring of macroinvertebrates along the Middle

Snake reach has revealed additional patterns. Population densities and total biomass tend to increase downstream from Auger Falls. Although species richness remains relatively constant, the composition of the community changes, with more pollution-sensitive species in the upstream reaches (Auger Falls to Crystal Springs). Throughout the reach, the macroinvertebrate community is dominated by an exotic species of snail, *Potamopyrgus* (Minshall and Robinson, 1994). The macroinvertebrate community also includes five threatened and endangered mollusc species. Little is known about their current distribution and abundance.

### 3. AQUATIC PLANT COMMUNITIES

The Middle Snake River is characterized by communities of epiphytes (attached algae), and macrophytes (rooted plants). The macrophyte community is dominated by *Ceratophyllum demersum, Potamogeton pectinatus,* and *P. crispus*. The epiphyte community principally consists of *Hydrodictyon sp.* and *Cladophora sp.* Aquatic plant communities respond to the physical, chemical, and biological conditions in the river. Low flows accelerate sedimentation of nutrients and suspended materials, which provides an ideal substrate for macrophyte colonization. Once established, macrophyte and epiphyte colonies stabilize these silt substrates and encourage further sedimentation by trapping additional suspended sediments. The plant communities are nourished by nutrients in the sediments and water column. This problem is most pronounced in shallow (<2 meters), slow flowing segments with adequate light penetration (Falter and Carlson, 1994).

### 4. RIPARIAN COMMUNITIES

The floodplain and surrounding springs, where plants can access surface water or ground water, support diverse plant and animal communities. These riparian communities vary from emergent wetlands, typically associated with the numerous springs and seeps along the Middle Snake River, to deciduous woodlands. Riparian communities provide habitats for a wide range of wildlife. Waterfowl, upland game birds, songbirds, and raptors are common throughout the Middle Snake River, as are numerous small mammals (Cogeneration, Inc., 1983; Murphey et al., 1991). Numerous species of reptiles and amphibians are also present (IPC, 1990).

### 5. SENSITIVE SPECIES

The Middle Snake River is a home to certain endangered or threatened species. These species are impacted by the water quality conditions in the river. These species are summarized in **TABLE 19**. Candidate species that appear in **TABLE 19** have no protection under the Endangered Species Act (ESA), but are included for consideration in early recovery planning. Candidate species could be proposed or listed during the first phase of the WMP process, and would then be covered under §7 of the ESA.

Of the listed species on the Endangered Species List, seven are listed. These included phyla for mammals (gray wolf), birds (bald eagle), and invertebrates (mollusc snails). There are no species that are proposed species. And, there are six species which are candidate species, which include the phyla for mammals (pygmy rabbit), birds (trumpeter swan and black tern), fish (Shoshone sculpin), and invertebrates (Idaho Dunes tiger beetle and California floater).

The USFWS has listed as "Species of Concern," or species which are not candidate, proposed, or listed, the following species: a bird, the Long-billed curlew (*Numenius americanus*) which may have a nesting area in the Hagerman segment; and a plant, the Snake River Milkvetch (*Astragalus purshii var. ophiogenes*) which may occur from Kanaka Rapids to King Hill, Idaho.

**TABLE 19. LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, AND CANDIDATE SPECIES THAT MAY OCCUR WITHIN THE AREA OF THE MIDDLE SNAKE RIVER WATERSHED MANAGEMENT PLAN.**

| PHYLA | SPECIES | COMMENTS |
|---|---|---|
| **Listed Species on the Endangered Species List** | | |
| Mammals | Gray wolf (LE/XN)(*Canis lupus*) | Experimental/Non-essential population |
| Birds | Bald eagle (LT)(*Haliaeetus leucocephalus*) | Wintering area/Nesting area |
| Invertebrates | Utah valvata snail (LE)(*Valvata utahensis*) | Recovery Plan from rivermile 572 to 709. |
| | Snake River physa snail (LE)(*Physa natricina*) | Recovery Plan from rivermile 553 to 675. |
| | Bliss Rapids snail (LT)(*Taylorconcha serpenticola*) | Recovery Plan from rivermile 547 to 585. |
| | Idaho springsnail (LE)(*Pyrgulopsis idahoensis*) | Recovery Plan from rivermile 518 to 553. |
| | Banbury Springs lanx (LE) (*Lanx sp.*) | Recovery Plan from rivermile 584.8 to 589.3 |
| **Proposed Species** | | |
| None proposed | | |
| **Candidate Species** | | |
| None: The USFWS has concerns about the following species. These species have no status under the Endangered Species Act. However, the USFWS is concerned about their population status and threats to their long-term viability. | | |
| Mammals | Pygmy rabbit (*Brachylagus idahoensis*) | |
| Birds | Trumpeter swan (*Cygnus buccinator*) | |
| | Black tern (*Chlidonias niger*) | |
| Fish | Shoshone sculpin (*Cottus greenei*) | |
| Invertebrates | Idaho Dunes tiger beetle (*Cicindela arenicola*) | |
| | California floater (*Anondonta californiensis*) | |

**TABLE 19** data provided by USFWS (Boise, Idaho): Effective date May 23, 1996 for 180 days.

A Recovery Plan for the Snake River Aquatic Species (the five listed snails) has been proposed by the USFWS in conjunction with numerous state and federal agencies. The short-term recovery objectives of this recovery plan are to protect known live colonies of the federally listed snails by eliminating or reducing known threats. The long-term objectives are to restore viable, self-reproducing colonies of the five listed snails within specific geographic ranges to the point that they are delisted. Because the recovery plan involves various state and federal agencies initiating recovery actions over a ten year period through the year 2000, the Middle Snake River WMP goal in the Recovery Plan is to improve water quality and quantity for the Middle Snake River. Thus, as part of those actions needed to initiate recovery, the Middle Snake River WMP will:

1. Attain state water quality standards for nuisance vegetation, DO, and temperature for support of cold water biota and habitat conditions so that viable, self-reproducing snail colonies are established in the free-flowing mainstem and the cold-water spring habitats within specified geographic ranges, or recovery areas, for each of the five endangered mollusc species. Attainment of state water quality standards is targeted for ten years of final WMP approval.

2. As part of attainment of state water quality standards for cold water biota and habitat conditions of the five endangered mollusc species on the Middle Snake River, the major water user industries will have full implementation of their WMPs within five years of final plan approval and maintain them for an additional five years. This will ensure attainment of state water quality standards.

3. The DEQ will participate and coordinate with the FERC actions on the Middle Snake River for both proposed and existing projects. The DEQ will develop additional study requests, if necessary, that provide additional insight and knowledge to the impacts by impoundments on the Middle Snake River so as to attain state water quality standards for support of cold water biota and habitat.

4. The DEQ will ensure that management actions by the water user industries from this WMP are consistent with the Endangered Species Act, thus attaining state water quality standards for support of cold water biota and habitat.

5. Because of pollution concerns to the Snake River Plain Aquifer, protection of this resource for attainment of state water quality standards for support of cold water biota and habitat is important. In order to develop a greater understanding of the hydrological interaction between the ground water and the surface water, both at the localized site and at those non-localized sites affected by the movement of the ground water, the Middle Snake River WAG will develop a ground water task force within Phase I and assess that research already developed in the Middle Snake River Watershed Management Area. The task force will prepare preliminary findings and/or conclusions and present them to the WAG, who then will advise the DEQ on prioritization of ground water concerns. The DEQ will continue to coordinate with other agencies that are currently monitoring the listed snails on the Middle Snake River.

## 2.04 IDENTIFICATION OF POLLUTANTS

For the Mid-Snake WMP, the pollutants to be discussed in this section will center on TP and sediment. Although nitrogen is a pollutant of concern, more data needs to be collected to define total Kjeldahl nitrogen (TKN), ammonia, and nitrite + nitrate. Nitrogen as a pollutant will be addressed in Phase III of the WMP.

The combined impacts associated with water quality degradation interact to affect human communities within the watershed. In order to determine the appropriate actions for mitigating these impacts, it is necessary to identify pollutant sources, understand their interactions, and apply necessary strategies (such as the WMP process) to remediate the activities of such pollutant sources. Nutrient supply is one of the most important factors determining the quantity of plant growth in aquatic systems (Hutchinson, 1973; Harper, 1992). The dynamics of this process are discussed later in this chapter under Pollutant Dynamics and Management Efforts. The specific nutrients often associated with eutrophication in fresh waters are phosphorus and nitrogen. Sediment functions more as a source of nutrients in a eutrophic system.

## 2.04.01 TOTAL PHOSPHORUS

Phosphorus is often the primary limiting nutrient (See Pollutant Dynamics and Management Efforts in this chapter) in aquatic systems and is present in a number of organic and inorganic forms. Typically, greater than 90% of the TP present in freshwater occurs in organic forms as cellular constituents in the biota or adsorbed to particulate materials (Wetzel, 1983). The small remaining fraction is inorganic, largely orthophosphate ($PO_4$), and in soluble forms that are rapidly assimilated by plants. As a result, this form of phosphorus tends to be rare in unenriched aquatic systems. The Middle Snake River clearly has excessive amounts of TP and orthophosphate. At times, approximately 70-90% of the TP is soluble orthophosphate (Falter and Carlson, 1994). The DEQ compared TP to soluble reactive phosphate (SRP or orthophosphate) and determined that during the 1995 monitoring season, SRP represented from 50 to 65% of the TP. This suggests that phosphorus may reach concentrations exceeding the ability of plants to use it. In addition, water column concentrations of total phosphorus often exceed values considered indicative of eutrophication in fresh waters (Minshall et al., 1994; Wetzel, 1983).

Sediments can be a major source of phosphorus to rooted plants and the stream water column. Phosphorus is typically bound to the particulate matter in aquatic systems. Agricultural surface runoff is often rich in sediments and carries higher concentrations of soluble phosphorus from fertilizer sources than what would be expected in the subsoil from percolation. Much of the larger sediment particles are deposited soon after entering the Middle Snake River. The smaller sediment particles remain suspended for longer distances before their deposition occurs. Normally, phosphorus fertilizers that are surface-applied will break apart at irrigation and percolate into the subsoil and become fixed to other soil particles or tied-up to the excess lime. However, phosphorus fertilizers tend to saturate the "fixing sites" of the soil surface and locally raise the concentration of the soil solution orthophosphate. When this occurs, the soluble phosphate concentrations in irrigated field runoff (as soil solution phosphate) frequently approaches or exceeds the expected average concentration in the soil solution. Thus, that water which percolates through the soil will tend to have a relatively lower soluble phosphate level (when compared to irrigation runoff or "tail water"). Therefore, it is quite plausible that a relatively greater portion of the soluble phosphate could reach the waterways via surface runoff.

Phosphorus in suspended particles (especially the smaller particles such as clay which contain the majority of the phosphorus) is present in both organic and inorganic forms. The organic forms undergo microbial transformations. The inorganic forms undergo a more complex chemical transformation. For example, the phosphorus bonded to iron, aluminum, or calcium in the mineral particles tends to equilibrate with the phosphorus (or phosphate) in solution. If the particles come from a surface soil that is high in phosphorus content, they will tend to support a relatively high concentration of phosphorus in solution. If the particles come from a subsoil that is low in phosphorus content, they will support a low concentration of phosphorus in solution. In fact, if subsoil particles were introduced into a stream containing a moderate or high concentration of soluble phosphorus, they would adsorb phosphorus from the water, thereby lowering the phosphorus concentration in solution. Since much of the sediment in streams during high flow is derived from stream-bank erosion, the phosphorus status of the sediments in the streambeds and stream banks is an important factor affecting the concentration of soluble phosphorus in the water during periods of high flow.

In a river system, once the phosphorus is deposited with the sediments in the stream bed, it becomes available for biological uptake by rooted aquatic macrophytes. In addition, dying organisms settle to the bottom and are incorporated into the sediments. This adds to the pool of phosphorus. In this fashion, the nutrients in the water column and sediments are continuously being recycled by plants (Wetzel, 1983).

### 2.04.02 SEDIMENT AS SETTABLE SOLIDS AND TSS

Settleable solids are defined as the volume (mL) or weight (mg) of material that settles out of a liter of water in one hour (*Standard Methods*, 1975; 1995). In the Middle Snake River, settleable solids consist primarily of large silt, sand, and organic matter. Total Suspended Solids (TSS) are defined as the material collected by filtration through a 0.45 $\mu$m (micrometer) filter (*Standard Methods*, 1975; 1995). The primary forms of TSS in the Middle Snake River are silt, clay, and phytoplankton. Settleable solids and TSS both contain nutrients that are essential for aquatic plant growth. Settleable solids are not as nutrient rich as the smaller TSS, but they do affect river depth and substrate nutrient availability for macrophytes. In slow flow, settleable solids accumulate on the Middle Snake River bottom, thus decreasing water depth. This increases the area of substrate that is exposed to light, facilitating additional macrophyte growth. The prinicipal concern over TSS is the nutrient content of the particles and their effect on the turbidity of water. Because TSS are rich in nutrients (such as phosphorus and nitrogen), they can increase primary production in the Middle Snake River. The ability of light to penetrate the water column is directly correlated to the TSS as well as the turbidity. Light penetration decreases as TSS increases. The TSS in the Middle Snake River is such that little plant growth occurs at water depths greater than 2 meters. Reduction in TSS may therefore stimulate growth of submerged macrophytes.

## 2.05 POLLUTANT DYNAMICS AND MANAGEMENT EFFORTS

Remediation of eutrophic waters requires a basic understanding of the direct and indirect effects of nutrients on aquatic ecosystems. Direct effects of eutrophication are those such as nutrient uptake by plants, whereas indirect effects are changes in the plant and animal communities. The concepts of nutrient spiraling and resource limitation are central to this understanding. The following describes this ecosystem process in more detail than previously noted on the Middle Snake River and its implications to management and remedial efforts.

### 2.05.01 LIMITING FACTORS

Because phosphorus is often in short supply relative to biological needs, this element limits plant growth in aquatic systems. Ecologically, a resource is considered limiting if the addition of that resource increases growth (Brewer, 1988). This concept is well understood by farmers, who add phosphorus fertilizer to increase crop production by stimulating root development. It follows, then, that sufficient and sustained removal of phosphorus (and other limiting factors) should result in reduced plant production.

Historically in the Middle Snake River, TP concentrations in addition to natural flows probably limited (and therefore controlled) plant productivity and community composition. Plant growth was kept below its potential due to short supplies of nutrients relative to required amounts. High summer water velocities limited deposition and prevented biomass accumulation through sheer physical stress. In addition, spring freshets scoured accumulated sediments and organic matter. However, sustained inputs of colloidal and dissolved nutrients in more recent history, compounded by restricted flows (due to impoundments and altered-diverted flows), stimulated plant growth. As a result, factors other than nutrients (such as water flow, stable substrate, and light) may currently be limiting plants (Falter and Carlson, 1994). Therefore, sustained long-term nutrient and sediment reductions will be required before instream nutrient concentrations are low enough to limit plant growth.

### 2.05.02 NUTRIENT PROCESSING (or SPIRALING) IN THE MIDDLE SNAKE RIVER

The Middle Snake River transports large quantities of elements from upstream and local terrestrial sources to the Columbia River. Some of these elements are essential nutrients for living organisms. Many essential nutrients (i.e., potassium, calcium, magnesium, nitrogen, phosphorus, sulfur, etc.) are present in quantities exceeding the immediate demand of the aquatic plant community. Conversely, nutrients such as TP are often in short supply relative to biological demands and therefore undergo intensive instream use and fluctuation. As nutrients are transported downstream, they are continuously recycled (or sprialed) through the biota and consequently change forms (i.e., inorganic to organic). Our current understanding of nutrient spiraling is rudimentary (Newbold, 1992), and on the Middle Snake River much research is currently being conducted to increase our understanding of these transformations.

The form a nutrient is in will affect its rate of downstream transport and cycling. For example, phosphorus bound up in the biota will be transported more slowly relative to dissolved phosphorus. The rates that nutrients are used relative to their rate of downstream transport describe the "retentiveness" of the Middle Snake River. For example, in flushing flow years, and in those areas that are swift-flowing with low biological activity, nutrients are transported downstream faster than they are used by the biota. Hence, the system at these locations may have low nutrient retention in flushing flow years.

The Middle Snake River, however, is very retentive of nutrients (Minshall and Robinson, 1994). This indicates that nutrients entering the Middle Snake River remain in the system (although in many different forms) for longer periods of time rather than being flushed downstream. Restricted water flow, dense aquatic plant beds, and heavy sedimentation are contributors to this condition. Even within the more faster moving portions of the Middle Snake River the water quality is still eutrophic due to the long-term historical effects from pollutant sources.

### 2.05.03 IMPLICATIONS OF THE MID-SNAKE WMP

The internal cycling processes and the resulting longer nutrient retention times in the Middle Snake River have several important implications for nutrient and watershed management efforts. This complexity indicates and dictates that noticeable responses to management efforts by the major water user industries will be slow, but not unachievable or ineffective. Soils on the Snake River Plain are primarily loessal in origin, being composed of wind-blown particles from a variety of sources which are good for most climatically adapted crops. These soils are relatively free of salt problems and have high permeability. However, they are readily subject to water and wind erosion, making sediment loss a perennial problem on the Middle Snake River. Such losses affect the quality of irrigation return streams and tributaries which eventually fill the Middle Snake River.

Because water column nutrients, particularly TP, may be more abundant than plant uptake rates, responses by plant commnunities to management efforts will take time. As TP inputs are reduced, plants that obtain nutrients from the water column (such as algae, epiphytes and *Cerratophyllum sp.*) will likely be the first to decline. Because nutrients persist longer in the sediments, plants that obtain nutrients from the sediments (such as *Potamogeton sp.*) will persist longer. Nevertheless, as reductions in TP (and sediment) continue, sediment nutrients will gradually be depleted as plant uptake outpaces recharge rates. (See Sosaik, 1990;

Armstrong, 1991; Barko, et al., 1991; Chambers, et al., 1991.) Additionally, submerged plant communities may currently be light limited (Falter and Carlson, 1994). Reducing TSS inputs will likely increase light penetration to the Middle Snake River bottom. It is therefore necessary to reduce both sediment and TP inputs so that increased light penetration from TSS reductions will not exacerbate the macrophyte problem. Thus, the Mid-Snake TMDL will address TP in Phase I and sediment in Phase II.

However, the importance of flow cannot be overlooked or overstated. The absence of natural flow variations, including spring freshets, have compounded the eutrophication and sedimentation problem in the Middle Snake River. High water velocities limit the sedimentation process and macrophyte growth, in addition to scouring the sediment deposits (Barko, et al., 1991; Chambers, et al., 1991; Falter and Carlson, 1994; Minshall and Robinson, 1994). Although nutrients may naturally be removed from the Middle Snake River system at a very slow rate, the effect of sediments may persist in this hydrologically modified system. For this reason the Mid-Snake TMDL was structured to address nitrogen in Phase III and flow in Phase IV. Sediment, nitrogen, and flow will, however, be an ongoing process in its development begining in Phase I.

Inspite of this complexity, the Middle Snake River WMP proposes to target TP initially for industry reductions. Point sources contribute an estimated 65.0% of the TP in the Middle Snake River annually. Nonpoint sources contribute an estimated 20.1% of the TP in the Middle Snake River annually. Background (springs) and upstream contributed an estimated 14.9% of the TP in the Middle Snake River in the summer. Modeling conducted by the EPA (John Yearsley with EPA's RBM10 Model) and the DEQ projects that industry reductions in TP will result in the instream water quality at Gridley Bridge, Hagerman, Idaho of 0.075 mg/L TP, thereby significantly reducing aquatic vegetation. See **TABLE 21**.

Despite the complex dynamics of the Middle Snake River, industry reductions in TP inputs to the Middle Snake River will improve water quality. Continued monitoring and research will determine additional restoration needs, as well as improve our understanding of the Middle Snake River ecology.

## 2.06 POLLUTANT SOURCES

There are a number of point and nonpoint sources that contribute pollutants to the Middle Snake River. Where influent and effluent monitoring data are available, net contribution sources are quantifiable. Otherwise, pollutant contribution estimates include some background and natural levels. Moreover, contributions from some nonpoint sources are currently unknown. Nevertheless, the best, currently available data were used to estimate contributions from a number of sources. Summer (April - October) and wintertime (November - March) estimates of sediment and nutrient loadings from known sources are summarized above in **TABLE 21.** The baseline was for the year 1991.

1. **BACKGROUND SOURCES**

   Nutrients and sediments enter the Middle Snake River from both upstream sources and some spring sources. Upstream sources include many point and nonpoint sources as well as natural inputs. Two food processors and two publicly owned treatment works (POTWs) discharge into the Milner pool. Their contributions are included as estimates based on the 1991 USGS flow data, such that only that portion that was going downstream of Milner Dam was prorated into the total load coming upstream into Milner. Based on flow data for 1991, approximately 20% of the flow went downstream of Milner Dam. The remainder either was diverted to the North Side Canal Company and/or the Gooding-Milner Canal, or the Twin Falls Canal Company, or was retained in the Milner Pool. During the summer, instream flows from Milner represent a small fraction of the water in the Middle Snake

River due to diversions at Milner. As a result, background pollutants that are not assimilated in the Milner Reservoir (Clark, 1994b) are diverted onto irrigated lands, with only limited amounts passing through Milner. Nutrient and sediment loadings from background sources are estimates using the median summer and winter loads for 1991 at Murtaugh Bridge (Brockway and Robison, 1992), which was the uppermost mainstream station monitored that year. Results are presented in **TABLE 21.** Approximately 18.0% (see section 2.07, Analysis of Pollutant Loads) of the TP load in the Middle Snake River in the summer is from background sources during the summer season. During the winter this percentage increases to 25.4% (see section 2.07, Analysis of Pollutant Loads). As described in previous sections, nutrients in spring water are from natural and human sources. Sediment concentrations are very dilute in spring water and likely from natural sources. Nutrient and sediment loads from springs were estimated using mean concentrations for the major springs in the Middle Snake River (MacMillan, 1992; Brockway and Robison, unpublished data; Clark, 1994b). Results are also presented in **TABLE 21.**

## 2. POINT SOURCES

Point sources are defined as any discernable confined and discrete conveyance from which pollutants are or may be discharged (IDAPA 16.01.02003.35). Agricultural returns are excluded from this definition. Point sources that discharge nutrients to the Middle Snake River include food processors, municipalities (POTWs), and aquaculture facilities. Confined animal feeding operations (CFOs) with more than 200 dairy cows or 300 feeder cows are also considered point sources; however, they are prohibited from discharging except during extreme storm events. Therefore, for purposes of the load estimates, they will be included in the nonpoint sources. Load estimates for the NPDES permitted POTWs and aquaculture facilities were made using data from discharge monitoring reports (DMRs). Approximately 58.1% (see section 2.07, Analysis of Pollutant Loads) of the TP summer load in the Middle Snake River is from point sources.

### a. AQUACULTURE FACILITIES

Aquaculture facilities generate continuous discharges with relatively dilute concentrations of ammonia, phosphorus, and organic solids as waste products (IDHW-DEQ, 1994c). These by-products enter the receiving waters and require well-planned and managed waste treatment systems to prevent water quality degradation. Cold-water facilities rearing more than 20,000 lbs. of fish per year are regulated by NPDES permits. Aquaculture facilities receive water from springs, irrigation returns, and tributaries and discharge into tributaries, irrigation returns, and the main stem of the Middle Snake River. Sediment and nutrient loads from the aquaculture industry are difficult to quantify because of the large number of facilities and variation in operating practices. Nevertheless, the DEQ estimated the loads for permitted facilities based on 1990-1991 DMRs (Brockway and Robison's Phase I Study). Weighted mean net contributions from DMR data were averaged with the Phase I estimates of gross contributions, resulting in an estimate of industry-wide contributions. Total industry load estimates were based on a 3000 cfs flow estimate. These estimates are presented in **TABLE 21.** Approximately 34.9% (see section 2.07, Analysis of Pollutant Loads) of the TP summer load in the Middle Snake River comes from aquaculture facilities.

b. **MUNICIPALITIES (POTWs)**

Sediment and nutrient load estimates for POTWs were made with 1991 DMRs from the Twin Falls wastewater treatment facility. The Twin Falls POTW is the largest water treatment facility on the Middle Snake River and the largest municipal contributor of nutrients to the river (see Appendix A.6). The Twin Falls POTW regularly tests effluent for phosphorus, ammonia, and TSS. Load estimates are presented in **TABLE 21.** Other POTWs discharge into the canal system, Milner pool, Cedar Draw Creek, and Mud Creek. Their loadings are therefore included in the background and the respective receiving stream loadings. Approximately 23.2% (see section 2.07, Analysis of Pollutant Loads) of the TP summer load in the Middle Snake River comes from municipalities.

c. **FOOD PROCESSORS**

Although many food processors exist in the Middle Snake area, few directly discharge into surface water. Two processing plants in Burley, Idaho (i.e., Ore-Ida and Simplot) discharge into the Milner Reservoir. Their pollutant loadings are included in both the background and other sources that receive water from diversions at the Milner Reservoir. Universal Frozen Foods discharges its waste through the Twin Falls POTW. Consequently, Universal's contributions to the nutrient loadings of the Middle Snake River are incorporated into the POTW's contributions.

