The Middle Snake River Watershed Management Plan

Phase 1 TMDL
Total Phosphorus

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and the major water user industries:

Aquaculture
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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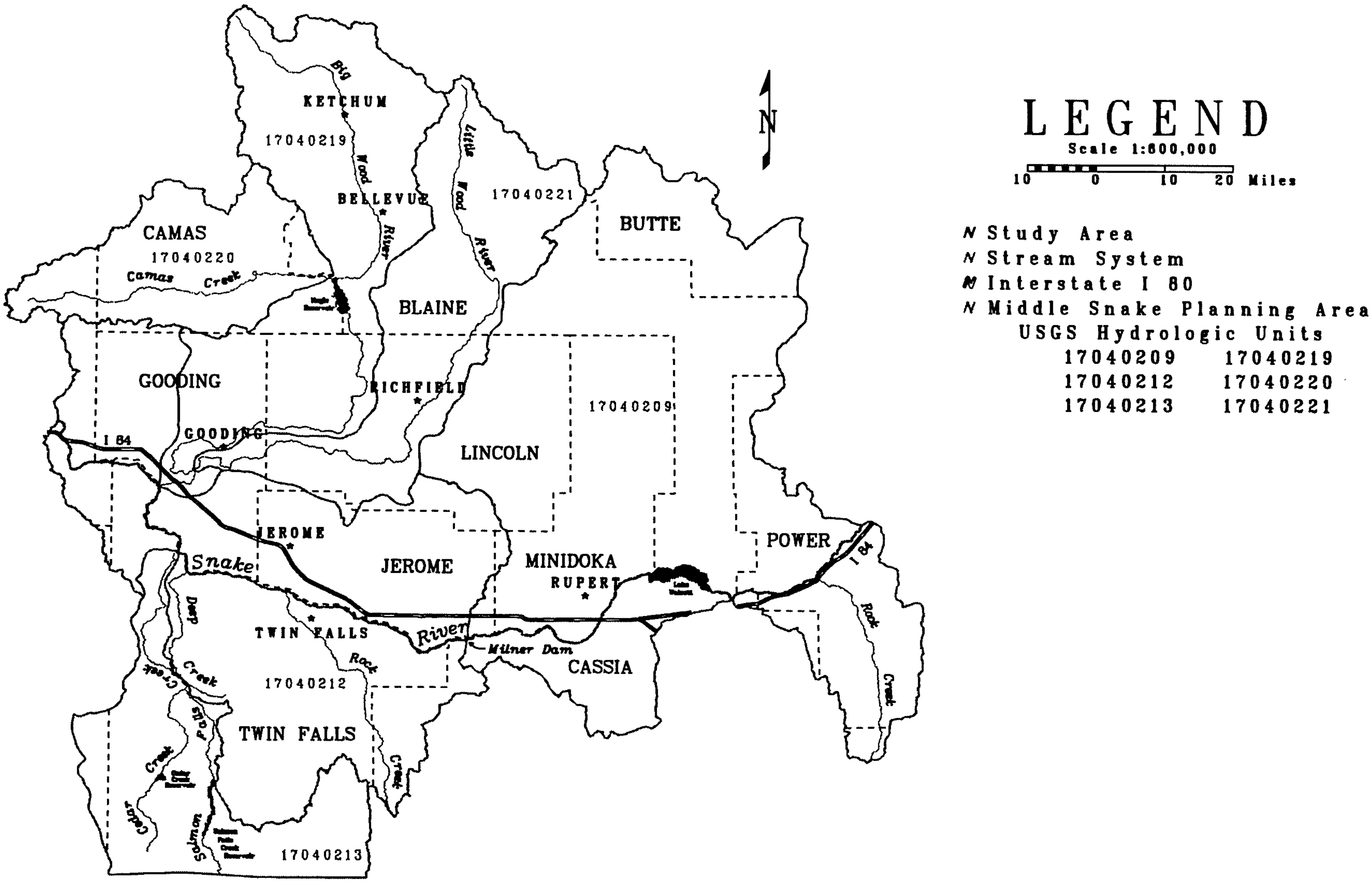

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CHAPTER 1
INTRODUCTION

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.

Phase Prioritization	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
I. Total Phosphorus	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx									
II. Sediment			xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx							
III. Nitrogen				xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx						
IV. Flow					xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx					
V. Other(s) as Needed						xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx				

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 2000+ in surplus water years
Tributaries	2300 cfs
80 Irrigation Return Flows: Twin Falls Canal Company & North Side Canal Company	250 cfs (TFCC) 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 μm (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 calibrate 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] 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)
Hageman	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 LA 000038	NA	0	NA	0
RussetValleyMarketing (Kimberly)	LA-000041 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 the 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 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
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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APPENDICES
TO
THE MIDDLE SNAKE RIVER
WATERSHED MANAGEMENT PLAN

including:

Appendix A-1: Aquaculture
Appendix A-2: CFOs
Appendix A-3: Food Processors
Appendix A-4: Hydroelectric Power
Appendix A-5: Irrigated Agriculture
Appendix A-6: Wastewater Treatment Facilities

Appendix B: Advisory Committee Members & Meeting Summaries

Appendix C: Public Comment Letters

Public comment letters includes only those letters directed specifically at the Mid-Snake TMDL and may include comments directed at the aquaculture industry. Comments directed only at the aquaculture industry are included in a special public comment binder held in repository at the DEQ-TFRO. All public comments are available to the public for viewing during normal working hours.

Appendix A-1

PROPOSED WATERSHED REDUCTION PLAN FOR AQUACULTURE FACILITIES FOR THE MIDDLE SNAKE RIVER

submitted to

Idaho Department of Health and Welfare
Division of Environmental Quality

AQUACULTURE NUTRIENT MANAGEMENT PLAN

GOALS OF THE IAA ENVIRONMENTAL ASSISTANCE COMMITTEE:

- 20% reduction in phosphorus discharges in Year 1
- Additional 20% reduction in phosphorus during next 5 years
- 40% total phosphorus reduction five years after plan implementation

MANAGEMENT ACTIONS:

1. Best Management Practice definition and implementation throughout industry
2. Development of standard industry guidelines and criteria for effluent control structures and waste system design.
3. Operator education through workshops, annual meetings, and seminars.
4. Development and implementation of Quality Assurance Program for producers.
5. Research at local, state, and federal level focusing on waste management technologies and management strategies and feeds and feeding.
6. Peer Pressure.

COMPLIANCE ACTIONS:

- NPDES Permits through EPA.
- Consent Orders/Compliance Schedules through DEQ.
- Section 401 Certification by the DEQ.

IMPLEMENTATION EFFECTIVENESS:

- Monitoring Program through combined industry programs and individual companies.
- Annual Progress Reports.

Table of Contents

Goal

The goal of this plan is to develop an environmentally sound program reducing effluent nutrients and solids emanating from aquaculture facilities thereby doing our part to protect water quality.

The primary objectives outlined in this plan include:

1. Identification of nutrient and solid sources.

2. Identification of problem areas.

3. Industry wide implementation of known effective waste management practices (Best Management Practices and/or Reasonably Achievable Control Technologies).

4. Research and development of improved waste management practices.

5. Incorporation of a "feedback loop" (as defined in Idaho law) and monitoring to refine treatment actions.

6. Education.

7. Verification and enforcement.

I. Introduction

A. History of Idaho Aquaculture

Aquaculture, a water resource based segment of agriculture, is the husbandry of aquatic plants and animals. The aquaculture industry of Idaho exists because of the abundant springs located along the Snake River, from Henry's Lake to Bliss, with the majority of aquaculture activity centered in the Magic Valley. Gentle elevation changes in some areas of the Snake River Canyon are ideal for aquaculture facilities. The first commercial trout farm was started in 1909 at Devil's Corral near Shoshone Falls. In 1914, Warren Meader of Pocatello began rainbow trout broodstock selection and egg production and by 1940 was supplying rainbow trout eggs throughout the United States. These eggs were primarily purchased by conservation organizations and various federal or state agencies. During the 1920s the Snake River bottom land was opened up to homesteading through legislation introduced by Congressman Mays of Utah. In 1928, Jack Tingey began the Snake River Trout Farm later known as Thousand Springs Trout Farm.

As the Idaho industry evolved, many advances occurred in both technology and biology. Rectangular earthen raceways were initially used for trout production and feed was made daily from dead animals (primarily horses and cattle). Feed conversions (ratio of amount of feed fed to produce a pound of trout) were approximately 7 to 1. The trout were hand processed for marketing. Beginning in the late 1940s, Rangen, Inc. of Buhl, Idaho, J.R. Clark in New Mexico and the U.S. Fish and Wildlife Service in Cortland, New York began developing pelleted feeds. The high cost of these early pelleted feeds restricted their use to feed fry only (very young fish) while the larger fish were still fed ground animals (including carp), but mixed with grains. By the mid to late 1960s, pelleted feeds were used for all fish. In the 1950s, mass selection and selective breeding for year-round spawning was developed allowing trout production throughout the year. In the 1950s the first concrete raceways were constructed, and in 1966, Clear Springs Foods, Inc. (formerly Clear Springs Trout Co.) became the first large scale commercial farm to use all concrete raceways. The industry currently consists of farms with cement raceways, raceways with cement or wooden sides, and earthen bottoms or all earthen raceways. As feed technology improved and pelleted feeds become more economical, feed delivery methods changed. Feed was first hand delivered but feed blowers were introduced in the 1960s and 1970s. By the late 1970s and 1980s many fish producers were using demand feeders, a mechanism by which the fish learn to feed themselves. A further refinement has been the introduction of computer mediated feeding.

Idaho aquaculture consists primarily of rainbow trout production, but includes catfish, tilapia, sturgeon and a variety of tropical fishes. Public resource agencies (Idaho Fish and Game; US. Fish and Wildlife Service, and tribal interests) produce various salmonid and warm water fish species for stocking into Idaho public waters. Commercially produced fish may also be stocked into public waters under the direction of the Idaho Department of Fish and Game.

Today, Idaho is one of the most successful aquaculture areas in the world. The Idaho Department of Agriculture (Phil Mamer, ID Dept. Ag.) reports 165 fish rearing permits in Idaho. It is not clear how many of these permitees commercially raise sufficient fish to impact water quality. In the mid-Snake River drainage, there are 144 fish rearing permits. Some operators may own or operate, by lease or cash rent, several permitted farms. The local industry is a significant economic factor in the region and is estimated to return over $70 million annually (Gary Fornshell, Univ. of Idaho) while employing nearly 1,000 people. Idaho produces 70% of all farm raised trout produced in the US. The vast majority of these Idaho produced fish, (approximately 95%), are exported throughout the US. and Canada as food fish for human consumption.

In 1990, the Idaho Aquaculture Association (IAA) was founded. Its mission is to foster the development of Idaho aquaculture. The IAA represents approximately 65% of the total estimated fish production in the state. Public agency hatcheries and personnel (federal and state) and non-IAA members participate in IAA programs and we encourage their participation in this Aquaculture Nutrient Management Plan. In 1993, the IAA and the US. Trout Farmers Association implemented a Quality Assurance Program to ensure product wholesomeness and good waste management. The IAA, in association with the Twin Falls IDHW-DEQ, has also begun development of aquaculture waste management facility construction guidelines.

B. Industry Practices

Good water quality is essential for successful fish culture. Water enters a raceway, is held for some brief time period (generally less than 1 hr) and is then released into the Snake River or its tributaries. Aquaculture is a non-consumptive user of water. During the time water passes through a facility, solids such as waste feed or inorganic sediments, settle-out and collect at the bottom of the pond or raceway. As knowledge of water quality requirements for fish has increased, so too has emphasis on water quality and waste management increased. During the formative years of Idaho aquaculture (prior to 1965), solid wastes accumulating in rearing areas were discharged into the Snake River or its tributaries. As with other human activities on and around the river, there was little thought as to the effect these solids might have on fish health on the farm or water quality in the river. It became apparent that fish health problems on the farm were magnified if solids accumulated in rearing areas. However, it wasn't until the mid-1970s that some effort was directed at limiting these solids.

In 1974, the Idaho aquaculture industry began being regulated by the Environmental Protection Agency (EPA). Farms producing over 20,000 pounds of fish annually were and are still required to have a National Pollutant Discharge Elimination System (NPDES) permit as a point-source pollutant discharger. In 1984, the NPDES discharge limits for total suspended solids (TSS) was set at 5 ppm (parts per million). The EPA-TSS detection limit is only 4 ppm. Additionally, a settleable solids limit was set at 0.1 ml/L settleable solids. Since laboratory tests for TSS are made by filtering water samples, any settleable solids present are automatically included in the TSS value. In May 1991, the NPDES permit requirements mandated effluent monitoring be expanded for one year to include nutrients--both phosphorus and nitrogen compounds; both possible contributors to water quality problems in the mid-Snake River. This expanded, one-year monitoring was concluded April 30, 1992.

Pollutants emanating from Idaho aquaculture facilities arise from upstream contributors and feeds fed to fish. Influent waters contain potential aquatic plant nutrients (nitrogen and phosphorous) and may also contain significant settleable and suspended solids. Most of these solids (silt and sand) can settle out in the raceway requiring frequent solids removal. Feeds (consumed and waste) contribute to solids (biosolids) deposition in raceways and if not completely settled, will contribute to solids (TSS and settleable solids) in the effluent. Solids containing nutrients will eventually dissolve releasing the nutrients into the water. Digested feed results in an increase in fish biomass (fish growth) and biosolids. The fecal material will also decompose releasing potential dissolved nutrients and, if not removed, solids into the effluent stream.

C. Waste Management Practices

A variety of waste management practices are used by the Idaho aquaculture industry and are dependent on geographic location, land availability, operation size and finances. These practices involve an iteration of two basic treatment strategies:

1. Total flow settling ponds. A large pond is constructed allowing the effluent stream to slow and settle solids prior to discharge to the receiving waters. This is the oldest treatment style used, with the first total flow settling basins constructed in the mid- to late 1970s.

2. Quiescent zones. A quiescent zone is a screened-off area devoid of fish at the end of each raceway allowing for solids settling and capture. Solids are then removed mechanically to a storage reservoir or directly land applied. Quiescent zones were developed and are continually being modified to ensure compliance with EPA requirements.

Each of these waste management practices, and combinations thereof, can be constructed to ensure mean TSS levels readily meet EPA discharge limitations (5 ppm). During the laboratory determination of TSS, any settleable solids in the water would be measured as TSS. Thus, as long as TSS levels are 5 ppm or less, only trace amounts of settleable solids will occur in effluent. Biosolids accumulating in quiescent zone settling basins are generally removed at 1-4 week intervals, placed in settling ponds for storage and harvested for distribution on agricultural land as fertilizer (in some operations as frequently as every 3 weeks), or directly land applied through large sprinkler nozzles during quiescent zone cleaning. Other operations will collect biosolids at the end of a raceway series in a single quiescent zone or rely on whole pond settling, all with apparently equal solids capture efficiency.

It is not known how many Idaho aquaculture facilities have quiescent zones. Those farmers producing at least 20,000 lbs of fish annually must have an NPDES permit and meet a discharge standard of 5 ppm TSS, so it can be assumed these facilities have quiescent zones, total flow settling or within pond settling. It is estimated by the Idaho Department of Agriculture that there are 160 aquaculture facilities effecting the Mid-Snake River. Of these, 16 have Class A NPDES permits, 16 have Class B NPDES permits, 3 have Class C, and 45 have Class D permits. The remainder were unpermitted facilities. We suggest that a large portion (90 %) of the total pounds of fish produced are reared in NPDES regulated facilities.. The frequency of biosolids removal from quiescent zones or ponds is variable ranging from weekly to almost never. It is not known how frequent biosolids should be removed from quiescent zones to help reduce dissolved nutrients. Determining the frequency of biosolids removal to reduce dissolved nutrients is one of our research objectives. Some production units may have no waste management practices. A few producers have constructed or are constructing wetlands to capture solids and dissolved nutrients. This practice is limited because of extensive land acreage required for the high water volumes used in aquaculture. Very nutrient dilute (0.02-0.3 ppm phosphorous) effluent occurs in aquaculture operations. The efficacy of nutrient removal by constructed wetlands, under these dilute nutrient conditions and throughout the year, remains to be demonstrated. Biosolids collected are often distributed on agricultural land directly or dried and hauled to gardens, etc. Composting could prove practical for some operations.

Good waste management is also dependent on good feeding practices and feed utilization. Thus, considerable effort may be devoted by some farmers to ensuring good feed conversion (relation of amount of feed fed to pounds of fish gained). Feed conversion varies with fish size, feed quality, water volume and quality, and fish health. The better the feed conversion, the less feed used to produce a pound of fish and hence the less pollutants potentially produced. Improvements in feed conversion directly reduce the amount of biosolids (Piper et al, 1982. "Fish hatchery management." U.S. Dept. of Interior). The relationship between improved feed conversion efficiency and nutrient reduction is less clear. Certain assumptions can nevertheless be made such that for each 10% improvement in feed conversion, phosphorous could be reduced by 5%. This will vary depending upon feed formulation. Optimizing feed utilization is an inexact science and yet one of the major factors determining the success of an aquaculture endeavor. A strong, industry-wide research effort is on-going, directed at optimizing feed formulations and improving feed conversions. Over the past decade, feed conversions for commercial aquaculture rations have declined from 1.85 to 1.45, under ideal environmental conditions. Diet improvements could have a significant impact on the generation of biosolids and perhaps on dissolved nutrients. Aquaculturists and feed suppliers are working together to produce economically viable low environmental impact feeds.

D. Permitting

The Idaho aquaculture industry is subject to regulation and/or permitting by the Environmental Protection Agency (EPA; for NPDES permits and water treatment chemicals), Idaho Division of Environmental Quality (IDHW-DEQ; 401 Certification of NPDES permits), Idaho Department of Agriculture (fish rearing licenses), Idaho Department of Fish and Game (for transportation permits when stocking to public waters and importation of exotic species), Idaho Department of Water Resources (water rights permits and licenses), local planning and zoning regulations, and the US. Food and Drug Administration (FDA; therapeutant regulation and fish wholesomeness). EPA regulates all Idaho aquaculture facilities producing more than 20,000 lbs/year limiting TSS levels to 5 ppm (only 1 ppm above the EPA detection limit of 4 ppm) and settleable solids to 0.1 ml/L. It must be emphasized that settleable solids are a component of TSS so that as long as TSS is 5 ppm or less, there will be only trace amounts of settleable solids in the effluent. Permits are not currently required for those aquaculturists producing less than 20,000 lbs/yr or who feed less than 5,000 lbs of feed.The IDHW-DEQ must issue 401 certifications, certifying a proposed facility will likely comply with state water quality standards. The Idaho Department of Agriculture issues facility licenses to help ensure compliance with other state laws and to protect natural fish populations. FDA regulates the use of therapeutants to ensure wholesome products are produced. Producers with an NPDES permit report chemical use to the EPA on Discharge Monitoring Reports (DMR). For drugs to be approved for aquaculture by the FDA, the drugs must meet strict environmental safety requirements.

The EPA classifies and regulates aquaculture facilities on the basis of pond type (method used for waste collection and treatment) and pounds of fish produced. Type A facilities are non-farm ponds with annual production greater than 500,000 pounds. Type B facilities are non-farm ponds with annual production greater than 100,000 pounds but less than 500,000 pounds. Type C facilities are those non-farm ponds producing less than 100,000 pounds and Type D facilities are farm ponds. Farm ponds usually have "flow-through settling" in which the pond itself has quiescent water where solids may settle-out. Accumulated solids are usually removed from these ponds after fish harvest is completed. The non-farm (Type A, B, and C) ponds require frequent cleaning and removal of settled solids. All four basic types of facilities may have an NPDES permit although not all facilities are currently required to have these discharge permits.

II. Aquaculture Industry Specific Pollutants

A. Mid-Snake River Water Quality and Aquaculture

The middle segment of the Snake River is a complex ecosystem subject to considerable human and natural impacts. Since the early 1900s, with the advent of water diversions and impoundments, river water flows have been controlled. This usually eliminates normal snow melt associated spring flushing flows which have been important in the Snake River's biological cycle.

Cold, spring water flows from the Thousand Springs increased from the early 1900s to about 1950. Since 1950, spring flows into the middle Snake River have been diminishing (US Geological Survey). River water temperature and flow rate have subsequently been negatively impacted. Summer time mid-Snake River water temperature may exceed 20°C. Considerable scientific data (Brockway, C. and C. Robison 1992, Middle Snake River water quality study: Phase I. Final report. I.D.H.W- D.E.Q., 69 pp; MacMillan, J.R. 1992, Water quality of the Middle Snake River and review of aquatic plant growth control literature. Clear Springs Foods, Inc.) indicates significant amounts of sediments and nutrients enter the mid-Snake River reach from sources above and below Milner Dam. Recent data indicates spring water itself may contain considerable amounts of nutrients (MacMillan 1992; Brockway, unpublished; Brannon and Collins, unpublished). Additionally, the entire Snake River hydrologic area has been under drought conditions which further diminish water flow and exacerbate cumulative negative impacts.

The IDHW-DEQ has designated the mid-Snake River as water quality limited (WQL) because of excessive plant growth. The plants of primary concern are aquatic macrophytes and floating filamentous algae (MacMillan, 1992). To a limited extent periphyton and phytoplankton blooms may be of concern as well (Litke, personal communication). Various outcomes are associated with the excessive plant growth, but of greatest concern may be spatially and temporally depressed oxygen concentrations causing violations of state water quality standards. Perceived problems on the river heightened public awareness leading to scientific study of the river. Several studies have been completed and others are in progress, the intent being to develop sound, scientific management strategies to improve water quality.

Considerable scientific evidence (summarized by MacMillan 1992) indicates aquatic plant growth is regulated by both physical and chemical factors. Scientific literature suggests any one chemical factor is also unlikely to result in plant growth limitation. Aquatic macrophytes and filamentous algae experience the same maximum growth rate at phosphorus concentrations of 0.015 up to 2.0 parts per million (ppm). Thus, phosphorous concentrations must be less than 0.015 ppm if phosphorous limitation alone is to inhibit plant growth. Spring water in the Magic Valley itself contains 0.01 to 0.16 ppm phosphorous (Brockway, unpublished; MacMillan, 1992). Brannon and Collins (unpublished, U. of Idaho) found phosphorus concentrations in the headwater of Billingsley Creek of approximately 0.09 ppm phosphorous. It is important to recognize that spring water constitutes approximately 66% of the water in the mid-Snake River during the aquatic plant growing season. Tributaries may also contain considerable phosphorous loads. Nitrogen is present in considerable concentrations in both spring water and surface tributary waters. It has been demonstrated by both Brockway and Robison (1991) and MacMillan (1992) that highest river phosphorous concentrations occur immediately below the Twin Falls Municipal Sewage Treatment Plant. Phosphorous concentrations progressively decline as one proceeds down river through the aquaculture and agriculture impact areas because of dilution. In the winter, when water may be discharged over Shoshone Falls, phosphorous concentrations at Shoshone Falls may be nearly as high as just below the sewage treatment facility. Yet, greatest weed populations are not observed until considerably down river in shallow, less turbid river reaches. Rooted macrophyte growth is light limited and any action that increases light (eg. reduced turbidity) will likely increase plant growth. Thus, physical factors such as water velocity, water depth, slope, substrate type, sedimentation, and turbidity have a dramatic impact on which, if any, aquatic plants will occur, the extent to which they will grow, and where they will grow.

There appears to be no single factor likely to limit plant growth in the mid-Snake River, thus it is unlikely that any one industry (point or non-point source) will have a "favorable" impact on plant growth. It is quite possible, that as industries reduce suspended materials (TSS) which decrease turbidity, rooted macrophyte growth will increase. Additionally, because of nutrient spiraling and sediment associated nutrients, it is unlikely that plant growth or abundance will change very rapidly in the river unless a catastrophic event (such as a flood) occurs to cause significant river modification. Collectively, with all impacters participating, positive river improvements may be possible over time. Assessment of any single industry's impact, including the aquaculture industry, on actual water quality conditions in the river is not possible because of the many factors known to regulate plant growth. Additionally, published studies have not adequately addressed influent (spring) water quality. What aquaculture will be able to demonstrate is overall improved aquaculture waste management with reduction in effluent nutrients and biosolids.

B. Background Studies

Several studies over the past 20 years have been conducted attempting to delineate river conditions or pollutant contributions from the aquaculture industry. Since aquaculture operations do not consume water, water volume itself is not affected. Aquaculture operations do however have the potential to add potential plant nutrients and biosolids. In 1979, IDHW-DEQ reported that approximately 60% of the phosphorous observed in the mid-Snake River came from sources above Shoshone Falls or Milner Dam while 20% resulted from spring flows. All human activity along the mid-Snake River, including fish hatcheries, contributed the remaining 20% of the phosphorus load. At that time, aquaculture contributed less than 5% of the total phosphorous entering the mid-Snake River reach (Parametrix and Tetratech, 1979 from Snake River Problem Assessment, 1990, IDHW-DEQ). In 1991, Brockway and Robison delineated phosphorous, nitrogen and solids contributions into the river from various sources. Influent spring waters were not examined nor was the Twin Falls sewage treatment facility. Results indicated aquaculture's phosphorous, nitrogen, and solids contributions steadily accrued from Shoshone Falls to King Hill although riverine concentrations of phosphorous steadily decreased. Estimates of actual pollutants discharged by aquaculture were not possible as influent water was not examined.

To provide additional information, Clear Springs Foods, Inc. (MacMillan, 1992) also examined the river, Twin Falls sewage treatment facility, tributary streams, and influent and effluent waters from Clear Springs Foods production facilities. They did not examine irrigation waters nor areas down river from Clear Springs Box Canyon Fish Hatchery. These studies showed that spring waters contain significant nitrite-nitrate nitrogen and phosphorous (0.02 - 0.05 ppm phosphorous). These aquaculture facilities did contribute phosphorous, nitrogen and solids directly to the river. Nitrogen contributions arose from ammonia and organic nitrogen. Dissolved phosphorous was the primary phosphorous form in effluent water (approximately 60-80% of total phosphorous), while low levels of solids were also present. Brannon and Collins (draft report; U. of Idaho) studied small-scale aquaculture facilities (farm ponds) within the Deep Creek drainage. Their results indicated a net decrease in solids and nitrogen emanating from aquaculture facilities (raceways serving as settling/treatment basins for creek and agricultural return flows), and a slight increase in phosphorous loading to the creek. Aquaculture facilities contributed 1.9 tons of the total 38 ton phosphorus load carried by Deep Creek to the Snake River (approximately 5% of total Deep Creek phosphorous contributions) through the 1 year sampling period.

Summarizing, results indicate aquaculture operations do contribute organic solids, phosphorous, and nitrogen both directly and indirectly, through tributary streams, to the Snake River. The impact of these on the river is of considerable scientific debate.

III. Management Actions

Aquaculture's long range goal is to reduce phosphorus concentrations in effluent waters by at least 40% within five years of plan implementation. We propose to accomplish this through short and long term actions. Our immediate goal is to reduce aquaculture industry derived phosphorous by 20% within one year of plan implementation. Within 5 years, we propose to reduce industry phosphorous by an additional 20% (total 40%) and to continue our entire industry pollution reduction efforts thereafter as research demonstrates feasibility.

A. Immediate Actions

1. The short term goal is to reduce phosphorous emanating from the aquaculture industry by 20% within one year of plan implementation. We will attempt to do this through industry wide BMPs and/or RACTs. Data

collected during 1990-1991 (Brockway and Robison 1992) will provide our baseline data. While an actual inventory of aquaculture facilities has never been done, we estimate only about 40% of aquaculture facilities are currently required to have NPDES permits. Currently only facilities producing over 20,000 pounds of fish per year are required to have an NPDES permit. The impact to water quality from 10 facilities each producing 5,000 lbs may be similar to the impact of producing 50,000 lbs assuming operations and maintenance are similar. Our initial waste management educational efforts will be directed at the approximately 60% of the industry without NPDES permits.

a. Objective 1. Establish an aquaculture Environmental Assistance Committee.
An aquaculture Environmental Assistance Committee was formed within IAA on April 1, 1992 and has assisted in development of BMPs and/or RACTs. This industry committee has no regulatory authority. It can however, facilitate communication and education, and function as a liaison to foster education with those agencies possessing regulatory authority such as EPA and IDHW-DEQ. This committee has and will continue to interact with the nutrient management committees, Watershed Advisory Committee, and Basin Advisory Committees.

b. Objective 2. Establish an aquaculture waste management education and training program.
A continuing education program, coordinated through the IAA Environmental Assistance Committee and the University of Idaho Extension System, will be developed. IAA Program development will be coordinated with state (IDHW-DEQ; Idaho Dept. of Agriculture) and federal (EPA) agencies. Information booklets, workshops, seminars and on farm visits will be made. All Idaho aquaculturists will receive NMP information and be eligible to receive educational materials and training. The purpose of this program is to:

1) promote understanding and responsibility for aquaculture waste management.
2) promote understanding of regulatory permitting and other requirements.
3) provide training sessions stressing the importance of following standard cleaning practices and good record keeping.
4) increase awareness of environmental stewardship responsibilities and the results of ongoing research.
5) provide training sessions on BMPs.

Subject specific training and educational workshops/seminars will be held 3 times each year. A fourth meeting, the IAA annual meeting, while addressing water quality related issues, will also include topics related to water quantity, fish health, and marketing. Several programs were held in 1993 and 1994. An annual research report will be published and distributed documenting waste management improvements.

c. Objective 3. Establish minimum Best Management Practices (BMP) for waste management.
The following minimum BMPs and/or RACTS will be instituted at all facilities, regardless of size or aquaculture species. Compliance schedules may be instituted by regulatory agencies for those not in compliance. BMPs may become a part of industry NPDES permits pending completion of NPDES negotiations with EPA.

1) Containment, Collection, and Disposal of Solids
   a) Raceway Systems (cement raceways)
      i. Quiescent areas and/or total flow settling will be installed and maintained.

ii. Biosolids removal and cleaning frequency: two times per month on lower raceway sets and once per month on upper raceway sets. Frequency of cleaning may be increased or decreased to conform to raceway design and hydraulics, fish stocking, harvesting, feeding programs, and other management practices. For example, individual rearing units are frequently harvested and may be empty or devoid of fish. The cleaning frequency of these units may be altered or suspended until such time as they are put back into production. Appropriate documentation of such changes is to be maintained by the operator and available for review by EPA or IDHW-DEQ.

iii. Harvesting of solids from waste ponds and quiescent zones will be accomplished to prevent scouring of solids.

iv. Biosolids (manure and uneaten feed) removed from ponds shall be removed from the system and stored, composted or land applied to insure it will not enter United States waters.

b) Farm Pond Systems (Earthen ponds).

i. Individual farm pond management plans will be developed to minimize resuspension of solids during cleaning and/or harvesting operations. "Flushing" to the receiving water will not be acceptable.

ii. The farm pond will have the capability to divert the total flow around the farm pond during cleaning operations or make other changes to ensure biosolids do not enter public waters.

iii. Quiescent zones or total flow settling ponds will be established at the downstream end of raceways or farm ponds.

iii. Quiescent zones or total flow settling ponds will be established at the downstream end of raceways or farm ponds.

iv. Biosolids removed from ponds will be removed from the system, stored, composted or land applied to ensure it will not enter United States waters.

2) Records and Documentation.

a) Records will be maintained for cleaning of quiescent zones, waste treatment ponds, and total flow settling ponds by all Type A, B, C, and D permitted facilities. These records will reflect the date of solids removal and how and where they were disposed. All entries will be dated on the date of entry and signed or initialed by the person entering the data.

b) These records and documentation are currently required by EPA through the NPDES permit. However, additional information may be required as compliance schedules are developed. Records for the current year are required to be maintained by the operator as are past records. Records may be kept indefinitely, but are required to be held for three (3) years.

c) Verification of records and implementation of these plans will be the responsibility of each producer. Each producer will submit to the IAA Environmental Assistance Committee, a form in which an independent verifier (extension agent, Depart. Agriculture representative, IDHW-DEQ representative or other designated official) confirms compliance with this plan and record keeping. The IAA Environmental Assistance Committee will submit to IDHW-DEQ a list of those producers submitting verification. The list will be submitted annually beginning one year after the Nutrient Management Plan's adoption and implementation.

d. Objective 4. Establish a water quality self-monitoring program to evaluate compliance and nutrient management plan improvements.

Current NPDES permits require monthly monitoring for total suspended and settleable solids. While there can be considerable variation in TSS determinations because of analytical limitations (EPA detection limit for TSS is 4.0 ppm), it nevertheless provides a measure of facility compliance. TSS determinations will be continued as per current NPDES requirements.

Decreased phosphorous loadings into the Snake River is a goal of the aquaculture nutrient management plan. To document improvements, total phosphorous concentrations will be determined monthly from Type A facilities. Type B, C, and D facilities will be encouraged to participate in a sampling program to be offered through the University of Idaho. Estimated decreases in pollutants discharged will be based on phosphorous concentrations and water volume discharged. The IAA Environmental Assistance Committee (in association with the University of Idaho) will issue an annual report based on these determinations.

e. Objective 5. Encourage strong enforcement of current effluent water quality requirements.

1) The IAA will provide "first-line" enforcement (educational) of BMPs and/or RACTs. First-line enforcement, as defined by DEQ and EPA, is strictly an educational effort. In this respect, the IAA will serve in a first-line enforcement (educational) role. The Idaho Aquaculture Association can facilitate this education and information exchange through the development of continuing education programs and seminars in conjunction with EPA, IDHW-DEQ, and the University of Idaho. Records of visitations and training will be maintained. Such programs have been held since 1992.

2) Efforts will be directed at preventing pollution through on-site waste management evaluation, problem identification and development of remedial actions. This will encompass information exchange, education, technology transfer, workshops and meetings. An integral component of this process will be to capitalize on the recently employed Aquaculture Extension System agent through the University of Idaho. This individual has agreed to annually visit (on approval from the facility owner) every aquaculture facility (not represented at formal training sessions) in the mid-Snake River hydrologic area. The proposed reviews are intended to be educational. This does not preclude regulatory inspections by either EPA or IDHW-DEQ.

3) Regulatory authority for aquaculture was transferred from Idaho Fish and Game to the Department of Agriculture in 1992. The Department is required to inspect all aquaculture facilities for compliance as required by Idaho law (I.C. 22-4601 through I.C. 22-4606). The provisions of license through the Department of Agriculture include: all appropriate permits and rights are properly held, appropriate effluent structures are in place and properly used, and effluent stream is properly screened to prevent fish escapement to state waters. In 1995, the IDA also assumed primary responsibility for aquaculture BMP development and enforcement (I.C. 39-3601 through 34-3639) for waters requiring a TMDL. BMPs then become enforceable under Idaho law.

4) Those producers verifying their participation in this NMP with the IAA, will be listed for IDHW-DEQ. A producer need not be a member of IAA to provide NMP compliance verification. Spot checks of all aquaculture facilities for NPDES permit requirements by IDHW-DEQ and EPA will continue to be encouraged.

5) In order to provide regulatory incentive, promote excellence in facility operation and design, and encourage widespread adoption of this plan, the IAA suggests the following:

   a) IDHW-DEQ may, at their option, develop compliance schedules/consent orders for aquaculturists (provided for and enforceable under I.C. 39-116) who do not verify compliance with aquaculture BMPs or, who cannot otherwise demonstrate BMP compliance when inspected by IDHW-DEQ or EPA. These compliance schedules/consent orders are enforceable under Idaho law (I.C. 39-116). IDHW-DEQ and EPA maintain the right to inspect facilities for adherence to the plan, compliance schedules/consent orders, NPDES permits, and to review records and documentation. BMPs may become a component of NPDES permits pending negotiations with EPA.

   b) Operations complying fully with the provisions of this plan, including implementation of management and technological strategies defined and demonstrated through research, would not be required to obtain a compliance schedule. An NPDES permit is still required of many operations and inspections by IDHW-DEQ, EPA, and Idaho Department of Agriculture are not precluded. A feedback loop is provided to refine and promote improved facility operation.

   c) Operations demonstrating difficulty in implementation of management strategies outlined herein, or as research suggests, would be encouraged to adopt a compliance schedule. The compliance schedule provides for situation and financial consideration, while providing assurance of progress in facility management improvement over a reasonable time period. A feedback loop is provided to refine and promote improved facility operation. Self-monitoring of effluent, regardless of operation size, would be required until operations are fully in compliance with the provisions of this plan.

   d) Recalcitrant operations, those operators and operations demonstrating an unwillingness to improve, would remain under the regulatory authority of the US. Environmental Protection Agency and IDHW-DEQ as do all other aquaculture facilities producing at least 20,000 lbs. of fish annually. EPA has indicated a willingness to author specific NPDES permits for the recalcitrant operator that may or may not reflect the provisions of this nutrient management plan. Self-monitoring of effluent would be required until operations are fully in compliance with the provisions of this plan, including implementation of management and technological strategies defined and demonstrated through research. For small producers, monitoring can be cost-prohibitive so it is to the producers advantage to comply with industry BMPs.

   e) The IAA will encourage all regulated industry to abide by the NPDES permits as enforced by EPA and DEQ. The IAA will also encourage the adoption of the NMP's BMPs throughout the industry.

6) Encourage IDHW-DEQ and EPA to enforce current pollutant discharge limitations. Current aquaculture NPDES permits limit TSS (5 mg/L or ppm) and settable solids (0.1 mg/L). Since settable solids are accounted for in the TSS measurement, such assays are redundant and should be eliminated. However, since 40-60% of the effluent phosphorus originating from aquaculture operations is in the TSS fraction, continued monitoring and enforcement of TSS restrictions is essential. The IAA strongly encourages EPA and IDHW-DEQ to continue their current enforcement of this regulation.

7) Evaluate monitoring data for phosphorus reductions (as described in Objective 4).

B. Mid and long term actions

Our goal is to reduce aquaculture industry derived phosphorus an additional 20% within 5 years. To achieve this goal, research must be conducted, technologies developed and improvements implemented.

1. Objective 1. Develop and cooperate in an aggressive research program.

Research has been initiated and will continue to be developed in the following areas:

a. nutritional phosphorous requirements of fish
b. alternate feed formulation and manufacturing that reduces phosphorous content of effluent.
c. feed characteristics that may alter pollution potential
d. physical factors controlling biosolids deposition
e. biosolids removal technology

Rationale:

All fish farm size classes (type A, B, C, and D) will be expected to participate in the Aquculture WMP. However, greatest phosphorus reductions will occur when changes are made in non-farm pond fish production facilities with annual production greater than 100,000 lbs (Type A and B NPDES permits). These farms are estimated to produce 85-90% of all aquacultured fish (30-36 million lbs) in the Mid-Snake River region, to feed more feed and hence to contribute the greatest phosphorus loads to the Snake River. Data to define total phosphorus loads for each permit type and for the industry are unreliable but best estimates (based on available EPA-NPDES permit records, IDA fish rearing permits, and Idaho Dept. Of Water Resources water flows) of the AEAC suggest that there are sixteen Type A and sixteen Type B permitted facilities contributing 70-90% of the total aquaculture industry phosphorus loads to the Mid-Snake River. The AEAC also estimates that 80-90% of all A and B facilities currently follow the minimum (IAA Aquaculture WMP) BMPs described earlier. Verification of this will occur during the first year of plan implementation when each producer verifies compliance with the WMP-BMPs and when monitoring data is compiled. To reduce phosphorus loadings by 40% within 5 years of plan implementation will require development of improved biosolids control and changes in feed technology. Improved biosolids control could reduce phosphorus loads by an estimated 10-15%. Feed conversion improvement (with high energy-nutrient dense feeds) at all type A and B facilities to at least 1.3 within the plan period could reduce phosphorus loads by an estimated 20-40% (Lall 1991; Cho, Hynes, Wood, and Yoshida 1991; Johnsen and Wandsvik 1991). Further effluent phosphorus reduction will occur when low phosphate feeds are developed (10%) and/or making the phosphorus in feeds more available to the fish and consequently less available to the environment (2-5%). These reductions should be accomplished by year five. When all Type A and B NPDES permitted facilities follow currently identified aquaculture WMP-BMPs, with in line settling basins and periodic removal of biosolids, an additional 2-20% phosphorus reduction for the industry will be accrued. This should occur within one to five years of plan implementation. Maximum total improvement within five years could be up to 75% while minimum improvement will be 40%. Changes in feeding technology and waste management practices would become part of the aquaculture industry standard BMPs.

Less is known about Type C and D permitted facilities. The AEAC estimates there are forty-five Class D and three Class C NPDES permitted facilities in the middle Snake River region. Initial efforts must be directed at facility inventory (number and waste management practices). The AEAC estimates full IAA Aquaculture WMP-BMP institution at these facilities will result in phosphorus decreases of 5-10% of total industry loads. These are expected to be completed within one-three years of plan implementation. Utilization of better, high energy feeds will cause a further 2-5% reduction in phosphorus loadings by this segment of the aquaculture industry. These will occur by year five.

To demonstrate industry improvement and achievement of industry goals, we propose a tiered monitoring program. Baseline information will be obtained from the most reliable information available (EPA-DMRs, Brockway and Robinson, 1991, or from self-monitoring). The AEAC will collate this information to provide an industry total phosphorus baseline. Documentation will be provided to DEQ and EPA. Monitoring will be required of all permittees, however, monitoring intensity will be commensurate with estimated pollutant loads. Type A and B facilities will continue to monitor TSS and water flows but also total phosphorus monthly. Type C and D permittees will monitor these as well but only twice per fish crop; half-way through production and at harvest. These monitoring reports will be required of all permittees (as part of their NPDES permit) but will also be collated by the AEAC and distributed to DEQ and EPA for confirmation. In all cases, inflow data will also be collected.