Phosphorous contributions of Ore-Ida and Simplot are estimates based on 1991 DMR data for both facilities. However, phosphorus monitoring has recently become a requirement of NPDES permits for these facilities which will refine the load estimates within the first three (3) year of final plan implementation. That portion of their load affecting the Middle Snake River was prorated based on USGS flow values for the 1991 flow year. Approximately 7.0 lbs/day of the 35.0 lbs/day (see section 2.07, Analysis of Pollutant Loads) of the TP upstream load in the Middle Snake River comes from food processors. Their reductions will be seen in the upstream portion of the allocation in **TABLE 21** and represents 0.8% reduction for the summer portion.

Although ammonia and TSS loads are quantifiable using the DMRs, the direct loads to the Middle Snake River during the summer are unknown because diversions at the Milner Reservoir are routed onto extensive irrigation tracts. Approximately 40 lbs/day of ammonia and 28,334 lbs/day of TSS are discharged by these two plants into the Milner Reservoir. Therefore, TSS was prorated much the same as TP for that portion affecting the Middle Snake River. Ammonia was not included in the estimates at this time.

3. **NONPOINT SOURCES**

Nonpoint sources of pollution include all activities that result in pollution entering a waterbody without a discrete conveyance system. A nonpoint source is a geographical area on which pollutants are deposited or dissolved or suspended in water applied to or incident on that area, the resultant mixture being discharged into the waters of the State. (See IDAPA 16.01.02.003, 60.) Nonpoint sources include, but are not limited to: irrigated and nonirrigated lands used for grazing, crop production, or silviculture; log storage or rafting; construction sites; recreation sites; septic tank disposal fields; and, rural stormwater. Nonpoint source pollution is typically more difficult to quantify and control than point source pollution. Nevertheless, it may represent a significant proportion of the pollution entering water bodies (IDHW-DEQ, 1989b). Significant amounts of pollutants in surface waters are a result of the cumulative effects of various land uses in the watershed. Land uses in the Middle Snake River watershed that may contribute to water quality degradation include soil erosion, over application of fertilizers, grazing, and urbanization. At present, it is not possible to precisely identify the loads in the Middle Snake River from each of these sources. Nevertheless, crude load estimates from nonpoint sources were compiled using the best available data. Approximately 24.0% (see section 2.07, Analysis of Pollutant Loads) of the TP load in the Middle Snake River comes from nonpoint sources.

a. **CONFINED FEEDING OPERATIONS (CFOs)**

The amount of nutrients entering the Middle Snake River from CFOs is not known. CFOs have the potential to contaminate both surface and ground water. CFOs using appropriate BMPs should have no effect on water quality in the Middle Snake River. CFOs are covered by a general NPDES permit that prohibits discharge to surface water except during a 25-year, 24-hour storm event. The CFO industry acknowledges that not all CFOs use BMPs and that some may contribute nutrients to the Middle Snake River through surface water contamination. Furthermore, CFOs can contaminate ground water by applying nutrients to the land that exceed recommended agronomic rates. Applying wastes in excess of agronomic rates, on fractured bedrock, or on shallow soils may result in ground water contamination. The contribution of CFOs to water quality degradation in the Middle Snake River has not yet been adequately investigated. As a result, data linking nutrients and sediments in receiving waters to CFOs are unavailable. Therefore, no attempt is made to quantify loadings from CFOs at this time. Because they are defined as a "zero discharge" permitted industry, the values are estimates of zero for both TP and sediment.

b. **IRRIGATED AGRICULTURE**

Characterization of pollutant contributions from irrigated agriculture is difficult due to extreme temporal and spatial variability of return flows and pollutant loads. It is also difficult to quantify current net pollutant contributions by irrigators in this area because background pollutants are not regularly monitored. Nevertheless, results from past research may indicate current patterns. Sediment and nutrient loads from irrigated agriculture enter the Middle Snake River both directly, via return flows, and indirectly, via tributary streams. The sediment and nutrient load estimates for irrigated agriculture therefore incorporate both sources. Brockway and Robison (1992) measured nutrient and sediment loads in return flows representing approximately 70% of total direct discharges to the Middle Snake River. The 1991 estimates for the Middle Snake River (See **TABLE 21**) indicate that approximately 13.2% (see section 2.07, Analysis of Pollutant Loads) of the TP summer load comes directly from irrigated agriculture.

Major tributaries were also monitored from June 1990 to June 1991. From the tributary data, accumulated nutrient and sediment loads for the growing season were compared to loads for winter (November to March; Brockway and Robsison, 1992). Winter loads were attibuted to sources other than irrigated agriculture. The proportion of winter to growing season loads was averaged across all monitored tributaries. This provided an estimate of the percent of the annual nutrient and sediment loads in the tributaries that is attributable to irrigated agriculture. These values were as follows:

**Table 20. TSS AND TP LOAD ON MAJOR TRIBUTARIES FROM JUNE 1990 TO JULY 1991.**

| NAME | TSS, tons/year | TP, tons/year |
|---|---|---|
| Vinyard Lake | 337.0 | 0.78 |
| Rock Creek (at Poleline Road) | 4318.0 | 10.33 |
| Cedar Draw | 18576.0 | 26.27 |
| Clear Lakes | 1791.0 | 68.37 |
| Mud Creek | 5539.0 | 17.50 |
| Deep Creek | 8317.0 | 15.22 |
| Blind Canyon | 1840.0 | 7.53 |
| Salmon Falls Creek | 6018.0 | 12.95 |
| Malad River | 5788.0 | 60.04 |
| TOTAL MONITORED LOAD | 52528.0 | 219.00 |

Source: Brockway & Robison, Phase 1 Study, February 1992. The study was conducted over 378 days.

Agriculture loads in the tributaries were then calculated and added to loads from the direct agriculture returns. Results are presented in **TABLE 21**.

c. **OTHER NONPOINT SOURCES**

In addition to irrigated agriculture, many other nonpoint sources contribute nutrients and sediments to the Middle Snake River. Improper grazing practices contribute sediments and nutrients to Rock Creek, Mud Creek, and Deep Creek. Streambank erosion also contributes sediments to most of the tributaries of the Middle Snake River. The DEQ estimated Total "Other" Nonpoint Loads in the tributary streams. Nutrient and sediment loads in the tributaries from November to March were assumed to originate from other other nonpoint sources. These are likely overestimates because many tributaries also receive inputs from point sources such as POTWs and aquaculture facilities. This method also assumes that non-agricultural nonpoint source loads are constant throughout the year. The results are presented in **TABLE 21**. Again, future monitoring data will allow us to better quantify pollutant loadings from these other nonpoint sources. Approximately 10.9% of TP summer load comes from other nonpoint sources.

## 2.07 ANALYSIS OF POLLUTANT LOADS

The first step in addressing the Middle Snake River water quality problem is to identify the pollutants of concern, and then, the sources of those pollutants. As noted, the beneficial uses on the Middle Snake River are impacted from excessive aquatic vegetation, low dissolved oxygen, and high temperature. These conditions are symptomatic of a eutrophic system. Research and monitoring indicate that these conditions are the result of excessive nutrient and sediment inputs and reduced instream flows in the Middle Snake River (Falter and Carlson, 1994; Minshall and Robinson, 1994). The pollutants of concern are therefore nutrients (particularly phosphorus) and nutrients associated with sediments. **TABLE 21** is provided as an estimate of nutrients and sediment loadings for point, nonpoint, and background sources in the Middle Snake River.

**TABLE 21. SUMMARY OF ESTIMATED TP AND TSS FOR POINT, NONPOINT, AND BACKGROUND SOURCES IN 1991 FOR HUCs 17040212 AND 17040213.**

| Sources | Sediments ( as TSS) (lbs/day) | Total Phosphorus (TP) (lbs/day) |
|---|---|---|
| **BACKGROUND** - Summer (Winter) [See **NOTE** below.] | | |
| Upstream[1] [Seasonal Loads] | **554.0 (2498.0)** | **35.0 (623.0)** |
| Springs[2] [Seasonal Loads] | **0.0 (0.0)** | **792.0 (671.0)** |
| **POINT SOURCES** | | |
| Aquaculture[3] [Annual Load] | 29753.0 | 1617.0 (E) + U |
| Municipalities[4,6] [Annual Load] | 1616.0 | 1071.2 (E) + U |
| Food Processor[6] [Annual Load] | 5666.8 | Upstream Background |
| **NONPOINT SOURCES** | | |
| Irrigated Ag[1] [Annual Load] | 348004.0 | 609.0 |
| Other[1] [Annual Load] | 94524.0 | 503.0 |
| CFOs[5] [Annual Load] | 0 | 0.0 |
| Hydroelectric Power[7] [Annual Load] | 0 | 0.0 |
| **TOTALS (Estimates)** | 480,117.8 (482,061.8)[8] | 4627.2 (5094.2)[8] |
| AVERAGE TOTALS (Estimates) | 481,089.8[8] | 4860.7[8] |

1 From Brockway & Robison, 1992. Major tributaries monitored from June 1990 to June 1991. This load accounts only for irrigation return drains and the major tributaries, or approximately 70% of the total direct discharges to the Middle Snake River.
2 From Brockway (unpublished); MacMillan, 1992; Clark, 1994b.
3 From 1991 DMRs, Brockway (unpublished).
4 From 1991 and 1992 DMRs
5 CFOs claim zero discharge for sediments and TP, although it is uncertain how much they discharge or minimize on discharge. The amount of nutrients entering the Middle Snake River from CFOs is unknown. CFOs have the potential to contaminate both surface and ground water. CFOs using appropriate BMPs should have no effect on water quality in the Middle Snake River.
6 Included in TP and TSS inputs in upstream from two food processing plants. See **Table 22** for a fuller explanation.
7 Hydroelectric Power does not contribute nutrients to the Middle Snake River, but functions as a flow stressor to water quantity.
8 Totals for sediment (as TSS) and total phosphorus are provided as estimates of summer and winter loads (in lbs/day) due to the background information provided. In general, the average between the summer and winter loads is 481,089.8 lbs/day for sediments and 4860.7 lbs/day for total phosphorus.

NOTE: Concentrations of TSS and other constituents below detection levels were adjusted to one-half the detection limit except for springs. Summer is defined from April to October. Winter is defined as November to March. U = Unknown value. E = Estimate value.

In reviewing **Table 21**, an explanation of the derived percentages in section 2.06 is in order. The data in **Table 21** represents the best available estimates that could be obtained for the year 1991 as to sediment and total phosphorus from the various water user industries. Percentages in section 2.06 (on a per industry basis) were calculated from the total summations (in **Table 21**) which reflect a summer and a winter value for background sources. Under this scenario, an estimate of the percent of an industry to the total estimated load can be derived for spring and summer growing seasons, bearing in mind that these are crude estimates and require more data for refinement. Values for point and nonpoint sources were not estimated relative to summer or winter seasons as were background sources. Therefore, the estimated percentages reflect an estimate based on the loads from the particular industry when compared to the total load for either sediment or total phosphorus. Further explanation of each industry's load may be found in **Tables 22 - 27**.

# CHAPTER 3
# MANAGEMENT ACTIONS AND IMPLEMENTATION

## 3.00 PRELIMINARY

This chapter covers the management actions and implementation of the Mid-Snake WMP. This chapter describes the instream water quality target of TP as 0.075 mg/L and the basis for its selection. It describes the WLA tables for each point source industries and the load allocation tables for the nonpoint source industries. It also describes industry and management actions, enforcement mechanisms, coordinating activities, public outreach, and additional restoration options.

## 3.01 WATER QUALITY TARGET

The water quality target of 0.075 mg/L TP was established from two separate analyses. The first analysis was derived from the EPA's recommended standards for various waterbodies (1986). For free-flowing rivers a TP recommended standard is 0.100 mg/L. For lake tributaries the recommended standard is 0.050 mg/L TP. And for lakes and reservoirs a recommended standard is 0.025 mg/L TP. The Middle Snake River has a modified flow regime with run-of-the-river impoundments. Based on discussions and research conducted by the Technical Advisory Committee of the Middle Snake River WMP (1988 to 1992), it was concluded that the best reasonable, preliminary target value for water column TP would be 0.075 mg/L. The compliance point was selected at Gridley Bridge, Hagerman, Idaho since it represented an "average" location downstream of the most impacted locations on the Middle Snake River (i.e., Crystal Springs, Box Canyon, Thousand Springs) as well as a "compromise average" of the upstream portion of Upper Salmon Falls Dam and what was entering Lower Salmon Falls Dam.

The second analysis was derived from the RBM10 Model simulations. There were four, ten-year, model simulations made using flow data from 1930-1939, which represent the lowest flow years on the hydrologic record. By using the assimilative capacity of the Middle Snake River under the "worst case flow" conditions, model simulations provided an answer to two objectives: (1) to evaluate the relative effectiveness of various industry management actions at improving instream water quality, and (2) to verify that the proposed industry load reductions would, on average, lead to attainment of the instream TP goal at Gridley Bridge under adverse flow conditions. Additionally, under high flow conditions the instream target should be easier to achieve given the dilution effect from water quantity. Results of the simulation runs show that within ten years of final plan implementation, proposed nutrient reductions should attain the instream TP target goal. The modeling results gave a value of 0.0728 mg/L at Gridley Bridge.

There are recognized uncertainties associated with ecosystem modeling. Complex models such as the RBM10 facilitate predicting a wide array of ecosystem responses to management actions. However, the uncertainties in ecosystem modeling should not be ignored when applying models to management decisions. For this reason a **margin of safety** is used in modeling efforts (which is a required component of a TMDL that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving waterbody). These uncertainties include the following:

1. Large amounts of data are required to calibate the model.
2. Data collection is expensive and time consuming.
3. Large number of processes and interactions in a complex model increase the number of assumptions the model developer must make.
4. When large amounts of input data are required, inaccuracies in some of these data are likely.

5. Complex models are not easily used, so simulating many different "what if" scenarios is difficult.

Several conclusions can be drawn from the RBM10 modeling effort on the Middle Snake River that better define the element of uncertainty and risk in the model simulations based on industry goals:

1. The modeling shows that plant biomass, for macrophytes and epiphytes, responds to nutrient reduction of TP. Implementation of the industry targets shows that plant biomass was reduced by 20-30% and would therefore improve reduced impacts to beneficial uses of the Middle Snake River caused by excess in aquatic vegetation.

2. There is a greater certainty that achievement of the 0.075 mg/L TP goal with accompanying plant biomass reduction will achieve state DO and temperature compliance standards.

3. Instream flow considerations need to be considered in establishing a more realistic perception of attaining the TP goal. In the absence of more instream flow, there will be a point of diminishing returns for water quality improvement resulting from sediment and nutrient input reductions. Thus, the use of the "worst case flow" conditions provides the basis for industry reductions so that under high flow conditions attainment of the water quality goal is easier.
4. Increased instream flow will dilute TP concentrations implying that higher instream flows can augment nutrient reductions in attempts to improve water quality in the Middle Snake River. Higher flows and velocities could both dilute nutrient concentrations and hinder plant production.

5. **MARGIN OF SAFETY**
The loading calculations in **TABLE 22** were based on an estimate of the 1991 TP loadings of point and nonpoint sources to the Middle Snake River from April to October (Brockway & Robison, 1992). The loadings predicted for 1991 were calculated for Gridley Bridge (RM 583), Hagerman, Idaho at low flow conditions for 1991 (5510 cfs). For an instream target of 0.075 mg/L TP, the TP loading goal generated by the RBM10 is 2227.4 lbs/day. The RBM10 predicted an instream TP target of 0.0728 mg/L, after the industry reductions, for a TP loading prediction of 2162.1 lbs/day. The difference between the two loadings is 65.3 lbs/day, which for the Mid-Snake TMDL is the net margin of safety. However, as described in **TABLE 24**, the conversion of the orthophosphate (or orthoP) value of 1030.0 lbs/day to an estimated TP value 1071.2 lbs/day gives a difference of 41.2 lbs/day, which is subtracted from the margin of safety. This gives a final margin of safety of 24.1 lbs/day. The reductions from municipalities discharging to tributaries are not currently accounted for in RBM10 estimates. However, these facilities will be reducing their loads to the tributaries by a total of 223.0 lbs/day overall load allocation. There is no load allocation shown for the tributaries in the overall allocation. However, due to the assimilation and diversion of tributaries, the net effect to the Middle Snake River is probably less than 223.0 lbs/day. Most likely, there will be some reduction which has not been credited explicitly, which is an undefined component of the margin of safety.

Regardless of the inevitable uncertainties in the modeling and the complexities of the Middle Snake River ecosystem, the RBM10 model represents the best effort to date to confirm that industry reduction efforts can achieve the water quality goals of this WMP. Because industry-specific watershed reduction plans provide the basis for water quality improvements, their implementation is a necessary first goal. Industry-specific watershed reduction plans include TP reduction targets to be met by Year 5 of plan implementation. Then, maintaining those target for an additional 5 years is the second goal in order to attain state water quality standards in 10 years. Research, monitoring, and preliminary predictive modeling indicate that due to the complexity and retentiveness of the Middle Snake River ecosystem, instream responses to nutrient (and sediment) load reductions will be slow, particularly if additional drought conditions occur in that 10-year time frame. Therefore, the 10-year planning horizon was agreed upon by the water user industries of the Middle Snake River Watershed Planning Area to achieve water quality standards.

As described previously, the Middle Snake River has a modified flow regime with "run of the river" impoundments, thus making the 0.075 mg/L TP selected target a reasonable, preliminary value for water column TP concentration. This equates to a 30% reduction from the reported TP concentrations at Gridley Bridge, Hagerman, Idaho (Brockway and Robison, 1992). Based on the 33.8% overall industry TP reductions (see **Table 22**), the RBM10 verified that these industry reductions will lead to an instream TP concentration at Gridley Bridge of 0.075 mg/L. The actual RBM10 value was 0.0728 mg/L. This reduction converts to at least a 30% reduction in nuisance aquatic plants, but the specific level of plant biomass that constitutes "nuisance" narrative (not numeric) in the state water quality standards. The DEQ researched and evaluated the scientific literature to determine those studies for filamentuous algae and macrophytes (submerged, rooted aquatic vegetation) which were considered excessive on river systems like the Middle Snake River because they inhibit designated beneficial uses. It was determined that algae biomass exceeding 150 mg chlorophyll-a/$m^2$ would likely inhibit beneficial uses in streams (Welch, *et al.*, 1988, 1989; Watson, 1989, 1991; Watson, *et al.*, 1990). On the Middle Snake River, it has been reported that algae biomass ranges from 10 - 600 mg chlorophyll-a/$m^2$ and averages 165 mg chlorophyll-a/$m^2$ from 1992 to 1994 (Minshall and Robinson, 1994). The most impacted reaches of the Middle Snake River include Crystal Springs, Box Canyon, and Thousand Springs. In these reaches filamentous algae often comprise half of the total plant biomass (5 - 2200 g/$m^2$ range and 314 g/$m^2$ average in 1992) during the growing season (Falter and Carlson, 1994). In other river systems, macrophyte biomass ranging from 1000 - 1900 g/$m^2$ has been considered "nuisance" (Coots and Williams, 1991; Chambers, *et al.*, 1991).

A 30% reduction in both macrophytes and filamentous algae on the Middle Snake River by Year 10 of plan implementation will reduce algal biomass below the nuisance threshold level. A 30% reduction of macrophyte biomass is predicted to facilitate reductions of filamentous algae because macrophytes are the major substrate for filamentous algae attachment. RBM10 simulations of industry-specific reductions support the Middle Snake River WMP goal to attain state water quality standards within the 10-year planning horizon. Monitoring by the DEQ, water-user industries, and other agenices through coordinated monitoring efforts, followed by evaluations of that monitoring effort, will verify the goals of the Middle Snake River WMP. If the goals are not being met, then additional actions will be necessary by all industries for attainment of the goals.

## 3.02 WASTELOAD AND LOAD ALLOCATION TABLES

The wasteload allocation tables that follow set forth the point source permitted industries' allocation and the nonpoint source allocation on the Middle Snake River for HUCs 17040212 and 17040213. The loads are calculated from April through October of the 1991 season. The load allocation tables are for nonpoint sources. **TABLE 22** represents the estimate 1991 loadings per industry with appropriate industry reductions. The RBM10 does not account for the inorganic phosphorus that is tied in the sediment. This component will be addressed in Phase II of the Mid-Snake TMDL. Additionally, the baseline for aquaculture, municipal, and confined animal feeding operations industries was unknown, except in the case of aquaculture and municipal where a few facilities did have information for the 1991 season. A discussion about the margin of safety is found in section 3.01, Water Quality Target. Any permitted facility who refuses to comply with the purposes of the Mid-Snake TMDL will be in violation of their NPDES permit and subject to sanctions and penalties under the permitting process. All monitoring will be based on DEQ approved QA/QC protocol, including blanks, spikes, duplicates, and split samples, as well as approved laboratory procedures. For purposes of this QA/QC protocol, the operating principles relative to QA will include those procedures (including collection and analysis) that will produce data of known and defensible quality, such that the accuracy of the analytical result can be stated with a high level of confidence. Additionally, the DEQ will conduct periodic compliance inspections on all point sources during each year of monitoring. An annual review of each facility will be done with the facility owner/operator.

**TABLE 23** represents the aquaculture industry's wasteload allocation. Eighty one (81) facilities are found in HUCs 17040212 and 17040213. Existing facilities that did not provide information during the public comment period will be reviewed by the DEQ and the EPA relative to issuance of NPDES permits. The EPA will issue a general permit for all aquaculture facilities. Technology based limits for TSS and settable solids will be included. An existing facility is any facility that has in the immediate past (at least since 1985) propagated fish and which its physical appurtenances are in place and can resume production with only minor modifications. Zero discharge is an approved land application permit that has no impact on surface or groundwater quality, or a discharge to surface water such that total phosphorus output does not exceed total phosphorus input. **TABLE 24** represents the municipality (POTWs) industry. The industry arrived at a consensus on values reported in Appendix C. These values are shown in **TABLE 24** for those facilities in HUCs 17040212 and 17040213. **TABLE 25** represents the food processing industry. Only two facilities discharge directly into the Snake River, but upstream of Milner Dam. Based on USGS flows for the 1991 flow year, it was estimated that 19.9% of the flow went downstream of Milner Dam directly into the Middle Snake River. Therefore, it was estimated that 19.9% of the TP loads from these facilities went directly into the Middle Snake River. For NPDES / Land Application facilities, more information is required to determine if discharges are actually occuring on a seasonal basis. These determinations will be conducted within three years of plan implementation. Therefore, the baseline loads for these facilities may not represent a zero discharge as defined in **TABLE 25**. **TABLE 26** represents the load allocation for the irrigated agriculture industry on 16 agricultural drains. This industry feels strongly that **TABLE 26** should be defined as an "integrated indicator" of drains for purposes of estimating seasonal aggregated loads entering the Middle Snake River from return flow streams. They feel that the treatment and implication that each drain will be treated as a point source (because of the daily load allocation value) is not conducive to a proper representation of the nature of ag returns as nonpoint sources. Regardless of these concerns, the CWA anticipates that the state of Idaho (as represented by the DEQ and other land management agencies) will control land disturbing activities affecting water quality which are not regulated by point source NPDES permits. (See section 3.04, Enforcement Mechanisms.). The DEQ and other designated agencies will utilize the Middle Snake River WMP as a guide to implementation of nonpoint source controls. The DEQ will adopt rules necessary to implement this WMP. And, **TABLE 27** represents the load allocation for the confined feeding operations industry.

**TABLE 22. ESTIMATED 1991 TP LOADINGS FOR POINT AND NONPOINT SOURCES ON THE MIDDLE SNAKE RIVER FROM APRIL TO OCTOBER.**

| SOURCE | 1991 LOADINGS lbs/day | NET REDUCTION lbs/day | LOADINGS GOALS lbs/day |
|---|---|---|---|
| **BACKGROUND:** Summer (Winter) | | | |
| Upstream[1] | 35.0 (623.0) | 1.4 (0.0) | 33.6 (499.0) (E) |
| Springs | 792.0 (671.0) | 0.0 | 792.0 (671.0) (E) |
| **POINT SOURCES:** | | | |
| Aquaculture[2] | 1617.0 + U (E) | 636.3 | 970.2 (E) + U |
| Municipalities[3] | 1071.2 + U (E) | 367.1 | 712.7 (E) + U |
| Food Processors[4] | (Upstream Background) | Affects Upstream Background | (Upstream Background) |
| **NONPOINT SOURCES:** | | | |
| CFOs[5] | 0.0 (E) | 0.0 | 0.0 (E) |
| Irrigated Ag[6] | 609.0 (E) | 60.9 | 548.1 (E) |
| Other[7] | 503.0 (E) | 0 | 503.0 (E) |
| Hydroelectric Power[8] | 0.0 | (Not Applicable) | 0.0 |
| **TOTAL INPUTS, lbs/day** | 4627.2 (5094.2) (E) | 1065.7 (1064.3) | 3559.6 (3904.0) (E) |
| **LOAD AT GRIDLEY BRIDGE, lbs/day** | 1991 Observed Load (Brockway, 1992) = 2767.0 | RBM10 Prediction based on 1991 values = 2372.0 | RBM10 Prediction = 2162.1(E) (by Year 10) |
| **MARGIN OF SAFETY lbs/day**[9] | [Initial Instream Target Goal - RBM10 Prediction = 65.3]<br>Margin of Safety - 41.2 lbs/day attributed to orthoP to TP conversion in Municipalities = 24.1 | | |
| **INSTREAM TARGET GOAL, lbs/day**[9] | (By Year 10 According to RBM10) = 2227.4 (E) | | |

E = Estimate Value due to insufficient data. U = Unknown Value.