Since fish feed is the only source of phosphorus contributed by aquaculture operations, it will be the primary research focus. Current theory suggests that once the fish's physiological phosphorus requirement is known, feeds can be developed that contain that requirement. Feeds used to date contain 1.2 to 1.2% phosphorus. Preliminary research results suggest the phosphorus requirement for trout is 0.5 to 0.6%. Phosphorus requirements may also be life stage dependent. Optimizing feed phosphorus may ultimately reduce effluent phosphorus by 30-80%. Effluent phosphorus may also be reduced by improving feed conversion efficiency. If less feed is fed, less pollutants are generated. The combination of improved feed conversion and reduced feed phosphorus will provide the greatest reduction in industry phosphorus contributions to the Mid-Snake River. Further, while aquaculture effluent total suspended solids (TSS) is generally well below even the EPA measurable limit of detection (4 mg/L) some solids nevertheless escape. These solids may contain phosphorus. Any improvements in solids capture technology will augment other efforts to reduce total phosphorus.

Aquaculture waste management and nutritional research already have regional and national research priority. Researches are being directed by the Western Regional Aquaculture Consortium, US Department of Agriculture, and private aquaculturists. Results to date suggest feed formulation changes and manufacturing processes may be useful for reducing pollutants in effluent. The economic feasibility and effects on product quality of these changes remains to be determined.

2. **Objective 2. Establish a feedback-loop program to ensure research progress is quickly implemented in farming operations.**
Current BMP/or RACTs will be continually evaluated and upgraded through the feedback loop. Upgrades will reflect improvements developed from research. The IAA Environmental Assistance Committee, in concert with the Idaho Extension System, will foster technology transfer to all aquaculturists (private, state and federal). Education tools will include workshops and seminars, annual research reports and on farm

contact (Idaho Extension System). New BMPs/or RACTs may become part of compliance schedules (established by EPA or IDHW-DEQ) for recalcitrant producers.

3. **Objective 3. Continue to foster industry-wide compliance and enforcement as described in immediate action section.**

IV. Summary

This aquaculture watershed management plan is progressive through research, provides for a mechanism to achieve effluent water quality improvement in both the short and long term, prevents "backsliding", and is enforceable under Idaho law. The program outlined is a continuation of aquaculture's commitment to address aquaculture waste management. We propose utilizing research, monitoring, and implementation to achieve the desired goal of improving effluent water quality in our farm operations and contribute to improved water quality in the Snake River.

V. References

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Appendix A-2

PROPOSED WATERSHED REDUCTION PLAN FOR THE MID-SNAKE RIVER BASIN OF THE CONFINED FEEDING OPERATIONS

submitted to

Idaho Department of Health and Welfare
Division of Environmental Quality

by

Confined Feeding Operations
Nutrient Management Plan Committee

CONFINED FEEDING OPERATIONS WATERSHED MANAGEMENT PLAN

GOALS OF THE CFO WATERSHED MANAGEMENT PLAN COMMITTEE:

1. Zero nutrient/sediment contribution to the Middle Snake River
2. Safely recycle nutrients through crop uptake to protect Idaho's water resources.

MANAGEMENT ACTIONS:

1. Use "*Idaho Waste Management Guidelines for Confined Animal Feeding Operations*" for livestock waste system design, construction, operation, and management.
2. Industry adoption of BMPs as defined in CFO guidelines.
3. Promote innovative site-specific solutions.
4. Educate related industry to achieve sustainability through nutrient recycling.
5. General public education to foster understanding of the relationship of the livestock industry to crop farmers, food processors, water quality, etc.
6. Continue to solicit research funds focused on waste management technologies, strategies, fertilizer guides, computer applications, feeding programs, etc.

COMPLIANCE ACTIONS:

1. Peer pressure is exerted by industry, by local and regional representatives, and neighboring facilities.
2. U.S. EPA NPDES Permit.
3. Industry support of EPA/DEQ enforcement of problem operations. The animal industry will cooperate closely with applicable regulatory agencies that have the authority and responsibility of enforcing and protecting water quality.
4. Develop Operation of Merit (environmental award).
5. Industry cooperation with canal companies.

IMPLEMENTATION EFFECTIVENESS:

1. Monitoring NPDES permit violations.
2. BMP inventory and monitoring.
3. Annual Progress Reports.

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PROPOSED NUTRIENT MANAGEMENT PLAN FOR MID-SNAKE RIVER BASIN CONFINED FEEDING OPERATIONS

OVERVIEW

The animal agriculture industry's plan for the Middle Snake River Nutrient Management Plan is centered around the document *Idaho Waste Management Guidelines for Confined Feeding Operations* (CFO Guidelines). This document was revised in 1993. The original document was developed in 1987 to guide livestock owners in the construction and operation of Concentrated Animal Feeding Operations (CAFO) in Idaho with the goal of eliminating surface water contamination. Since its inception, this document has been widely used by new as well as existing CAFOs in the Magic Valley to design and operate waste management facilities. Portions have also been incorporated into local county planning and zoning ordinances dealing with livestock operations. The revision includes a title change to include all livestock operations as confined feeding operations (CFO) as compared to concentrated animal feeding operations (CAFO) which is used in the EPA permitting process. Thus, the document is now called *Idaho Waste Management Guidelines for Confined Feeding Operations*. The document has been distributed to every dairy operation in the state and has been widely distributed to the CFOs.

The current edition includes information for crop specific waste application rates. By matching liquid and solid waste application to crop needs, nutrients can be cycled back into animal feeds and other crops creating a closed and sustainable system. Education of farmers as to the value of animal waste can reduce the use of commercial chemical fertilizers. All this will further reduce the risk of surface and also ground water contamination.

Technical and editorial assistance was provided by a CFO Advisory Committee representing these agencies and organizations.

- Idaho Cattle Association
- United Dairymen of Idaho
- Idaho Department of Agriculture
- Idaho Department of Health and Welfare, Division of Environmental Quality
- U.S Department of Agriculture, Soil Conservation Districts
- University of Idaho Cooperative Extension System
- Idaho Soil Conservation Commission
- Idaho Conservation League
- Idaho Association of Conservation Districts
- South Central District Health Department
- Hagerman Valley Citizens Alert
- Environmental Protection Agency
- The Public

ABSTRACT

Idaho Waste Management Guidelines for Confined Feeding Operations.

The purpose of this document is to help confined feeding operation managers and regulators understand management practices and design criteria that prevent water pollution. Methods of managing animal waste on confined feeding operations (CFO) - dairies, feedlots, sheep, hogs, poultry and other animal-rearing facilities - directly affect the potential

for pollution of Idaho's surface and ground waters. This information can be used to develop best management practices (BMP). These guidelines also are intended to assist managers in complying with state and federal water quality regulations and clarify governmental agency involvement.

This document is used by Idaho's Division of Environmental Quality for regulating confined feeding operations. It is also incorporated into local county planning and zoning regulations. In addition, the CFO guidelines are being considered as an integral component of the U.S. EPA NPDES permit and Idaho DEQ Plan and Specification review and approval process through Idaho Code 39-118. Information on water quality, existing regulations, site evaluation and planning considerations should improve evaluation of a confined feeding operation. It will also provide general direction for developing a waste management system best management practice to comply with legal requirements.

The intent of these guidelines is to show that waste and wastewater must be captured, and stored on-site for proper treatment, preferably through agronomic utilization back on the land. The basic methods to achieve a good waste management system are explained in the text. Minimizing wastewater volumes by conserving water and diverting surface runoff, is often overlooked as a means of reducing size of storage basins or preventing overflows in existing basins. This topic is covered in the document. Runoff control for the surface of the lot is discussed. Critical design criteria for waste collection and storage facilities is discussed. Estimating storage requirements in a step-by-step procedure is also addressed in the document. Practices that help control odors and other potential pollutants are described. Land application of animal waste may be a source of nonpoint source pollution, particularly ground water. Methods to prevent this through proper waste application are described.

THE ROLE OF NATURAL RESOURCE-BASED INDUSTRIES IN IDAHO'S ECONOMY

To explain the economic role of natural resource-based industries in Idaho, University of Idaho Ag Economists developed a computer model of the Idaho economy that uses value added as the key measure of an industry's economic output. The sum of all value added in Idaho equals the gross state product: the value of all goods and services produced in the state during a given year or roughly the state equivalent of gross national product. Idaho's gross state product in 1987, the year on which they based their economic model, was $13.65 billion (U.S. Department of Commerce 1988. The last year reported was 1986. To arrive at the 1987 estimate, they extrapolated based on the 1986-87 change in Idaho employment).

The model takes into account the many interconnections that characterize the Idaho economy. The model identifies the value added of a particular industry such as agriculture and links to it the value added of all the industries and activities it supports.

Industry Contributions to Gross State Product

University of Idaho economic analysis indicates that agriculture is Idaho's leading natural resource-based industry, accounting for $2.87 billion or 21 percent of Idaho's gross state product. Food processing ranks second, followed in order by timber, tourism, mining, and minerals processing (Table 1). Production agriculture and food processing combined account for over a third (35.9 percent) of Idaho's gross state product.

Table 1. Idaho gross state product linked to natural resource-based industries, 1987.

	million ($)	(%)
Agriculture	2,867	21.0
Food processing	2,039	14.9
Timber	1,620	11.9
Tourism	459	3.4
Mining	297	2.2
Minerals processing	253	1.9
Other	6,115	44.7
Gross state product	13,650	100

The picture changes with geographic focus. Idaho is a geographically diverse state with several distinct and in many ways independent subregional economies: northern Idaho, southeastern Idaho, southcentral Idaho, and southwestern Idaho (Table 2). Timber dominated the economic landscape of northern Idaho, accounting for 44.5 percent of that region's gross product. Agriculture, meanwhile, is the dominant natural resource-based industry in the south.

Table 2. Gross regional product linked to natural resource-based industries, 1987.

Industry	Northern Idaho		Southwestern Idaho		Southcentral Idaho		Southeastern Idaho	
	(million $)	(%)	(million $)	(%)	(million $)	(%)	(million $)	(%)
Agriculture	225	8.4	786	14.6	914	45.3	942	26.5
Food Processing	21	0.8	630	11.7	648	32.1	741	20.8
Timber	1,197	44.5	264	4.9	6	0.3	153	4.3
Tourism	180	6.7	129	2.4	59	2.9	91	2.6
Mining	127	4.7	42	0.8	negl.	negl.	128	3.6
Minerals Processing	negl.	negl.	negl.	negl.	negl.	negl.	254	7.1
Other	939	34.9	3,535	65.7	391	19.4	1,248	35.1
TOTAL	**2,690**	**100.0**	**5,385**	**100.0**	**2,018**	**100.0**	**3,557**	**100.0**

Agriculture is particularly important in southcentral Idaho where it accounts for more than 45 percent of that region's gross product. If we include southcentral Idaho food processors, whose location is dictated by proximity to inputs, the region's dependence on agriculture rises to 77.4 percent. In southwestern Idaho, agriculture accounts for 14.6 percent of the gross regional product. In southeastern Idaho, agriculture and food processing account for 26.5 percent and 20.8 percent of gross regional product, respectively.

Idaho's economy is acutely dependent on natural resource-based industries. Agriculture, food processing, timber, tourism, mining and minerals processing together account for well over half of the state's gross product. Even that figure is an underestimate because it does not include the federal government's resource-based links such as the timber, range, and recreation staffs of the U.S. Forest Service and Bureau of Land Management.

Because of Idaho's acute dependence on natural resource-based industries, its economy is more vulnerable than most states' to land and resource management decisions. Salmon recovery, water management, wilderness designation, log exports, public grazing, and other issues have profound implications for Idaho's economic well-being and development.

The Role of the Dairy Industry in Idaho's Economy

Idaho has more dairy cows than all but two western states, California and Washington. Income derived from milk cows has always played an important role in the State's agricultural economy. In the past sixty plus years, farm sales of milk and dairy products have increased twenty-five fold from $12.8 million in 1924 to $319 million in 1991. Milk cow numbers during the period rose to a high of 250,000 head in 1944, but has since declined to and estimated 185,000 as of January 1, 1993. The essential factor in increasing the high level of milk production in the State has been the steady gain in output per cow. From a low of 4,820 pounds per cow in 1924, the output has more then tripled to the record of 16,475 pounds in 1990. Output per cow declined slightly in 1991 to 16,399 pounds, but Idaho ranked eighth among the states in the Nation in productivity per cow. Cash receipts from milk accounted for 12 percent of all cash proceeds from farm marketing's in 1991 (Idaho Agricultural Statistics 1991). Milk receipts surpassed those of wheat in 1984, and milk presently ranks third in the state in terms of income received by farmers.

In the development of the dairy industry, Idaho producers have increasingly turned to markets outside the State. On the downside, Idaho producers have been at a price disadvantage because of extra transportation costs to markets outside the State. This has traditionally forced Idaho producers to accept lower prices to remain competitive. Transportation costs also limit the movement of whole milk. Thus, marketing has predominately occurred in the form of dairy products. In the early years, butter was the most important Idaho product shipped to distant markets. Peak output of this product occurred during World War II. Since then its production declined and American Cheese has become the major product. From 8.0 million pounds annually in the mid-1920s, production of American Cheese has expanded sixteen times to the record level of 128 million pounds. Idaho now ranks fourth among all states in the manufacture of American cheese. In 1987, 12 Idaho cheese plants employed 904 people and had $384.1 million in shipments (U.S. Department of Commerce 1990).

Measuring the economic role of the dairy industry requires a model of the state's economy. In 1991 a team of economists in the University of Idaho's College of Agriculture completed the IDAho Economic Modeling Project (IDAEMP). IDAEMP tracks economic activity in the state, capturing interindustry trade, and shows how income creation in one industry is related to income creation in other industries.

A summary of their findings follows. When all supply and income multiplier effects are considered, dairy farming, cheese manufacturing, milk processing, and other dairy product processing industries generated $984 million, or 6 percent, of Idaho's gross income in 1989. The percentage is higher in the Magic Valley, however with 14.5% of the gross regional product linked to dairy.

WASTE MANAGEMENT GUIDELINES

Due to increasing development and use of land and water resources, responsible land stewardship is critical. Allowing any waste from confined feeding operations to enter streams, canals, rivers and lakes, or allowing wastes to reach ground water, is not only unacceptable but in most cases is illegal.

A practice that manages wastes on confinement areas and on cropland where wastes are fully utilized, thus maintaining surface and ground water quality is a best management practice (BMP). A BMP is the most effective way to prevent or reduce pollution generated from confined feeding operations. Because of unique site characteristics, water quality goals, practices and operations management, BMPs will be unique for each site.

The CFO guidelines were developed to help managers evaluate specific situations and understand practices needed to implement a BMP. The 1991 Idaho Agricultural Pollution Abatement Plan (Ag Plan) states, "Using the *Idaho Waste Management Guidelines for Confined Feeding Operations* with site-specific information will result in a Best Management Practice designed to meet water quality goals." The plan addresses Idaho's agricultural nonpoint source water quality concerns in response to the federal Clean Water Act. Conservation, environmental, and industry groups assisted technical agencies in development of these guidelines.

OBJECTIVES OF ANIMAL WASTE MANAGEMENT

The goal of CFO Watershed Management Plan is to safely recycle nutrients through crop uptake to protect Idaho's water resources. Land application to cropland or pasture is the best and most widely adopted technique to recycle nutrients from animal waste. The purpose of proper land application is to safely dispose of wastes to provide crop fertilization, improve or maintain soil structure, prevent erosion, reduce dependence on commercial fertilizers, and protect Idaho's water resources.

The primary objectives of animal waste management are:

- To collect and store all solid and liquid waste on-site in a manner that prevents wastes from entering surface water and seepage of nutrients into ground water.
- To manage both solid and liquid waste by proper land application for crop production and soil enhancement without excessively loading the soil profile which could result in ground water pollution.
- To control odors, flies, rodents and other vermin.
- To install a system that will solve present problem and prevent future animal waste problems economically.

PURPOSES OF GUIDELINES

The purposes of these guidelines are:

- To describe basic waste management practices.
- To educate owners and operators to effectively manage waste systems to protect Idaho's surface and ground water. If successful, there would be no need for additional regulations.
- To identify alternative practices that meet primary objectives of an animal waste management system that, when applied in combination, will result in a BMP.

Not all of these guidelines may be needed for a confined feeding operation, only those that are appropriate to the particular site. Also, some practices may not be practical. Therefore, innovative, site-specific solutions to an animal waste management problem are encouraged.

WHO'S INVOLVED IN ANIMAL WASTE ISSUES?

Various Federal, State and local agencies ensure proper waste management of confined feeding operations. They are responsible for programs including the Idaho Agricultural Pollution Abatement Plan (Ag Plan).

Division of Environmental Quality (DEQ)

The DEQ is responsible for protecting surface and ground water quality in Idaho. It is concerned with wastes and other pollutants entering and adversely impacting state water quality. It will also provide information to confined feeding operation managers to assist them in proper waste management. The DEQ is the primary regulatory and enforcement agency for Idaho environmental issues.

U.S. Environmental Protection Agency (EPA)

The EPA regulates discharge of pollutants to waters of the United States under authority of the Idaho General NPDES CAFO (National Pollutant Discharge Elimination System Concentrated Animal Feeding Operation) Permit. Discharge of pollutants to waters of the United States from CFOs, except as provided in the permit, is a violation of the Clean Water Act (CWA), subject to penalty. Proper management of wastes greatly reduces probability of discharge, and, therefore reduces possibility of penalty.

USDA Agencies

Soil Conservation Service (SCS): The SCS provides technical assistance to managers for developing BMPs and design of waste management facilities.

Agricultural Stabilization and Conservation Service (ASCS): The ASCS provides financial assistance to managers for constructing BMPs for waste management facilities.

Cooperative Extension System (CES): The CES provides educational programs in constructing, operating and maintaining confined feeding operations waste management systems.

Local Agencies

Soil Conservation District (SCD): The SCD is the local management agency responsible for agricultural nonpoint source pollution activities. It provides assistance to private landowners through design or adoption of BMPs and component practices to meet State Water Quality Standards and protect beneficial uses.

Irrigation Districts: Local irrigation districts are responsible for water conveyance for irrigation purposes. They are concerned with wastes and debris entering canal and drain systems and could assist animal agriculture with reporting of discharges.

County Planning & Zoning: Certain counties such as Jerome, Minidoka, Gooding and Twin Falls have local laws or regulations concerning confined feeding operations. Other counties may develop such regulations. Strict enforcement of permitted cow numbers will aid in waste management.

ANIMAL WASTE MANAGEMENT CONCERNS

January 1, 1993 estimates indicate there were 185,000 dairy cows located on approximately 1250 dairies in Idaho. It is further estimated there were 105,500 dairy cows located on 450 dairies in the Magic Valley. Dairy cattle produce an estimated 85 pounds of manure per day per 1,000 pounds of live weight. In one year, a 500-cow herd of 1,000-pound cows can produce about 850 tons of solids with 34 tons of nitrogen, six tons of phosphorous and 25 tons of potassium (USDA-SCS, 1975).

In 1989, there were 45 feedlots in Idaho with 617,000 head of cattle (Idaho Agricultural Statistics). Feedlot cattle produce an estimated 62 pounds of manure per day per 1,000 pounds of live weight. A 500-head lot can produce about 6,900 tons of manure per year with 810 tons of solids, 39 tons of nitrogen, eight tons of phosphorous and 21 tons of potassium (USDA-SCS, 1975).

In 1990, there were about 16,000 head of sheep and lambs, 62,000 hogs and pigs on feed, and a few large commercial poultry operations in Idaho. Approximate animal numbers for poultry and other animal-rearing operations are not known.

Animal waste contains elements which may impact surface and ground water quality. Nitrogen, phosphorus and potassium are nutrients of primary concern. Proper nutrient budgeting will not only allow manure to be spread correctly, it can reduce the need for application of commercial fertilizer. For example, it has been estimated the total nitrogen produced by the dairy cows in Jerome county would supply less than 60% of the nitrogen needs of the potato acreage in Jerome county. However, the livestock industry recognizes the concentration of animals in specific areas may require that manure nutrients be transported to applicable sites. The CFO guidelines illustrate BMPs such as composting that would enhance this aspect of livestock waste management.

ANIMAL WASTE NUTRIENT MANAGEMENT

Because of its nutrient value, manure should be considered a resource instead of a waste. The amount and kind of nutrient value in this "resource" depends on the animal, type of feed, method and length of storage, and method of application. Proper land application of manure will result in decomposition of organic matter into available elements essential to plant growth, notably nitrogen, and an improved crop yield. Decomposed organic matter also improves soil tilth, increases water-holding capacity, reduces wind and water erosion, improves aeration, and promotes growth of beneficial organisms. Depending on the water content of waste applied, it can also supplement irrigation. The nutrient content, while minimal in diluted wastes, can still be valuable. The value to crop production then includes both nutrient and water value.

Factors to consider in waste utilization are site evaluation, soil characteristics, timing of application, application rates, crop rotation, and available land for application. Tracking nutrient application may be necessary to protect ground water. Specific information relative to all these factors are addressed in detail in the CFO guidelines.

EDUCATION

Education is the key to participation in CFO Nutrient Management Plan. The CFO guidelines have been distributed to the following organizations.

- Idaho Cattle Association
- United Dairymen of Idaho
- Idaho Pork Producers Association
- Idaho Poultry Association
- Idaho Veterinary Medical Association
- Idaho Wool Growers Association

Examples of other agencies using the CFO guidelines include:

- Idaho Department of Agriculture
- University of Idaho Cooperative Extension System
- USDA - Soil Conservation Service
- Lending Agencies

United Dairymen of Idaho has distributed this document to every dairyman in Idaho.

Current and Future Activities

Idaho water quality standards are regulations of the Idaho Department of Health and Welfare, Division of Environmental Quality. General water quality standards state that as a result of man-caused point or nonpoint source discharge, waters of the state must not contain a) excess nutrients that impair designated or protected beneficial uses and, b) materials in concentrations that would result in an anaerobic water condition.

In 1987 the Environmental Protection Agency (EPA) issued a general permit to regulate discharges for confined feeding operations in Idaho under the Clean Water Act's (CWA) National Pollutant Discharge Elimination System (NPDES) permit program.

As a result of the EPA general permit, a planning grant was funded by USEPA. In addition to EPA, technical and editorial assistance was provided by a broad based advisory committee. This committee was instrumental in developing a workshop program for feedlot and dairy operators to introduce and discuss the concepts and practices presented in this report. Over the years, numerous educational programs have been presented to aid livestock operators in meeting the original intent of reducing surface water pollution. It is our opinion the effect was highly successful in this regard.

The 1993 revision of the *Idaho Waste Management Guidelines for Confined Feeding Operations* adds considerable material and especially strengthens the concept of maintaining surface and ground water quality through proper land treatment of animal waste. We feel that through continued educational efforts the success enjoyed with the original CAFO guidelines can be enhanced.

Confined feeding operations differ in many factors including specie, size, location and management. In addition, the waste management facilities and management also differ by operation. Because of this, educational programs are considered the best method to encourage CFOs to increase the use of best management practices (BMPs). This would include education of those involved directly in animal agriculture, crop farmers, contractors, lenders, processors and the general public. It is important to note that education is not new, but an ongoing program.

Confined Feeding Operation Education

The emphasis of education programs for CFOs will focus on the current water quality situation as it relates to animal agriculture and the impact of current rules, regulations and guidelines. The *Idaho Waste Management Guidelines for Confined Feeding Operations* has been addressed throughout this WMP. The goal of DEQ and the CFO industry is to have the guidelines used industry-wide.

Potential delivery methods include:

- University of Idaho newsletters, Current Information Series and Extension Bulletins. This material could discuss current projects/activities, system design, maintenance, operation, rules, regulations, nutrient budgeting, etc.

- Commodity meetings. These meetings usually are grass roots driven to meet specific concerns of the group. An example would be the Magic Valley Winter Dairy Forum in 1993 sponsored by the University of Idaho with a one day educational program on waste management/water quality concerns.

- Field day/tours. Tours of state of the art facilities and innovative practices will be conducted.

- Industry annual meetings. Presentations as directed by membership and board of directors will be made by appropriate speakers. For example, during the last three (3) years in state and out-of-state invited speakers have addressed livestock waste issues at the annual meeting of United Dairymen of Idaho. Several speakers addressed livestock waste issues at the 1993 annual meeting of the Idaho Cattlemen's Association. In 1994 speakers will address waste issues at regional beef schools and the annual meeting of the Idaho Swine Association.

- Operation of merit - Encourage each of the animal organizations to develop recognition awards based on aesthetics of the operation. It would include a properly designed, operated and maintained waste management system. DEQ, EPA and others are assisting in this evaluation.

- Continue to solicit financial resources from animal agriculture to fund projects that provide information to fill voids in our database. An example would be United Dairymen of Idaho's support of Milking Center Waste Characteristics project initiated in 1989 and supported yearly. This data will be the basis of liquid waste application guidelines.

- Cooperative workshops. Work with other agencies to conduct/coordinate waste management efforts. An example would be the February 1994 workshop "Saving and Making Money from Organic Waste: A Workshop on Sustainable Waste Management " to be held in Twin Falls. Nationally recognized experts will discuss waste management practices that result in beneficial reuse of organic waste. This workshop is supported by the University of Idaho, U.S. EPA and numerous state and local organizations.

Related Industries Education

There is a direct relationship between animal and crop agriculture. Many of the crops grown by farmers in Idaho are utilized by animals either directly or indirectly. Crops fed directly to animals include alfalfa, silage corn, barley, wheat and field corn.

The Idaho CFO industry provides economical disposal for many food processing waste products. For example, 179,000 tons of wet beet pulp and tailage, 75,000 tons of corn cannery waste and significant tonnage of potato waste and whey are products used by the livestock industry in the Magic Valley. The livestock and food processing industries are very dependent on each other for their long-term sustainability. Without the livestock industry, food processors would have considerably greater expenses in waste disposal. In contrast the livestock industry maintains sustainability through feeding low cost by-product feedstuffs.

This symbiotic relationship between animals and crops also extends into waste management/water quality. Programs and projects to further determine the fertilizer characteristics and value of animal waste products will be continued with animal and crop farmers. Proper matching of animal waste nutrients to crop and soil condition will eliminate any pollution potential. Proper nutrient budgeting will allow manure to be spread correctly and will reduce the need for application of commercial fertilizer. Examples of on-going programs/projects include:

- University faculty will continue to determine animal waste nutrient characteristics.
- Continue to review fertilizer guides especially relative to animal waste.
- Continue to review or develop applicable computer programs to aid in matching animal waste to crop needs.

Contractors, Lenders, Processors Education

Many allied groups or people have an impact on confined animal operators either directly or indirectly. For example, education of contractors concerning animal waste requirements and regulations would be desirable as new facilities are constructed. Lenders can play a role in waste/water quality issues. Confined animal feeding operations often need to borrow capital to upgrade a waste facility and/or lenders often want to know the regulatory status of the waste system on new or purchased facilities.

Educational methods include:

- Invitations to programs, workshops, seminars, etc. already discussed.

- Specific education opportunities as determined by respective groups.

- Develop video of example livestock waste management systems. (U of I Extension faculty have received funding through Federal Water Quality Funds).

General Public Education

Animal agriculture is important to the economic well being of the Magic Valley and the whole state. Understanding the relationship to animals, crops and water quality will continue to be covered in educational efforts. Specific innovative practices will be documented. Delivery methods included to date:

- TV and radio interviews
- Popular press articles
- Service group presentations

In addition to the educational efforts discussed, the animal industry will continue to cooperate with all agencies to develop programs and/or projects that will aid in implementation, monitoring and compliance of BMPs. An example could be the close association between animal agriculture and the canal companies. In the past it was common for livestock facilities to be built along side canals in order to provide cattle drinking water. In addition, irrigated agriculture provides direct and byproduct feeds for animal agriculture. Therefore, many confined feeding operations are found in association and close contact to canals. Because of this relationship, the monitoring program being developed by irrigated agriculture could be used to evaluate animal industries level of implementation and compliance. Another example would be to continue to support the well testing programs.

Leadership and board of directors for both the United Dairymen of Idaho and Idaho Cattlemen Association are working on supporting more effective means of reaching all operators. The Idaho Dairymen's Association is interested in finding a commonsense approach to protecting Idaho's water quality. During a joint meeting in January 1995 with federal, state, county agencies, organizations, and other groups, the idea of transferring dairy waste inspections from the US EPA and ID DEQ to the Idaho Department of Agriculture was formulated. A task force formulated the Idaho Dairy Pollution Prevention Initiative Memorandum of Understanding (i.e., Dairy MOU).

The objectives of this Dairy MOU are to define roles of the agencies in regulating the dairy industry in Idaho and to recognize the Idaho State Department of Agriculture's (ISDA's) lead role in ensuring dairy waste systems and practices in accordance with the provisions outlined in the *Idaho Waste Management Guidelines for Confined Feeding Operations* (CFO Guidelines), a 1993 publication by the IDHW's DEQ. This Dairy MOU sets forth a working arrangement between the agencies and the Idaho dairymen to reduce duplicative inspection efforts, increase the frequency of inspections of dairy waste management systems and to provide a sound inspection program, in order to prevent pollution and protect Idaho's surface and groundwater from dairy waste contamination.

This Dairy MOU has been developed because of the recognition by the Idaho Dairyment's Association (IDA), ISDA, the U.S. EPA, IDEQ, and other interested parties for the need to formalize an ongoing effort to conserve resources, to more effectively and efficiently use personnel, to reduce duplicative inspection services, and toensure Idaho dairymen comply with the Clean Water Act (CWA) and the Idaho Water Quality Standards and Wastewater Treatment Standards (IWQS). This approach will capitalize on the already frequent presence of ISDA dairy inspectors on dairy farms and is intended to enable IDEQ and the EPA to redirect and focus resources.

Current pollution contribution by CFOs is difficult to measure. The CWA and state regulations dictate zero runoff. Any producer currently allowing this is in violation of existing laws. EPA can levy a fine on an NPDES permitted CFO. Therefore, the CFO industry will utilize peer pressure to bring offenders under control as the industry does not have enforcement authority.

Implementation of the BMPs illustrated in the CFO guidelines by the livestock industry along with strict enforcement of the existing "no" runoff as required by EPA/DEQ should achieve zero nutrient contribution by animal agriculture.

MONITORING AND COMPLIANCE

Action and Compliance Timetable for the Mid-Snake Nutrient Management Plan

1985 — Aerial survey conducted by EPA.

1986 — CAFO Advisory Committee formed to develop animal waste guidelines.

1987 — CAFO Advisory Committee publish and distribute *Idaho Waste Management Guidelines for Concentrated Animal Feeding Operations.*
USEPA issued general permit to regulate discharges from CAFOs under CWA's NPDES permit program.

1987-88 — CAFO Advisory Committee workshop program for feedlot and dairy operators to introduce and discuss guideline concepts and practices.

1993 — Distribute state CFO guidelines to all dairy producers in Idaho.
Conduct waste management seminars at UDI and ICA annual meetings.
Conduct regional waste management seminars in south eastern, south central and south western Idaho.
Regional workshops (4) on NPDES permit.
University of Idaho lagoon waste water sampling project.

1994 — Waste management seminar at Idaho Pork Producers annual meeting.
Organic Waste workshop in Twin Falls (February).
Attempted to ammend Idaho Code 39-118 to give DEQ statewide authority to review plans and specifications for CFO waste facilities.
University of Idaho research project on lagoon sealing. Published.
Manure for Energy workshop in Twin Falls (December).
Develop contractor workshops on CFO facility design and construction.

1995 — Conduct contractor workshops (February).
Finalize producer education programs.
Conduct Animal Waste Management workshops in Boise valley (Spring).
Develop farmer education programs in conjunction with irrigated agriculture for dealing with CFO wastes.
Continue to work on 39-118 legislation.
Develop and conduct statewide survey on producer adoption of waste management BMPs to establish a baseline of compliance in terms of which BMPs are being used and number of operations using BMPs.
Finalize criteria for "EPA Environmental Good Steward" awards as a measure of adoption of BMPs by industry.
Continue to develop "out of basin" markets for compost as means to reduce nutrients in Mid-Snake area.

1996 — First round of environmental awards.

1997 — Continue education and awards programs.

1998 — Reevaluate education programs if not achieving 10% per year environmental awards.

1999 — Repeat producer survey to determine percent of BMPs adopted.

2000 — 50% of operations achieving environmental awards.
90% of operations adopting at least some BMPs

Appendix A-3

PROPOSED WATERSHED REDUCTION PLAN for THE FOOD PROCESSING INDUSTRY for THE MIDDLE SNAKE RIVER

Submitted to

Idaho Department of Health and Welfare
Division of Environmental Quality

by

Idaho Association of Commerce and Industry
South Central Idaho Food Processors

FOOD PROCESSING WATERSHED MANAGEMENT PLAN

THE GOALS OF THE IACI SOUTH CENTRAL IDAHO FOOD PROCESSORS:

1. Quantify phosphorus discharges.
2. Identify phosphorus sources.
3. Identify technologies for phosphorus reduction.
4. Determine feasibility of 75% reduction in phosphorus discharges through both in-plant source reductions and end-of-pipe treatment.
5. Reduce total phosphorus discharge to the Middle Snake River by 20% within five years of plan approval.

MANAGEMENT ACTIONS:

1. Reduce SAPP (Sodium Acid Pyro-Phosphate) usage
2. Research to identify, segregate and treat Phosphorus in waste streams
3. Research and Develop BMPs.
4. Plant Operator Education.
5. Upgrades of waste management facilities.
6. Improved Operation and Maintenance Procedures
7. Certifications

COMPLIANCE ACTIONS:

1. NPDES permits.
2. Land application permits.
3. Pre-treatment Agreements with POTW

IMPLEMENTATION EFFECTIVENESS:

1. NPDES Monitoring
2. Internal Waste Stream Monitoring
3. Annual Reports

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INTRODUCTION

The food processing industry in South Central Idaho is a mature, stable industy, constituting 32.1% of the $650 million gross regional product. The industry includes frozen, canned and dehydrated vegetable products, cheese, packaged meats and processed sugar.

The food processors most directly affected by the Mid Snake Nutrient Managemen process consist of two potato processors who discharge directly into Milner Pool, which is immediately upstream of the segment of concern in the present planning process. The other food processors in the area either land apply waste water or discharge through a publicly owned treatment plant. Many of these are also seasonal dischargers.

The discharges of waste water from food processors are regulated either as direct dischargers to waters of the United States by EPA under the provisions of National Pollutant Discharge Elimination System permits, by the state of Idaho under the land application permit system or under permits with municipalities. Land application of waste water, unlike normal farming practices, allows no discharge to surface waters. All systems are self-contained and under the terms of the permits waste water must be applied in such a manner that ground water is not adversely affected. If furrow irrigation is the application method of choice, tail water runoff must be collected and reapplied to the land.

Because there is no surface runoff from land application sites and because, as a general rule, phosphorus will mineralize and adhere to soil particles, rather than solubilize and be transported through ground water, this plan is specifically targeted toward the control of phosphorus in point source discharges to surface water. Those food processors who land apply waste water are not directly involved in this study and plan, but are supporting the plan through participation in either the IACI Environmental Committee or the IACI Potato Research Committee. Land applying food processors, however, will be listed on the wasteload allocation table for the food processing industry and will be allocated a value of zero since they do not discharge directly to a tributary or the Middle Snake River.

INDUSTRY SPECIFIC POLLUTANTS AND TREATMENT SYSTEMS

The two direct dischargers operate under the constraints of NPDES permits which limit certain constituents of the discharge. Phosphorus has not been a permit-limited constituent and, therefore, until they started collecting data in 1994, these plants had little information on the phosphorus content of the discharged water. EPA issued permit renewals, effective on October 31, 1994, for both plants. End-of-pipe phosphorus monitoring is a requirement in both permits. In addition, the permits provide for instream monitoring for nutrients and other constituents to be conducted in Milner pool twice a year for the duration of the permit.

A typical potato processing plant uses one to two million gallons of water per day. Water is used in contact with the potato to wash incoming raw product, to move product through the process, to force potatoes through cutting knives and to partially cook product. Starch is recovered from the water used in cutting the potato. Water is also used to clean the factory.

The major contribution of pollutants from potato processors consist of organic matter (measured as BOD and COD), nitrogen in the ammonia, TKN and nitrate forms, total suspended solids (TSS) and phosphorus in the ortho and total P forms. BOD, ammonia and TSS are regulated under the NPDES permit program. The limitations in the permits are first derived from technology-based effluent guidelines that have been developed by EPA. Additional permit limits are water-quality-based limitations. The two discharges to Milner Pool have limits on BOD and ammonia based upon the quality of the receiving water, temperature, and river flow. There are no discharge limitations on either nitrate or phosphorus, but the permits included monitoring requirements for total phosphorus, dissolved orthophosphate, nitrate/nitrite nitrogen and total Kjeldahl nitrogen (TKN).

The two potato processors have some similarities in waste water treatment. Both have anaerobic digesters which remove much of the BOD and convert most of the protein nitrogen to ammonia. The anaerobic digesters also produce biogas that can be used in the plants' boilers. The digesters do not appear to remove phosphorus. The two discharges have activated sludge systems which convert ammonia nitrogen to nitrate nitrogen and settling and polishing ponds prior to discharge into Milner Pool. Both processors have installed significant upgrades to their treatment systems.

In the past, neither nitrate nitrogen nor phosphorus have been considered to be pollutants of concern, and, therefore, have not been regulated in the discharge permits. This plan does not address nitrate nitrogen. The intent of this plan is to quantify the discharge of phosphorus and to identify measures that can be used to reduce phosphorus discharges. Those measures will include both in-plant source reduction and end-of-pipe treatment. In addition, the two potato processors commit to achieve a 20 per cent reduction in total phosphorus in their effluent within five years of approval of this plan.

Many vegetable and milk processing plants land apply waste water. In that case, there is no direct discharge to the river. The phosphorus mineralizes and remains in the soil and nitrate is generally the limiting parameter. The processors have no evidence that phosphorus leaches to ground water or to interconnected surface water. Should it prove to leach, it can be controlled through mechanisms in the land application permit. The land application permit program is administered by the state of Idaho.

MANAGEMENT RESPONSE STRATEGY

In addressing the response of the food processors to the Mid Snake Watershed Management Planning Process, it is clear that the first phase must be identification of the problem. That is, what is the contribution of the potato processing facilities to phosphorus loading in the river. Second, the information on phosphorus removal from waste streams that has been generated by EPA and others for the most part pertains to municipalities. Potato processing waste streams are significantly different from domestic waste and will require additional research.

The potato processors are, for all practical purposes, starting from scratch in the area of phosphorus removal. Thus the program, which was implemented beginning in early 1992 consists of the following:

I. GOALS

The goal of this undertaking is to quantify phosphorus discharges from potato processing plants, to identify sources of phosphorus in the plants, to identify technologies for phosphorus reduction, and to reduce phosphorus discharges from the potato processing plants by at least 20 per cent within five years of approval of this plan. Phosphorus sources include the potato itself, food additives and some cleaning materials. The initial goal of determining the feasibility of reaching 75% removal or better, is a continuing effort and results of removal studies will be taken into consideration in setting future removal goals.

Management actions to achieve these goals will include short term measures such as reduction in SAPP usage and identification and reduction of high-strength waste streams. In the long term the plan includes research to develop BMPs, improved operation and maintenance, upgrades to waste management facilities and education measures. These are outlined below. The measure of all of these is ultimately at the point of discharge of the effluent to Milner Pool and reduction measurements will be based upon reduction from baseline levels determined in a two year period from November 1994 through October 1996 as documented in NPDES Discharge Monitoring Report data submitted to EPA.

II. QUANTIFICATION/CHARACTERIZATION

A. All three plants have analyzed discharge streams for quantities of phosphorus. Phosphorus analysis in high concentration waste streams has been a problem. The ability to achieve reproducible results has been problematical. Therefore, the IACI Potato Research Committee has, through the Potato Commission's Research and Education Committee, financed research at the University of Idaho to develop a protocol for testing phosphorus in a variety of potato waste water streams. This research began in July 1992 through 1994.

B. Originally the IACI Committee's research was directed toward identification of specific in-plant streams that possibly could be isolated and treated, as opposed to end-of-pipe treatment for phosphorus. As a preliminary conclusion, it appears that added chemicals, such as SAPP (sodium acid pyrophosphate) and certain sanitation chemicals, are small contributors to the total phosphorus loading. It appears that most of the phosphorus in the waste water comes from the potato itself.

C. Much remains to be done with the analysis of the potato and in-plant waste streams. Part of the difficulty in going to end-of-pipe treatment is the large flow of water that is used by a potato processing plant. There may be opportunities to segregate the most concentrated streams for treatment.

D. Analysis of in-plant streams at certain specified locations was conducted by the University of Idaho, and a report has been issued. In conjunction with that research, the processors have worked with the University researchers to analyze the data and determine the effects that total phosphorus and specific species of phosphorus have on potential treatment technologies that are applicable to the potato industry. Although the results of bench scale testing show that there are a couple of chemicals that appear feasible to remove phosphorus, there remains significant uncertainty. Lime and alum will precipitate phosphorus, but the ramifications of the effect of the presence of these chemimals in the solid byproduct has unknown ramifications on other uses of that material. Currently the byproduct solids from the primary clarification process are used for cattle feed. It is not at all clear whether the addition of chemicals would affect this use.