[1]Includes TP estimates from two POTWs and two food processors. See **TABLE 25**, footnote 3 for verification.
[2]See **TABLE 23** for specifics.
[3]See **TABLE 24** for specifics.
[4]See **TABLE 25** for specifics on the derivation of the Upstream Background load for the Food Processing Industry. Their industry 20% reduction is reflected as an estimate of 7.0 lbs/day of the 35.0 lbs/day summer value (based on 1991-1993 USGS flow estimates), which is approximately 1.4 lbs/day net reduction by Year 5 of plan implementation.
[5]The CFOs are point sources only if an NPDES permit has been applied for and issued. All processed waste must be contained and discharges are allowed only for runoff exceeding a 25-year, 24-hour storm event or in 1 in 5-year winter precipitation on permitted facilities. All other CFOs are not allowed to discharge. Penalty for discharge for dairy CFOs is revocation of permit to ship milk. Although the CFOs reduction is 100%, in reality the amount is unknown because of lack of data. A better understanding of this will be reviewed by the Middle Snake River WAG, the DEQ, and the CFO Industry after plan implementation within three years.
[6]Irrigated Ag estimates of TP load are based on estimates for what is derived from TSS loads. The loading goal of 548.1 lbs/day is predicated on no additional input from any sources into tributaries or return flow streams. This load is allocated to irrigated agriculture effects only.
[7]This category includes TP estimates from urban runoff, construction, land disposal, silviculture, bank erosion, grazing, some municipalities, and some aquaculture. These loads need to be further categorized within three years of plan implementation.
[8]The Hydroelectric Industry does not contribute nutrients to the Middle Snake River. However, they do impact the water quality via their impoundment restrictions to the Middle Snake River. No loads or reductions are assigned to them.
[9]The Instream Target Goal is derived by adding the RBM10 Prediction (by Year 10) with the Margin of Safety (65.3 lbs/day). This value was reduced to 24.1 based on the conversion of orthophosphate to TP as discussed in **TABLE 24**. Thus the Margin of Safety = 24.1 lbs/day.

**TABLE 23. WASTELOAD ALLOCATION TABLE FOR THE AQUACULTURE INDUSTRY FOR 17040212 AND 17040213 (EXCLUDING FACILITIES ON BILLINGSLEY CREEK).**

# AQUACULTURE INDUSTRY's

## Wasteload Allocation Table for the Middle Snake River TMDL

**The aquaculture wasteload allocation is a preliminary wasteload allocation. Each facility will be required through their NPDES permits to collect and report additional data on phosphorus concentration and flow. The allocation for the aquaculture industry and each of its facilities will be reevaluated in light of this information.**

The 13 largest production facilities will receive a preliminary wasteload allocation; however, it will be reevaluated after 3 years of phosphorus monitoring. The remaining facilities (14-81) will not initially have a phosphorus load attributed to them due to lack of data characterizing small aquaculture facilities' effluent in regards to phosphorus. Limited effluent studies performed on these types of facilities are inadequate to estimate loads for individual facilities. After 3 years of monitoring, sufficient data will exist to allow for fair and equitable distribution of the phosphorus load for all facilities (1-81) with total industry load equaling 970.2 lbs/day from Year 5 through Year 10. The monitoring data collected in years 1 through 3 will be used to give a wasteload allocation to individual facilities at the end of Year 3. A reevaluation of the Mid-Snake TMDL for all industries will occur after Year 10 to determine if water quality standards and the beneficial uses have been met, and, if necessary, wasteload allocations will be adjusted.

In Year 1 all facilities will be required, at a minimum, to monitor for TP, TSS, and flow. "A" and "B" facilities will monitor weekly. Monitoring frequency for "other" facilities will be determined in the permit writing phase. All facilities will use EPA approved protocols on QA/QC for sampling and for laboratory procedures. All facilities will receive an appropriate wasteload allocation at the end of Year 3 based on Year 1 through Year 3 monitoring data through revisions of the TMDL.

New facilities and the expansion of existing facilities will be allowed provided they can acquire phosphorus through pollution trading; or, through facility plans and monitoring, they can demonstrate compliance with this TMDL. Pollution trading will be permitted in accordance with this TMDL (see §3.04, Enforcement Mechanisms). Facilities desiring a modification in their wasteload allocation through effluent trading must receive approval from DEQ and EPA. Facilities that are not currently in production but have current NPDES permits will receive an allocation in year 3 provided they are in production and have monitoring data sufficient to demonstrate their phosphorus contribution to the Mid-Snake.

DEQ will recommend the following conditions in the facility's NPDES permit: (1) an approved BMP Operating Plan developed within 3 months consistent with the approved Idaho Aquaculture Guidelines; (2) a compliance schedule for phosphorus limits; and, (3) a monitoring plan with adequate frequency, QA/QC, and reporting.

After sufficient data is available, NPDES permits may be modified to contain quarterly load limits that reflect the variability of individual waste streams and flow fluctuations, such that quarterly totals do not exceed the facility's wasteload allocation on an annual basis. The EPA and DEQ must approve all variable quarterly load limits.

The following provisions serve as additional components to this allocation method: (1) Fish processors were not included in the original 1617.0 lbs/day load; therefore, the allocation for these facilities is additional to the 1617.0 baseline. (2) Warm water facilities are included in the 970.2 lbs/day allocation and serve as a portion of the "other" facilities. (3) Conservation hatcheries (IDFG, USFWS, and CSI Hatchery) are allocated under the 970.2 lbs/day and serve as a portion of the "other" facilities. And, (4) the Billingsley Creek facilities are not included in the Mid-Snake TMDL because they are covered by a separate TMDL.

| FACILITY | NPDES PERMIT NO. | LATITUDE/ LONGITUDE LOCATION | MEAN ANNUAL PRODUCTION FLOW mgd[1] | ESTIMATED BASELINE LOAD lbs/day | YEAR 5 NET LOAD ALLOCATION lbs/day |
|---|---|---|---|---|---|
| Type "A" Production Facilities:[2] | | | | | |
| 1 | 002532-1 | To Be Done Later | 4.6 | U | 3.29 |
| 2 | 002600-0 | To Be Done Later | 17.0 | U | 12.22 |
| 3 | 000095-7 | To Be Done Later | 97.5 | U | 70.98 |
| 4 | 002290-0 | To Be Done Later | 192.0 | U | 139.61 |
| 5 | 002684-1 | To Be Done Later | 15.6 | U | 11.28 |
| 6 | 000101-5 | To Be Done Later | 103.9 | U | 75.68 |
| 7 | 000089-2 | To Be Done Later | 132.8 | U | 96.36 |
| 8 | 002580-1 | To Be Done Later | 20.3 | U | 14.57 |
| 9 (Cold) | 002501-1 | To Be Done Later | 37.0 | U | 26.79 |
| 10 | 000093-1 | To Be Done Later | 119.0 | U | 86.49 |
| 11 | 000097-3 | To Be Done Later | 79.5 | U | 57.82 |
| 12 | 000099-0 | To Be Done Later | 87.7 | U | 63.93 |
| 13 | 000075-2 | To Be Done Later | 64.3 | U | 46.54 |
| "Other" Cold Water + Warm Water Facilities: | | | | | |
| 9 (Warm) | 002501-1 | To Be Done Later | TBD | U | TBD |
| 14 | 000082-5 | To Be Done Later | TBD | U | TBD |
| 15 | 002304-3 | To Be Done Later | TBD | U | TBD |
| 16 | 002599-2 | To Be Done Later | TBD | U | TBD |
| 17 | 002191-1 | To Be Done Later | TBD | U | TBD |
| 18 | 002680-8 | To Be Done Later | TBD | U | TBD |
| 19 | 002515-1 | To Be Done Later | TBD | U | TBD |
| 20 | 000080-9 | To Be Done Later | TBD | U | TBD |
| 21 | 002670-1 | To Be Done Later | TBD | U | TBD |
| 22 | 002238-1 | To Be Done Later | TBD | U | TBD |
| 23 | 000103-1 | To Be Done Later | TBD | U | TBD |
| 24 | 000102-3 | To Be Done Later | TBD | U | TBD |
| 25 | 002292-6 | To Be Done Later | TBD | U | TBD |
| 26 | 002606-9 | To Be Done Later | TBD | U | TBD |
| 27 | 002604-2 | To Be Done Later | TBD | U | TBD |
| 28 | 002668-9 | To Be Done Later | TBD | U | TBD |
| 29 | 002674-3 | To Be Done Later | TBD | U | TBD |
| 30 | 000091-4 | To Be Done Later | TBD | U | TBD |
| 31 | 000096-5 | To Be Done Later | TBD | U | TBD |
| 32 | 002423-6 | To Be Done Later | TBD | U | TBD |
| 33 | 002424-4 | To Be Done Later | TBD | U | TBD |
| 34 | 002491-1 | To Be Done Later | TBD | U | TBD |
| 35 | 002503-8 | To Be Done Later | TBD | U | TBD |

| FACILITY | NPDES PERMIT NO. | LATITUDE/ LONGITUDE LOCATION | MEAN ANNUAL PRODUCTION FLOW mgd[1] | ESTIMATED BASELINE LOAD lbs/day | YEAR 5 NET LOAD ALLOCATION lbs/day |
|---|---|---|---|---|---|
| 36 | 002517-8 | To Be Done Later | TBD | U | TBD |
| 37 | 002533-0 | To Be Done Later | TBD | U | TBD |
| 38 | 002583-6 | To Be Done Later | TBD | U | TBD |
| 39 | 002592-5 | To Be Done Later | TBD | U | TBD |
| 40 | 002601-8 | To Be Done Later | TBD | U | TBD |
| 41 | 002611-5 | To Be Done Later | TBD | U | TBD |
| 42 | 002615-8 | To Be Done Later | TBD | U | TBD |
| 43 | 002673-5 | To Be Done Later | TBD | U | TBD |
| 44 | 002676-0 | To Be Done Later | TBD | U | TBD |
| 45 | 002677-8 | To Be Done Later | TBD | U | TBD |
| 46 | 002683-2 | To Be Done Later | TBD | U | TBD |
| 47 | 002687-5 | To Be Done Later | TBD | U | TBD |
| 48 | 002689-1 | To Be Done Later | TBD | U | TBD |
| 49 | 002714-6 | To Be Done Later | TBD | U | TBD |
| 50 | 002718-9 | To Be Done Later | TBD | U | TBD |
| 51 | 002725-1 | To Be Done Later | TBD | U | TBD |
| 52 | 002730-8 | To Be Done Later | TBD | U | TBD |
| 53 | 002732-4 | To Be Done Later | TBD | U | TBD |
| 54 | 002618-2 | To Be Done Later | TBD | U | TBD |
| 55 | 002675-1 | To Be Done Later | TBD | U | TBD |
| 56 | 002630-1 | To Be Done Later | TBD | U | TBD |
| 57 | 002703-1 | To Be Done Later | TBD | U | TBD |
| 58 | 002733-2 | To Be Done Later | TBD | U | TBD |
| 59 | 002734-1 | To Be Done Later | TBD | U | TBD |
| 60 | 002752-9 | To Be Done Later | TBD | U | TBD |
| 61 | 002761-8 | To Be Done Later | TBD | U | TBD |
| 62 | 002762-6 | To Be Done Later | TBD | U | TBD |
| 63 | 002763-4 | To Be Done Later | TBD | U | TBD |
| 64 (Warm) | 002295-1 | To Be Done Later | TBD | U | TBD |
| 65 (Warm) | 002777-4 | To Be Done Later | TBD | U | TBD |
| 66 (Warm) | 002731-6 | To Be Done Later | TBD | U | TBD |
| 67 | 002729-4 | To Be Done Later | TBD | U | TBD |
| 76 | 002781-2 | To Be Done Later | TBD | U | TBD |
| 77 | 002780-4 | To Be Done Later | TBD | U | TBD |
| 78 | 002779-1 | To Be Done Later | TBD | U | TBD |
| 79 | 002778-2 | To Be Done Later | TBD | U | TBD |
| 80 | 002788-0 | To Be Done Later | TBD | U | TBD |
| 81 | 002775-8 | To Be Done Later | TBD | U | TBD |

| FACILITY | NPDES PERMIT NO. | LATITUDE/ LONGITUDE LOCATION | MEAN ANNUAL PRODUCTION FLOW mgd[1] | ESTIMATED BASELINE LOAD lbs/day | YEAR 5 NET LOAD ALLOCATION lbs/day |
|---|---|---|---|---|---|
| COLD WATER ("A" + "Other") + WARM WATER: | | | | | |
| Subtotal for Cold Water + Warm Water | | | $971.2_A + U_{O,WW}$ | 1617.0 (E) | 970.2 (E) |
| FISH PROCESSORS (FP) : | | | | | |
| 68 (Proc) | 000095-7 | To Be Done Later | TBD | U | TBD |
| 69 (Proc) | 002688-3 | To Be Done Later | TBD | U | TBD |
| 70 (Proc) | 000101-5 | To Be Done Later | TBD | U | TBD |
| 71 (Proc) | 000102-3 | To Be Done Later | TBD | U | TBD |
| 72 (Proc) | SEAPAC | To Be Done Later | TBD | U | TBD |
| 73 (Proc) | Fish Breeders | To Be Done Later | TBD | U | TBD |
| 74 (Proc) | Silver Creek | To Be Done Later | TBD | U | TBD |
| 75 (Proc) | Canyon Trout | To Be Done Later | TBD | U | TBD |
| GRAND TOTAL OF ALL FACILITIES | | | $971.2 + U_{O,WW} + U_{FP}$ | $1617.0 + U_{FP}$ | $970.2\ (E) + U_{FP}$ |

E = Estimate Value. (Warm) = Warm water facility as opposed to all other facilities being cold water. U = Unknown. TBD = To be determined at year 3 based on monitoring data from individual facilities. A = Type A Facilities. O = "Other" Facilities. WW = Warm Water Facilities.

[1] Mean Annual Production Flow is defined as the flow used to produce fish at commerically viable quantities. For conservation hatcheries, production flow is the flow used to produce fish for sport or mitigation obligations. Fish Processors are estimated as an additional 11.0 lbs/day to the 970.2 lbs/day; however, this will be determined after 3 years of additional monitoring data.

[2] [Flow] x [Concentration] x 8.337 = [TP Load]; when flow is the Mean Annual Production Flow (MGD), concentration is 0.0872 (mg/L) TP and 8.337 is a unit conversion factor. The 0.0872 mg/L TP is derived from using the Clear Springs Foods DMR data from 1991 and 1992 and reducing it by 40%. Most of the Type A facilities agree that the data collected by Clear Springs Foods in their 1991-1992 DMRs represents the best data available to characterize large aquaculture facilities TP effluent.

1 Big Bend Trout Inc.
2 Blind Canyon Aqua Ranch (Ten Springs)
3 Blue Lakes Trout Farm
4 Box Canyon Trout Farm (Clear Springs)
5 Briggs Creek Fish Hatchery
6 Clear Lakes Trout Co. (w/ processing)
7 Crystal Springs Trout Farm (Clear Springs)
8 White Springs Trout Farm
9 Pristine Springs (Sunny Brook)
10 Middle Hatchery (Clear Springs Trout Co.)
11 Pisces Investment Inc. (Magic Springs)
12 Rim View Trout Co. Inc.
13 Snake River hatchery (Clear Springs)
14 Hagerman National (USFWS)
15 Magic Valley Steelhead Hatchery (IDFG)
16 Blind Canyon Hatchery (Domsea)
17 Canyon Trout Farm
18 Daydream Ranch
19 Deep Creek Trout Farm (Boswell)
20 Hagerman State (IDFG)
21 Boswell Trout Farms
22 Niagara Springs Hatchery (IDFG & IPC)
23 Rainbow Trout Farm Inc. (Buhl Hatchery)
24 Rainbow Trout Farm Inc. (Filer Hatchery)
25 Tunnel Creek Fish Farm
26 W&W Trout Farm
27 White's Trout Farm
28 Lemmon Ponds
29 Buhl Trout Rearing Facility
30 White Water Ranch
31 Greene's Trout Farm
32 Yoder Farm Ponds
33 Peter's Farm Pond
34 Bell Fish Pond
35 Cedar Draw Hatchery
36 Richard Kaster Trout Farm
37 Cox Farm Ponds
38 Rand Trout Farm
39 Olson Ponds
40 Birch Creek Trout Inc.
41 Buckeye Ranch
42 Dolana Farm Ponds
43 Blau Farm Pond
44 Eckles Fish Farms
45 Talbott Trout Farms
46 C.J. Simms Ponds
47 Smith Farm Ponds
48 Deadman Hatchery
49 C&M Fish Farm
50 Fish Breeders of Idaho (Barret)
51 Gary Wright Farm Ponds
52 Roger Stutzman
53 Mike Fleming
54 Juker Farm Ponds
55 Rainbow Falls Fish Ponds
56 CSI Fish Hatchery
57 Aquaculture Industries
58 Rangen Inc. (Woods)
59 Rangen Inc. (Decker)
60 RCP (Rick & Cheryl Partnership)
61 Coats' Farm Pond
62 Fish Breeders of Idaho (Henslee)
63 Howell Farm Ponds
64 Fish Breeders of Idaho Inc.
65 First Ascent
66 Canyon Springs
67 Rocky Ridge Ranch
68 Blue Lakes Trout Farm
69 Clear Springs Foods
70 Idaho Trout
71 Rainbow Trout Farm (Filer)
72 SEAPAC
73 Fish Breeders of Idaho
74 Silver Creek
75 Canyon Trout

Aquaculture facilities added as a result of the public comment period and who have applied for NPDES Permits with the EPA include:

65 First Ascent
76 Stevenson Ponds
77 John Flemming Ponds
78 Slane Ponds
79 Standal Ponds
80 Larry Compton (Mi Vida Loca Farm)
81 Leo Martins

NOTE: Facilities 49 & 61 are the same facility with two NPDES numbers. At Year 3 only one will receive an allocation.

**TABLE 24. WASTELOAD ALLOCATION TABLE FOR THE MUNICIPALITY (POTW) INDUSTRY FOR HUCs 17040212 and 17040213.**

# MUNICIPAL (POTW) INDUSTRY's

## Waste Load Allocation Table for the Middle Snake River WMP

Control Measures: NPDES Permits on Municipal (POTW) Industry based on water quality-based effluent limits.

| FACILITY | NPDES PERMIT NO. | LATITUDE/ LONGITUDE LOCATION | 1991 BASELINE LOAD Lbs/Day | NET REDUCTION Lbs/Day | LOAD ALLOCATION Lbs/Day |
|---|---|---|---|---|---|
| **FACILITIES THAT DO NOT DISCHARGE (Land Application, Pre-treatment agreement, Total Containment):** | | | | | |
| Hazelton | LA-000023 | NOT APPLICABLE | 0 | 0 | 0 |
| Kimberly | PT/A | NOT APPLICABLE | 0 | 0 | 0 |
| Eden | TC | NOT APPLICABLE | 0 | 0 | 0 |
| Castleford | TC | NOT APPLICABLE | 0 | 0 | 0 |
| Wendell | LA-000076 | NOT APPLICABLE | 0 | 0 | 0 |
| Murtaugh | LA-000147 | NOT APPLICABLE | 0 | 0 | 0 |
| Crossroads of ID (Jerome) | LA-000096 | NOT APPLICABLE | 0 | 0 | 0 |
| | | **SubTotal:** | 0 | 0 | 0 |
| **FACILITIES THAT SEASONALLY DISCHARGE (but not to the Middle Snake River):** | | | | | |
| Filer | 0020061/LA-000149 | TO BE DONE LATER | Unknown | 8.5 | 16.4 (E) |
| | | **SubTotal:** | Unknown | 8.5 | 16.4 (E) |
| **FACILITIES THAT DISCHARGE (but not directly to the Middle Snake River):** | | | | | |
| Buhl | 002066-4 | TO BE DONE LATER | Unknown | 8.9 | 17.4 (E) |
| Hansen | 002244-6 | TO BE DONE LATER | Unknown | 1.8 | 3.3 (E) |
| Jerome | 0020168/LA-000149 | TO BE DONE LATER | Unknown | 105.4 | 204.7 (E) |
| | | **SubTotal:** | Unknown | 116.1 | 225.4 (E) |
| **FACILITIES THAT DISCHARGE DIRECTLY INTO THE MIDDLE SNAKE RIVER:** | | | | | |
| Twin Falls | 0021270 | TO BE DONE LATER | 1071.2 (E) | 364.2 | 707.0 (E) |
| Hagerman | 0025941 + TC/EP | TO BE DONE LATER | Unknown | 2.9 | 5.7 (E) |
| | | **SubTotal:** | 1071.2 + U (E) | 367.1 | 712.7 + U (E) |
| | | | | | |
| **WATERSHED TOTALS[1] (for HUCs 17040212 & 17040213) :** | | | Unknown | 491.7 | 954.5 (E) |
| **Middle Snake River Reduction TOTALS[2]:** | | | 1071.2 + U | 367.1 | 712.7 + U (E) |

TC/EP = Total containment with evaporation ponds. PT/A = Pre-Treatment Agreement. U = Unknown. E = Estimate.

Facilities that discharge require an NPDES permit. TC and PT/A facilities do not require an NPDES permit unless this status has changed and they are currently discharging.

[1] WATERSHED TOTALS, 1991 Baseline Load (in lbs/day), is unknown except for the Twin Falls Municipality (1071.2 lbs/day). The industry baseline will be further amended at the 3-year mark after plan implementation. The Load Allocation estimate value of 712.7 lbs/day represents 33.5% reduction in phosphorus for the whole industry over five years in the Middle Snake River Watershed Management Area. With the exception of the Hagerman and Twin Falls Municipalities, the loads for all other municipalities are accounted for in **Table 22** in Nonpoint (Other) or Background Sources (Upstream).

[2] The Twin Falls Municipality has pre-treatment agreements with the following facilities for their processed wastewater: Lamb Weston (previously Universal Frozen Foods), Independent Meat, Silver Creek Aquaculture Farm, Avonmore West, and Gem Linen Supply. The effect of these pre-treatment facilities on the load from the municipalities will be reviewed and defined by the Municipal Industry by Year 3 of plan implementation.

Initially, the baseline allocation of 1030.0 lbs/day for the Twin Falls Municipality represented an allocation of orthophosphate (OP) as described in Attachment E of Appendix A-6 (Wastewater), which states, "Orthophosphate value is used in place of phosphate value. Phosphate was not being tested in 1991. Phosphate values would have been slightly higher." The "phosphate" referred as not being tested is "total phosphorus" and would have been higher than the orthophosphate level reported. The Attachment E values for Twin Falls indicate 15.80 mg/L orthophosphate (although the Total P column also has 15.80 mg/L), a flow of 6.50 mgd, and a load of 856.52 lbs/day (load = 15.8 mg/L x 6.50 mgd x 8.34 conversion factor).

According to *Water Quality of the Middle Snake River and Review of Aquatic Plant Growth Control Literature*, 1992, p. 30, the Twin Falls Municipal treatment facility had a total phosphorus concentration of 9.82 mg/L (as a mean; ranged from 5.4 to 15.9 mg/L) and a dissolved phosphorus of 9.43 (mean; or 96% of the total phosphorus). Therefore, the allocation for the Twin Falls Municipality and for the other municipalities represents an allocation derived by the following equation for TP: 1030.0 lbs/day x 0.04 = 41.2 lbs/day. The 0.04 is a conversion value derived from the difference of 100% - 96% = 4%. Thus, 4% = 0.04 as a multiplier. The 4% is the amount of OP found in the TP as described in the reference cited in this paragraph. The DEQ could not substantiate from the industry reduction plan the derivation of their suggested 10% increase to the OP load, versus the referenced 4% from a published source. In effect, 4% is "slightly higher" than 4%. Thus, the load allocation was derived as follows: 1030.0 lbs/day OP + 41.2 lbs/day derived TP = 1071.2 lbs/day estimate TP baseline. Applying the industry 34% reduction goal to the estimate TP baseline will give: 1071.2 lbs/day TP baseline x 0.34 reduction goal = 364.2 lbs/day net reduction amount. This reduction amount is subtracted from the baseline as: 1071.2 lbs/day baseline - 364.2 lbs/day net reduction amount = 707.0 lbs/day load allocation by Year 5 of plan implementation. This is the best available estimate for TP at this time. Further monitoring by the municipality will substantiate the actual TP loadings over the next three yeares. (These data substantiate Appendix A-6's statement that the TP values would be slightly higher than the OP values.)