III. TREATMENT TECHNOLOGIES

A. The industry participants have conducted and will continue to update a literature review and examination of current operating systems to identify the broad group of technologies available of phosphorus control. Physical and chemical separation and biological assimilation of phosphorus and the impact of the treatment on down stream treatment units will be addressed. This research will continue until a final decision is made on the appropriate removal technology.

B. Specific technologies will be identified and refined as a result of the above study. This study will also include evaluation of secondary impacts, such as effects of treatment on sludge, animal feed uses, anaerobic resolubilization of phosphate, cross media problems for sludges.

IV. EDUCATIONAL COMPONENTS

Since this evaluation process started, participants have already implemented some programs to reduce phosphorus-containing chemical usage. These programs include reduction in SAPP usage, substitution of low-phosphorus cleaning chemicals for sanitation, reduction in water usage and excessive use of cleaning chemicals. These are in-plant best management practices that will be implemented on a plant-by-plant basis. The BMP program includes reduction in water usage, overall plant management and waste minimization will be continued on a voluntary basis in each plant.

This plan does not focus on BMP development, except as an educational component. BMPs, in general, will be plant specific and implemented as deemed appropriate by management. Because this end-of-pipe discharge is the point of compliance, BMPs are optional. Source reduction opportunities will be evaluated and implemented where they make sense, but the focus of this plan is overall phosphorus reduction at the discharge point.

V. MONITORING AND COMPLIANCE

A. Monitoring is required for the two direct dischargers as part of their NPDES permits. The mechanism for compliance with final limits is in the permit. The processors commit to embark upon an internal phosphorus minimization program. In fact, these have already begun.

B. There is a presumption that ultimately phosphorus reduction will be required. The steps that the processors are taking here are designed to systematically determine what is the extent of the phosphorus contribution from potato processing and how can that amount of phosphorus be most effectively reduced.

C. The timetable for ultimate reduction of phosphorus will be in the permits for the three facilities. Two years, starting in July 1992, were used to broadly identify and characterize phosphorus in waste streams and develop an analytical protocol. Additional time will be required for the identification of appropriate treatment. Two years starting November 1994 will be used to quantify the baseline discharge of phosphorus from the potato processing plants. In light of the total contributions of the two direct discharges to the Mid Snake nutrient loading in the growing season and an evaluation of how the discharges into Milner Pool affect the lower reaches of the river, the processors are committing to a 20 percent reduction in total phosphorus in their discharges using the two years of analytical data as a baseline. The processors will continue to evaluate the feasibility and necessity of further reduction.

D. The analytical results are required as a condition of the NPDES permits for the two direct dischargers and thus are reported to EPA on a monthly basis. This information will provide the basis for determining the total reduction in phosphorus loading in the effluents. The information is available to EPA, DEQ and the industry group and will serve as the basis for determining compliance with this plan. Should further reduction be necessary, it will be achieved first through voluntary efforts by the food processors and if that proves ineffective, permit modifications can be implemented to achieve this.

APPENDIX A-4

THE PROPOSED WATERSHED REDUCTION PLAN FOR THE HYDROELECTRIC INDUSTRY FOR THE MIDDLE SNAKE RIVER

submitted to

Idaho Department of Health and Welfare
Division of Environmental Quality

Contributors:

Idaho Power Co.
L.B. Industries, Inc.
Cogeneration, Inc.
B & C Energy, Inc.

HYDROELECTRIC INDUSTRY WATERSHED MANAGEMENT PLAN

GOALS:

1. Comply with existing state and federal regulations.
2. Minimize impacts on Snake River by adopting BMP strategies.

MANAGEMENT ACTIONS:

1. Participate on Mid-Snake Public Advisory committees.
2. Monitor dissolved oxygen and temperature levels.
3. Develop Environmental Evaluations and Protection, Mitigation, and Enhancement plans in conjunction with relicensing.
4. Removal of aquatic vegetation (trash) at Upper Salmon facility.
5. Evaluate minimum target flows for river bypass reaches.
6. Support Idaho Power's energy conservation program.
7. Possible participation in beneficial water quality projects.

COMPLIANCE ACTIONS:

1. Permits, licenses, consent orders and compliance schedules.

IMPLEMENTATION EFFECTIVENESS:

1. Monitoring permit and license compliance.
2. Annual Progress Reports.

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EXECUTIVE SUMMARY

POSITION: Snake River water quality will likely benefit from reductions in nutrient loading, but the Hydroelectric Industry is unique from many other entities that utilize the river because hydroelectric facilities are not sources of nutrients.

GOALS: The Hydroelectric Industry's nutrient management goals are to comply with existing State and Federal regulations, and minimize impacts on the Snake River by adopting Best Management Practice Strategies.

OBJECTIVE # 1: The Hydroelectric Industry will comply with all Federal and State regulations and licenses. There are many general regulations that govern how the Hydroelectric Industry conducts business. Each power facility is issued a license from the Federal Energy Regulatory Commission (FERC) that contains many specific environmentally related provisions. Each hydroelectric facility is also regulated by State permits. These license articles and consent orders are developed to ensure environmental protection and carry severe penalties for non-compliance.

OBJECTIVE # 2: Best Management Practice Strategies that the Hydroelectric Industry will adopt include:

A) The Hydroelectric Industry is participating in the Department of Environmental Quality Mid-Snake River Nutrient Management Planning Process. A Hydroelectric Industry representative has participated at each meeting.

B) The Hydroelectric Industry will monitor dissolved oxygen and temperature levels of the water as it flows from each facility. This activity also calls for measures to insure compliance with State Water Quality Criteria (i.e. oxygen additions, or operational modifications).

C) The Hydroelectric Industry is conducting extensive monitoring to evaluate environmental conditions associated with hydroelectric facility operations. For example, Idaho Power is conducting aquatic, terrestrial, and recreational studies associated with the relicensing of its Mid-Snake River hydroelectric facilities. These studies will be used to develop Protection, Mitigation, and Enhancement plans and actions to maintain or improve existing conditions.

D) The Hydroelectric Industry will remove debris and aquatic macrophytes that gather at the intakes of the facilities wherever practical. For example, Idaho Power Company will continue the removal of aquatic vegetation that gathers on the Upper Salmon hydroelectric facility intake structures (by December 1994, Idaho Power removed in excess of 6,000 cubic yards of vegetation from the River).

E) The Hydroelectric Industry will evaluate minimum target flows for river bypass reaches of the Snake River. This has been done at Milner Dam where a 200 cfs bypass target flow has been adopted.

F) The Idaho Power Company, the largest electric utility in Southern Idaho, has taken significant steps to slow the need for additional power generation facilities. Idaho Power has developed a Conservation Plan that includes residential, commercial, and agricultural programs to delay the need for additional generation facilities. Idaho Power has also developed an Integrated Resource Plan. This plan provides a menu of power sources into the future.

G) The Hydroelectric Industry will consider participation in water quality projects which will potentially provide benefits to the environment, and society, by reducing, or removing sediment and nutrient additions to the Snake River. Participation will be based on a case-by-case evaluation of the merits of proposed projects.

I. INTRODUCTION

The Snake River is the largest river system in Idaho, draining approximately 87 percent of the state. It is over 1,000 miles long and drops nearly 5,000 feet from where it enters Idaho from Wyoming to where it leaves the state near Lewiston. Most of the flows of the Snake River basin are derived from snow melt in mountainous areas.

The Snake River basin is subject to relatively large variation in runoff. A period of above normal runoff began in 1965 and continued through 1976, although 1968 and 1973 were drier than normal. Runoff in 1977 was the lowest of record at most gauges in the basin and was followed by generally below normal flows in the 1978-81 period. Unusually high flow conditions returned in the 1982-84 period, including the maximum discharge of record on June 14, 1984. From 1985-86, flows were about average, followed by a low flow period from 1987 to the present.

Water quality problems in the middle Snake River (Milner Dam to King Hill) have become significant issues for regulatory agencies, resource agencies, user groups, and the general public. The river is a valuable resource which supports many uses. This Hydroelectric Industry Nutrient Management Plan is being submitted as part of an organized effort by all interest groups to maintain a quality of water in the Snake River adequate to support beneficial uses.

The Hydroelectric Industry differs from many other entities that utilize the river because hydroelectric projects are not a source of nutrients. Impoundment of the river, or reducing flows in segments of the river can affect the capabilities of the river to transport and process nutrients that are in the water, but the hydroelectric facilities in the middle Snake River are not a source of nutrients. As such, all actions that the industry can propose will be limited to removal of nutrients that have already been discharged into the river, and monitoring and re-mediation of effects related to nutrient enrichment by other activities.

Water quality conditions in a system are the function of complex natural and man-made causes and the resulting interactions in both time and space (Sanders et al. 1983); the result of the activities of society, and the natural hydrologic cycle (Petts 1984). Enrichment of the waters of the middle Snake River by nutrient pollutants, and associated biological activity is placing some designated beneficial uses at risk. Eutrophication (process of productivity enrichment) is a major water quality concern.

The 1988 Idaho Water Quality Status Report and Non-point Source Assessment rated the overall water quality at the measuring point at King Hill as fair. Analysis of the water quality data indicates that while some of the river's physical and chemical characteristics are within ranges which support aquatic life, other parameters may exert toxic influences upon the aquatic community.

GOALS OF INDUSTRY

The Hydroelectric Industry's nutrient management goals are to comply with existing State and Federal regulations, and minimize impacts on the Snake River by adopting Best Management Practice Strategies.

STATUS OF INDUSTRY

Hydroelectric power production in the Mid Snake Reach was initiated at Shoshone Falls in 1907 (Idaho Power Company 1991a). Twin Falls development occurred next in 1935 (Idaho Power Company 1983). In 1947, 1948, and 1949, Upper Salmon Falls, Bliss, and Lower Salmon Falls were developed, respectively (Idaho Power Company 1990). Milner Dam was built in 1905, but hydroelectric generation capabilities were not added until 1992 (Twin Falls Canal Company et. al. 1990).

There are seven potential hydroelectric development sites, that have been evaluated for development since 1990, on the Snake River between Milner and King Hill. These sites include Star Falls (B & C Energy, Inc. 1982), Auger Falls (Cogeneration, Inc. 1983), Boulder Rapids (L.B. Industries, Inc. 1992a), Empire Rapids (L.B. Industries, Inc. 1992b), Kanaka Rapids (L.B. Industries, Inc. 1992c), A. J. Wiley (Idaho Power Company 1991b), and Dike (Dike Hydro - Mr. Bart O'Keffe Sacramento, CA). These potential hydroelectric sites are in various stages of evaluation for development (Table 1).

At the end of 1992 approximately 37 small hydroelectric generating facilities were in operation in Gooding, Twin Falls, and Jerome Counties (Appendix). These small hydroelectric facilities are on spring returns, irrigation drops or returns and have no measurable impact to Snake River water quality. These facilities were in part developed because of the Public Utility Regulatory Policy Act of 1978 (PURPA). This act encouraged competitive alternatives to utility generation and the use of all resources effectively for the generation of electricity. PURPA also established requirements for utilities to purchase power from outside parties. The Idaho Public Utilities Commission is responsible for implementing PURPA within Idaho.

Table 1. Current status of existing and proposed mainstem middle Snake River Hydroelectric projects.

Project	Stage of Licensing	Stage of Relicensing	Current License Effective Date	Current License Expiration Date
Milner - EXISTING	5	NA	1988	2038
Twin Falls - EXISTING	5	NA	1991	2040
Shoshone Falls - EXISTING	5	2	1949	1999
Upper Salmon Falls - EXISTING	5	2	1949	1998
Lower Salmon Falls - EXISTING	5	2	1947	1997
Bliss - EXISTING	5	2	1948	1998
Auger Falls - PROPOSED	5	NA	1991	2041
Star Falls	1	NA	NA	NA
Boulder Rapids	6	NA	NA	NA
Empire Rapids	6	NA	NA	NA
Kanaka Rapids	6	NA	NA	NA
A. J. Wiley	6	NA	NA	NA
Dike - PROPOSED	1	NA	NA	NA

1) Decision to file and initial actions
2) Study execution and draft application preparation
3) Completion of second stage consultation
4) Application process and NEPA compliance
5) License issuance and monitoring
6) License not currently being pursued

CHANGES IN INDUSTRY PRACTICES THAT IMPACT WATER QUALITY

Electric companies are facing a period of great uncertainty as the United States addresses the issues of deregulation and competition in the electric industry. This change in regulation was set forth in 1992 Energy Policy Act. Historic regulation guaranteed utilities service territories. These new regulations could significantly alter, if not eliminate, the "regulatory compact." In a competitive market place with no service area boundaries, the market price for energy will dictate the utility's generation-related revenues, regardless of the cost of its resources. Historic regulation will not take the place of the market and the wholesale and retail prices of energy would rise and fall to meet market conditions.

APPENDIX A-5

THE WATERSHED REDUCTION PLAN

OF

THE IRRIGATED AGRICULTURAL INDUSTRY

FOR

THE MIDDLE SNAKE RIVER

for

The Idaho Department of Health and Welfare
Division of Environmental Quality

by

Middle Snake River Irrigators' Water Quality Committee

IRRGIATED AGRICULTURE WATERSHED MANAGEMENT PLAN

THE GOALS OF THE MID-SNAKE IRRIGATION WATER QUALITY COORDINATION COMMITTEE:

1. Decrease sediment by an initial 21%, with 27% decrease by year 2000

MANAGEMENT ACTIONS:

1. Construction of sediment ponds and wetlands on irrigation return flows
2. Sponsor water quality and technology research.
3. Water user (operator, canal company, and public) Education on Best Management Practices.

COMPLIANCE ACTIONS:

1. Peer pressure.

IMPLEMENTATION EFFECTIVENESS:

1. Monitoring Program for canals, drains and river
2. Irrigator Attitude Survey of BMP Implementation
3. Annual Reports

FOREWARD

The Mid Snake Irrigation Water Quality Coordination Committee was formed during the spring of 1992 to address water quality concerns in the Middle Snake River reach related to irrigated agriculture and to interface with Idaho Department of Health and Welfare Division of Environmental Quality nutrient management planning activities. The membership of the committee includes representation of the irrigators in the Magic Valley, agencies involved with agricultural best management practice research and implementation. Magic Valley irrigators who are served by irrigation companies or districts either own stock in the canal companies or have title to lands served by the irrigation district. Due to these facts, the directors and management serve at the pleasure of the irrigators and therefore represent the irrigators. The current makeup of the committee is:

Organization	Positions	Representation
Northside Canal Company	4	Management: 2 Board of Directors: 2
Twin Falls Canal Company	4	Management: 2 Board of Directors: 2
USDA Agricultural Research Service	1	Research Scientist
USDA Soil Conservation Service	2	Twin Falls Office: Jerome Office:
University of Idaho	3	Research: 2 Extension: 1
Local Educators	1	Jo Dodds, Twin Falls School District
Soil Conservation Districts	3	Snake River SCD: Balanced Rock SCD: Northside SCD:
USBR	1	Burley Office:

The committee selected Ted Diehl and Charles Coiner to chair the committee. Clarence Robison serves as the committee's secretary. Correspondence to the committee should be addressed to Clarence Robison, University of Idaho Research and Extension Center, 3793 North 3600 East, Kimberly ID 83341.

The canal companies started the development of the watershed management plan for irrigated agriculture by contracting with Jack Eakin, retired manager, to draft a plan. The draft plan was submitted to the committee in May 1992. The committee then proceeded to expand the plan with input from the organizations represented. After incorporation of items from the various agencies, the committee submitted a draft plan to Idaho Department of Health and Welfare Division of Environmental Quality on July 22, 1992. Since that time, the committee has presented the plan and revisions numerous times to the nutrient management planning committees, executive and technical, receiving comments and suggestions for revisions. Based on the comments and suggestions received prior to October 1, 1993; the committee has revised the proposed plan to its current form.

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PROPOSED WATERSHED MANAGEMENT PLAN FOR THE IRRIGATED AGRICULTURE INDUSTRY

INTRODUCTION

The 94 mile reach of the Snake River from Milner Dam to King Hill in southern Idaho is commonly known as the Middle Snake River or Mid Snake. The river flows through an incised canyon in the basalts of the Snake River Group. Flowing west from Milner Dam, the river becomes incised in the basalts as it splits the Magic Valley area of sourthern Idaho in half. During the summer months the flow at Milner may be zero due upstream irrigation diversion requirments. The river regains significant flows from return flow streams, tributaries, and ground water springs and has typically gained 6000 cfs by the time it reaches King Hill. In this reach, the Mid Snake also receives and transports sediments, nutrients, bacteria, and other chemicals from various point and non-point sources. These pollutents result from various activities such as irrigated agriculture, aquaculture, food processing, confined animal feeding operations, and urban industries and activities. Due to the levels of sediments and nutrients combined with the low flows in the reach; the Mid Snake has been designated water quality limited by Idaho Department of Health and Welfare Division of Enviromental Quality (IDHW-DEQ).

Agriculture is the major producer of wealth in the Magic Valley. A University of Idaho study (Robison, M. Henry, et al., 1991) determined that agriculture accounted for 45 percent of the gross regional product, and food processing for 32 percent. Therefore agriculture and associated food processing accounted for over 77 percent of the goods and services produced in the Magic Valley area.

Water use requirements for the crops grown in the Magic Valley Area range between 24 and 36 inches annually. Since average annual rainfall in the area is approximately 9 inches; irrigation is essential to produce the crops and maintain the local economy. The Twin Falls Canal Company and the North Side Canal Company were both developed in the early 1900's as gravity diversion systems providing irrigation water for some 365,000 acres along the Middle Snake River in the Magic Valley.

Return flows from both systems enter the Mid Snake or one of the tributaries to the river. The return flows convey nutrients, bacteria, and sediment rich irrigation tailwater to the river along with urban and storm runoff that impact the beneficial uses of the Snake River. Additionally, the suspended sediment and nutrients transported in the return flows from irrigated lands represent lost crop productivity due to soil erosion.

Since the early 1970's both companies have recognized the problems of return flows and cooperated with federal and state agencies in numerous studies to define the problems. Individual stockholders of each company have also cooperated and participated in projects to reduce the effects of irrigation return flows on the river and its tributaries.

Both companies have developed policies for improvement of the quality of return flows and for several years have participated in the construction and cleaning of sediment ponds and other facilities to reduce the sediment load to the river.

Individual stockholders of both canal companies have independently and in cooperation with federal agencies adopted farming practices to reduce erosion and have constructed settlement ponds to recapture sediment in order to return it to their fields. The canal companies' clean-up efforts, along with those of individual farmers, should significantly reduce agricultural pollutants carried with irrigation return flows. Pollution from non-farming activities and streambank erosion, other than livestock management of riparian vegetation, are not a part of this plan.

The State Nutrient Management Act requires the development of a formal plan for nutrient management. The following is proposed as part of this plan for management of nutrients returning to the middle Snake River arising from irrigated acres in the area. The goal of this plan is to assist in improving the water quality of the Mid Snake through reduction of agricultural contributions of sediments and nutrients in irrigation return flows.

Included in this plan is a program of education for water users and canal company staffs, an inventory of current and potential water quality improvement facilities, with a prioritization of potential facilities, plus a program of water quality monitoring to assess the success of the other programs.

The inventory and prioritization of potential water quality improvement facilities will allow the canal companies in the non irrigation season to work in cooperation with stockholders to construct facilities, beginning with the sites having the heaviest contributions to the Mid-Snake River.

The education program should result in individual stockholders modifying their operations and adopting Best Management Practices (BMP's) with an improvement in the water quality of return flows.

In the past, irrigators, both independently and in cooperative cost share programs with federal and state agencies, have engaged in numerous activities in order to improve water quality. Although such programs will be encouraged, the plan presented herein does not depend upon federal or state financial participation other than the services of personnel from the federal and state agencies.

CHARACTERISTICS OF A GRAVITY IRRIGATION SYSTEM

Both canal company systems were constructed in the early 1900's as gravity diversion systems. All diversions were made from open channel canals and laterals which were constructed along contours dropping only in elevation at a rate sufficient to maintain the flow at the required velocity. Water delivered to farmers was distributed to portions of the farm by means of small farm ditches and from there to corrugates across the fields. The water flowed through the corrugates for a sufficient time to provide the crop with the required moisture. Some water exited the corrugates into a tail ditch while the lower end of the field was absorbing its moisture. Water in tail ditches continued by gravity until it flowed into another lateral, a coulee, a natural water course or the Snake River. The aggregate of water from all tail ditches is referred to as return flows.