The 1086.6 lbs/day load allocation in Appendix A-6 in the section on Wasteload Allocation Table represents the load for all facilities in the Middle Snake River Watershed Planning Area (which covers six HUCs). The Municipal Industry developed its own wasteload allocation based on flows and know TP data for all facilities in the Middle Snake River Watershed Planning Area. Attachment E in Appendix A-6 reflects a portion of the data collected by the industry, but does not include data shown in **TABLE 24**. Values found in Appendix A-6, the section on Wasteload Allocation Table, were used for **TABLE 24**, but reflect the 4% overage estimate previously described for the Twin Falls Municipality. The original load estimate of 1030.0 lbs/day used in the RBM10 has been retained for their allocation as the industry baseline (which is 1071.2 lbs/day based on the previous OP to TP conversion). Further monitoring in the first 3 years of plan implementation will refine the allocation. TP estimates for the Municipal Industry were made with 1991 DMRs for the Twin Falls wastewater treatment facility which is the largest wastewater treatment facility on the Middle Snake River. The other POTWs listed discharge into irrigated ag canals, the Milner Pool, Cedar Draw Creek, and Mud Creek. Other facilities discharge upstream of Milner Dam, or in other HUCs. Their loadings are included as background and the respective receiving stream loadings. Monitoring by these facilities, in conjunction with Twin Falls POTW, is on-going for the development of a more realistic baseline for the entire industry.

Load reductions from those municipalities which discharge into creeks or ag drains (Filer and Buhl into creeks; Hansen and Jerome into an ag drain) will be reflected in the loads from the Other component in **TABLE 22**. The effect of this reduction on the creeks and ag drains cannot be calculated at this time. These impacts and their effect on the drainages in creeks and ag drains will be researched and reviewed over the first three years of plan implementation by the Middle Snake River WAG and the DEQ.

Additionally, within three years of plan implementation, the DEQ will assess all municipalities in the Middle Snake River Watershed Management Area using GPS to determine latitude/longitude of their discharge point.

**TABLE 25. WASTELOAD ALLOCATION TABLE FOR THE FOOD PROCESSING INDUSTRY FOR HUCs 17040212 and 17040213.**

# FOOD PROCESSING INDUSTRY's

## Waste Load Allocation Table for the Middle Snake River WMP

Control Measures: NPDES Permits on Food Processing Industry based on water quality-based effluent limits.

The Food Processing Industry is composed of those facilities that do not discharge (7), those that have land application permits (9), and those that discharge to the Snake River (2). There are only two direct discharging facilities to the Snake River. They are J.R. Simplot (in Heyburn, Idaho) and Ore-Ida (in Burley, Idaho). Both are upstream of Milner Dam. Therefore, their contribution to the Middle Snake River is accounted for in upstream background sources (see **TABLE 22**). It is estimated that of the 35.0 lbs/day 1991 load from the background, approximately 7.0 lbs/day is from the Food Processing Industry. Under more normal flows at the Milner Dam (i.e., 1993 USGS figures), approximately 19.9% comes from the Milner Pool into the Middle Snake River. The Food Processing Industry has committed to a 20% TP reduction (at the End-of-Pipe load) over the next five years, based on plan implementation, resulting in a final total load allocation of 953.6 lbs/day into the Milner Pool (which is upstream of Milner Dam). Due to mixing and assimilation of this end-of-pipe load, approximately 7.0 lbs/day impacts the Middle Snake River in the summer months. This will be evaluated further by the DEQ and the Middle Snake River WAG with monitoring data over the initial 3 years of plan implementation.

| FACILITY | PERMIT NO. | LATITUDE/ LONGITUDE LOCATION[4] | 1991 BASELINE LOAD lbs/day | NET REDUCTION[1] Lbs/day | LOAD ALLOCATION[2] lbs/day |
|---|---|---|---|---|---|
| **FACILITIES THAT DO NOT DISCHARGE (ACTIVE):** (Potato Storage Facilities) | | | | | |
| Roast Potato Co. (Eden) | NA | NA | 0 | NA | 0 |
| A.C. Enterprises (Hazelton) | NA | NA | 0 | NA | 0 |
| IDA-Pride Potatoes (Hazelton) | NA | NA | 0 | NA | 0 |
| Heitzman Product Co. (Jerome) | NA | NA | 0 | NA | 0 |
| Schutte Potato (Jerome) | NA | NA | 0 | NA | 0 |
| J.R. Simplot (Jerome) | NA | NA | 0 | NA | 0 |
| Eagle Snacks Inc. (Twin Falls) | NA | NA | 0 | NA | 0 |
| **FACILITIES WITH LAND APPLICATION PERMITS:** | | | | | |
| TASCO * (Twin Falls) | LA-000049 NPDES 000023-0 | NA | 0 | NA | 0 |
| Avonmore West * (Twin Falls) | NPDES 002741-1 LA 000022 | NA | 0 | NA | 0 |
| Seneca Foods Corp.* (Buhl) | LA-000016 NPDES 000059-1 | NA | 0 | NA | 0 |
| Independent Meat * (Twin Falls) | LA-000046 NPDES 000038-8 | NA | 0 | NA | 0 |
| Jerome Cheese * (Jerome) | NPDES 002760-0 | NA | 0 | NA | 0 |

| FACILITY | PERMIT NO. | LATITUDE/ LONGITUDE LOCATION[6] | 1991 BASELINE LOAD lbs/day | NET REDUCTION[1] Lbs/day | LOAD ALLOCATION[2] lbs/day |
|---|---|---|---|---|---|
| Western Idaho Potato (Jerome) | NPDES 002679-4<br>LA 000038 | NA | 0 | NA | 0 |
| RussetValleyMarketing (Kimberly) | LA-000041<br>Total Containment | NA | 0 | NA | 0 |
| Keegan Inc. (Twin Falls) | LA-000044 | NA | 0 | NA | 0 |
| A.E. Staley Mfg. Co. (Murtaugh) | LA-000045 | NA | 0 | NA | 0 |
| **FACILITIES THAT DISCHARGE TO THE SNAKE RIVER ABOVE MILNER DAM[3]:** | | | | | |
| | | | **End-of-Pipe Load lbs/day** | **Net Reduction End-of-Pipe lbs/day** | **20% Reduced TP End-of-Pipe lbs/day** |
| J.R. Simplot (Heyburn) | NPDES 000066-3 | TO BE DONE LATER | 572.0 | 114.4 | 457.6 |
| Ore-Ida (Burley) | NPDES 000061-2 | TO BE DONE LATER | 620.0 | 124.0 | 496.0 |
| | | | | | |
| | | **TOTALS:** | 1192.0 | 238.4 | 953.6 |

*NPDES non-contact cooling water permit. This is water used for cool refrigeration equipment and generally does not come in contact with processed wastewater. The TP load from cooling water is unknown, but is expected to be very low.

NA = Not Applicable.

[1] NET REDUCTION = which represents the industry reduction amount that will be subtracted from the baseline load.

[2] LOAD ALLOCATION = which represents the difference between the 1991 Baseline Load and the Net Reduction amount.

[4] END-OF-PIPE LOAD, lbs/day, represents the end-of-the-pipe discharge into the Snake River above the Milner Pool at the Heyburn and Burley area. These values were provided by the industry for both facilities.

[6] LATITUDE/LONGITUDE LOCATION will be based on GPS determinations to be conducted within three years of final plan implementation.

**TABLE 26. LOAD ALLOCATION TABLE FOR THE IRRIGATED AGRICULTURE INDUSTRY FOR HUCs 17040212 and 17040213.**

# IRRIGATED AGRICULTURE INDUSTRY's

## Load Allocation Table for the Middle Snake River WMP

Control Measures: Implementation of BMPs as set forth in Idaho's water quality standards.

Land uses in the Middle Snake watershed that may contribute to water quality degradation include soil erosion, overapplication of fertilizers, grazing, silviculture, and urbanization. At present, it is not possible to accurately partition the loads in the Middle Snake River to each of these sources. Major sources of pollution to the Middle Snake River come from irrigation agricultural drains and tributaries. Implementation of monitoring program for canals, drains, and the Middle Snake River will lead to selection of those irrigation returns that may require construction of sediment ponds, wetlands, and technologically-driven BMPs. The Clean Water Act as amended does not require permits for nonpoint sources. The industry has committed to participation of BMP implementation by operators/land owners/farmers by focusing on BMPs on field and farm erosion and sediment reduction. Yearly, many farmers install BMPs without assistance from government agencies. Typically, these BMPs deal with improved irrigation practices as well as installation of sediment ponds. (See Appendix A-5, Canal Companies and Their Stockholders.) In addition, the effort in the construction of new water quality facilities will be replaced by maintenance and improvement of existing facilities.

The Irrigators' Water Quality Committee has developed goals for total phosphorus reductions from 16 specific irrigation return flow streams for which baseline water quality data has been conducted for the 1990-1991 irrigation season. These 16 return flow do not constitute the total number of sites that return to the Middle Snake River. The expected reductions are based on best available data and technology available for those streams under current (1996) conditions. The canal companies have begun implementation of all items in the Irrigated Ag WRP including facilities' construction, monitoring, and educational programs and will continue to pursue and attempt to exceed the target load reductions where possible. The reduction in total phosphorus of 10% is a goal based on reductions in sediment from the agricultural returns. Because the total phosphorus is closely associated with the finer sediment sizes, the total phosphorus reduction rate was estimated at 1/3 of the sediment rate.

| AGRICULTURAL DRAIN | NPDES PERMIT NO. | LATITUDE/ LONGITUDE LOCATION | 1991 BASELINE LOAD lbs/day[1] | NET REDUCTIONS lbs/day[2] | LOAD ALLOCATION lbs/day |
|---|---|---|---|---|---|
| **NORTH SIDE CANAL COMPANY AGRICULTURAL DRAINS:** | | | | | |
| A Drain | NOT APPLICABLE | To Be Done Later | 11.6 | 2.3 | 9.3 |
| C55 Drain | NOT APPLICABLE | To Be Done Later | 5.6 | 0.0 | 5.6 |
| N42 Drain | NOT APPLICABLE | To Be Done Later | 6.8 | 0.0 | 6.8 |
| J8 Drain | NOT APPLICABLE | To Be Done Later | 5.2 | 0.2 | 5.0 |
| S29 Drain | NOT APPLICABLE | To Be Done Later | 2.1 | 2.1 | 0.0 |
| S/S19 Drain | NOT APPLICABLE | To Be Done Later | 57.4 | 7.5 | 49.9 |
| W26 Drain | NOT APPLICABLE | To Be Done Later | 12.3 | 2.4 | 9.9 |
| | | **SubTotal:** | 101.1[1] | 14.5 | 86.5 |
| **TWIN FALLS CANAL COMPANY (SOUTH SIDE):** | | | | | |
| A Drain | NOT APPLICABLE | To Be Done Later | 4.3 | 0.0 | 4.3 |
| Twin Falls Coulee | NOT APPLICABLE | To Be Done Later | 9.6 | 0.7 | 8.9 |
| E. Perrine Coulee | NOT APPLICABLE | To Be Done Later | 39.1 | 2.6 | 36.5 |
| W. Perrine Coulee | NOT APPLICABLE | To Be Done Later | 4.2 | 0.9 | 3.3 |
| Main PerrineCoulee | NOT APPLICABLE | To Be Done Later | 22.2 | 4.3 | 17.9 |

| AGRICULTURAL DRAIN | NPDES PERMIT NO. | LATITUDE/ LONGITUDE LOCATION | 1991 BASELINE LOAD lbs/day[1] | NET REDUCTIONS lbs/day[2] | LOAD ALLOCATION lbs/day |
|---|---|---|---|---|---|
| 43 Drain | NOT APPLICABLE | To Be Done Later | 0.3 | 0.3 | 0.0 |
| 30 Drain | NOT APPLICABLE | To Be Done Later | 9.4 | 1.9 | 7.5 |
| LQ/LS Drain | NOT APPLICABLE | To Be Done Later | 73.3 | 9.6 | 63.7 |
| LS2/39A Drain | NOT APPLICABLE | To Be Done Later | 17.6 | 0.7 | 16.9 |
| 39 Drain | NOT APPLICABLE | To Be Done Later | 21.6 | 4.3 | 17.3 |
| I Drain | NOT APPLICABLE | To Be Done Later | 13.9 | 0.9 | 13.0 |
| | | **SubTotal:** | 215.5[1] | 26.2 | 189.3 |
| **ADDITIONAL NONPOINT SOURCE INPUTS UNALLOCATED[3]:** | | | | | |
| Unallocated Inputs[4] | NOT APPLICABLE | To Be Done Later | 292.5 | 20.2 | 272.3 |
| | | **SubTotal:** | 292.5 | 20.2 | 272.3 |
| | | | | | |
| | | **TOTAL:** | 609.0[3] | 60.9 | 548.1 |

[1] The 1991 BASELINE LOAD (in lbs/Day) is estimated from the Tons/Year of TP divided by 210 days/irrigation season.

[2] The NET REDUCTIONS (in lbs/Day) is estimated from the Tons/Year of TP divided by 210 days/irrigation season. The NET REDUCTIONS spells out to 14.3% reduction for the North Side Canal Company on seven agricultural drains, and 12.2% reduction for the Twin Falls Canal Company (south side) on 11 agricultural returns. The overall reduction is 12.9% on 18 agricultural drains, of which two (Southside 43 Drain and Northside S29 Drain) have been eliminated from the program since their overall contribution to the total TP load amounts to 0.77%.

[1&3] The 609.0 lbs/day represents the estimated 1991 load in **Table 22** for Irrigated Ag. The 1991 BASELINE LOAD of 316.5 lbs/day for the the 16 Drains for TFCC & NSCC will be modified within the first five years of plan implementation and include additional unallocated inputs (292.5 lbs/day) that have yet to be identified by the Irrigated Agriculture Industry. These will be specified over the next five years. The 584.1 lbs/day load allocation is an estimate from the anticipated TP reductions achieved by reducing TSS over the next five years based on final plan implementation. Total reductions for the industry will be 10.0%. Of this, TWCC will provide 12.2% reduction and NSCC will provide 14.4% reduction. The 20.2 lbs/day net reduction from the unallocated inputs will bring about a 6.9% reduction.

[4] Based on the Irrigated Agriculture Plan (see Appendix A-5), the makeup of their water quality coordination committee includes two private canal companies (who have provided the data to the 16 drains listed in **TABLE 26**) the USDA Ag Research Service & Soil Conservation Service, three Soil Conservation Districts (Snake River, Balanced Rock, and Northside), the U of I, and the BOR (see Foreward in the Appendix A-5). According to their water quality monitoring program, "an irrigation water quality monitoring program will be established to document general levels of water quality..." Also, "a general monitoring program for irrigation water quality will be developed and inititated. The program will allow for the documentation of water quality levels entering the system, within the delivery system, and, finally, leaving the system. A network of monitoring stations will be developed to include irrigation return flow streams not monitored recently by the U of I under the Middle Snake River Water Quality Study." Also, "future monitoring programs will be developed by the U of I and canal company staff and approved by the MSIWQCC. All monitoring will be coordinated with IDHW/DEQ personnel." Over the next three years, the Irrigated Agriculture Industry will collect data from other drains and tributaries to better assess the remaining 292.5 lbs/day load attributed to their industry. A plan will be developed to complete performance of theremaining 20.2 lbs/day reduction to reach the target goal of 548.1 lbs/day by Year 5. It is assumed that because of the makeup of the irrigated ag's coordination committee (Soil Conservation Districts), their monitoring plan will include inputs from tributaries to the Middle Snake River. The DEQ will continue to provide technical assistance to accomplish the goals of the Mid-Snake TMDL in conjunction with the Irrigated Agriculture Watershed Reduction Plan, but also to meet the goals setup by the TMDL over the next 10 years.

[5] The 548.1 lbs/day load allocation is a total seasonal daily load estimate derived from the tons/year total phosphorus load estimate divided by 210 days/irrigation season for each of the 16 ag drains, which are summed to arrive at a total load estimate based on 10% net reduction.

**TABLE 27. LOAD ALLOCATION TABLE FOR THE CONFINED ANIMAL FEEDING OPERATION INDUSTRY FOR HUCs 17040212 and 17040213.**

# CONFINED ANIMAL FEEDING OPERATIONS INDUSTRY's

## Load Allocation Table for the Middle Snake River WMP

Control Measures: NPDES permits on certain facilities. Facilities with a certain number of animals (e.g., 200 dairy cows or 300 beef cattle) can be covered under an NPDES permit. The permit states that all wastes must be contained, and discharges are not allowed, except during a 25 year, 24 hour storm event or a 1-in-5 year winter. Very few CFOs have requested to be covered by this permit. Facilities with few animal numbers, other than dairies, are nonpoint sources and come under regulatory authority of the DEQ. All dairy CFOs are currently regulated by the IDA through a joint memorandum of understanding. Dairy CFOs are not allowed to discharge to surface or ground water. Penalty for dishcarge for dairy CFOs may include revocation of the permit to ship milk. The contribution of CAFO's to water quality degradation in the Middle Snake River has not yet been adequately investigated. Data linking total phosphorus in receiving waters to CAFO's are unavailable. No attempt is made to quantify loadings from CAFO's at this time. However, the industry is committed to achieving a zero discharge goal. Therefore, the load allocation for the CFO industry is zero. The *Idaho Waste Management Guidelines for Confined Feeding Operations* are used by the DEQ, the IDA, and the CFO owners to help bring CFOs into compliance with state and federal water quality regulations.

| FACILITY | NPDES PERMIT NO. | LATITUDE/ LONGITUDE LOCATION | 1991 BASELINE LOAD lbs/day | NET REDUCTIONS lbs/day | LOAD ALLOCATION lbs/day |
|---|---|---|---|---|---|
| **NPDES PERMITTED FACILITIES:** | | | | | |
| In the process of being identified by the Idaho Department of Agriculture as part of the Dairy MOU effort. | | | Unknown | 0.0 | 0.0 |
| **NON-NPDES PERMITTED FACILITIES:** | | | | | |
| In the process of being identified by the Idaho Department of Agriculture as part of the Dairy MOU effort. | | | Unknown | 0.0 | 0.0 |
| | | **TOTALS:** | Unknown | 0.0 | 0.0 |

NOTE: In June 1995 the Idaho Agricultural Statistics Service indicated that 63% (or 139,500 dairy cows) of dairy cows in Idaho were raised in the south-central region of Idaho. The previous year, there were 114,500 dairy cows. By June 1996, 65% (or 159,500 diary cows) of Idaho dairy cows raised in the south-central region. Impacts to groundwater in the Jerome, Gooding, and Twin Falls counties of south-central Idaho, are of most imminent concern since it is possible that applying wastes in excess of agronomic rates, on fractured bedrock, or on shallow soils may result in groundwater contamination. As a part of the phased WMP process for the Middle Snake River Watershed Management Plan, the Middle Snake River Watershed Advisory Group will form a Groundwater Task Force within three years of final plan implementation to address those concerns, and will prepare preliminary findings and/or conclusions for consideration during subsequent phases of this WMP.

## 3.03 INDUSTRY AND MANAGEMENT ACTIONS

Major water user industries affecting water quality on the Middle Snake River have prepared industry-specific plans that identify solutions to potential water quality problems. These plans are included in **APPENDIX A** of this WMP.

Implementation of industry waste reduction plans/strategies is critical to achieving the goals of this WMP. Portions of the industry plans have already been implemented due to proactive leadership. Industry Watershed Reduction Plans require the participation of all individual users in the Middle Snake River Watershed Management Area. The plans emphasize environmental and resource stewardship, BMPs, cooperation, technical assistance, and education provided by extension professionals, industry associations, and agency specialists. The DEQ has participated in the development of industry-specific plans and will continue to assist industry groups with plan implementation as directed by the actual components and objectives of the plans. The Middle Snake River WAG, along with the DEQ, will monitor the progress of each industry's plan implementation.

The following is a summary of each industry's Watershed Reduction Plans. The DEQ will continue to work with each industry and with the Middle Snake River WAG to achieve plan implementation of industry goals and management strategies. Each industry will be an active participant with the WAG and help in the further development of this phased TMDL.

### 3.03.01 POINT SOURCES

This section identifies the goals, the management actions, and the implementation of waste reduction plans/strategies by the industries. The DEQ will coordinate with the Middle Snake River WAG to insure full implementation of industry WMPs within five years of final plan implementation.

1. **AQUACULTURE INDUSTRY**

   **TABLE 28** summarizes the goals and strategy of the Aquaculture Industry for the Middle Snake River.

**TABLE 28. Aquaculture Industry Goals and Strategy on the Middle Snake River.**

| INDUSTRY GOALS | INDUSTRY STRATEGY |
|---|---|
| Goals: | 20% reduction in TP discharges in Year 1. |
| | Additional 20% reduction in TP during next 5 years. |
| | 40% TP reduction after 5 years of plan implementation. |
| Management Actions: | BMP definition and implementation throughout industry. |
| | Development of standard industry guidelines and criteria for effluent control structures and waste system design. |
| | Operator education through workshops, annual meetings, and seminars. |
| | Development and implementation of quality assurance program for producers. |
| | Research at local, state, and federal level focusing on waste management technologies and management strategies and feeds and feeding. |
| | Peer pressure. |

| INDUSTRY GOALS | INDUSTRY STRATEGY |
|---|---|
| Compliance Actions: | Consent Orders/Compliance Schedules with the DEQ. Section 401 Certification by the DEQ. |
| | NPDES permits through the EPA. |
| Implementation: | Monitoring program through combined industry programs and individual companies. |
| | Annual progress reports. |

## 2. FOOD PROCESSORS INDUSTRY

**TABLE 29** summarizes the goals and strategy of the Food Processors Industry for the Middle Snake River.

**TABLE 29. Food Processors Industry Goals and Strategy on the Middle Snake River.**

| INDUSTRY GOALS | INDUSTRY STRATEGY |
|---|---|
| Goals: | Quantify TP discharges. |
| | Identify TP sources. |
| | Identify technologies for TP reduction. |
| | Determine feasibility of 75% reduction in TP discharges through both in-plant source reductions and end-of-the-pipe treatment. |
| | Reduce TP discharge to the Snake River by 20% within 5 years of plan approval. |
| Management Actions: | Reduce Sodium acid pyrophosphate (SAPP) usage. |
| | Research to identify, segregate and treat TP in waste streams. |
| | Research and develop BMPs. |
| | Plant operator education. |
| | Upgrades of waste management facilities. |
| | Improved operation and maintenance procedures. |
| Compliance Actions: | NPDES permits by the EPA. |
| | Land application permits by the DEQ. |
| | Industry Pre-treatment agreements with POTWs. |
| | Certifications. |
| Implementation: | NPDES monitoring. |
| | Internal waste stream monitoring. |
| | Annual progress reports. |

## 3. MUNICIPAL INDUSTRY

**TABLE 30** summarizes the goals and strategy of the Municipal Industry for the Middle Snake River.

**TABLE 30. Municipal Industry Goals and Strategy for the Middle Snake River.**

| INDUSTRY GOALS | INDUSTRY STRATEGY |
|---|---|
| Goals: | Develop a public education program. |
| | Develop a database. |
| | Recommend all plants along the Middle Snake River test their influent and effluent for nutrients. |
| | Reduce TP by 34% within 5 years of plan implementation. |
| Management Actions: | Survey Municipal Treatment Plants. |
| | Municipal adoption of WMP. |
| | Develop and implement public information program. |
| | Initiate nutrient sampling of influent and effluent. |
| | BMPs for operation and maintenance. |
| | Promote land application. |
| | Promote storm water pollution prevention. |
| | Promote water conservation. |
| Compliance Actions: | NPDES permit requirements by the EPA. |
| | Plant and facility upgrade incentives. |
| | Consent orders with recalcitrant operators. |
| | Develop pre-treatment agreements with another industry. |
| Implementation: | Monitoring program. |
| | Develop DEQ public recognition awards. |
| | Annual progress reports. |

## 3.03.02 NONPOINT SOURCES

This section will categorize the CFOs and Irrigated Agriculture industries relative to their goals, management actions, compliance actions, and implementation. Another industry that may be defined more fully in the future will be the impacts from grazing. The DEQ will coordinate with the Middle Snake River WAG for full implementation of industry WMPs within five years of the final plan.

1. **CFO INDUSTRY**

   **TABLE 31** summarizes the goals and strategy of the CFO Industry for the Middle Snake River.

**TABLE 31. CFO Industry Goals and Strategy for the Middle Snake River.**

| INDUSTRY GOALS | INDUSTRY STRATEGY |
|---|---|
| Goals: | Zero nutrient/sediment contribution to the Middle Snake River. |
| | Safely recycle nutrients through crop uptake to protect Idaho's water resources. |

| INDUSTRY GOALS | INDUSTRY STRATEGY |
|---|---|
| Management Actions: | Use *Idaho Waste Management Guidelines for Confined Animal Feeding Operations* for livestock waste system design, construction, operation, and management. |
| | Industry adoption of BMPs as defined in the CAFO guidelines. |
| | Promote innovative site-specific solutions. |
| | Educate related industry to achieve sustainability through nutrient recycling. |
| | General public education to foster understanding of the relationship of the livestock industry to crop farmers, food processors, water quality, etc. |
| | Continue to solicit research funds focused on waste management technologies, strategies, fertilizer guides, computer applications, feeding programs, etc. |
| | Peer pressure. |
| Compliance Actions: | NPDES permit by the EPA. |
| | Industry support of EPA/DEQ enforcement of problem operations. |
| | Industry cooperation with canal companies. |
| | Industry cooperation and support of "Dairy MOU." |
| Implementation: | Monitoring NPDES permit violations. |
| | BMP inventory and monitoring. |
| | Develop Operation of Merit (environmental award). |
| | Annual progress reports. |

## 2. IRRIGATED AGRICULTURE INDUSTRY

**TABLE 32** summarizes the goals and strategy for the Irrigated Agriculture Industry for the Middle Snake River.

**TABLE 32. Irrigated Agriculture Industry Goals and Strategy for the Middle Snake River.**

| INDUSTRY GOALS | INDUSTRY STRATEGY |
|---|---|
| Goals: | Decrease sediment by an initial 21% (which is about 10% TP), with a 27% decrease by year 2000. |
| Management Actions: | Construction of sediment ponds and wetlands on irrigation return flows. |
| | Sponsor water quality and technology research. |
| | Water user (operator, canal company, and public) education on BMPs. |
| | Peer pressure. |
| Compliance Actions: | IDAPA 16.01.02.350.03, knowledgable and reasonable efforts. |
| Implementation: | Monitoring program for canals, drains, and Middle Snake River. |
| | Irrigator Attitude Survey of BMP implementation. |
| | Annual progress reports. |

### 3.03.03 OTHER SOURCES

This sections includes the hydroelectric industry which utilizes Snake River water but does not discharge additional nutrients to it. The hydroelectric industry alters the physical characteristics of the Snake River, which in turn affects water quality and the biotic communities. Riverine characteristics that are frequently changed are water velocity, discharge, water depth, and water retention times which enhance eutrophication, changes in biotic communities, and alteration of habitat for aquatic species. Other industries included in this section for future development are recreation and grazing.

1. **HYDROELECTRIC POWER INDUSTRY**
   **TABLE 33** summarizes the goals and strategy of the Hydroelectric Power Industry for the Middle Snake River.

**TABLE 33. Hydroelectric Industry Goals and Strategy for the Middle Snake River.**

| INDUSTRY GOALS | INDUSTRY STRATEGY |
|---|---|
| Goals: | Comply with existing state and federal regulations. |
| | Minimize impacts on Snake River by adopting BMP strategies. |
| Management Actions: | Participate on Middle Snake River WAG. |
| | Monitor DO and temperature levels. |
| | Develop Environmental Evaluations and Protection, Mitigation, and Enhancement plans in conjunction with relicensing. |
| | Removal of aquatic vegetation at Upper Salmon Falls facility. |
| | Evaluate minimum target flows for river bypass reaches. |
| | Support Idaho Power's energy conservation program. |
| | Possible participation in beneficial water quality projects. |
| Compliance Actions: | Permits, licenses by FERC, consent orders, certifications and compliance schedules. |
| Implementation: | Monitoring permit and license compliance. |
| | Annual progress reports. |

2. **RECREATIONAL INDUSTRY**
   To be defined more fully within five years of the final plan.

3. **GRAZING INDUSTRY**
   To be defined more fully within five years of the final plan.

## 3.04 ENFORCEMENT MECHANISMS

As noted in Chapter 1, §303(d) of the CWA requires each state to submit a biennual list to the EPA which identifies those waters which are not achieving state water quality standards in spite of the application of technology-based controls in NPDES permits. Such waterbodies are called "water quality limited segments (WQLSs)." After the idenfication of a WQLS, the state is required to develop TMDLs for these waterbodies. The development of TMDLs is also required by Idaho Code §39-3601 *et seq.* TMDLs are first developed on WQLSs that are identified by the state as "high" priority waters. TMDLs are pollution budgets which attempt to predict "daily load" of a particular pollutant which can be discharged to state waters from all sources without causing exceedances of water quality standards. Once the state identifies the actual pollutant loading discharge to state waters from both point and nonpoint source activities, the state exercises existing authorities to implement point source and nonpoint source controls to cut back on the daily loading of pollutants until the waterbody is brought back into compliance with water quality standards. Once developed, TMDLs are submitted to EPA for approval. TMDLs are therefore plans or guidelines on how to achieve compliance with State Water Quality Standards. TMDLs are not, however, self-implementing, and state and federal agencies must rely upon existing enforcement authorities to ensure achievement of the goals of the particular TMDL (e.g., compliance with State Water Quality Standards).

## 3.04.01 FEDERAL AND STATE AUTHORITIES

Implementation of TMDLs affect both federal and state authorities. To ensure successful implementation of the Middle Snake River WMP, it is important that both federal and state agencies coordinate their respective enforcement processes. The regulatory community and interested citizens should have a clear understanding of each agency's roles and responsibilities. The following briefly describes the roles of the EPA and the DEQ in implementing the goals of this WMP.

1. **THE EPA AUTHORITY**

   a. **NPDES PERMITS**

      The discharge of pollutants from a point source (pipe or other discrete conveyance) into navigable waters of the United States is prohibited under the CWA unless permitted by the EPA. The EPA authorizes the discharge of certain pollutants from point sources through the issuance of NPDES permits. The NPDES permits establish technology-based effluent limitations or maximum concentrations of pollutants that can be discharged from a permitted facility. When technology-based effluent limitations are not sufficient to achieve compliance with State water quality standards, the EPA establishes water quality-based effluent limitations in the NPDES permits. In effect, §303(d) of the CWA establishes the TMDL process to provide for more stringent water quality-based controls when technology-based controls are inadequate to achieve State water quality standards. The EPA will utilize the goals of this WMP in establishing water quality-based effluent limitations on the NPDES permits for facilities that discharge to the Middle Snake River. Various affected industries in the Middle Snake River watershed are currently regulated by technology-based NPDES permits. These industries include aquaculture, municipal wastewater treatment plants, and certain food processors.

      Any NPDES permit noncompliance constitutes a violation of the CWA and is grounds for administrative, civil, and/or criminal enforcement action by the EPA. Permit noncompliance may also result in permit termination, revocation, and reissuance or modification, or for permit denial of the removed application. The permittee is required to comply with technology-based and/or water quality based effluent limitations set forth in the permits. NPDES permits are self-policing in that permittees are required to monitor and report the quality of the effluent being discharged to navigable waters. The permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures.

b. **TMDL DEVELOPMENT, REVIEW, AND APPROVAL**

Section 303(d) of the CWA requires each state to submit a biennual list to the EPA which identifies those waters which are not achieving state water quality standards in spite of the application of technology-based controls in NPDES permits. As previously discussed, such waterbodies are "water quality limited segments (WQLSs)." After the identification of WQLSs, the state must then develop TMDLs for these waterbodies. TMDLs are submitted to the EPA for approval. The Middle Snake River WMP was developed to meet the basic requirements of a TMDL. The Mid-Snake TMDL is the Middle Snake River WMP.

c. **REVIEW AND APPROVAL OF STATE WATER QUALITY STANDARDS**

In addition to the approval or disapproval of a TMDL, the EPA (under §303(c) of the CWA) has authority to review and to approve or disapprove state-adopted water quality standards. This review involves a determination of:

(1) whether the state has adopted water uses which are consistent with the requirements of the CWA;
(2) whether the state has adopted criteria that protect the designated water uses;
(3) whether the state has followed its legal procedures for revising or adopting standards;
(4) whether the state standards which do not include the uses specified in §101(a)(2) of the CWA are based upon appropriate technical and scientific data and analyses; and,
(5) whether the state submission meets the requirements included in §131.6 of the CFR.

Each state must specify appropriate water uses to be achieved and protected. The classification of the waters of the state must take into consideration the use and value of water for public water supplies, protection and propagation of fish, shellfish, and wildlife, recreation in and on the water, agricultural, industrial, and other purposes including navigation. Under no circumstances can a state adopt waste transport or waste assimilation as a designated use for any waters of the United States. In designating beneficial uses of a waterbody and appropriate criteria for those uses, the state shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters. At a minimum, beneficial uses are deemed attainable if they can be achieved by the imposition of effluent limits required under §301(b) and §306 of the CWA; and, there are cost-effective and reasonable BMPs for nonpoint source control.

## 2. THE DEQ ENFORCEMENT AUTHORITY

### a. GENERAL AUTHORITY

In the state of Idaho there are four primary agencies charged with regulating environmental concerns. These are: the Department of Health and Welfare (through the Division of Environmental Quality), the Department of Lands, the Department of Agriculture, and the Department of Water Resources. In addition, there are other agencies which play a role in environmental regulation and the development of environmental policy. These include: the Idaho Emergency Response Commission, the Idaho Department of Fish and Game, the Idaho Geologic Survey, the State Historic Preservation Office, and the Idaho Public Utilities Commission. Proceedings for all these agencies are affected by the Idaho Legislature through the Idaho Administrative Procedures Act (IDAPA) which prescribes procedures for adoption of rules, hearings in contested cases, and judicial review for final agency action.

Idaho Code §39-101, *et seq.*, known as Idaho's Environmental Protection and Health Act (EPHA), provides the general authority for the DEQ to protect the general health and welfare of the people of the state of Idaho along with the protection of the environment. The EPHA provides the authority for the DEQ to regulate activities that adversely impact the state's three natural resources: water, air, and land. The EPHA enables the DEQ to enforce all laws, rules, regulations, codes, and standards relating to environmental protection and health (Idaho Code §39-105). Idaho Code §39-108 sets forth the DEQ's authority to prosecute administrative and civil enforcement actions against persons that violate applicable state laws and regulations, including state water quality standards. The DEQ generally insures compliance with state water quality standards through a combination of enforcement tools including warning letters, administrative notices of violation, consent orders, compliance schedules, and where necessary, civil enforcement action.

If the Mid-Snake TMDL does not achieve its goals, then the DEQ will consider modifying the water quality standards and the development of site specific standards for heavily impacted sections of the Middle Snake River. The development of such standards will be dependent on IDAPA §16.01.02.275 and adopted following the public review process and administrative procedures for water quality standards revisions.

### b. NONPOINT SOURCES

As noted, the CWA anticipates that states will control land disturbing activities affecting water quality which are not regulated by point source NPDES permits. These activities are known as nonpoint source activities. Typical nonpoint source activities that affect water quality in the Middle Snake River watershed include irrigated agriculture, grazing, construction activities, and the operation of hydroelectric facilities. The regulations governing nonpoint source activities are set forth in the Idaho Water Quality Standards. Nonpoint source activities are required to follow approved BMPs or in the absence of approved BMPs, reasonable and knowledgeable efforts to minimize water quality impacts. Most of the industries affecting water quality in the Middle Snake River do not have BMPs that have been specifically approved by the IDHW through the regulatory process. The DEQ, in consultation with other designated state agencies, controls nonpoint source activities through monitoring and, if necessary, modification of BMPs or other knowledgeable and reasonable efforts. This process is otherwise known as the **feedback loop**. (See Section 5.03 on a discussion of the feedback loop.) Specifically, the Water Quality Standards anticipate the following:

(1) For an activity occurring in a manner not in accordance with approved BMPs, or in a manner which does not demonstrate a knowledgeable and reasonable effort to minimize resulting adverse water quality impacts, the Director (of the IDHW) may with appropriate inter-Departmental coordination:

(a) Prepare a compliance schedule as provided in Idaho Code §39-116, and/or

(b) Institute administrative or civil proceedings including injunctive relief under Idaho Code §39-108.

(2) For activities conducted in compliance with approved BMPs, or conducted in a manner which demonstrates knowledgeable and reasonable effort to minimize resulting adverse water quality impacts, the Director may, with appropriate inter-Departmental coordination:

(a) For those activities with approved BMPs as listed in Idaho Code §16.01.02.350.03 formally request that the responsible agency conduct a timely evaluation and modification of the practices to insure full protection of beneficial uses.

(b) For all other nonpoint source activities which do not have approved BMPs as listed in Idaho Code §16.01.02.350.03, develop and recommend to the operator control measures necessary to fully protect the beneficial uses. Such control measures may be implemented on a voluntary basis, or where necessary, through appropriate administrative or civil proceedings.

(c) If, in a reasonable and timely manner the approved BMPs are not evaluated or modified by the responsible agency, or if the appropriate control measures are not implemented by the operator, then the Director may seek injunctive relief to prevent or stop imminent and substantial danger to the public health or environment as provided in Idaho Code §39-108.

(3) The Director may review for compliance project plans for proposed nonpoint source activities, based on whether or not the proposed activity will fully maintain or protect beneficial uses as listed in Idaho Code §16.01.02.200 and §16.01.02.250. In the absence of relevant criteria in

those sections, the review for compliance will be based on whether or not the proposed activity:

(a) Will comply with approved or specialized BMPs; and

(b) Provides a monitoring plan which, when implemented, will provide information to the Director adequate to determine the effectiveness of the approved or specialized BMPs in protecting the beneficial uses of water; and

(c) Provides a process for modifying the approved or site-specific BMPs in order to protect beneficial uses of water.

(4) For projects determined not to comply with those requirements, the plan may be revised and resubmitted for additional review by the Department. Any person aggrieved by a final determination of the Director may, within 30 days, file a written request for hearing before the Board in accordance with the IDAPA. In all cases, implementation of projects detailed in a plan shall be conducted in a manner which will not result in imminent and substantial danger to the public health or environment.

Approved BMPs for the purpose of Idaho Code §16.01.02.350.03 include ... following:

(1) Idaho Forest Practices Rules as adopted by Board of Land Commissioners;
(2) IDHW Rules, Title 1, Chapter 6, "Rules Governing Solid Waste Management;"
(3) IDHW Rules, Title 1, Chapter 3, "Rules and Minimum Standards for Stream-channel Alterations" as adopted by the Board of Water Resources;
(4) "Rules and Minimum Standards for Stream-channel Alterations" as adopted by the Board of Water Resources;
(5) "Rules Governing Exploration and Surface Mining Operations in Idaho" as adopted by the Board of Land Commissioners;
(6) "Rules Governing placer and Dredge Mining in Idaho" as adopted by the Board of Land Commissioners.

The DEQ and other designated agencies will utilize the Middle Snake River WMP as a guide to implement nonpoint source controls. If approved or required BMPs are necessary for a specific industry or activity to achieve the goals of this WMP, the DEQ and other designated agencies will thereafter adopt rules necessary to implement such BMPs. Although the Irrigated Agriculture Watershed Reduction Plan (see Appendix A-5) appears to rely solely on peer pressure to assure implementation of the Mid-Snake TMDL provisions, the DEQ and the Middle Snake River WAG will consider a greater emphasis on the development of farm conservation plans for farms in the Middle Snake River Watershed Management Area so that impacts to water quality are minimized

c. **401 CERTIFICATION**

Section 401 of the CWA provides that any applicant for a federal license or permit to conduct any activity including but not limited to the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the state in which the discharge originates or will originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over the navigable waters at the point where the discharge originates or will originate, that any such discharge will comply with the applicable provisions of §s 301, 302, 303, 306, and 307 of the CWA. Any discharge to waters of the United States authorized by federal licenses or permits must, therefore, be preceeded by a state of Idaho water quality certification. Typical federal permits subject to §401 certifications include NPDES permits, FERC licenses and relicenses for hydroelectric facilities, and the U.S. Army Corps of Engineers §404 Permits (for dredge and fill).

On all NPDES permits on the Middle Snake River, the DEQ will continue to exercise its authority to insure compliance with State Water Quality Standards. The DEQ will utilize the Middle Snake River WMP as a guide in making future §401 certification decisions.

d. **ANTI-DEGRADATION POLICY**

Idaho's anti-degradation policy requires that the DEQ must fully protect the existing beneficial uses of all surface waters. On the Middle Snake River, fourteen segments have been listed as water quality limited, because the state water quality standards are not met and designated beneficial uses are impaired. Therefore, the state will manage the Middle Snake River to improve its water quality and prevent further degradation of those fourteen segments through the Mid-Snake TMDL.

3. **EFFLUENT TRADING POLICY IN WATERSHEDS**

The Mid-Snake TMDL as a watershed management plan calls for innovative approaches to achieving load reduction goals in the receiving stream. One such approach is effluent trading between the pollutant sources in watershed. The EPA and the DEQ recognize effluent trading as a possible way to assist industries to achieve water quality goals in the Middle Snake River. Effluent trading potentially offers the following benefits:

1. **ECONOMIC BENEFITS OF EFFLUENT TRADING**

   Reduces costs for individual sources contributing to water quality problems. By allowing dischargers to take advantage of economies of scale and treatment efficiencies that vary from source to source, thereby reducing the overall cost of addressing water quality problems in the watershed.

2. **ENVIRONMENTAL BENEFITS OF EFFLUENT TRADING**

   Achieves equal or greater reduction of pollution for the same or less cost. By creating economic incentives for dischargers to go beyond minimum pollution reduction and also encourages pollution prevention and the use of innovative technologies.

3. **SOCIAL BENEFITS OF EFFLUENT TRADING**

Encourages dialogue among stakeholders and fosters concerted and holistic solutions for watersheds with multiple sources of water quality impairment.

4. **TYPES OF EFFLUENT TRADING**

The items to be traded are the pollutant reductions or water quality improvements sought. Under trading, a source that can more cost-effectively achieve greater pollutant reduction than is otherwise required would be able to sell or barter the credits for its excess reduction to another source unable to reduce its own pollutants as cheaply. To ensure that water quality standards are met throughout the watershed, an equivalent or better water pollutant reduction would need to result from a trade. The various types may include the following:

a. **INTRA-PLANT TRADING**

A point source is allocated pollutant discharges among its outfalls in a cost-effective manner, provided that the combined permitted discharge with trading is no greater than the combined permitted discharge without trading in the watershed.

b. **PRETREATMENT TRADING**

An indirect industrial point source(s) that discharges to a publicly owned treatment works (POTW) arranges, through the local control authority, for additional control by other indirect point sources beyond the minimum requirements in lieu of upgrading its own treatment for an equivalent level of reduction.

c. **POINT / POINT SOURCE TRADING**

A point source(s) arranges for other point source(s) in a watershed to undertake greater than required control in lieu of upgrading its own treatment beyond the minimum technology-based treatment requirements in order to more cost-effectively achieve water quality standards.

d. **POINT / NONPOINT SOURCE TRADING**

A point source(s) arranges for control of nonpoint source dishcarge(s) in a watershed in lieu of upgrading its own treatment beyond the minimum technology-based treatment requirements in order to more cost-effectively achieve water quality standards.

e. **NONPOINT / NONPOINT SOURCE TRADING**

A nonpoint source(s) arrange for more cost-effective control of other nonpoint sources in a watershed in lieu of installing or upgrading its own control.

# 3.05 COORDINATING ACTIVITIES

The DEQ will continue to coordinate the activities of the various agencies that are monitoring on the Middle Snake River in conjunction with advise from the Middle Snake River WAG. Those activities that have or will have a direct impact on the water quality standards or the beneficial uses of the watershed, will be coordinated prinicipally by the DEQ with deference to advise and assistance from the WAG. The DEQ will continue to provide input on monitoring programs that impact water quality to all agencies, organizations, etc., especially if they deal with the Middle Snake River. The DEQ will continue to be the lead agency when it comes to matters of water quality on point and nonpoint sources affecting the Middle Snake River and its tributaries. Many federal, state, regional, and local agencies have jurisdiction in the Middle Snake River Watershed Management Area. The action of these agencies may directly or indirectly affect water quality in the Middle Snake River. The DEQ will continue to foster cooperation and coordination with these agencies to enhance efforts to prevent negative water quality impacts. General guidlines that the DEQ will use include:

1. Promote and encourage responsible sustainable resource development.
2. Ensure no further degradation of water quality in those Middle Snake River segments listed as WQL.
3. Wherever possible, work cooperatively with industries to develop and use site and operation specific BMPs for waste management.
4. Coordinate pollutant trading consistent with the goals of this WMP.

### 3.05.01 LOCAL GOVERNMENTAL AGENCIES

The DEQ will continue to assist with planning, engineering, and design of municipal and subdivision facilities for drinking water, solid waste facilities, and wastewater. The DEQ will assist local governments, where appropriate. The DEQ will continue to review plans and specifications for proposed facilities and/or modifications to existing systems for local government entities, including city and county officials.

### 3.05.02 REGIONAL AGENCIES

The DEQ will continue to coordinate and cooperate with management actions of the Mid-Snake Regional Water Resource Commission to study, protect, and enhance water resources within the Middle Snake River Watershed Planning Area, which encompasses the counties of Twin Falls, Jerome, Gooding, Blaine, Minidoka, and Cassia.. The DEQ will also continue to participate and technically assist the Middle Snake River Recreation Work Group which promotes such recreational activities as fishing, hiking, camping, scenery, hunting, boating, wildlife, and horseback on the Middle Snake River. The DEQ will continue to solicit input from regional agencies or work groups through the public review process and the through the Middle Snake River WAG.

### 3.05.03 STATE AGENCIES

The DEQ will continue to coordinate activities in accordance with state laws and programs. The DEQ will coordinate its activities where appropriate with state governmental agencies, such as IDWR, IDFG, IDL, and IDA. With the Idaho Department of Water Resources (IDWR), the DEQ will continue to review and comment on injection well permits, water use permits, stream channel alteration permits, minimum stream flows, and the Comprehensive State Water Plan. With the Idaho Department of Fish and Game (IDFG), the DEQ will continue to coordinate biological monitoring programs and support fishery goals in management actions, especially those activities related to the Benefical Use Reconnaissance Project (BURP). With the Idaho Department of Lands (IDL), the DEQ will continue to review and comment on Lake Encroachment Permits (LEP) and Placer Mining Permits (PMP). With the Idaho Department of Agriculture (IDA, the DEQ will continue to cooperate fully with the Dairy MOU on CAFO facilities as well as provide technical assistance when requested.

### 3.05.04 FEDERAL AGENCIES

The DEQ will continue to coordinate activities in accordance with federal laws and programs. Most federal water quality programs integrate closely with the CWA and its provisions. The following **TABLE 34** describes the general provisions of those pertinent sections in the CWA.

**TABLE 34. FEDERAL CLEAN WATER ACT AND ITS GENERAL SECTION PROVISIONS.**

| SECTION IN CWA | GENERAL SECTION PROVISIONS |
|---|---|
| 106 | Authorizes grants to states to assist them in administering programs for the prevention, reduction, and elimination of pollution, including monitoring and enforcement. |
| 201 | To require and to assist the development and implementation of waste treatment management plans and practices, including technology-based treatment, areawide planning, construction grants, combined sewer overflow (CSO) funds. |
| 205j | Water quality management planning: reservation of funds for nonpoint source management. Includes development and implementation of BMPs, identification of water quality problems. |
| 208 | Areawide waste treatment management; for the identification and designation of areas having substantial water quality control problems. Includes provisions for the planning process, regional operating agencies, permitting conformity, grants, technical assistance, and agricultural cost sharing. |
| 210 | Annual survey to determine efficiency of operations and maintenance of treatment works. |
| 214 | Public information program for wastewater recycling and reuse, land treatment and reduction of wastewater volume. |
| 301 | Effluent limitations procedures. |
| 302 | Water quality-based effluent limitations when technology-based limits are insufficient to protect water quality, public health and the maintenance of uses. |
| 303 | Water quality standards and implementation plans including review and revision of standards, WQL segments, WMPs, the continuing planning process, and thermal standards. |
| 304(l) | Individual control strategies for toxic pollutants, includes toxic "hot spots," "long lists," "short list," and "mini list." |
| 305(b) | State reports on water quality. Biennial reporting on surface water and groundwater quality regarding use support, current status, and the achievements of the various regulatory and assessment programs. |
| 314(a) | Clean Lakes program establishment. Biennial reporting on the nutrient (eutrophication) status of lakes; procedures, methods to control sources of pollution required subsequent to funding. |
| 319(a) | State assessment reports for identification/priority setting of waters impacted by nonpoint source pollution. |
| 319(b) | State management program. This section provides guidance on the development and implementation of nonpoint source control programs. Includes utilization of local and private experts, and development on a watershed basis. |
| 401 | State certification for discharge to the waters of the state. Includes the NPDES program, FERC licenses, and 404 Dredge and Fill Permits. |
| 402 | NPDES permitting system for discharges. |
| 404 | Permits for dredge or fill materials. Is synonymous with the wetlands protection. |

The DEQ will continue to coordinate with the following federal agencies: EPA, USFWS, USBOR, ACOE, USFS, BLM, and FERC.