SURFACE WATER CONCERNS

As water flows through ditches and corrugates it erodes soil which is then transported further down the system. The water and soil particles also transport other nutrients. The result is that the return flows from irrigated agriculture contribute to the sediment and nutrient load in the Snake River. The loads entering the Snake River from irrigation are typically composed of sediment and nutrients. The sediment consists of fine soil particles. These particles have associated nutrients and pesticides attached to them. Also included in the return flow are dissolved nutrients and pesticides. A study by the University of Idaho in 1990-91 (Brockway, C.E. and C.W. Robison, 1992) monitored sediment and nutrient inflow from irrigation return flow streams and tributaries in the Mid Snake. River flows during the study period were near record lows due the drought which had been occuring since 1987. However, irrigation return flow were near normal due firm water supplies may possible by upstream storage. The study showed that over 21000 tons of sediment entered the river from measured irrigation returns during the 13 month period. Major tributaries which also include additional irrigation return flows accounted for over 52000 tons of sediment. Irrigation return flows supplied the river with 37 tons of phosphorus and 189 tons of nitrate+nitrite nitrogen during the 13 months. Studies by the USDA-ARS (Brown, M.J. et al., 1974; Carter, D.L. et al., 1971; Carter, D.L. et al., 1974) show that the Northside Canal Company tract retains over 51,000 tons of sediment diverted from the river at Milner annually. The Twin Falls tract however exports 42000 tons of sediment. The Northside system retains 90 percent of the phosphorus diverted and the Twin Falls system retained 50 percent of the diverted amount.

GROUND WATER CONCERNS

Irrigation and resulting deep percolation to aquifers can result in leaching of nutrients, both naturally occurring due to nitrogen fixation from legumes and excess commercially applied fertilizer. Confined animal feeding operations, use of manure for fertilizer, and percolation of soluble pesticides are also sources of contaminants in aquifers bordering the

Mid Snake River. Surface irrigation using furrow application of canal water occurs on approximately 90 percent of the Twin Falls Canal Company lands and 50 percent of the Northside Canal Company. Irrigation efficiencies for surface applications are generally between 40 and 60 percent resulting in significant surface return flows and deep percolation below the root zone.

Water quality of underlying aquifers shows concentrations of nitrates above background levels for both the Northside and Twin Falls systems. Ground-water return flows from the Twin Falls tract enter the river during the non-irrigation season and co-mingle with surface return flows during the irrigation season. These return flows therefore show higher nitrate+nitrite concentrations in the winter time but with significantly lower flows. Surface return flow streams from the Northside do not collect ground water returns and therefore show lower concentrations of nitrogen. However, spring flows from the Snake Plain aquifer underlying the Northside system show nitrate+nitrite levels which vary spatially with locations along the reach of the Snake River from Milner to King Hill. Contributions of nitrogen forms from land use activities including rural subdivision septic tank-drainfield systems, municipal treatment systems, confined animal feeding operations as well as irrigated agriculture can all result in elevated nitrogen levels in the ground-water systems. Improved management of applied irrigation water can decrease deep percolation and leaching of nitrogen to the aquifers. Alteration of crop distributions, rotations and tillage practices can improve utilization of applied fertilizers and naturally occurring nutrients with resulting decreases in nutrient and pesticide leaching.

Surface irrigation results in both deep percolation and surface runoff. Reduction of surface runoff from furrow irrigation may increase advance times and result in increased deep percolation. Conversely, minimizing infiltration may be accompanied by increased surface runoff and/or increased erosion and sediment transport from the field. Reduction of both deep percolation and surface runoff requires major changes in application systems and irrigation management.

Springs issuing from the Snake Plain Aquifer and aquifers underlying the Twin Falls Canal Company lands are the primary source of discharge in the Mid Snake River reach. Over 50 percent of the recharge to these aquifers is a result of irrigation on overlying lands from the Snake River and surface streams. Reduction of recharge to these aquifers from irrigated agriculture, while potentially reducing nutrient or pesticide concentrations, will reduce spring flows thereby reducing river flows and the ability of the river to assimilate nutrient loads.

CANAL COMPANY ROLE IN WATER QUALITY IMPROVEMENTS

Canal companies are private stock companies with the stockholders receiving water deliveries in proportion to the shares of stock owned. The purpose of the canal companies is to deliver water and maintain the delivery facilities. The source of revenue for performing this work is an annual assessment paid by the stockholders for each share of stock owned. The canal company has no authority over the stockholder as to the use of the water after delivery other than the flooding of other property. If flooding of other property occurs, the canal company is obligated to shut off water deliveries until the flooding problem is corrected.

The canal companies are in a difficult position concerning water quality since they are responsible for water deliveries to thousands of acres, but have no authority or policing powers concerning the return flows coming from the farms of the stockholders.

Canal companies are authorized under Sec 42-2201 of the Idaho Code to levy charges to shareholders for system maintenance and rehabilitation. There is no specific authorization for assessments for water quality improvement or enhancement. The unsettled issues relate to whether Canal Companies can expend moneys for water quality improvement under the "maintenance" provisions.

The Twin Falls Canal Company and Northside Canal company boards have interpreted their by laws and applicable statutes to "allow" expenditures for water quality improvement but not to require expenditures. For this reason, operating budgets for both canal companies include moneys for water quality improvement projects.

Irrigation return flows are not point source discharges as defined by the Clean Water Act. Therefore, there are no National Pollutant Discharge Elimination System (NPDES) permits for these sources.

Because of water quality problems associated with delivery and because of damage to the environment, the canal companies have over the years engaged in numerous activities; cooperated with agencies in studies and full scale projects, and through education encouraged farmers in adopting BMP's to improve the quality of return flows.

PREVIOUS STUDIES AND NUTRIENT REDUCTION ACTIVITIES

GENERAL

From the beginning of the irrigated tracts in 1905, the primary objective of the canal companies was the delivery of water to their stockholders. The original basic systems were well designed for gravity irrigation and very few modifications have been made in the ensuing years.

As the years progressed, maintenance of the systems became a larger part of the operation, and efforts were made to become more efficient through the use of better water measurement devices, canal and lateral shaping and straightening.

As the techniques became cost effective many individual stockholders abandoned the head ditch and furrow irrigation systems and installed sprinklers on their land while others installed concrete ditches with siphon tubes or installed gated pipe. These changes in the on-farm water delivery system required a substantial investment in dollars and made a marked improvement in the quality of the return flows.

Although soil erosion and its effect upon return flows were recognized in the 1940's it wasn't until the early 1970's that the public became more involved in the problems associated with water quality. The continuing drought, beginning in 1987, has increased the public awareness of the problems.

Numerous studies of sediment and nutrients in return flows, as well as methods to substantially reduce the nutrient levels in these flows, have been studied by the USDA Agricultural Research Service (ARS), Kimberly, Idaho.

The USDA Agricultural Research Service, Agricultural Stabilization and Conservation Service (ASCS) and Soil Conservation Service (SCS), through local Soil Conservation Districts (SCD), have worked cooperatively with stockholders in many studies as well as major projects (both state and federally funded) which have resulted in the improvement of conservation practices and substantial improvement in water quality.

The University of Idaho through the Kimberly Research and Extension Center as an independent agency and in cooperation with the canal companies have worked on numerous projects to define problems of water quality and their solutions.

The canal companies have independently and in cooperation with their stockholders constructed settlement ponds and vegetative strip filters. In certain instances sediment ponds have been constructed and cleaned for one-half the sediment. Large quantities of soil are required by the canal companies for maintenance purposes.

USDA AGRICULTURAL RESEARCH SERVICE

The USDA Agricultural Research Service (ARS), Northwest Irrigation and Soils Research Laboratory at Kimberly, Idaho has conducted numerous studies on sediment and nutrients in irrigation return flows and has also developed extensive technology to reduce sediment and nutrient losses and improve runoff water quality. Some of these studies have been cooperative with the University of Idaho; USDA-ASCS; USDA-SCS; several SCDs; IDHW-DEQ; the Twin Falls and Northside Canal Companies; other agencies and groups; and specific farmers and irrigators. Other studies have been specific, independent research projects to develop and evaluate management alternatives to reduce erosion and water pollution and improve crop production efficiency.

These studies began in the late 1960's and have continued to the present. The first studies involved sediment and nutrient inflow and outflow balances for the Twin Falls and Northside Canal Companies. Results of these studies showed that the Northside Canal Company has a net sediment inflow of 0.31 tons/acre each irrigation season, or the amount of sediment in the water diverted into that system exceeded the amount in return flows entering the Snake River by 0.31 tons/acre. The Twin Falls Canal Company had a 0.21 tons/acre net sediment outflow, or the amount of sediment returned to the Snake River in runoff water exceeded that in the water diverted from the river into the canal system by 0.21 tons/acre each irrigation season. Both canal company systems retained phosphorus. Approximately 90 percent of the phosphorus diverted into the Northside system was retained so that only 10 percent of the diverted amount returned to the river in return flows. The Twin Falls system retained 50 percent of the diverted amount. Both canal companies experienced deposition of large amounts of sediment within canals and drains, indicating serious furrow erosion on farms with subsequent sediment entering canals and drains. This sediment deposition caused expensive canal and drain cleaning.

Following those studies, extensive research was directed toward developing erosion and nutrient loss control technology. In cooperation with other agencies, many best management practices were developed and evaluated. For example, the sediment and nutrient removal efficiencies for sediment ponds of all sizes and types, buried pipe sediment and run off control systems, vegetative filters and placing straw in furrows, were evaluated. Most of these practices concern trapping sediment and nutrients at the tail end of the field. These practices are useful and effective, and installation and management guidelines were developed and area available.

The most recent research studies have been directed towards controlling erosion and preventing sediment and nutrient losses from fields and farms. Emphasis has been places on conservation tillage practices, including no-tillage and reduced tillage practices. This research has also concerned changing cropping sequences to permit the application of no-till practices and minimize the number of tillage operations over a several year crop rotation. Results have shown that irrigation induced erosion can be nearly eliminated and farmers can realize significantly greater profits if this new erosion and nutrient control technology is applied.

Promising studies are in progress which involve treating furrows with whey or with whey and straw together. Early results indicate excellent erosion control. Also the addition of very low concentrations of polymers to irrigation water can eliminate furrow erosion. These studies are in progress and are intended for use on fields where residues from previous crops are not sufficient to control erosion with conservation tillage practices.

USDA SOIL CONSERVATION SERVICE AND SOIL CONSERVATION DISTRICTS

Several water quality projects in the Middle Snake River area have been carried out by the Soil Conservation Service (USDA-SCS) and local Soil Conservation Districts (SCDs).

The Snake River Soil and Water Conservation District in 1977 contracted with the Idaho Division of Environmental Quality to carry out a demonstration project on the LQ Drain in Twin Falls County with funding from US EPA under section 208. Other participating agencies included the University of Idaho and the USDA-ARS. This two year project showed that farmers were willing to participate in voluntary agricultural water quality projects and also that Best Management Practices could significantly reduce sediment levels in irrigation return flows.

In 1981 the Rock Creek Rural Clean Water project was funded by the US EPA with the USDA-ASCSadministrating the project. Participating agencies included the Snake River Soil and Water Conservation District, the USDA-SCS, the Twin Falls County Extension Service, US-EPA, USDA-ARS and IDHW-DEQ. This program provided cost share assistance to farmers to install Best Management Practices. A comprehensive monitoring and evaluation program was also funded to document the effect of the project. Water quality monitoring showed that streambank erosion was a much larger problem than earlier anticipated. Monitoring showed that stream banks contributed from two to over five times as much sediment as cropland. Between 1982 and 1990 the sediment entering the Snake River from Rock Creek had been decreased by over 70 percent.

In Gooding County, the USDA-SCS in conjunction with the Gooding Soil Conservation District has recently completed a River Basin Study on an area south of Wendell. This study looked at the problems and impacts of wind erosion. During the study, water quality impacts were identified. This was primarily from soil being deposited in irrigation ditches and canals.

The North Side Soil Conservation District in conjunction with the USDA-SCS has carried out several water quality project. A public law 566 watershed has been carried out in the Hazelton Butte area. This project covered 14,000 acres. Cost share assistance was provided for farmers to reduce gully and rill erosion, to reduce sediment damage to roads, canals, and cropland, and to improve water quality in the Snake River.

An irrigation water quality project has been conducted on the Vineyard Creek watershed. This project covers 9,800 acres and is located between Jerome and Eden. A grant of approximately $812,000 was received from the IDHW-DEQ. These funds were used to cost share conservation tillage, sprinkler mainlines, irrigation pipelines, gated pipe and concrete ditches. The Balanced Rock Soil Conservation District in western Twin Falls County has conducted agricultural water quality planning projects on Cedar Draw, Deep Creek and Mud Creek. These have been conducted with grants from the IDHW-DEQ. Implementation projects have been conducted on Cedar Draw and a portion of the Deep Creek watershed.

UNIVERSITY OF IDAHO

The University of Idaho Departments of Agricultural Engineering and Civil Engineering have been involved with non-point water quality problems since the early 1970's. The efforts have been on irrigated and dry land watersheds. Typically, the University has been involved in water quality research and demonstration projects with other governmental agencies and canal companies. Documentation of erosion rates, modeling of erosion, evaluation of best management practices (sediment ponds, vegetal filter strips, etc.), impacts on receiving streams, modeling of treatment practices, sediment yield, and transport are a few of the topics covered by the various research projects. In southern Idaho, University water quality projects primarily dealt with surface return flow from irrigated lands in addition to projects dealing with irrigation system design and operation, crop consumptive use, ground water modeling, ground water quality, irrigation water supplies, and water measurement. It has been the experience of the University that if water quality of the receiving stream is the primary issue; then, projects should focus on treatment of irrigation return flows. If the primary focus is on soil erosion and productivity, then project practices should focus on preventing erosion.

In the early 1970's sediment from surface irrigated fields started receiving attention from the local canal companies and agencies. Local canal companies have systems that receive surface runoff from irrigated field. The companies had to deal with the sediment and associated nutrients deposited in their canals and laterals, and were concerned about the water quality of the surface streams receiving irrigation return flows. Initially, canal companies helped in funding these projects which assisted obtaining funding from state and federal agencies. Starting in the early 1970's, the primary effort by the University was development of various computer models for evaluating the performance of detention type best management practices (sediment ponds and mini-basins), documentation of attainable removal efficiencies of the practices, and development of a procedure or method to determine sediment yield from surface irrigated fields. By the mid 70's, the research efforts had expanded to include water management, tillage practices, and filter strips. During the late 70's, research and demonstration efforts on farmer implemented best management practices were being conducted on an irrigated watershed evaluating their effect on the resulting water quality leaving watershed. In the early 80's, University efforts were focused on the transport of irrigation sediments in natural streams and development of sediment yield computer models for irrigated watershed while involved with the Rock Creek Rural Clean Water Program project. As part of the first two years of the Rock Creek project, the University had two extension personnel assigned to non-point source pollution control, primarily irrigated agriculture. These positions were funded from the RCWP project for only two years.

CANAL COMPANIES AND THEIR STOCKHOLDERS

With the advent of new and better irrigation practices many farmers adapted the changes to improve their operations. There has been no inventory or timetable of these changes but visual observation confirms that the changes have been widespread. Some the these practices include: conversion from furrow irrigation to sprinkling, conversion from unlined head ditches to concrete ditches or gated pipe, conversion from sod cut outs to siphon tubes, and conversion from unlined ditches to pipe and bubble screens.

Many farmers have adapted BMP's to improve the water quality return flows. These have included low till and no-till practices, vegetative filter strips, construction and cleaning of sediment ponds, the use of straw in furrows, and just recently the use of polymers. No compilation of the number and type of BMPs has been made and determination of the level of implementation is difficult.

BMP installation can be divided into two major groups: with government assistance and without government assistance. Federal government programs that assist farmers with BMP installation include Agricultural Conservation Program, Long Term Agreements, Rural Clean Water Program, PL 566 Small Watershed Program, and Water Quality Incentive Program. These programs provide for cost share to the farmer for the installation -- not maintenance. The State of Idaho provides financial assistance for BMP installation through two programs: State Agricultural Water Quality Program and Resource Conservation and Rangeland Development Program.

Yearly, many farmers install BMPs without assistance from government agencies. Typically, these BMPs deal with improved irrigation practices. However, farmers are installing sediment ponds. The committee estimates that 85 percent of the Magic Valley farmers have installed one or more Best Management Practices. Year to year BMP installation by farmers depends on economic and weather conditions that impact crop rotations and distributions.

Practices for controlling sediments and nutrients from irrigated lands can be classified into two areas: treatment practices and prevention practices. Treatment practices remove sediment and nutrients from irrigation return flows. Prevention practices reduce soil erosion and thus sediment and associated nutrients. Some practices incorporate treatment and prevention characteristics. Certain practices will mask the water quality benefits associated with upstream practices. Treatment practices include detention facilities, filter areas, irrigation runoff reuse, and constructed wetlands. Sediment ponds, sediment basins, mini-basins, slots, buried runoff control systems are examples of detention facilities. Preventative practices include irrigation system improvement, crop rotation, reduced tillage, stream bank protection (including canals, laterals and drains), furrow mulching, buried runoff control systems, and management of water, fertilizers, and pesticides. Table 1 shows the BMPs applicable to irrigated lands in the Magic Valley with associated effectiveness and management requirements.

Detention and wetland facilities do provide some measure of flood mitigation and detention of storm related sediment and nutrient runoff both from urban and agricultural lands.

Collectively all of these changes have resulted in a distinct improvement in the water quality of return flows.

The two canal companies have maintained a policy of cooperation with their stockholders in the construction and cleaning of sediment ponds. This has been the primary thrust of the companies with regard to water quality since the companies have no control over the practices of individual farmers.

The two canal companies have worked cooperatively with agencies on specific water quality projects such as the J-8 project on the north side near Clear Lake Bridge where return flows were cleaned and ultimately eliminated by using the water to irrigate river bottom land through a central pivot sprinkler system.

Table 1. Irrigated Agriculture Water Quality Best Management Practices

BMP	TYPE	PRACTICES EFFECTIVENESS		LIFE EXPECTANCY	MANAGEMENT REQUIREMENT
		CONSTITUENTS	INDIVIDUAL		
Ponds	Treatment	Sediment Phosphorus	75% 35%	3 to 5	Minor
Basins	Treatment	Sediment Phosphorus	70% 30%	3 to 5	Minor
Slots	Treatment	Sediment	40%	Annual	Moderate

BMP	TYPE	PRACTICES EFFECTIVENESS		LIFE EXPECTANCY	MANAGEMENT REQUIREMENT
		CONSTITUENTS	INDIVIDUAL		
Mini-basins	Treatment Corrective	Sediment Phosphorus	80% 35%	Annual	Moderate
Filter Strips	Treatment Corrective	Sediment Phosphorus	50% 20%	Annual	Major
Buried Runoff Control Systems	Treatment Correction Prevention	Sediment Phosphorus	90% 40%	Indefinite	Minor
Tail Water Reuse	Treatment Prevention	Sediment Nutrients Pesticides	90%	Indefinite	Major
Conversion to Sprinkler	Prevention	Sediment Nutrients Pesticides	95%	Indefinite	Minor
Conservation Tillage Residue Management	Prevention	Sediment Nutrients Pesticides	Variable up to 90%	Annual	Major
Irrigation Water Management	Prevention	Sediment Nutrients	Variable	Annual	Major
Irrigation System Improvement	Prevention	Sediment Nutrients Pesticides	Variable	Indefinite	Moderate
Crop Rotation	Prevention	Nutrients Sediment	Variable	Indefinite	Moderate
Fertilizer Management	Prevention	Nutrients	Variable	Annual	Major
Pesticide Management	Prevention	Pesticides	Variable	Annual	Major
Stream Bank Protection	Prevention	Sediment	Variable	Indefinite	Minor
Permanent Vegetative Cover	Prevention	Sediment Nutrients	Variable	Indefinite	Minor
Constructed Wetlands	Treatment	Sediment Nutrients	Variable	Indefinite	Major
Soil Stabilizers and Additives	Treatment Prevention	Sediment Nutrients	Variable	Annual	Major

MANAGEMENT ACTIONS

CURRENT ACTIVITIES

During the months leading up to the issuance of this plan the participants organized a committee, the Mid Snake Irrigation Water Quality Coordination Committee (MSIWQCC), to represent irrigated agriculture along the Middle Snake River. The committee includes representatives of the canal companies, the USDA-SCS, the USDA-ARS, local SCDs, the University of Idaho and local education.

The committee has contributed to the preparation of this plan, has met regularly to review and comment on drafts of the plan and to authorize the submittal of the plan to the IDHW-DEQ. Monthly or more frequent meetings of the committee will continue to consider IDHW-DEQ's response to the plan. The committee will also act in an advisory capacity for irrigation water quality projects.

The two canal companies have contracted with the University of Idaho for a two year study as outlined in the plan.