## 3.06 PUBLIC OUTREACH

The development of the Middle Snake River WMP (or Mid-Snake TMDL) has resulted in an increased level of public understanding of water pollution problems, the activities that impact water quality, and potential mitigation strategies to improve water quality in the Middle Snake River. The DEQ will continue to use public outreach for communicating pollution control efforts to the public.

As part of Idaho Code §39-3601 *et seq.*, the Middle Snake River WAG will hold open forum meetings for public comment. Every provision will be made to allow for the interests of the watershed to be represented in all meetings. As part of the industry WMPs, all industries will be encouraged to develop their own public outreach programs. The DEQ will continue to participate in such programs as Water Awareness Week, Earth Day, and Drinking Water Week, and use these to educate the citizens of the watershed water quality issues and pollution concerns.

## 3.07 ADDITIONAL RESTORATION OPTIONS

The DEQ and the Middle Snake River WAG will continue to explore such avenues as nuisance algae control (with phosphorus precipitation and inactiviation, sediment dredging, dilution and flushing) and nuisance weed control (with sediment removal, rototilling and flushing flows, biological controls, harvesting).

### 3.07.01 FLOW AUGMENTATION

Because of the retentiveness of the Middle Snake River, restricted water flow, dense plant beds, and heavy sedimentation contribute to the eutrophications process. Due to restricted water flow, nutrients entering the Middle Snake River remain in the system for longer periods of time rather than being flushed downstream. Phase IV (although this will begin in Phase I) of the Middle Snake River WMP will research options that may increase minimum flows. Conservation mechanisms that may provide an incentive to water users, without affecting their water rights, is one possible option for the Middle Snake River. See Section 1.04, Strategy of the Mid-Snake WMP. The DEQ supports the Idaho Water Resource Board Designations of the River which preclude further impoundments, diversions, and hydroelectric facilities on those "water quality limited" reaches of the Middle Snake River (IWRB, 1993). Each hydropower development increases the potential for water quality degradation due to cumulative impacts of altered flows and habitat degradation.

### 3.07.02 DREDGING

A current inventory of costs for this type of activity on the Middle Snake River by the Irrigated Agriculture Industry indicates that costs initially predicted in 1981 (by S.A. Peterson) are about the same or greater. The most difficult portion of this process is the lack of uniformity on the Middle Snake River's bottom. It is filled with myriad of odd-size boulders and rocks that makes dredging difficult. However, the DEQ and the Middle Snake River WAG will continue to explore this option, since it may be an option that is feasible in certain areas of the Middle Snake River.

### 3.07.03 CONSTRUCTED WETLANDS FOR WASTEWATER TREATMENT

**Wetlands** are defined as those land areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. These systems are unique in that the vegetation ranges from marshes to forested swamps. Wetlands are considered waters of the United States. (See *Code of Federal Regulations*, Parts 100 to 149, §122.2, pp. 67-68, Revised as of July

1, 1992.) They provide natural flood prevention and pollution filtering systems, and they contribute significantly to groundwater recharge. Many sport fish, migratory waterfowl, fur-bearers, and other valuable wildlife live and breed in wetlands.

The most common use of constructed wetland is for the treatment of municipal wastewaters, acid mine drainage, textile waste, photo lab waste, pulp mill effluent, refinery effluent, swine farrowing and feeding waste, poultry rendering wastes, landfill leachate, and urban runoff. In addition, the use of wetlands has more recently been in the area of nonpoint source pollution reduction, such as irrigated agriculture, confined animal feeding operations (such as dairies and feedlots), and grazing. Thus, constructed wetlands as planned systems designed and constructed to employ wetland vegetation assist in the treatment of wastewater in a more controlled environment than what would occur in a natural setting. The following describes the major transformation removal mechanisms found in constructed wetlands.

1. **BIOLOGICAL TRANSFORMATIONS**
As biochemial transformations of wastewater constituents, wetlands simulate conventional wastewater treatment plants, septic tanks, drain fields, and other forms of land treatment. In association with microorganisms and soils, wetland plants (both submerged and emergent) are responsible for the majority of treatment. The use of wetland treatment systems is limited though to providing further treatment of secondary effluent to meet downstream water quality standards. In general, the objective is to reduce concentrations of BOD-5, TSS, nutrients (like nitrogen and phosphorus), trace metals, trace organics, and pathogens. Most wetlands can effectively remove these parameters, although phosphorus removal capability varies among individual wetlands and depends largely on site-specific factors like soil type. While there appears to be some capacity for improving water quality of wastewater, runoff, or industrial discharges, some wetlands are not appropriate for daylong use as part of a wastewater disposal or treatment system. Additionally, the breeding of mosquitoes or flies, odor development, and maintenance of flow control structures need to be considered. Proposed physical modification of a natural wetland to allow wastewater application requires a permit from the Army Corps of Engineers (under §404 of the CWA) and review under the National Environmental Policy Act (NEPA).

2. **CONTAMINANT REMOVAL MECHANISMS**
Contaminant removal mechanisms in aquatic systems employing plants and animals may be divided into three areas: (1) physical, (2) chemical, and (3) biological. Performance expectations is accomplished by diverse reducing mechanisms such as sedimentation, filtration, chemical precipitation and adsorption, microbial interactions, and uptake by vegetation. The effect of these mechanisms is summarized as follows:

**TABLE 35. CONTAMINANT REMOVAL MECHANISMS IN CONSTRUCTED WETLANDS.**

| REDUCING MECHANISMS | AFFECTED CONTAMINANT | DESCRIPTION |
|---|---|---|
| **PHYSICAL REDUCING MECHANISMS:** | | |
| Sedimentation | Primary effect is Settable Solids | Gravity settling solids and constituent contaminants in pond/marsh settings. |
| | Secondary effect is Colloidal Solids | |
| | Tertiary effect is BOD, nitrogen, phosphorus, heavy metals, refractory organics, bacteria and virus | |

| REDUCING MECHANISMS | AFFECTED CONTAMINANT | DESCRIPTION |
|---|---|---|
| Filtration | Secondary effect is Settable Solids and Colloidal Solids | Particulates filtered mechanically as water passes through substrate, root masses, or fish. |
| Adsorption | Secondary effect is Colloidal Solids | Interparticle attractive force (van der Waals force). |
| **CHEMICAL REDUCING MECHANISMS:** | | |
| Precipitation | Primary effect is phosphorus and heavy metals. | Formation of or coprecipitation with insoluble compounds. |
| Adsorption | Primary effect is phosphorus and heavy metals. | Adsorption on substrate and plant surface. |
| | Secondary effect is refractory organics. | |
| Decomposition | Primary effect is refractory organics. | Decomposition or alteration of less stable compounds by phenomena such as UV irradiation, oxidation, and reduction. |
| **BIOLOGICAL REDUCING MECHANISMS:** | | |
| Microbial Metabolism | Primary effect is Colloidal Solids, BOD, nitrogen, refractory organics, heavy metals. | Removal of Colloidal Solids and soluble organics by suspended, benthic, and plant-supported-bacteria. Bacterial nitrification/denitrification. Microbially mediated oxidation of metals. |
| Plant Metabolism | Secondary effect is refractory organics, bacteria, and virus. | Uptake and metabolism of organics by plants. Root excretions may be toxic to organisms of enteric origin. |
| Plant Absorption | Secondary effect is nitrogen, phosphorus, heavy metals, refractory organics. | Under proper conditions, significant quantities of these contaminants will be taken up by plants. |
| Natural Dieoff | Primary effect is bacteria and virus. | Natural decay or organisms in an unfavorable environment. |

Microbial & Plant Metabolism includes both biosynthesis and catabolic reactions.

# CHAPTER 4
# EVALUATION OF MANAGEMENT ACTIONS

## 4.00 PRELIMINARY

This chapter includes an evaluation of proposed industry management actions and evaluation of the EPA's water quality RBM10 (River Basin Model 10). The RBM10 is a simulation water quality model of the Middle Snake River (between Milner Dam, River Mile 640.0, and Upper Salmon Falls Dam, River Mile 583.0) for purposes of water resource planning. The RBM10 is one of the scientific tools being used to develop and refine industry water quality management plans in accordance with the CWA and with the State of Idaho's Nutrient Management Act. The RBM10 has also been used as a decision support tool in the Spokane River (Yearsley and Duncan, 1988) and on the Snake River above Milner Dam (Yearsley, 1976).

On the Middle Snake River, the RBM10 will be used as a scientific tool for evaluating the estimates of point and nonpoint source TP reduction inputs from the various water user industries. Its use will be as a developing decision support tool on the Middle Snake River. As an enforcement tool the RBM10 has no enforcement authority. It still requires many improvements that will develop its scientific usefulness over time. As part of the DEQ's commitment to this modeling effort, it will continue to use the RBM10 with more current data to better quantify and qualify the effectiveness of those reduction efforts on the Middle Snake River.

Evaluation of management actions includes mechanisms that feed back revisions into the planning process. As management actions and industry plans are carried out, the water quality of the tributaries and in the Middle Snake River will be monitored to document improvement. The Middle Snake River WAG and the DEQ will review progress annually and note status of plan goals as they either meet or don't meet the target. If plan goals are being met, implementation of the WMP will continue as prescribed. If plan goals are not being met, then management actions will be reviewed and modified if necessary.

## 4.01 THE EPA'S WATER QUALITY MODEL

The DEQ will utilize the RBM10 to compare the relative effectiveness of management actions and estimate the assimilative capacity of the Middle Snake River. By providing tributary and headwater source data to the model, predictions can be made on the water quality and plant biomass production on the Middle Snake River. The RBM10 is fairly flexible, but it is also very data intensive. The more data is provided to the model, the more plausible the predictions. Levels of error in the validation process between 20-30% are technically acceptable. For DO and TP, the RBM10 appears to produce reasonable predictions, but not so for temperature and the plant components. Using 1992 data (Falter and Carlson, 1994), the model was validated in 1994 using the plant component. In 23 of 30 comparisons, predicted plant biomass fell within 95% CI of mean observed values. This validation will be repeated in 1996 with 1994 data (Falter and Burris, 1996), and with other data that is collected over the next phases of the plan. Regardless of the predicted estimates of averages, the high variability in the observed plant biomass suggests that conclusions about model validity should be made with some level of caution, particularly if evaluation of industry management actions are to be made based on modeling results. Therefore, it will be necessary to run the model annually with more information collected by DEQ or other agencies so as to fine tune the variability. It will be necessary also to revisit initial best professional judgements (that were incorporated in the model) for aquatic macrophytes and to use more current data that is descriptive of the Middle Snake River system. The DEQ is prepared to commit resources to research the ecosystem components to better refine the RBM10.

### 4.01.01 UNDERSTANDING THE BASIC CONCEPTS OF THE RBM10

The dynamics of nutrient flow in a system such as the Middle Snake River are complex. However, knowledge of the physical, chemical, and biological processes contributing to and affected by nutrient flow has increased as a result of laboratory and field studies. For some of these processes it is possible to describe important features of the system in terms of mathematical relationships. For processes which can be described in this way, simulation of water quality with mathematical models can be a useful tool for water resource planning. As in all models, the RBM10 is based on several assumptions. These assumptions are described as follows:

1. Major features of the Middle Snake River ecosystem in the river segments between River Mile 640.0 and River Mile 583.0 can be described in terms of compartments. Between these compartments there can be flows of energy, material, and information which can be identified in a river monitoring scheme.

2. The flows of energy, material, and information between ecosystem compartments can be described mathematically within given bounds of uncertainty.

3. There is sufficient information to characterize the environmental forcing functions such as meterorology, hydrology, and water chemistry.

4. There is sufficient information to estimate the parameters describing the dynamics of energy and material flow.

The water quality related components determined to be relevant to the planning process in the Middle Snake River and which to varying degrees satisfy the above assumptions include:

1. **RECEIVING WATER COMPONENTS**
   a. Carbonaceous Biological Oxygen Demand (c-BOD)
   b. DO
   c. Algal Biomass
   d. Organic Nitrogen
   e. Ammonia Nitrogen
   f. Nitrite+Nitrate Nitrogen
   g. Organic Phosphorus
   h. Orthophosphorus
   i. Temperature

2. **BENTHOS COMPONENTS**
   a. Macrophytes
   b. Epiphytes
   c. Periphyton

Hydrologically, the Middle Snake River is conceptualized in terms of well-mixed compartments organized either longitudinally or vertically. The longitudinal organization is used to describe freely-flowing segments or river-run reservoir segments. The vertical organization is used to describe vertically-stratified reservoirs. The general assumptions associated with the mathematical development of the receiving water model are:

1. Horizontal and vertical advection and vertical eddy diffusion are the primary physical processes for water and mass transport.

2. The vertical eddy diffusivity is the same for all state variables.

3. The lateral variations of properties in the waterbodies are negligible compared to longitudinal and vertical variations of the properties.

4. Rate constants for the various reactions do not change over a given length segment.

5. Hydrodynamic characteristics are a function of the stream, river, or reservoir geometry only.

6. The river system can be divided into a finite number of segments within which hydrodynamic characteristics are constant.

7. Hydrodynamic characteristics of free-flowing river segments and river-run reservoirs can be expressed as a simple function of the flow in any segment.

8. Hydrodynamic characteristics of stratified reservoir segments are a function of the density structure of the reservoir.

9. The time required for flow in a reach to adjust to changes in elevation is small compared to the travel time of some constituent.

10. Simulated state variables of the ecosystem are averages over a given computational element and a finite time interval.

The general assumptions associated with the mathematical development of the benthos model, including both benthic and water column components, are derived from the concepts of mass and energy bases. The rates of the reactions of these processes are generally determined from the results of site-specific field studies. Key elements to the hypothesis of macrophyte, epiphyte, and periphyton growth include:

1. Nutrient uptake rates are low at low river velocities due to poor rates of exchange, but increase as river velocity increases up to a certain optimal velocity. As river velocity increase beyond a certain point, physical stresses begin to occur in the plants and mortality of the plants increases.

2. Vascular macrophytes, such as *Potamogeton*, take a large percentage of their nutrients from the sediments, while others, such as *Ceratophyllum*, derive the majority of their nutrients from the water column.

3. Rooted macrophytes do not generally occur in the Middle Snake River at water depths greater than two meters.

4. Epiphytes, such as *Cladophora*, requires macrophytes to attach themselves and grow, and also intercept solar radiation in the top 10% of the water column, rather than over the entire water column.

5. The sediments of the Middle Snake River provide an unlimited supply of nutrients for that fraction of nutrients which plants may derive from sediments.

## 4.01.02 MODEL SIMULATIONS OF THE MIDDLE SNAKE RIVER

Data collected for the RBM10 was from local universities, agencies, and organizations conducting monitoring research on the Middle Snake River. Model simulations were based on the USGS flows for the years 1930-1939, the ten lowest flow years on record. Utilizing "worst case" flow conditions (drought conditions), model simulations can provide two objectives: (1) verify that proposed industry load reductions will lead to the attainment of the instream TP goal; and, (2) provide an implicit margin of safety for the TMDL. Model testing was done in two stages. The first stage was a test of the receiving water portion of the model using receiving wate data for 1990-1991 as reported by Brockway and Robison (1992). The second stage focused on the benthic components using the results of studies reported by Falter and Carlson (1993).

1. **SYSTEM BOUNDARIES**
   The upper end of Twin Falls Reservoir (River Mile 619.0) was chosen as the point of initialization for the model. This was because there was no stream cross-section data available for developing hydraulic properties of river flow in this segment. The downstream boundary was at Upper Salmon Falls Dam (River Mile 583.0).

2. **LENGTH AND TIME SCALES**
   The Middle Snake River was divided into 42 segments of longitudinal orientation with segment length varying from 0.2 miles in length to 3.3 miles in length. Shorter reaches were used to describe sections of the river with rapids, while the longer reaches were used to describe the sections between rapids.

3. **DATA SOURCES**
   The testing of the receiving water portion of the model made use of water quality and quantity data collected from the following sources: Brockway and Robison (1992); MacMillan (1992); USGS flow records for Snake River gauges at Milner, Kimberly, Buhl, and Lower Salmon; National Weather Service records; and, the Pacific Northwest River Basin Commission (1968). Field studies of macrophyte growth were obtained from the University of Idaho (Falter and Carlson, 1993) and Idaho State University (Minshall et al.., 1993). A comprehensive study of system inputs, such as done by Brockway and Robison (1992) was not done in conjunction with the macrophyte studies, it was necessary to develop input conditions for testing the benthic model from a number of sources. These sources included the following: Brockway and Robison (1992) for source characteristics such as fish hatcheries, tributaries, and irrigation return flows; Brockway (1993) for Ground water return flows as a preliminary data report; USGS for developing the water budget in conjunction with tributary flow estimates from Brockway and Robison (1992); and, City of Twin Falls for source characteristics for the municipality discharging into the Middle Snake River.

4. **HYDROLOGY**
   The approach used to determine the water budget was based on estimates of surface return flow increments given in Brockway and Robison (1992) coupled with estimates of reach gains based on gauge data from the various USGS stations on the main stem of the Middle Snake River. Differences between the accumulated surface gains and the gauge

measurement were assigned to "Ground water" return flow. It was assumed the Ground water flow computed in this way between USGS gauges was distributed uniformly along the length of the Middle Snake River.

5. **HYDRAULIC CHARACTERISTICS**

The coefficients needed to define the hydraulic properties of the Middle Snake River were obtained from three sources: Gebhardt, Brockway and Robison, and the Idaho Power Company. Backwater profile analyses done by Gebhardt (1993) and Brockway and Robison (1992) were used for river segments between River Mile 610 and River Mile 588. Soundings of reservoir depth reported by Idaho Power Company were used to develop very simple relationships for the three reservoirs, Twin Falls, Shoshone Falls, and Upper Salmon Falls.

6. **POINT SOURCES AND NONPOINT SOURCES**

Point sources included the following for estimate loadings: Blue Lakes Trout Farm Fish Processing Plant, Blue Lakes Trout Farm Hatchery, Twin Falls Municipality, Crystal Springs Hatchery, Magic Valley Fish Hatchery, Rim View Hatchery, Idaho Fish Breeders, and Box Canyon Fish Hatchery. These point sources discharge directly into the Middle Snake River and were used for estimate loadings.

Nonpoint source tributaries included the following for estimate loadings: Vinyard Lake, Rock Creek, Southside Cedar Draw Creek, Clear Lakes Outlet, Southside Mud Creek, Southside Deep Creek, Blind Canyon Creek, and Salmon Falls Creek. Nonpoint source agricultural returns included the following for estimate loadings: Southside Twin Falls Coulee, Southside East Perrine Coulee, Southside Main Perrine Coulee, Southside West Perrine Coulee, Southside 43 Drainage, Southside 30 Drain, LQ/LS Drain, Southside LS2/39A Drain, Northside N42 Drain on Canyon Rim, Southside 39 Drain, Southside I Drain, Northside J8 Drain, Southside N Drain prior to Idaho Fish Breeders, Northside S29 Drain, Northside S19/S Drains, and Northside W26 Drain. Nonpoint source Ground water and spring inflow was assumed to be the same as that reported by Brockway and Robison (1992) for the Middle Snake River in the segment which the Ground water entered. Return flow quality was estimated from Brockway and Robison (draft 1993) for the 1992 testing of the benthic model.

7. **METEOROLOGICAL DATA**

Air temperature, relative humidity (or dew point), cloud cover, wind speed, and atmospheric pressure are necessary inputs to the RBM10 for purposes of estimating heat budget and the amount of solar energy available for primary productivity on the Middle Snake River. Average daily air temperature observations for 1990-1992 in Twin Falls were obtained from the National Weather Service's Local Climatological Summaries. Average monthly wind speed, dew point, and cloud cover were obtained from the statistical analysis of weather data done by the Pacific Northwest River Commission (1968).

8. **PARAMETRIC ESTIMATION**

Estimates of parameters needed to characterize the kinetics of mass and energy transfer for the receiving water were obtained from the literature (Bowie et al., 1985; Barber, 1991; Chambers et al., 1991; Horner et al., 1983; Van Wijk, 1989; and, Falter and Carlsen, 1993).

These estimates included: Deoxygenation Rate, Reaeration Rate, Stoichiometric Ratio for Nitrification, Nitrification Rate, Phytoplankton Sinking Rate, Maximum Phytoplankton Growth Rate, Maximum Phytoplankton Respiration Rate, Phytoplankton Optimal Temperature, Phytoplankton Minimum Temperature, Phytoplankton Maximum Temperature, Light Extinction Coefficient, Optimal Plytoplankton Light Intensity, Half-Saturation Constant for Nitrogen, Half-Saturation Constant for Phosphorus, Mineralization Rate for Organic Nitrogen, Ratio of Nitrogen to Carbon in Phytoplankton, Phytoplankton Preference for Ammonia, Mineralization for Organic Phosphorus, Ratio of Phosphorus to Carbon in Phytoplankton, and Ratio of Carbon to Chlorophyll-a.

9. **RESULTS**

Results of three model simulations are summarized in **TABLE 36**, and represent the season from April to October in 1992. The four model simulations are defined as follows:

a. **WMP**
Full implementation of the Middle Snake River WMP. This includes all industry plans in place.

b. **2xWMP**
Full implementation of the Middle Snake River WMP at twice the reduction levels proposed by industries.

c. **No WMP**
No implementation of the Middle Snake River WMP.

**TABLE 36. AVERAGE DATA VALUES FOR RBM10 SIMULATIONS FOR 1992 DATA.**

| "TREATMENTS" | TIME FRAME | DO mg/L (average) | Temp. C (average) | Mean Plant Biomass g C/m$^2$ | TP mg/L (average) |
|---|---|---|---|---|---|
| WMP | 10 years | 8.56 | 16.13 | 605 | 0.0728 |
| 2 x WMP | 10 years | 8.58 | 16.15 | 560 | 0.0659 |
| No WMP | 10 years | 8.49 | 16.13 | 1000 | 0.0840 |
| 1992 Values "as is" | 10 years | 8.15 | 16.25 | - | 0.1116 |

The conclusions from **TABLE 36** may be summarized as follows:

1. Alternative nutrient reduction scenarios have little effect on water temperature possibly due to the "rigidity" of the RBM10, or temperature is not affected by the level of proposed reductions in aquatic plant growth. In fact, there is no statistical difference between WMP or 2 x WMP when compared to No WMP.

2. Alternative nutrient reduction scenarios have a slight effect on water column DO. In fact, there is slightly less than 1% increase in DO in WMP and 2 x WMP when compared to No WMP.

3. Alternative nutrient reduction scenarios affect water column TP concentrations. Proposed nutrient reductions, including both implicit and explicit margins of safety, should attain the

instream TP goal of 0.075 mg/L at Gridley Bridge, Hagerman, Idaho after 10 years. In fact, there is an 11.3% decrease in WMP when compared to No WMP;and, a 24.1% decrease in 2 x WMP when compared to No WMP.

4. Plant biomass responds to nutrient reduction scenarios. In all reaches of the 30 river miles studied, the full implementation of WMPs resulted in 20-60% less plant biomass than no application of WMPs. This is evidence that a plant reduction goal of 30% is achievable and will lead to levels below those considered "nuisance" and likely restore beneficial uses in the Middle Snake River to some extent. In fact, on an average-to-average basis, there is 39.5% reduction in WMP when compared to No WMP; and, a 44.0% reduction in 2 x WMP when compared to No WMP. This averages to at least a 41.8% reduction in plant biomass when averaging the two nutrient reduction scenarios.

Therefore, the DEQ will support the proposed nutrient reduction goals and what the RBM10 is predicting at Gridley Bridge for TP over a ten year proposed WMP phase. It is very likely that in high flow years, the attainment of this goal is quite possible. In low flow years, continued nutrient reductions will help a long ways to remediation of the Middle Snake River.