Management personnel of the canal companies together with representatives of the University of Idaho and the Soil Conservation Service made a field review of return flows to the Snake River to ascertain the extent of the task of inventorying and prioritizing return flows as a part of the University of Idaho study.

The canal companies have cleaned sediment ponds in order to participate in experiments in polymer use in achieving greater sedimentation efficiency. The canal companies have continued their program of cooperatively constructing and cleaning sediment ponds for farmers.

FUTURE PROGRAMS

The Middle Snake River Water Quality Study that was completed in early 1992 was carried out in order to establish base data from many sources of nutrient and sediment inflows that impact the river. Irrigated agriculture was one of the sources in the study. Even with the many improvements in irrigation practices in the past, a continuing water quality problem has been identified and some areas with heavy sediment and nutrient loads were defined. The problems that were identified have been greatly amplified by the six years of drought that we are presently experiencing.

The Mid Snake Irrigation Water Quality Coordination Committee recognizes that problems exist and, building on the 1992 Water Quality Study, have developed the following program to improve inflows to the Snake River.

RESEARCH PROJECT

The Twin Falls Canal Company and the North Side Canal Company have jointly contracted with the University of Idaho for three part study; a water quality education program, a water quality improvement program, and an irrigation water quality monitoring program. The program started July 1, 1992 for an initial two year period.

Water Quality Education Program

Because of the canal companies lack of authority to require stockholders to use BMP's, a program of education and training is considered the best way to encourage stockholders to increase the use of BMP's. This program will focus on methods and procedures to educate and train water users (stockholders) the general public and the canal company staffs.

Education of the General Public

The public education program will concentrate on documenting the historical perspective of water development in the Magic Valley. The proper use of water in the high desert area of southern Idaho is in direct correlation with the economic well being of the agricultural community which in turn influences the economy of the entire state.

Understanding of the irrigation process and the operation of irrigation systems, constraints to change, and trade-offs in water management, energy and water supply will be discussed. Management practices such as conservation tillage, permanent vegetative cover, animal waste control systems, sediment retention, stream protection, fertilizer management, pesticide management, and maintenance of sediment retention systems will be covered. Water quality improvements such as concrete ditches, siphon tubes, gated pipe, sprinklers, sediment ponds, and vegetative strip areas which have been made within the irrigation systems will be documented. Anticipated improvements and stockholders education programs will be discussed. Newer items such as the use of polymers will be introduced.

Delivery methods for public education will include:

- TV and radio
- Popular press
- Service group presentations
- Participation in local chamber of commerce self guided agricultural tours and in 1 day water quality tours.
- Video and other materials for "Ag in the Classroom" and other programs for use by schools and youth programs.

The Soil Conservation Districts in the Middle Snake River areas will continue their commitment to water quality activities. All districts have developed five year programs. These programs identify soil and water conservation problems and proposed solutions. Water quality programs presently in progress include the Rock Creek Rural Clean Water Project, the Cedar Draw Water Quality Project, the Deep Creek Water Quality Project, and Vinyard Creek Water Quality Project. Additional projects are either planned or underway at Scotts Pond and for the Middle Little Wood River watershed.

Besides specific projects, all districts are carrying out information and education programs. These include newsletters, tours, conservation awards, brochures, exhibits, and displays.

A conservation education program for students is also ongoing. Activities include poster contests, speech contests, environmental education field days, youth conservation boards, and natural resource conferences.

To better coordinate and to accelerate water quality programs, the Soil Conservation Districts in the Magic Valley have formed a special Water Quality Committee. This committee has applied for an Environmental Protection Agency grant to accelerate water quality education programs. Educational activities under this irrigation nutrient management plan will be coordinated with SCD educational programs, University of Idaho programs, and USDA-ARS technology transfer activities.

Water User Education

This program will convey to users the current water quality situation as it relates to legal requirements, current water quality status of the distribution system and Snake River, technical management practices for water quality improvement and possible impacts of new regulations. Meetings will be held where discussions of delivery systems and collection systems for sediment and nutrient control will be covered. Procedures for incorporating wildlife habitat enhancement with sediment ponds and vegetative areas will be explained.

Management practices to reduce nutrient leaching to ground-water systems will be emphasized. Information on minimum tillage practices developed by the USDA-ARS at Kimberly will be stressed. Educational programs to encourage improvement of irrigation systems and water management improvements for both surface application and sprinkler systems will be developed. Improved crop rotations which increase nitrogen utilization will be presented and financial benefits resulting from adapting new technology will be covered. Fertilizer management including soil sampling and waste utilization to reduce the potential for nutrient leaching into the ground-water or entering surface streams will be encouraged. Also, use of integrated pest management programs and weed control programs will be encouraged.

Although livestock operations are relatively minor in the irrigated areas these operations can contribute to water quality problems. Livestock management BMP's, including riparian vegetation to prevent streambank erosion, and the use of alternate water sources will be included.

Potential delivery methods for user information include:

- Canal company newsletters: Periodic newsletters will disseminate information on water quality projects completed and planned, current legislative activity applicable to shareholders,and other Company information.

- Commodity group meetings: These meetings, normally held during the winter, are useful forums for user interface with research and agency personnel and updates on industry-wide activities in water quality in water use areas.

- Soil Conservation District meetings: These meetings will provide a forum for updating members on water quality projects and encouraging further participation.

- Field day presentations: Tours of demonstration projects of actual installments and operation of water quality enhancement facilities will be conducted.

- Popular press: Local and regional press outlets including newspaper, radio and TV will be utilized. The University of Idaho Agricultural Communications facilities and Boise and Moscow will be utilized for press releases.

- Canal Company Annual Meetings: Presentations at company annual meetings will be made by research and extension personnel as directed by the canal company Boards.

- The publication of a brochure outlining company activities, policy and planning will be explored. The distribution of a questionnaire to determine attitudes, understanding, and current usage of BMP's and documented methods of water quality improvement, and to request irrigators input.

- Educational displays at community, commodity, and agricultural equipment "customer appreciation days" have been initiated. These customer appreciation days provide the opportunity to reach irrigators that may not attend traditional U of I extension or canal company meetings.

- Water quality awareness inserts in the canal companies billings.

Canal Company Staff Education

Since ditch riders are the direct contact between the canal companies and their stockholders, the emphasis in education will be directed to ditch riders.

Company ditch rider workshops are held in the spring to refresh and update ditch riders on safety, water measurement, and procedures for the use of chemicals for control of weeds and aquatic growth. Either through additions to existing meetings or in special meetings, the ditch riders can be trained in water management to promote improvement in water quality.

Basic hydraulics of erosion and sediment transport will be presented to show how discharge or flow levels affect the volume of sediment carried. Sharing of other canal company experiences with sediment problems will be offered. Public relations and ditch rider-shareholder relationships relative to water quality problems and improvement will be discussed. Tips on dealing with the public will be explored.

In addition to special ditch rider meetings, other methods of training and information dissemination will be used including:

- Regular staff meetings and training sessions.

- Training sessions sponsored by Idaho Water Users and other associations.
- Production and use of a training video by U of I Ag Communications Department.

Assessment of Education Effectiveness

One of the major goals of any educational effort such as that outlined in this plan is the documentation of positive changes in client attitude or actions. The method used to measure the success of this project in bringing about changes in attitudes and actions is a pre-test/post-test approach. A survey instrument was developed to obtain information about the level of current conservation practice use, suggestions for additional conservation practices that could be tested, and a measure of attitudes about the nature of the water quality problem in the Middle Snake and potential solutions. Preferred sources of new information were also determined. The survey form used is located in Attachment I.

The pre-project measurement was obtained in December 1992 by sending a survey form to about 2300 shareholders of the North Side and Twin Falls Canal Companies. Surveys were sent to all shareholders with 40 or more shares to obtain responses from what we would define as production farms (as opposed to smaller shareholders that are primarily hobby farms or rural subdivisions). Nearly 400 completed surveys were returned.

Near the end of the current education/demonstration/monitoring project the survey will be sent to the same shareholder population to measure changes in attitudes or actions brought about by the project. The base information collected on page 1 of the survey and the attitudes and information source questions on page 2 will remain unchanged. The series of questions at the bottom of page 1 on suggestions for conservation practices and reasons why practices were not adopted will be changed to try and determine what project activities were most successful in bringing about change and what barriers to adoption of improved conservation practices still remain.

Water Quality Improvement Facilities

Inventory and Prioritization

An initial task undertaken by the University in their research project was an inventory of the current and potential return flow Water Quality Improvement (WQI) facilities. This inventory began with flows that directly enter the Snake River or its tributaries. There are many return flows from farms that enter canals, laterals or coulees for reuse by other farmers that will be addressed in the future. Attachment II shows current and potential irrigation return flow treatment sites.

The inventory documents existing WQI facilities and identifies return flow streams where WQI facilities should and could be constructed. An end product of the inventory will include an updated irrigation return flow, drain/stream map with existing and potential WQI facilities identified. A data base of all on-stream existing WQI facilities will be developed to include location, nature, actual pond area and volume, filter area,sediment detention potential, visibility, ownership, access and wildlife habitat. A similar data base will be developed for potential WQI facilities with additional information for topography, construction requirements, cost and impact.

The inventory will then be used to prioritize sites for WQI facility construction through an engineering evaluation of construction requirements and cost and the consideration of nutrient load in order to provide the greatest improvement to water quality with the time and funds available.

As a secondary benefit of the inventory, a maintenance schedule will be established for the cleaning of sediment ponds under contract to the canal companies, and under certain conditions to private concerns.

The Soil Conservation Service and the Agriculture Stabilization and Conservation Service will be encouraged to match funds of farmers for paid maintenance. A review of sediment ponds already in place has demonstrated that without maintenance, sediment ponds become totally ineffective.

Design and Evaluation

Assistance in hydraulic design and performance evaluation will be requested of University and Soil Conservation Service personnel. Estimation of detention system size and efficiency will be facilitated by application of detention facility computer models. Hydraulic evaluation for the design of inlet and outlet structures or off-stream diversion facilities will be provided. A construction cost accounting procedure will be developed for WQI facilities to develop cost data for future facilities and document cost and effort expended by each company on water quality improvement.

Economy and efficiency of construction will be a primary goal in the design of WQI facilities as well as the feasibility of using canal company personnel and equipment.

Water Quality Monitoring

Monitoring Program

An irrigation water quality monitoring program will be established to document general levels of water quality and the removal performance of WQI facilities. Generally, the programs will consist of grab samples collected bi-weekly. However, some time-integrated sampling will be conducted to confirm the adequacy of the grab samples. The parameters will include total suspended solids, nitrogen, phosphorus, and flow rate. A quality control and assurance program will be established to confirm sampling and analysis methods.

General System Monitoring

A general monitoring program for irrigation water quality will be developed and initiated. The program will allow for the documentation of water quality levels entering the systems, 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 University of Idaho under the Middle Snake River Water Quality Study. Relationships between water quality parameters will be evaluated from existing irrigation return flow quality data in order to reduce the data collection and analysis for this project. It is anticipated that 10 to 20 sites will be sampled during an irrigation season on a bi-weekly basis. The sampling (monitoring) locations will be selected by University personnel with assistance from canal company staff, this committee, and IDHW-DEQ.

Evaluation of water supply impacts on irrigation return flow water quality will be attempted and if possible the costs associated with water supply impacts documented. An evaluation of bio-accumulators for pesticide sampling in irrigation waters will be performed in addition to exploring pesticide monitoring methods.

Under the general monitoring plan, sites will be selected to complement the 1990-91 Phase I water quality monitoring by the University of Idaho, address evaluation of base line water quality data, and provide comparative data for general water quality improvement determination. For the 1992 irrigation season, the following sites were monitored:

Snake River at the Milner Pool-Integrated sample from Northside and Twin Falls Canals
Snake River at Murtaugh Bridge
Snake River at Blue Lakes Bridge
Snake River at Warm Creek confluence
Snake River at Clear Lakes Bridge
Snake River at Bliss Bridge
S-S19 Irrigation Return-Northside

X/W Irrigation Return-Northside

During the winter season of 1992-93 the following sites were monitored:

- Snake River at Milner Pool
- Snake River at Murtaugh Bridge
- Snake River at Blue Lakes Bridge
- Snake River at Clear Lakes Bridge
- Snake River at Bliss Bridge

One time sampling of the following sites:

- Snake River below Minidoka Dam
- Snake River at Declo Road Bridge
- Snake River at Overland Road Bridge-Burley

Field parameters measured included: air temperature, water temperature, pH, dissolved oxygen, and electrical conductivity. Laboratory analyses included: total suspended solids, nitrate+nitrite , ammonia nitrogen, total Kjeldahl nitrogen, dissolved ortho-phosphate, total phosphorus, 5-day Biological Oxygen Demand, and Chlorophyll-A. Discharge was determined only at the nearest USGS gaging station for Snake River flows and by current meter at return flow sites.

The general monitoring program for the 1993 irrigation season included:

- Snake River above Murtaugh Bridge
- Snake River at Blue Lakes Bridge
- Snake River at Clear Lakes Bridge
- Snake River at Bliss Bridge

Monitoring stations on canal delivery systems for 1993 included:

- Snake River at Milner Dam-integrated sample Northside and Twin Falls canal
- Northside Canal north of Eden
- Northside X Canal northeast of Wendell
- Northside Y Canal northeast of Bliss
- Southside(Twin Falls) Main Canal south of Hansen
- Southside Lowline Canal southeast of Buhl
- Southside Highline Canal southeast of Buhl

Water quality parameters determined for these sites are the same as for the Snake River Stations and will be sampled every two weeks during the irrigation season. Discharge will be determined from Canal Company records or current metering.

Selected irrigation return flows and tributary streams were monitored for the 1993 irrigation season using the same parameter list and current metering for discharge determinations. The irrigation return flow streams included:

- Southside Return Flow Streams and Tributaries:
  - Dry Creek at Murtaugh Bridge
  - Lateral 10(above hydropower forebay)
  - Lateral 6
  - Lateral 5A2/5A Complex
  - Lateral 3

- Northside Return Flow Streams and Tributaries:
  - S-S19 (near Blind Canyon)
  - W-28 Lateral (near Sand Springs)

W-46 Lateral (near Billingsley Creek)*
Y-8 Lateral (near Clover Creek)
W-26 Lateral (near Bickel Spring)*
W Lateral (near Big Wood River)*
W 9 Lateral (discharge to S-19 lateral)*
X 4 Lateral (at pond site)*
W 9 Lateral (at pond site)*

Future monitoring programs will be developed by University of Idaho and canal company staff and approved by MSIWQCC. All monitoring will be coordinated with IDHW/DEQ personnel.

Monitoring of impacts from implementation of ground-water quality improvement practices is beyond the scope of the nutrient management plan for irrigated agriculture. Sources of nutrients in ground-water are diffuse and vary both spatially and temporally. Differentiation of beneficial changes in ground-water quality due to voluntary implementation of management practices has not been successful, even on closely monitored and well-funded projects. Spring flows monitored as part of the general monitoring plan will provide data for evaluation of trends in aquifer water quality but will not be adequate for delineation of changes in nutrient sources by user groups. No water quality sampling of wells is planned. Laboratory analysis will be performed either at the University of Idaho Analytical Laboratories at the Moscow Campus, the US. Bureau of Reclamation Regional Laboratory in Boise, or at the Kimberly Research Center.

Performance Monitoring of Water Quality

Two pond facilities were monitored during 1992 to determine removal efficiencies. The pond complex on the East Perrine Coulee or the Twin Falls Canal Company on the Kasel property was evaluated and experiments with addition of polyacrylimides to increase removal efficiencies were conducted. The X-W pond on the Northside Canal Company was also evaluated. Facilities monitoring for the 1993 season will be conducted to determine the sediment and nutrient removal efficiencies of various pond and pond/wetland complexes as constructed. The number and nature of facilities and monitoring frequency will depend on the facilities actually constructed. The removal efficiencies of the facilities will be based on inflow and outflow measurements of sediment and nutrient concentrations and flow. Some facilities will require the measurement or estimation of the retention time of the facility. If retention times cannot be determined, continuous samplers may be installed on the facility to determine removal performance.

Sampling Protocol and Analyses

The water quality sampling protocol to be used will be that used for previous water quality studies conducted by the University of Idaho Kimberly Research and Extension Center. Prior to sampling, all sampling equipment is rinsed three times downstream of the sampling point. Then two to three gallons of water are collected in a churn splitter. While churning the water in the bucket the parameter sample containers are filled from the churn splitter. The samples are then placed on ice in a cooler. At the end of the day the samples are removed from the cooler and repackaged with fresh ice in a shipping cooler and shipped to the analysis laboratory.

Field Parameters

Air Temperature: Air Temperature is determined using an electronic thermometer with a resolution of ±0.1 C. The thermometer is placed in a shaded location and read after the reading stabilizes.

Water Temperature: Water Temperature is determined with the same electronic thermometer used for determining air temperature. It is placed in the churn splitter after all the laboratory samples have been collected. Again, the temperature is recorded after the reading has stabilized.

pH: The pH of the water is determined using an electronic pH pen with automatic temperature compensation. The pH pen is calibrated to known solutions at the beginning of each sampling day. The pen is dipped in the water contain in the churn splitter after the laboratory samples have been collected and read after the reading has stabilized.

Electrical Conductivity: The electrical conductivity of the water is determined with an electronic EC pen manufactured by Hanna Instruments. The pen is calibrated to a known solution at the beginning of the sampling day. The pen is dipped into the water in the churn splitter after the laboratory samples have been collected and allowed to stabilize prior to reading.

Dissolved Oxygen: The dissolved oxygen content of the water is determined with an electronic dissolved oxygen meter. The meter is calibrated according to manufacturer's specifications each morning when sampling. Prior to collecting the analysis samples from the churn splitter; the oxygen probe is placed in the splitter and the reading is recorded while stirring the water with the probe. Insitu measurements are recorded while the probe is immersed in the flowing stream.

Laboratory Analysis Parameters

Total Suspended Solids: The total suspended solids analysis will use Method 160.2 or other suitable method that qualifies for STORET parameter number 530. The results will be reported in mg residue per liter. A one liter water sample is collected from the churn splitter and stored in an untreated 1 liter cubicontainer. The sample is placed on ice immediately in the field and shipped to the laboratory in a chest packed with ice.

Ammonia Nitrogen: The total ammonia nitrogen analysis will follow methods which qualify for STORET parameter number 610 and allow for a detection level of 0.1 mg-N/l or lower. Method 350.1 is the preferred method. The results of the analysis will be reported as mg nitrogen per liter. The analysis sample will be collected from the churn splitter in a treated 1 liter cubicontainer which be stored on ice until received by the laboratory. The preservative used will be 2 ml of concentrated sulfuric acid per liter. This treated sample container will also contain the water sample for Nitrate+Nitrite, Total Kjeldahl Nitrogen, and Total Phosphorus analyses.

Nitrate+Nitrite Nitrogen: The Nitrate+Nitrite Nitrogen analysis will follow analysis methods which qualify for reporting as STORET parameter number 630 and allow for a detection limit of 0.01 mg-N/l. Method 353.1 is the preferred method. The results of the analysis will be reported in mg of Nitrogen per liter. The analysis water sample will be collected in a treated 1 liter cubicontainer which be stored on ice until received by the laboratory. The preservative used to treat the cubicontainer will be 2 ml of concentrated sulfuric acid. This treated sample container also contains the water sample for Ammonia, Total Kjeldahl Nitrogen, and Total Phosphorus analyses.

Total Kjeldahl Nitrogen: The Total Kjeldahl Nitrogen analysis will follow analysis methods qualifying for reporting the results as STORET parameter 625 and allow a detection limit of 0.05 mg-N/l. The results of the analysis will be reported in mg of Nitrogen per liter. The analysis water sample will be collected in a treated 1 liter cubicontainer which be stored on ice until received by the laboratory. The preservative used to treat the cubicontainer will be 2 ml of concentrated sulfuric acid per liter. This treated sample container also contains the water sample for Ammonia, Nitrate+Nitrite, and Total Phosphorus analyses.

Dissolved Ortho Phosphate: The dissolved ortho-phosphate analysis will follow methods allowing for reporting the results as STORET parameter number 671 and a minimum detection level of 0.01 mg-P/l or better. The method chosen should be similar to that for Total Phosphorus. The analysis results will be reported as mg of Phosphorus per liter. The analysis sample is collected from the churn splitter and filtered in the field using a 4.7 cm phosphorus free filter with a pore size of 0.45 micron. The filtrate is placed in a vial (approximately 20 ml), which is immediately capped and placed on ice. No preservative is used.

Total Phosphorus: The Total Phosphorus analysis will follow methods qualifying for reporting the results as STORET parameter 665 and allow for a minimum detection level of 0.01 mg-P/l. The method will be similar to the method used in the Dissolved Ortho Phosphate analysis. The analysis results will be reported as mg of Phosphorus per liter. The analysis water sample will be collected in a treated 1 liter cubicontainer which will be stored on ice until received by the laboratory. The preservative used will be 2 ml of concentrated sulfuric acid per liter. This treated sample container also contains the water sample for Ammonia, Nitrate+Nitrite, and Total Kjeldahl Nitrogen analyses.