## 4.02 MONITORING

Monitoring is a crucial component to the success of the Middle Snake River WMP. The Mid-Snake TMDL must provide assurance that water quality standards will be achieved by demonstrating how reductions in key indicators, such as macrophyte biomass, are linked to compliance with water quality standards. The DEQ will continue to encourage research that provides a better understanding of the Middle Snake River system. As more data becomes available, refinement of management decisions to instream conditions can be accomplished. The DEQ will continue to determine the effectiveness of the Mid-Snake WMP and its associated BMPs. The DEQ will continue to utilize the RBM10 to identify those components of the ecosystem which are at greatest risk from various management strategies. Techniques that can be used and which the DEQ will explore for additional funding, include:

1. **MAINSTEM AND TRIBUTARY SAMPLING EFFORTS**
A coordinated monitoring effort is being implemented by various agencies and organizations on the Middle Snake River as part of the overall effort to accomplish the goal of the Mid-Snake TMDL. Information collected will be provided to the DEQ and the Middle Snake River WAG for refinement of the RBM10. The DEQ will continue to monitor the Middle Snake River and the main tributaries and will provide the monitoring results to the Middle Snake River WAG for consideration of proposed pollution reduction strategies in the watershed. The DEQ will continue to monitor the following tributaries: East Perrine Coulee, LQ/LS Drain, Rock Creek, Cedar Draw, Mud Creek, Deep Creek, Clear Lakes, and Salmon Falls Creek. Sites on the Middle Snake River will include Upper Twin Falls Resevoir, Pillar Falls, Pigeon Cove, Niagara Springs, Crystal Springs, Boulder Rapids, Kanaka Rapids, Upper Box Canyon Reach, Blue Heart Springs, Lower Box Canyon Reach, Gridley Bridge, and Upper Salmon Falls and other tributaries advised by the WAG. Water quality information collected will be used as a baseline to determine the effectiveness of the Mid-Snake WMP. Monitoring data collected will be provided to the Middle Snake River WAG for consideration of pollution reduction strategies in the watershed. In addition, the Middle Snake River will be monitored through cooperative efforts with the U of I, ISU, or other contract agencies or organizations. Monitoring will continue to be done by the

DEQ (or through one of its contractors) with emphasis on those parameters (TP, nitrite + nitrate, total Kjeldahl nitrogen, ammonia, bacteria, flow, temperature, DO) that can be used directly with the RBM10 for model simulations. See also section 4.03, Water Quality Research, for additional monitoring of the Middle Snake River, its tributaries, and its spring sources.

2. **SAWQP**

The SAWQP (or State Agricultural Water Quality Plan) is a plan developed by the participant (which is an individual, partnership, association, corporation, estate, or trust engaged in an agricultural enterprise as an owner, landlord, operator, or tenant of eligible land), technical agency (which is the agency designated by the soil conservation district to provide technical assistance and quality control in BMP planning and implementation), and the district (which is the soil conservation district) which identifies the critical areas and sources of water pollution on the participants's land and sets forth BMPs which will reduce water pollution from these critical areas and sources. Monitoring funds are made available as part of the planning process and implementation of the grants to the Soil Conservation Districts. The DEQ will assist with SAWQP relative to the monitoring plan development and with some monitoring where appropriate. The DEQ will continue to support the SAWQP process which allows for monitoring to determine the status of beneficial uses in agriculturally impacted waters. Also, the effectiveness of BMPs in restoring and supporting beneficial uses can be assessed by the Soil Conservation Commission. The Middle Snake River WAG will participate in advising the DEQ in prioritization of specific SAWQP projects within the watershed for consideration of pollution reduction strategies. The SAWQP process will not be construed to amend or replace Idaho Code §39-3607 which allows the DEQ to conduct a beneficial use attainability and status survey to identify appropriate designated uses and to determine the status of designated beneficial uses in each waterbody. SAWQP monitoring conducted in the recent past include the following: Vinyard Creek, East Upper Deep Creek, Middle Little Wood River, Scott's Pond, and several Camas Creek tributaries. Currently, the Perrine Coulee system is under a SAWQP grant and the DEQ will continue to support this monitoring effort.

3. **GROUND WATER SAMPLING**

The DEQ will continue to participate with the Idaho Snake River Plain Water Quality Demonstration Project. The DEQ will continue to respond to documented levels that exceed state standards for nitrite + nitrate as detected in the ground water. Ground water monitoring still needs to be assessed and developed in the Middle Snake River. The DEQ will continue to work with the Middle Snake River WAG to look at potential sources of ground water pollution on the Middle Snake River as well as providing technical assistance with other agencies on pollution concerns.

4. **INDUSTRY MONITORING**

Industries involved in BMP effectiveness plans will also monitor to verify the effectiveness of those plans. In addition, the DEQ will continue to facilitate the Coordinated Monitoring Program for the Middle Snake River to help alleviate duplication efforts and allow for a more effective and coordinated monitoring program. Data collected (specifically TP, nitrite + nitrate, total Kjeldahl nitrogen, ammonia, TSS, temperature, and DO) from this effort will be used in the RBM10 to help validate the effectiveness of BMPs or industry WMPs on the Middle Snake River.

(a) **POINT SOURCE MONITORING**
Point source industries will be monitoring effluent TP. The purpose of the monitoring is to serve as a benchmark for progress relative to management strategies and to adjust the wasteload allocation if necessary. The food processing industry (i.e., Simplots in Burley, Idaho) is currently doing some Snake River monitoring (for TP and bacteria) upstream and downstream of its discharge point prior to entrance into the Milner Pool. They are committed to assisting in the coordinated monitoring effort of the Middle Snake River WAG.

(b) **NONPOINT SOURCE MONITORING**
Nonpoint sources will continue to be encouraged to monitor either on a facility/farm basis or on agricultural drains (or both), and to realistically assess the impact of nutrients and sediments on the Middle Snake River. Key to this is the realization that agricultural drains not included in the first phase of this WMP need to establish target goals for seasonal impacts. The Irrigated Agriculture Industry will continue their monitoring program as outlined in their watershed reduction plan. However, the monitoring of the Middle Snake River, the tributaries, and irrigation return flows will be coordinated by the Coordinated Monitoring Committee which will function as a committee of the Middle Snake River WAG.

Potential nonpoint source pollution from the confined feeding operations (CFOs), will be reassessed to determine the effectiveness of waste management practices established in the *CAFO Guidelines*. A key component of the *CAFO Guidelines* is proper land application of dairy waste at proper agronomic rates. Therefore, an effective component of monitoring of the potential impacts of CAFOs is accurate recordkeeping "for tracking land application and cropping systems." (See p. 54 of *CAFO Guidelines*.)

Nonpoint source pollution from grazing is yet to be addressed in this phase of the WMP. The DEQ will continue to work with the WAG and key agencies, organizations, and operations to develop an industry plan. The grazing plan will take into account pollution prevention strategies, streambank protection for riparian zones and wetlands, and other management strategies that reduce sediment and nutrient losses.

5. **BENEFICIAL USE RECONNAISSANCE PROJECT (BURP)**
The BURP workplan was developed by the DEQ to describe the methods used to measure water quality, beneficial use attainability, beneficial use status, and general stream health. The overall process uses the best technology available to assess hundreds of streams over a five-year cycle. As part of the overall objective and purpose of BURP, the following streams have been monitored in HUCs 17040212 and 17040213 intermittently since 1993: Big Creek, Cedar Creek, Clover Creek, Cottonwood Creek, Deep Creek, Devil Creek, Dry Creek, Dry Gulch Creek, Ellison Creek, Harrington Fork, Hopper Gulch, Horse Creek, Hot Creek, House Creek, Loangford Flat Creek, Little Creek, Little House Creek, McMullen

Creek, Pole Camp Creek, Riley Creek, Rock, Creek, Salmon Falls Creek, Secret Creek, Shoshone Creek, Swanty Creek, Toolbox Creek, and Vinyard Creek. The DEQ will continue to monitor these stream (an other streams) as part of the BURP process and in conjunction with those timeframes already established.

6. **REMOTE SENSING**

Where appropriate this technique will be used by the DEQ to investigate the watershed management area or subwatershed areas to describe land use activities. Land use activities are of particular interest in the development of preliminary investigations for potential WQLSs in the watershed. Any remote sensing results will be provided to the Middle Snake River WAG for consideration of pollution reduction strategies in the watershed. Ground truthing will be conducted on all remote sensing of the watershed.

7. **BIOLOGICAL SAMPLING AND MAPPING**

Because of nuisance aquatic growth on the Middle Snake River, the DEQ will map the macrophyte impacted areas. These river maps will be made available to the Middle Snake River WAG for discussion and for inclusion in those biological studies to correlate TP reduction efforts with macrophyte reduction responses. Therefore, in addition to water quality monitoring, the DEQ will coordinate with other agencies and organizations on the monitoring of algae and macrophytes (both qualitatively and quantitatively) on the biomass effects as nuisance growths on the Middle Snake River. **TABLE 37** details the most recent monitoring effort by the DEQ beginning in 1997 based on fiscal year 1996.

**TABLE 37. MONITORING IN HUCs 17040212 AND 17040213 BY THE DEQ.**

| WATERBODY | PARAMETERS | | | | | | | | MONITORING PROGRAM |
|---|---|---|---|---|---|---|---|---|---|
| | TP | N | TSS | pH | SC | Flow | Temp | DO | |
| Middle Snake River + Macrophyte Mapping | X | X | X | X | X | X | X | X | DEQ (biweekly) |
| Deep Creek | X | X | X | X | X | X | X | X | DEQ (biweekly) |
| East Perrine Coulee | X | X | X | X | X | X | X | X | DEQ (biweekly) |
| Rock Creek | X | X | X | X | X | X | X | X | DEQ (biweekly) |
| Cedar Draw Creek | X | X | X | X | X | X | X | X | DEQ (biweekly) |
| Mud Creek | X | X | X | X | X | X | X | X | DEQ (biweekly) |
| Salmon Falls Creek | X | X | X | X | X | X | X | X | DEQ (biweekly) |
| LQ/LS Drain | X | X | X | X | X | X | X | X | DEQ (biweekly) |
| Burley Demo (Ground Water) | | X | | | X | | X | | DEQ (quarterly) |
| Billingsley Creek | X | X | X | X | X | X | X | X | DEQ (quarterly) |

Monitoring in HUCs 17040212 and 17040213 by the DEQ will be done as indicated based on current best available information on funding sources and monitoring protocols. Other agencies and organizations will be monitoring as well but will coordinated through the the Coordinated Monitoring Committee developed by the Middle Snake River WAG. At the time of this writing, monitoring for 1997 had not be finalized for other agencies and a coordinated meeting had just been finalized in January 1997.

TP = Total phosphorus
N = Nitrate-N
TSS = Total Suspended Solids
SC = Specific Conductivity
Temp = Temperature
DO = Dissolved Oxygen

## 4.03 WATER QUALITY RESEARCH

Various water quality research projects are funded by the DEQ as part of the Middle Snake River effort. In addition, some of the data gaps that have be identified by the DEQ and the EPA for the watershed will receive priority status relative to funding. The DEQ will continue to fund such projects that will aid the Middle Snake River WAG in making appropriate decisions that affect management strategies for pollution prevention and reduction in the watershed. The following ongoing research projects will provide additional validation to the RBM10 predictions and fill those identified data gaps.

1. **ECOSYSTEM RESEARCH INSTITUTE (ERI)**
   This project will entail the following components: nutrient budgets for Upper Salmon Falls, Shoshone, and Twin Falls Reservoirs; quantify primary productivity in Upper Salmon Falls, Shoshone and Twin Falls Reservoirs; quantify PAR Extinction at different turbidities; intensive sampling of six tributaries; measure diel fluctuations of temperature, pH, and DO in macrophyte beds; estimate periphyton productivity in the Middle Snake River between Twin Falls Reservoir and Lower Salmon Falls Reservoir; and, measure water quality and nutrient loads contributed by 12 major springs.

2. **UNIVERSITY OF IDAHO STUDY**
   The 1994 Middle Snake River Productivity and Nutrient Assessment final report was finalized in June 1996 by the College of Forestry, Wildlife and Range Science, with the University of Idaho (Dr. C. Michael Falter). Information provided in this report will be used in the RBM10 for validation of water quality goals.

3. **USGS MIDDLE SNAKE RIVER WORKPLAN**
   Because of a combination of large reservoir carryover from water years 1995 to 1996, and above normal snowpack in the Upper Snake River Basin, it is anticipated that stream flows in the Middle Snake River (Milner Dam to King Hill) will be well above average during the spring/summer period of 1996. The United States Bureau of Reclamation (BOR) has indicated that stream flow in the Middle Snake River reach will probably be maintained throughout much of the spring and summer at levels comparable to the mid-1980s when stream flows were at or near historic highs. The potential "flushing" effect of such anticipated high flows in mobilizing sediment and associated nutrients which have accumulated during the last decade within the Middle Snake River is of critical interest to the watershed. Beginning in March 1996, the USGS will collect water-quality samples at each of the six Middle Snake River gauging stations, in conjunction with sampling conducted as part of the NAWQA program. Samples will be collected every other week at each station through the end of June. An additional sample will be collected in the middle of July for a total of 10 samples at each station. Sampling will be based on a width and depth integrated sampling approach, and will be analyzed for total suspended sediments (not TSS), nitrate + nitrite, ammonia, TKN, dissolved orthophosphate, and total phosphorus. Field parameters will include water temperature, pH, specific conductance, and DO. Sample "splits" will be provided to the DEQ personnel on a periodic basis to evaluate the comparability of laboratory procedures.

4. **RALSTON AND ASSOCIATES BATHYMETRIC STUDY**
   This is a bathymetric study contracted by the DEQ at three locations on the Middle Snake River for the purpose of determining the effect of high flows (in the 1996 water year) on

sediment flushing. The locations being studied are: Upper Salmon Falls Dam, Lower Salmon Falls Dam, and Bliss Dam. A hydrographic survey will be conducted using a land-based hydrographic survey system and a survey quality depth sounder, which are then interfaced with a hydrographic survey software program that details the transects and spacing of soundings along the transect. Horizontal position and depth at predetermined intervals are automatically recorded. Soundings are made every ten feel along each transect to increase accuracy of the survey for comparison with future surveys. Transect spacing of 100 feet will also improve accurace and increase the likelihood of detecting irregularities in the river bottom.

5. **CONTINUAL MONITORING OF THE MID-SNAKE RIVER AND TRIBUTARIES**
The Middle Snake River will continue to be monitored every two weeks for the entire year. Sampling runs from Upper Twin Falls Reservoir to Upper Salmon Falls Dam. Parameters for analysis include BOD5, fecal coliform, fecal streptococci, total suspended solids (TSS), fixed solids, TP, hydrolyzable phosphorus, soluble reactive phosphorus, TKN, nitrite + nitrate, and ammonia. Field parameters include water temperature, DO, specific conductivity, pH, redox, total dissolved solids, turbidity, % saturation, and Secchi depth. Monitoring on the tributaries includes East Perrine Coulee, LQ/LS Drain, Rock Creek, Cedar Draw, Mud Creek, Deep Creek, and Salmon Falls Creek. Parameters for analysis are similar for the Middle Snake River, as are the field parameters (except for Secchi depth).

6. **ADDITIONAL STUDY REQUEST FOR IDAHO POWER COMPANY**
As a consequence of the FERC relicensing process and concerns raised on the impact of impoundments on the Middle Snake River, the DEQ requested Additional Study Requests (ASRs) of Idaho Power Company (IPC). The DEQ submitted two ASRs pursuant to §4.32(b)(7) of the FERC's regulations. The studies requested by the DEQ are essential to understanding the impacts of IPC's hydropower projects on the water quality of the Middle Snake River reach. These ASRs include:

**ASR 1**
The DEQ recommended that IPC study the impact of the Upper Salmon Falls (FERC #2777), Lower Salmon Falls (FERC #2061), and Bliss (FERC #1975) hydroelectric projects on nutrient processing and sediment dynamics on the Middle Snake River. This study will examine the impact of the projects on water quality through detailed water quality data collection and computer modeling of current and predicted water quality conditions in the Middle Snake River. The results of the modeling efforts will be used to determine adequacy and validity of the proposed prevention, mitigation, and enhancement measures. The objectives of the study are to:

a. Determine the effect these projects have on the ability of the Middle Snake River to process nutrients.
b. Determine the effect of these projects on sediment transport, accumulation, and retention.
c. Determine the effect of sediment on water column nutrient levels.
d. Determine the role of sediment as a nutrient source or sink for water column nutrients.

All of these are to be investigated on a year round basis so as to capture seasonal changes of the effects of the projects on the Middle Snake River. Furthermore, they must be analyzed in enough detail to permit assessment of impacts of the facilities on nutrient processing.

**ASR 2**

The DEQ recommended that IPC study the impact of the Upper Salmon Falls (FERC #2777), Lower Salmon Falls (FERC #2061), and Bliss (FERC #1975) hydroelectric projects on nutrient processing and sediment dynamics in the Middle Snake River. The individual project license applications do not adequately analyze data collected by IPC during the preapplication period. The objectives of this study are to:

a. More fully explain the methodology used in the water quality studies.
b. Discuss why IPC believed that the methodology accurately characterized water quality conditions in the Middle Snake River.
c. Do additional data analysis on water quality information already collected.
d. Discuss how the projects impact the water quality conditions.

# CHAPTER 5
# SCHEDULE AND LONG-TERM STRATEGY

## 5.00 PRELIMINARY

This chapter sets forth the schedule and long-term strategy for implementation of the phased Middle Snake River WMP. Phase I will address total phosphorus. Phase II will address Sediment. Phase III will address nitrogen. Phase IV will evaluate flow. And, Phase V will address other pollutants as defined by the DEQ and the Middle Snake River WAG.

## 5.01 LONG-TERM STRATEGY

The goal of the Middle Snake River WMP is to restore beneficial uses within ten years through total phosphorus reduction efforts. Sediment and nitrogen will also be addressed in subsequent phases. The Middle Snake River WMP is a phased TMDL, beginning with an initial phase of five years for TP, proceeding to sediment (commencing about two years or sooner after plan initiation), and then to nitrogen sources (commencing about three years after plan initiation). Within the first three years of Phase I certain management actions on the part of the Middle Snake River industries (see the Appendix A for the industry plans) and the DEQ will commence so that the phased WMP process continues on an annual basis for review. See **TABLE 2** in Chapter 1 of this WMP.

### 5.01.01 RESTORING BENEFICIAL USES AND STATE WATER QUALITY STANDARDS

The long-term strategy on the eight priority stream segments that are scheduled in the Middle Snake River WMP, are: (1) to restore all beneficial uses to full support, and (2) to comply with all state water quality standards. To accomplish this, management actions and pollution control efforts will focus on both point and nonpoint sources to meet the demands of a WMP for the watershed. The beneficial uses that have been shown to be impaired are reviewed in **TABLE 38.**

**TABLE 38. IMPAIRED BENEFICIAL USES ON THE MIDDLE SNAKE RIVER.**

| Impaired Beneficial Use | Criteria Being Violated |
|---|---|
| Aquatic Life Beneficial Use: Cold Water Biota | DO; Temperature; Turbidity; Excess Nutrients; Sediment; Floating, Suspended or Submerged Matter |
| Aquatic Life Beneficial Use: Salmonid Spawning | DO; Temperature; Turbidity; Excess Nutrients; Sediment; Floating, Suspended or Submerged Matter |
| Recreation: Primary Contact | Fecal Coliform; Excess Nutrients; Sediment; Floating, Suspended or Submerged Matter |
| Recreation: Secondary Contact | Fecal Coliform; Excess Nutrients; Sediment; Floating, Suspended or Submerged Matter |
| Wildlife Beneficial Use | DO; Temperature; Sediment; Excess Nutrients; Floating, Suspended or Submerged Matter |
| Aesthetics Beneficial Use | Nuisance aquatic vegetation; Sediment; Excess Nutrients; Floating, Suspended or Submerged Matter |

There is no state water quality standard for TP. However, the target goal of 0.075 mg/L TP at Gridley Bridge, Hagerman, Idaho will be utilized as a guide to achieve compliance with State water quality standards. This was agreed to by all industries on the Middle Snake River. Achieving 0.075 mg/L TP will result in a 20-30% reduction in nuisance aquatic vegetation within ten (10) years of final plan implementation. The RBM10 Model will assist in evaluating management actions and pollution reduction strategies as monitoring data is collected annually on those tributaries and agricultural drains as well as on point sources that impact the Middle Snake River.

### 5.01.02 TP AS THE INITIAL COMPONENT OF THE MIDDLE SNAKE RIVER WMP

The TP pollutant loadings to the Middle Snake River were initially addressed in this WMP through TP reductions from all sources which will achieve both a reduction in aquatic vegetation and a reduction in sediment. However, instream TP reductions from point sources alone would well help the Middle Snake River towards a more fuller recovery. TP will continue to be addressed in each subsequent phase of the Middle Snake River WMP because of its linkage to sediment.

### 5.01.03 SEDIMENT AND NITROGEN WMP DEVELOPMENT

Sediment will be addressed in the Phase II of the Middle Snake River WMP. Nitrogen will be addressed in Phase III of the Middle Snake River WMP. Initially, all sources for both these pollutants will need to be identified. The management strategy for sediment and nitrogen is yet to be developed by the industries and the Middle Snake River WAG. This will be developed by the WAG as they advise the DEQ within three years of final plan implementation. Monitoring will also be developed, especially if nonpoint source voluntary BMPs are being applied.

Phase IV of the Middle Snake River WMP will evaluate alteration of flow with water quality.

### 5.01.04 FLOW IMPACTS ON TP, SEDIMENT, AND NITROGEN

It is recognized that reduced flows impact the water quality of the Middle Snake River. Therefore, within three (3) years of final plan approval, a working committee (to be called the Flow Task Force) will be formed by the Middle Snake River WAG for purposes of identifying minimum and/or altered flows needed to assist in the improvement of water quality and beneficial uses on the Middle Snake River. Representation in the task force will include those key agencies and organizations who will assist in defining the process or steps towards acquiring higher flows on the Middle Snake River. This task force will help to define more fully those goals and strategies of Phase IV of the Middle Snake River WMP. It is accepted that the effects of TP loadings is impacted by flow conditions. The more water in river system, the less the impact from TP.

### 5.01.05 WHAT IF BENEFICIAL USES AND WATER QUALITY STANDARDS CANNOT BE MET?

If the implementation of the WMP does not result in achieving water quality goals, then the WMP is reviewed by the DEQ and the Middle Snake River WAG to determine if further pollution controls are necessary and/or if goals of the WMP are achievable. However, it is possible that goals may not be reached because eutrophication impacts cannot be corrected without causing severe economic impacts. If this happens and if it appears that some beneficial uses cannot be fully supported after implementation of pollution controls, the DEQ will conduct a Use Attainability Analysis on the stream to evaluate whether protected beneficial uses need to be modified. Any change to State water quality standards would require the approval of the EPA At this time, all agencies and industries involved in the development of the WMP agree that attaining State water quality standards within a sufficient amount of time is a realistic goal with the implementation of industry management strategies and appropriate pollutant reductions.

## 5.02 SCHEDULING

This WMP will be submitted to the EPA for approval by the end of 1996. The EPA must either approve or disapprove the Middle Snake River WMP within 30 days after submission. When approved, the EPA will transmit a letter of such approval. If the EPA disapproves the Middle Snake River WMP and if the state of Idaho does not agree or correct the alleged problems, then, the EPA must within 30 days of the disapproval date, establish a WMP that is necessary to implement water quality standards.

As part of the Middle Snake River WMP, two milestone targets are included: a short-term phase milestone and a long-term phase milestone. These are discussed as follows.

### 5.02.01 SHORT-TERM PHASE MILESTONES

The short-term phase of the Middle Snake River WMP will be for five (5) years. Within this five year period the industries will be collecting data within the first three years. For point sources, the DEQ will review the DMRs for the aquaculture, food processor, and municipality industries and provide the Middle Snake River WAG quarterly and annual reports on the TP effluent values being reported. TSS and nitrogen will also be reported. Point source industries will receive a more detailed report on a facility-by-facility basis. Nonpoint sources will also be monitoring and reporting their reduction goals to the DEQ and the Middle Snake River WAG. In the first three (3) years of the short-term phase, the data collected will be reviewed by the Middle Snake River WAG, the DEQ, and the EPA to determine compliance with industry plans. As part of the reporting and review process under the Middle Snake River WMP, the Middle Snake River WAG, in conjunction with the DEQ and the EPA, will evaluate and refine the following goals:

1. Refine the certainty of loadings to the Middle Snake River for TP by industry on an annual basis.

2. Refine the sediment and the various forms of nitrogen for the next phases of the WMP process.

3. Refine the certainty of the RBM10 and begin to expand the modeling to incorporate sediment and nitrogen components. The DEQ is prepared and willing to assist in this effort.

4. Refine and evaluate flow impacts on water quality and develop strategies for flow augmentation as a management tool.

### 5.02.02 LONG-TERM PHASE MILESTONES

As previously discussed, the Middle Snake River WMP is a phased TMDL that proposes pollution reduction strategies in TP and achievement of instream water quality standards for restoration of beneficial uses within ten (10) years of final plan implementation on the Middle Snake River. The DEQ proposes to begin writing the second phase of the WMP (on sediment) within three (3) years of final plan implementation which will include:

1. Evaluation of monitoring data on the Middle Snake River;

2. Establishment of water quality targets for sediment and nitrogen on the Middle Snake River; and,

3. Establishment of pollution control strategies to reduce sediment and nitrogen on an industry basis.

## 5.03 FEEDBACK LOOP

The **feedback loop** is a component of the Middle Snake River WMP strategy that provides for accountability of plan goals. For the Middle Snake River WMP (Phase 1) the main goal is to reach the instream water quality target of 0.075 mg/L TP at Gridley Bridge, Hagerman, Idaho within ten years of final plan implementation. In order to ascertain the reality of management strategies, industries cannot wait until Year 10 to make management decisions on the effectivenes of their industry Watershed Reduction Plans.

In order for the feedback loop to be successful in the Middle Snake River WMP, there needs to be a concrete mechanism for the DEQ and the Middle Snake River 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 are not effective in achieving state water quality standards.

In order to make the feedback loop effective and meaningful, the DEQ will review all monitoring results for point and nonpoint sources, and will report industry results to the WAG on a quarterly basis, and on a facility-by-facility basis to their particular industry. Each industry will provide an annual report to the DEQ and to the Middle Snake River WAG on its montoring efforts, strategies, and on-going reduction mechanisms. Each industry will provide its data in their annual report. An annual report (or Water Quality Status Report of the Mid-Snake TMDL) will then be compiled by the DEQ for the Middle Snake River WAG with the DEQ's conclusions and proposed recommendations. Agencies that may have monitoring components that reflect the validity of applied BMPs to a facility or a stream will be included by reference in the annual status report with the DEQ's recommendations for continual performance of those BMPs that aid water quality and the beneficial uses. In addition, the DEQ will assist, where necessary, in the revision of annual monitoring plans for an industry or for any facility (whether point or nonpoint). The Mid-Snake TMDL functions as an iterative plan and, therefore, all industry plans are iterative and developing as new knowledge and technology is discovered for pollution reduction efforts. The DEQ will include in the annual status report, a review of industry monitoring plans with appropriate discussion relative to their strengths and weaknesses so that improvements can be documented.

In terms of nonpoint sources, the DEQ and other land management agencies (i.e., USFS, BLM, NRCS, SCC, SCDs) will provide technical assistance in the development of strategic management decisions for BMP applications that will assist any industry in resolving pollution problems relative to nonpoint sources. The incorporation of BMPs or the development of new BMPs for application to nonpoint pollution will be discussed and refined continually by the Irrigated Agriculture Industry, the Grazing Industry, the Middle Snake River WAG, and the DEQ. Discussions will address but not be limited to such activities that impact water quality from nonpoint sources. As such, the nonpoint source feedback loop process will include: (1) identification of water quality criteria, (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. Monitoring of BMPs will be coordinated between the agencies, organizations, and private land owners by the DEQ and Middle Snake River WAG.

# Acronyms

| ACRONYM | ACTUAL NAME |
|---|---|
| **BAG** | Basin Advisory Group |
| **BLM** | United States Department of Interior<br>Bureau of Land Management |
| **BMP or BMPs** | Best Management Practice or Best Management Practices |
| **BOD or BOD5** | Biological Oxygen Demand or 5-day Biological Oxygen Demand |
| **BOR** | United States Department of Interior Bureau of Reclamation |
| **CAFO** | Confined Animal Feeding Operations |
| **CBOD** | Carbonaceous Biological Oxygen Demand |
| **CFO** | Confined Feeding Operations |
| **CFR** | Code of Federal Regulations |
| **cfs** | Cubic feet per second |
| $\mathbf{CR_{24}}$ | Community Respiration (24-hour) |
| **CSO** | Combined Sewer Overflow |
| **CWA** | Clean Water Act |
| **cwt** | Hundred-weight |
| **DEQ** | Division of Environmental Quality |
| **DO** | Dissolved Oxygen |
| **DMR or DMRs** | Discharge Monitoring Report or Discharge Monitoring Reports |
| **EAC** | Executive Advisory Committee |
| **EPA** | United States Environmental Protection Agency |
| **EPHA** | Idaho Environmental Protection and Health Act |
| **ESA** | Endangered Species Act |
| **FERC** | Federal Energy Regulatory Commission |
| **FIRE** | Financial, insurance, and real estate |

| ACRONYM | ACTUAL NAME |
|---|---|
| GIS | Geographic Information System |
| GPP | Gross Primary Productivity |
| GPS | Global Positioning System |
| GRP | Gross Regional Product |
| HUC or HUCs | Hydrologic Unit Code or Hydrologic Unit Codes |
| IAA | Idaho Aquaculture Association |
| IACI | Idaho Association of Commerce and Industry |
| IDAPA | Idaho Administrative Procedures Act |
| IDAEMP | ID Economic Modeling Project |
| IDE | Idaho Department of Employment |
| IDFG | ID Department of Fish and Game |
| IDHW | Idaho Department of Health and Welfare |
| IDL | Idaho Department of Lands |
| IDWR | Idaho Department of Water Resources |
| IPC | Idaho Power Company |
| ISU | Idaho State University |
| IWMG | Idaho Waste Management Guidelines |
| IWRB | Idaho Water Resources Board |
| LA | Load Allocation |
| LC | Loading Capacity (which = TMDL = Assimilative Capacity) |
| LE | Listed Endangered |
| LT | Listed Threatened |
| MOS | Margin of Safety |
| MOU | Memorandum of Understanding |
| NAWQA | National Agriculture Water Quality Assessment |
| NMP | Nutrient Management Plan |

| ACRONYM | ACTUAL NAME |
|---|---|
| **NPDES** | National Pollutant Discharge Elimination System |
| **NPS** | Nonpoint Source |
| **NRCS** | Natural Resource Conservation Service |
| **NSSCD** | North Side Soil Conservation District |
| **POTW or POTWs** | Publicly Owned Treatment Work or Publicly Owned Treatment Works |
| **PS** | Point Source |
| **RCWP** | Rural Clean Water Project |
| **RM or R.M.** | USGS River Mile |
| **RV** | Recreational Vehicle |
| **SAWQP** | State Agricultural Water Quality Program |
| **SCC** | Soil Conservation Commission |
| **SCD or SCDs** | Soil Conservation District or Soil Conservation Districts |
| **SCIRO** | South Central Idaho Regional Office (DEQ's Twin Falls office) |
| **SCR** | South Central Region of Idaho |
| **SCS** | Soil Conservation Service |
| **sp** | Species |
| **SSOCs** | Stream Segments of Concern |
| **TAC** | Technical Advisory Committee |
| **TFRO** | Twin Falls Region Office (of the DEQ) |
| **TKN** | Total Kjeldahl Nitrogen |
| **TMDL or TMDLs** | Total Maximum Daily Load or Total Maximum Daily Loads |
| **TP** | Total Phosphorus |
| **TRM** | Total Resource Management |
| **TSS** | Total Suspended Solids |
| **U of I** | University of Idaho |

| ACRONYM | ACTUAL NAME |
|---|---|
| **USACOE** | United States Army Corps of Engineers |
| **USBOR** | United States Bureau of Reclamation |
| **USDA** | United States Department of Agriculture |
| **USFS** | United States Forest Service |
| **USFWS** | United States Fish and Wildlife Service |
| **USGS** | United States Geological Survey |
| **WAG** | Watershed Advisory Group |
| **WLA** | Waste Load Allocation |
| **WMP or WMPs** | Watershed Management Plan or Watershed Management Plans |
| **WQLS or WQLSs** | Water Quality Limited Segment or Water Quality Limited Segments |
| **WQSR** | Water Quality Status Report |

# Glossary

**Aquifer** - a water-bearing bed or stratum of permeable rock, sand, or gravel capable of yielding considerable quantities of water to wells or springs.

**Acre-foot** - the volume of water required to cover 1 acre of land (43,560 cubic feet) to a depth of one foot; this is equivalent to 325,851 gallons.

**Adsorption** - the adhesion of one substance to the surface of another; clays, for example, can adsorb phosphorus and organic molecules.

**Aerobic** - describes life or processes that require the presence of molecular oxygen.

**Agronomic Rate** - Amount of materials and/or nutrients applied to soil to meet specific crop needs in addition to naturally occurring nutrient utilization such as volatilization, denitrification, and soil reservoir additions based on crop and soil research information for specific environments.

**Algae** - small aquatic plants that occur as single cells, colonies, or filaments.

**Anaerobic** - describes processes that occur in the absence of molecular oxygen.
For glossary:

**Antidegradation** - A federal regulation requiring the States to protect high quality waters. Waters standards may be lowered to allow important social or economic development only after adequate public participation. In all instances, the existing beneficial uses must be maintained.

**Aquatic** - growing, living, or frequenting water.

**Assimilative Capacity** - an estimate of the amount of pollutants that can be discharged to a waterbody and still meet the state water quality standards. It is the equivalent of the Loading Capacity which is the equivalent of the TMDL for the waterbody.

**Autotrophic** - an ecosystem is considered autotrophic if the majority of the energy required for growth and maintenance of organisms is produced by plants within the system.

**Bedload** - sand, silt, gravel, or soil and rock detritus carried by a stream on or immediately above (3") its bed.

**Beneficial uses** - any of the various uses which may be made of the water of an area, including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics.

**Benthic organic matter** - the organic matter on the bottom of the river.

**Benthic** - pertaining to or living on the bottom or at the greatest depths of a body of water.

**Benthos** - macroscopic (seen without aid of a microscope) organisms living in and on the bottom sediments of lakes and streams. Originally, the term meant the lake bottom, but it is now applied almost uniformly to the animals associated with the substrate.

**Best Management Practice (BMP)** - a measure determined to be the most effective, practical means of preventing or reducing pollution inputs from point or nonpoint sources in order to achieve water quality goals.

**Biochemical oxygen demand (BOD)** - the rate of oxygen consumption by organisms during the decomposition (= respiration) of organic matter, expressed as grams oxygen per cubic meter of water per hour.

**Biomass** - the weight of biological matter. Standing crop is the amount of biomass (e.g., fish or algae) in a body of water at a given time. Often measured in terms of grams per square meter of surface.

**Biomass Accumulation** - a measure of the density and lateral and downstream extent of plant growth across a waterbody.

**Biota** - All plant and animal species occurring in a specified area.

**Ceratophyllum** - a genus of aquatic macrophyte in the Mid-Snake, it does not have a well developed root system and gets most of its nitrogen and phosphorus from the water column.

**Cfs** - cubic feet per second, a unit of measure for the rate of discharge of water. One cubic foot per second is the rate of flow of a stream with a cross section of one square foot which is flowing at a mean velocity of one foot per second. It is equal to 448.8 gallons per minute, or 1.98 acre-foot per day.

**Cladophora** - a genus of aquatic epiphyte in the Mid-Snake, it derives all of its nutrients from the water column.

**Coliform bacteria** - a group of bacteria predominantly inhabiting the intestines of man and animal but also found in soil. While harmless themselves, coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms.

**Decomposition** - the transformation of organic molecules (e.g., sugar) to inorganic molecules (e.g., carbon dioxide and water) through biological and non-biological processes.

**Designated Beneficial Use or Designated Use** - Those beneficial uses assigned to identified waters in Idaho Department of Health and Welfare Rules, Title 1, Chapter 2, "Water Quality Standards and Wastewater Treatment Requirements:, Sections 110. through 160. and 299., whether or not the uses are being attained.

Designated SSOCs receive priority for water quality management actions and monitoring by state and federal agencies to demonstrate effectiveness of actions in restoring and protecting beneficial uses. A coordinated water quality monitoring program has been implemented to provide the public and resource agencies information on current and ongoing trends in water quality, the status of beneficial uses, and the effectiveness of BMPs in meeting water quality standards and protecting existing beneficial uses for each SSOC.

**Dissolved oxygen** - commonly abbreviated D.O., it is the amount of oxygen dispersed in water and is usually expressed as mg/L (ppm). The amount of oxygen dissolved in water is affected by temperature, elevation, and total dissolved solids.

**Ecology** - scientific study of relationships between organisms and their environment; also defined as the study of the structure and function of nature.

**Ecosystem** - a complex system composed of a community of flora and fauna taking into account the chemical and physical environment with which the system is interrelated; ecosystem is usually defined to include a body of water and its watershed.

**Environment** - collectively, the surrounding conditions, influences, and living and inert matter that affect a particular organism or biological community.

**Epiphyte** - a plant that grows upon another plant nonparasitically or sometimes upon some other object, derives its nutrients from the air, water or debris accumulating around it.

**Erosion** - the wearing away of areas of the earth's surface by water, wind, ice, and other forces. **Culturally-induced erosion** is that caused by increased runoff or wind action due to the work of man in deforestation, cultivation of the land, overgrazing, and disturbance of the natural drainage; the excess of erosion over that normal for the area.

**Eutrophic** - from Greek for "well-nourished," describes a body of water of high photosynthetic activity and low transparency.

**Eutrophication** - the process of physical, chemical, and biological changes associated with nutrient, organic matter, and silt enrichment and sedimentation of a body of water. If the process is accelerated by man-made influences, it is termed cultural eutrophication. Eutrophication refers to natural or artificial addition of nutrients to waterbodies and to the effects of added nutrients.

**Existing Beneficial Use or Existing Use** - Those beneficial uses actually attained in waters on or after November 28, 1975, whether or not they are designated for those waters in Idaho Department of Health and Welfare Rules, Title 1, Chapter 2, "Water Quality Standards ad Wastewater Treatment Requirements."

**Exotic Species** - non-native or introduced species.

**Feedback Loop** - a component of a watershed management plan strategy that provides for accountability on targeted watershed goals.

**Flow** - the water that passes a given point in some time increment.

**Freshet** - a great rise of a stream caused by heavy rain or melting snow.

**Gross Primary Productivity (GPP)** - an indicator of the total amount of photosynthesis in a system.

**Groundwater** - water found beneath the soil's surface; saturates the stratum at which it is located; often connected to surface water.

**Growth Rate** - the amount of new plant tissue produced per a given time unit of time. It is also a measure of how quickly a plant will develop and grow.

**Habitat** - a specific type of place that is occupied by an organism, a population or a community.

**Headwater** - the origin or beginning of a stream.

**Hydrologic basin** - The area of land drained by a river system, a reach of a river and its tributaries in that reach, a closed basin, or a group of streams forming a drainage area. There are six basins described in the Nutrient management Act (NMA) for Idaho -- Panhandle, Clearwater, Salmon, Southwest, Upper Snake, and the Bear Basins.

**Hydrologic cycle** - the circular flow or cycling of water from the atmosphere to the earth (precipitation) and back to the atmosphere (evaporation and plant transpiration). Runoff, surface water, groundwater, and water infiltrated in soils are all part of the hydrologic cycle.

**Influent** - a tributary stream.

**Inorganic** - materials not derived from hydrocarbons.

**Irrigation return flow** - surface and subsurface water which leaves the field following the application of irrigation water.

**LA** - Load Allocation for nonpoint sources.

**Land Application** - a process or activity involving application of wastewater, surface water, or semi-liquid material to the land surface for the purpose of disposal, pollutant removal, or groundwater recharge.

**Lava Plain** - a broad stretch of nearly level to gently undulating surface underlain by basaltic flows.

**Limiting** - a chemical or physical condition that determines the growth potential of an organism, can result in less than maximum or complete inhibition of growth, typically results in less than maximum growth rates.

**Limnology** - scientific study of fresh water, especially the history, geology, biology, physics, and chemistry of lakes.

**Load Allocation** - The amount of pollutant that nonpoint sources can release to a waterbody.

**Loading** - the quantity of a substance entering a receiving stream, usually expressed in pounds (kilograms) per day or tons per month. Loading is calculated from flow (discharge) and concentration.

**Loading Capacity** - a mechanism for determining how much pollutant a waterbody can safely assimilate without violating state water quality standards. It is also the equivalent of a TMDL.

**Loam** - moderately coarse, medium and moderately fine-textured soils that include such textural classes as sandy loam, fine sandy loam, very fine sandy loam, silt loam, silt, clay loam, sandy clay loam and silty clay loam.

**Luxury Consumption** - a chemical phenomenon in which sufficient nutrients are available in either the sediments or the water column of a waterbody, and the aquatic plants take up and store an abundance in excess of the plant's actual needs.

**Macroinvertebrates** - aquatic insects, worms, clams, snails, and other animals visible without aid of a microscope, that may be associated with or live on substrates such as sediments and macrophytes. They supply a major portion of fish diets and consume detritus and algae.

**Macrophytes** - rooted and floating aquatic plants, commonly referred to as waterweeds. These plants may flower and bear seed. Some forms, such as duckweed and coontail (*Ceratophyllum*), are free-floating forms without roots in the sediment.

**Margin of safety** - an implicit or explicit component of water quality modeling that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving waterbody.

**Mean** - the arithmetic mean is the most common statistic familiar to most people. The mean is calculated by summing all the individual observations or items of a sample and dividing this sum by the number of items in the sample. The geometric mean is used to calculate bacterial numbers. The geometric mean is a back-transformed mean of the logarithmically transformed variables.

**Meter** - the basic metric unit of length; 1 meter = 39.37 inches or 3.28 feet.

**Milligrams per liter (mg/L)** - see parts per million.

**Monitoring** - the process of watching, observing, or checking (in this case water). The entire process of a water quality study including: planning, sampling, sample analyses, data analyses, and report writing and distribution.

**MOS** - Margin of Safety. This accounts for any lack of knowledge concerning the relationship between pollutant loads and the water quality of the receiving waterbody. It is a required component of a TMDL and is normally incorporated into the conservative assumptions used to develop the TMDL (generally within the calculations or models) and is approved by the EPA either individually or in State/EPA agreements. Thus, the TMDL = LC = WLA + LA + MOS.

**Mouth** - the location where a water body flows into a larger waterbody.

**National Pollution Discharge Elimination System (NPDES)** - a national program from the Clean Water Act for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcement permits, and imposing and enforcing pretreatment requirements.

**Nitrogen** - a nutrient essential to plant growth, often in more demand than available supply.

**Nonpoint Source** - A geographical area on which pollutants are deposited or dissolved or suspended in water applied to or incident on that area, the resultant mixture being discharged into the waters of the state. Nonpoint source activities include, but are not limited to irrigated and nonirrigated lands used for grazing, crop production and silviculture; log storage or rafting; construction sites; recreation sites; and septic tank disposal fields.

**Nuisance** - anything which is injurious to the public health or an obstruction to the free use, in the customary manner, of any waters of the state.

**Nutrient** - an element or chemical essential to life, such as carbon, oxygen, nitrogen, and phosphorus.

**Nutrient cycling** - the flow of nutrients from one component of an ecosystem to another, as when macrophytes die and release nutrients that become available to algae (organic to inorganic phase and return).

**Oligotrophic** - "poorly nourished," from the Greek. Describes a body of water with low plant productivity and high transparency.

**Organic matter** - molecules manufactured by plants and animals and containing linked carbon atoms and elements such as hydrogen, oxygen, nitrogen, sulfur, and phosphorus.

**Oxygen-demanding Materials** - those materials in a waterbody in such concentrations that would result in an anaerobic water condition. Sediment could be considered an oxygen-demanding material ("anaerobic sediment") if aquatic conditions are such that TP is released directly back into the water column from the sediment to become available for increased algal and macrophyte production in the immediate area and downstream of the anaerobic location.

**Periphyton** - attached microscopic organisms growing on the bottom or other submersed substrates in a waterway.

**pH** - a measure of the concentration of hydrogen ions of a substance, which ranges from very acid (pH = 1) to very alkaline (pH = 14). pH 7 is neutral, and most lake waters range between 6 and 9. pH values less than 7 are considered acidic, and most life forms cannot survive at pH of 4.0 or lower.

**Phased TMDL** - A TMDLwhich identifies interim load allocations with further monitoring to gauge success of management industry actions in achieving load reduction goals and the effect of actual load reductions on the water quality of a waterbody. Under a phased TMDL, the TMDL has load allocations and wasteload allocations calculated with margins of safety to meet water quality standards.

**Phosphorus** - a nutrient essential to plant growth, typically in more demand than the available supply.

**Phytoplankton** - microscopic algae and microbes that float freely in open water of lakes and oceans.

**Point source pollution** - the type of water quality degradation resulting from the discharges into receiving waters from sewers and other identifiable "points." Common point sources of pollution are the discharges from industrial and municipal sewage plants.

**Potamogeton** - a genus of aquatic macrophyte in the Mid-Snake, it has a well developed root system and gets most of its nitrogen and phosphorus from sediment.

**Pretreatment** - the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a POTW.

**Primary productivity** - the rate at which algae and macrophytes fix or convert light, water, and carbon dioxide to sugar in plant cells. Commonly measured as milligrams of carbon per square meter per hour.

**Reach** - a continuous unbroken stretch of river.

**Respiration** - process by which organic matter is oxidized by organisms, including plants, animals, and bacteria. The process releases energy, carbon dioxide, and water.

**Riparian vegetation** - vegetation that is associated with aquatic (streams, rivers, lakes) habitats.

**Risk Analysis** - a procedure performed to determine the risk of not achieving a prescribed goal.

**Run-of-river** - Operating on the flow of the river without modification by upstream storage

**Runoff** - the portion of rainfall, melted snow, or irrigation water that flows across the surface or through underground zones and eventually runs into streams.

**Scabland** - an elevated tract of bare or shallow soiled rocky land in the Northwest caused especially by denudation of the soil mantle or prevention of its formation

**Sediment** - bottom material in a body of water that has been deposited after the formation of the basin. It originates from remains of aquatic organism, chemical precipitation of dissolved minerals, and erosion of surrounding lands.

**Sestonic** - free-floating particles in water.

**Settleable solids** - the volume or weight of material that settles out of a liter of water in one hour.

**Specific conductance** - also known as specific conductivity. It is a numerical expression of the ability of an aqueous solution to carry electric current, expressed in umhos/cm at 25°C. Conductivity is defined as the reciprocal of the resistivity normalized to a 1 cm cube of liquid at a specific temperature.

**Stream Segments of Concern (SSOCs)** - Stream segments nominated by the public and designated by a committee whose members are appointed by the Governor. Designated SSOCs in the Mid-Snake watershed are identified in The Water Quality Advisory Working Committee Designated Stream Segments of Concern, 1992-1994 (DEQ, 1993). The designated SSOCs for this watershed are: Cassia Creek (PNRS #438.00), Shoshone Creek (PNRS #466.00 and #467.00), Big Wood River (PNRS #481.00, #482.00, and #483.00), Little Wood River (PNRS #511.00 and #512.00), Silver Creek

(PRNS #517.00 and #518.00), Camas Creek (PNRS #532.00), Willow Creek (PNRS #534.00), Elk Creek (PNRS #535.00), Soldier Creek (PNRS #538.00), Coral Creek (PNRS #543.00), Lower Salmon Falls (PNRS #372.00), Upper Salmon Falls (PNRS #373.00, Clover Creek (PNRS #381.00), Billingsley Creek (PNRS #384.00), Vinyard Creek (PNRS #407.00), and Rock Creek (PNRS #87.00).

**Sub-watershed** - smaller geographic management areas within a watershed delineated for purposes of addressing site specific situations.

**Threatened species** - a species, determined by the U.S. Fish and Wildlife Service, which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

**TMDL** - Total Maximum Daily Load. TMDL = LA + WLA + MOS. A TMDL is the equivalent of the Loading Capacity which is the equivalent of the assimilative capacity of a waterbody.

**Total suspended solids (TSS)** - the material retained on a 45 micron filter after filtration

**Tributary** - a stream feeding into a larger stream or lake.

**Turbidity** - a measure of the extent to which light passing through water is reduced due to suspended materials. Excessive turbidity may interfere with light penetration and minimize photosynthesis, thereby causing a decrease in primary productivity. It may alter water temperature and interfere directly with essential physiological functions of fish and other aquatic organisms, making it difficult for fish to locate a food source.

**Vadose zone** - The zone containing water under less pressure than that of the atmosphere, including soil water, intermediate vadose water, and capillary water. This zone is limited above by the land surface and below the surface of the zone of saturation, that is, the water table.

**Waste Load Allocation** - the portion of receiving water's loading capacity that is allocated to one of its existing or further point sources of pollution. It specifies how much pollutant each point source can release to a waterbody.

**Water column** - water between the interface with the atmosphere at the surface and the interface with the sediment layer at the bottom. Idea derives from vertical series of measurements (oxygen, temperature, phosphorus) used to characterize water.

**Water Pollution** - Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to fish and wildlife, or to domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.

**Water quality Management plan** - a state or areawide waste treatment management plan developed and updated in accordance with the provisions of the Clean Water Act.

**Water Quality limited segment (WQLS)** - any segment where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards.

**Water table** - the upper surface of groundwater; below this point, the soil is saturated with water.

**Watershed** - a drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation. The whole geographic region contributing to a water body.

**Wetlands** - lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have the following three attributes: (1) at least periodically, the land supports predominately hydrophytes; (2) the substrate is predominately undrained hydric soil; and

(3) the substrate is on soil and is saturated with water or covered by shallow water at some time during the growing season of each year.

**WLA** - Wasteload Allocation for point sources.

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