5-Day Biological Oxygen Demand: The 5 day biological oxygen demand analysis will follow methods qualifying for STORET parameter number 310. The analysis will be performed using a calibrated DO probe. The analysis results will be reported as mg per liter biological oxygen demand. A one liter sample from the churn splitter will be collected in a cubicontainer and placed on ice without additional preservation.

Chlorophyll A: The chlorophyll A analysis method will follow methods qualifying for STORET parameter number 32211. The analysis results will be reported as µg chlorophyll A per liter. The sample consists of the residue from 0.3 to 1.0 liter of water obtained from the churn splitter and filtered through a glass fiber filter. The filter is placed in a petri dish. The dish is then wrapped in aluminum foil and frozen until the analysis is performed.

Laboratory Selection
The residue and chemical parameter analyses will be performed by the US. Bureau of Reclamation Regional Laboratory in Boise, Idaho. The 5-day BOD and Chlorophyll A analyses will be performed by the University of Idaho at Kimberly.

Quality Control and Assurance
The quality control and assurance program will consist of blank samples, blind duplicate samples, and spiked samples. The QA/QC program will produce three sample sets (blank, duplicate, and spiked) for every 10 sample sets submitted for analysis. The spiked program will only deal with total suspended solids and the nutrients. The laboratory will be responsible for supplying the spiking material and computing the percentage recovery.

Data Storage and Retrieval
All water quality data will be coded by site (Latitude and Longitude) and uploaded to the STORET system.

IMPLEMENTATION

EDUCATION PROGRAM

During the irrigation season most stockholders put in long hours taking care of the irrigation water and other farming activities. Meetings scheduled during the period April to October generally draw meager attendance. In an effort to reach the most stockholders with the water quality message it is planned to have most meetings and other activities during the November to March period.

- During the time prior to November the thrust of the efforts for the educational program will be in preparation including:
- Preparation of videos and visual aids for the winter meetings.
- Sending out newsletters with schedules of winter meetings and raise awareness of the critical situations to be addressed in the meetings.
- Sending out a questionnaire to determine the current BMP's used by irrigators, their attitudes and concerns.
- Seeking cooperative assistance from farm organization such as Soil Conservation Districts and the Farm Bureau in order to enlarge the sphere of knowledge and enhance the credibility of the education program.
- Exploring methods of holding smaller neighborhood type meetings to get the one on one feeling to encourage involvement.
- Publicizing the positive actions and beneficial results obtained by individuals.
- Publicizing the portion of the canal company assessment being used to improve water quality in order to develop peer pressure on water quality offenders from those following BMP's.

Summer farm tours will be planned and announced well in advance. Specific site visits will be conducted covering various aspects of ongoing activities for improvement in water quality of Snake River return flows. Farmers who have implemented BMPs will be encouraged to tell their "story" and experiences with water quality improvement practices.

During the winter months meetings of stockholders will be held to impress upon them the need and the urgency of improving the quality of return flows. The ideas developed prior to the end of irrigation season will be utilized and adjusted to attempt to reach and convince the maximum number of stockholders that the use of BMP's is beneficial to both the irrigator and the environment. This educational effort will require the full cooperation of personnel from the Agriculture Research Service, the Soil Conservation Service, the University of Idaho, Soil Conservation Districts, other farm organization and the two canal companies.

All Soil Conservation Districts have part-time Information and Education personnel who will be working with school districts and cooperating farmers.

Most agricultural organizations hold their annual meetings in the non-irrigation season. The above agencies will volunteer speakers, videos and other means of disseminating information concerning the quality of return flows in order to convey the message to as many persons involved in agriculture as possible.

Prior to the start of the next irrigation season classes for ditch riders will be held. In additions to the normal classes in safe practices, water measurements, use and handling of chemicals for weeds and aquatic growth, classes will be added in water management with emphasis on control of erosion. A review of BMP's for the improvement of the quality of return flows will be included to acquaint the ditch riders and make them conversant with proven methods for accomplishing this goal.

IMPROVEMENT FACILITIES

During the irrigation season, flows are generally continuous in the drains and coulees where return flows from the farms make their way to the river. Construction activities during this period are inadvisable as they would in most cases increase the sediment load of the river.

Prior to the end of the irrigation season efforts will be concentrated on the inventory and assessment of sites for construction of WQI. From this inventory of sites, projects will be prioritized, balancing costs and benefits in order to maximize the improvements for the time and money available.

During the non-irrigation season selected projects will be constructed. This season will also be used to clean existing sediment ponds.

MONITORING

Monitoring of specific sites commenced in early July 1992 and will continue as outlined under section IV. The results of this monitoring will add to the data base and further define the extent of the water quality problem. The monitoring will also be used to measure the effectiveness of existing WQI. This data will be factored into the selection of sites and type of installation at new WQI in order to maximize efficiency and the cost-benefit ratio.

COMPLIANCE

The two canal companies and the agencies who have developed this plan have the utmost confidence that major improvement in the quality of return flows to the middle Snake River is achievable and are dedicated to the task of insuring ongoing improvement.

Other than federal and state cost share programs which require implementation of water quality improvement practices under signed contracts, there are no means to enforce compliance. Currently, there are no permit or regulatory requirements for non-point sources such as irrigation return flow in state and federal statutes dealing with water quality. The irrigated farm producing general cash crops do not have license or permit requirements which could be used to aide implementation of BMPs. The education of irrigators and the general public will raise the level of knowledge concerning BMP's and appropriate usage. The influence of water quality educated neighbors, bankers, equipment dealers, fieldmen, and childern on irrigators will have some impact. The local soil conservation districts and canal companies have a "good" stewards award program or acknowledgement of the irrigators who are working towards a cleaner irrigation return flow stream and are expanding the program.

Some compliance is obtained through the Idaho Pesticide Appplication Laws which require licensing of irrigators who apply chemical through irrigation systems. Mandatory attendence at workshops which include education or water quality programs is required.

It is understood that the plans presented herein will have to be adjusted periodically to insure that less successful efforts are replaced by other methods that are more achievable.

Because of the complexity of the irrigation system, the continual changes in farm ownership, the rotation of crops, the seasonal variations and the indeterminate availability of water, a finite reduction in total sediment discharge is difficult to predict. However following a review of the results of monitoring return flows over the period July 1992 -- September 1993, and after analyzing the results of the inventory and prioritization of existing and potential WQI facilities, a reduction in sediment load was estimated. It is estimated a reduction of 21% of the agricultural sediment load entering the Middle Snake River from irrigation return flows can be achieved by treatment. This is based on 1990-91 sediment load base.

Detention facilities are a short term treatment approach and will be supplemented by on farm water quality improvements through the education program. In addition the detention facilities assist retention of storm runoff from urban areas.

All participants are firmly committed to a continuing improvement in the quality of flows returning to the Snake River. A 27% reduction is expected to be achieved primarily by treatment of return flows through detention systems and wetlands projects, reduction of return flow volumes and education. This reduction is expected to be achieved by the year 2000.

The North Side Canal Company has assessed $1.00/acre per year for water quality improvement facilities. The Twin Falls Canal Company has obligated water users to over $1.50/acre per year for water quality. These assessments and expenditures can be reduced as more on-farm BMPs are implemented.

CONCLUSIONS

The Mid-Snake Irrigation Water Quality Coordination Committee irrigated agriculture nutrient management plan sets forth the following goals for improving irrigation return flows:

Goal	Year 2000	Year 2005	Method
Reduction of Sediment	21%	21%	Construction of treatment facilities, ponds, and wetlands
Education	6%	14%	Water user awareness, and reduction of return flow and on-farm BMPs
Reduction of total phosphorus loads	10%	12%	Treatment facilities Education Reduction of return flow

After the year 2000, it is expected that the focus of best management practices will be on field and farm erosion and sediment reduction. Effort in construction of new water quality facilities will be replaced by maintenance and improvement of existing facilities.

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AGRICULTURE WATERSHED MANAGEMENT PLAN AMENDMENT 1

[DATED: MAY 28, 1996]

Irrigation return flow streams convey significant storm water runoff from both agricultural land and municipal lands. These runoff events occur primarily during the non-irrigation season but can occur during diversion periods. All of these events convey sediments, debris, and other wastes to the Middle Snake River.

Canal Companies have historically "accepted" urban and storm runoff into return flow streams because of the evolution of urban areas and topography of the irrigated areas. With the onset of watershed management planning and development of programs to reduce sediment and nutrients into the Middle Snake River, it has become necessary to address the contributions from storm runoff as a component to total load analysis.

Therefore, the Twin Falls and North Side Canal Companies are cooperatively developing storm water detention and runoff guidelines and/or ordinances with counties and municipalities in the Magic Valley which will be incorporated in the agricultural watershed management plan.

It is anticipated that these plans will require on-site storm water detention from subdivisions and commercial developments to minimize storm water runoff in return flow streams. Although water quality monitoring to date has not addressed non-irrigation season storm runoff related contributions of sediment and nutrients to the Middle Snake River, it is anticipated that adoption of storm water detention programs will significantly reduce total loads.

ATTACHMENT I

Mid-Snake Irrigation Water Quality Coordination Committee Irrigation Questionnaire

Please complete and Return by December 21

Name:______________________________ Address:______________________________

General Location (check all that apply):

Northside_____ Hazelton_____ Jerome_____ Wendell_____ Bliss_____

Twin Falls_____ East of Rock Creek_____ Rock Creek to Cedar Draw_____ West of Cedar Draw_____

Are you: _____Owner and farmer or _____Owner but not farming as primary income?
Acres Owned: ________ Acres Furrow Irrigated:________
Acres Rented: ________ Acres Sprinkler Irrigated_______

Crop	Yearly Acres Grown	Acres Grown With Reduced Tillage	Reduced Tillage or Residue Management System Used (e.g. chisel, disk, harrow)
Winter grain	________	________	________________
Spring grain	________	________	________________
Alfalfa	________	________	________________
Beans	________	________	________________
Sugarbeets	________	________	________________
Potatoes	________	________	________________
Peas	________	________	________________
Corn	________	________	________________
________	________	________	________________

Best Management Practices (BMP's) Used	Field Acres Treated
Sediment Ponds	__________(number of ponds_____)
Grass Filter Strips	__________
Straw Mulching (adding straw in furrows)	__________
Cover Crops	__________
I-slots, T-slots or mini-basins at base of field to remove sediment	__________
Gated pipe or siphon tubes for better water control	__________
Improved on-field water management (reduced set time, flow rate, etc.	__________
Conversion from surface to sprinkler in last 3 years	__________
Conservation Tillage	__________
Other	__________

Are there soil conservation practices you believe would be useful that you would like to have studied?

What BMP's and sediment control practices have you tried and do not plan to use again?

Why were these practices not workable for you?

How could they be modified to work? (More space for answer on back)

The committee believes we have an opportunity to initiate voluntary water quality programs that will be effective in improving water quality and demonstrate that the agricultural community is responsive and responsible. The alternative to our actions is government-mandated cleanup programs.

Please circle the category that best describes your opinion on each of the following statements: (1=strongly agree; 3=neutral; 5=strongly disagree)

1.	The water quality problem on the Middle Snake does need to be addressed.	1 2 3 4 5
2.	If we were not in a drought, there would be no concern about a water quality problem on the Mid-Snake.	1 2 3 4 5
3.	The seriousness of the water quality problem on the Middle Snake has been exaggerated.	1 2 3 4 5
4.	Irrigated agriculture contributes to water quality problems on the Middle Snake and should therefore be responsible to help improve the water quality of the Middle Snake.	1 2 3 4 5
5.	The major cost to meet possible future water quality requirements from irrigated requirements from irrigated agriculture should rest with the canal companies and not individual farmers.	1 2 3 4 5
6.	Individual farmers should have a major role in improving water quality in the Middle Snake.	1 2 3 4 5
7.	Because the general public benefits from improved water quality and conservation quality and conservation of soil, they should pay a major portion of expenses necessary to improve water quality and soil conservation.	1 2 3 4 5
8.	Because some perceive current farming practices as the major cause of water quality problems in the Mid-Snake, they believe that farmers should bear the majority of costs to improve water quality.	1 2 3 4 5
9.	Reasons for no additional level of conservation tillage or other BMP usage or other BMP usage for sediment control on my farm are:	
	Initial cost of necessary equipment is too high..	1 2 3 4 5
	Too much additional time is required...	1 2 3 4 5
	Crop yields are reduced compared to conventional practices...................	1 2 3 4 5
	I just don't think that additional conservation practices are necessary......	1 2 3 4 5
10.	I would use additional conservation tillage or other BMP's if additional cost-share funds were available.	1 2 3 4 5
11.	I would be willing to compare an experimental conservation tillage cropping system with my traditional system if I were guaranteed equal or greater net income from the experimental system over a multiple-year crop rotation.	1 2 3 4 5
12.	If water quality standards for irrigation return flows are established, I would convert surface irrigation acreage to sprinkler rather than adopt more BMP's or conservation tillage for surface irrigation.	1 2 3 4 5
13.	The following are valuable sources of irrigation management information:	
	Newspaper Articles..	1 2 3 4 5
	Farm Magazine Articles...	1 2 3 4 5
	Radio..	1 2 3 4 5
	Television...	1 2 3 4 5
	Field Days...	1 2 3 4 5
	SCS Technical Services...	1 2 3 4 5
	Conferences and Workshops..	1 2 3 4 5
	Other Conferences and Workshops..	1 2 3 4 5
	Trade or Ag. Product Shows..	1 2 3 4 5
	Coffee shop conversation...	1 2 3 4 5

14. What is your highest priority topic and best method of delivery for future University Cooperative Extension educational programs? (Please continue answer on back if need more room)

APPENDIX II.

Inventory of Return Flows with Current and Potential Water Quality Improvement Facilities.

For TSS: L = Low; M = Medium; H = High

LATERAL/DRAIN	PROPERTY OWNER	EXISTING	FLOW (MAX.)	TSS	POTENTIAL	Estimated Additional Removal %
Dry Creek	Silver	None	6 cfs	H	Pond-wetland	60
A10	Coiner	Pond, Wetland	10 cfs	L	RehabWetlnd	5
Twin Falls Coulee	Randall	High Ponds/Past.	25 cfs	M	Pond - wetland	25
	BLM	Pasture	25 cfs	M		
	?	1/4 ac. Pond	25 cfs	M	enlarge pond	
	U.ofI.	Pond	25 cfs	M		
	Chuck Coiner	2 small ponds	25 cfs	M	assist cleaning	
Lateral 26/Willows	Willows Subdivision	High Ponds/Past.	4 cfs		Pond - wetland	15
East Perrine (#1)	Kasel	Pasture	30 cfs	M	Ponds	20
	Kasel	High Ponds	30 cfs	M	Ponds - wetland	
	Yamagato	None	30 cfs	M	Pond	
	Lateral 39 E Nielsen	Pasture	5 cfs		Pond	5
Main Perrine	County Park	None	30 cfs	M	Pond - wetland	60
	McMullin	None	30 cfs	M	Ponds	
	Breckingridge/McMullin	Pasture	2 cfs	M	Combine w/MP	
	CSI	None	30 cfs	M	Pond - wetland	
	Lateral 41A Over Rim	None	3 cfs		Assist cleaning	60
West Perrine (#3)	Ruther	None	12 cfs	M	Pond	

LATERAL/DRAIN	PROPERTY OWNER	EXISTING	FLOW (MAX.)	TSS	POTENTIAL	Estimated Additional Removal %
	Lateral 43 Asgrow	None	3 cfs	M	Redivert to west	
Rock Creek Complex	Q2 Drain Vickers	Wetland/Riparian	5 cfs		Wetland	5
	Lateral 38 Standlee	Pond & No Runoff	3 cfs		Assist Cleaning	0
	Lateral 38 Spill Halloway	Pond	6 cfs		Assist Cleaning	5
	P2 drain McCabe	Pond	6 cfs		Enlarge pond	5
	P drain Moyles	Pond	10 cfs		Assist Cleaning	5
	P1 drain Griffinson	None	4 cfs	M	Pond - wetland	60
	O1 drain NW Crane	Pond	4 cfs	M		0
L Drain East	Moore	None	12 cfs	M	Pond	60
Lateral 30	Hunt/Vicent	None	5 cfs	H	Pond	60
Pigeon Cove Complex	LQ Drain Turnipseed	Reservoir	30 cfs	H	Enlarge Reservoir	40
	LQ Drain Smith-Pospichal	Pasture	30 cfs	H	Pond	
	LQ Drain Blass	Nothing	30 cfs	H	Pond	
	LQ Drain Malone	3 acre pond	30 cfs	H	Reuse pond	
	LQ Drain Brennan	2 ponds	30 cfs	H	Clean and build	
	S Drain Rand	Fish Ponds	15 cfs	H	Clean ponds	50
	S Drain Fay-Peterson	None	15 cfs	H	Pond	
	S Drain Ihlers	None	15 cfs	H	Pond	
	S1 Drain Fay	None	5 cfs	H	Pond	
Lateral 40	Pruett	None	5 cfs	H	Relocate ditch & use pond	60
S2 Drain	Blass/Scott/Mallard	Bottom Pond	15 cfs	H	Imp. Pond wet.	5

LATERAL/DRAIN	PROPERTY OWNER	EXISTING	FLOW (MAX.)	TSS	POTENTIAL	Estimated Additional Removal %
Lateral 39A	Miller Hydro	None	5 cfs	H	Reservoir	60
Lateral 39 West	Miller Hydro	None	15 cfs	H	Reservoir	60
Cedar Draw Complex	Loveless	Low ponds	200 cfs	M	Ponds	20
	E Drain East / Crown	None	40 cfs	H	Ponds	
	Lateral 11A / Hicks	None	2 cfs	M	Pond-asst clean	
	F Drain / Connell	Pond	8 cfs	M	Ponds	
	I 10 Drain / Bishop/Fleming	None	10 cfs	M	Pond	
Lateral 31A	Johnson	None	3 cfs	M	Pond	60
I Drain Complex	I Drain / Powers Orchard	None	20 cfs	M	No room	20
	I Drain / Capalbo	None	20 cfs	M	Existing ponds	
	I Drain / Romans	None	5 cfs	M	Ponds	
	I9 Drain / Dalos	None	5 cfs		Pond	
	I8 Drain / Dalos	None	5 cfs		None	
	Lateral 33 / Compton	None	3 cfs		Pond	
	Lateral 32 / Paulson	None	5 cfs		Ponds	
I7 Drain	Elkins	Pond	5 cfs		Enlarge Pond	20
Mud Creek Complex	N Drain (Mud Ck) / Kanaka Rapids Rc	None	150 cfs	L	Existing ponds	10
	Silo Creek Complex / Snedigar	None	75 cfs		Existing ponds	
	Silo Creek Complex / Lateral 30A / Miller	None	2 cfs		Pond	
	Silo Creek Complex / I6 Drain / Snedigar - hydro	Reservoir	50 cfs		Clean Reservoir	

LATERAL/DRAIN	PROPERTY OWNER	EXISTING	FLOW (MAX.)	TSS	POTENTIAL	Estimated Additional Removal %
	Silo Creek Complex / I6 Drain / Shriver	High pond	10 cfs		Maintain pond	
	Silo Creek Complex / I1 Drain / Miller	None	5 cfs		Existing ponds	
	Silo Creek Complex / Lateral 42 / Snedigar	None	2 cfs		Ponds	
	Silo Creek Complex / Lateral 43 / Snedigar	None	1 cfs		Pond	
	J Drain / Campbell	Ponds	5 cfs	M	Enlarge ponds	
	K Drain / Lyons	Pasture	4 cfs		Ponds/Wetland	
	L Drain West / Hiatt	Ponds	10 cfs		None - uncoop.	
	Lateral 40A / White	Pasture	2 cfs		None	
	Lateral 40B / Leipold	Pasture	1 cfs		None	
Deep Creek Complex (250 cfs / Medium TSS / 20% removal)	N1 Drain /White	Ponds	10 cfs		Wetlands	
	N2 Drain / Hunt	None	10 cfs		Pond	
	Lateral 10B / Pearson	None	2 cfs		Pond	
	LP Drain / Kaufman	None	12 cfs		Existing ponds	
Lateral 10A	Fresien	Kerr's pond	2 cfs		Pond / wetland	
Lateral 10C	Mason	Kerr's pond	2 cfs		Pond / wetland	
Lateral 13	Brown Brothers	Kerr's pond	2 cfs		Pond / wetland	
Lateral 14	Meitzner	Kerr's pond	2 cfs		Pond / wetland	
Salmon Falls Complex (250 cfs / Low TSS / 15% removal)	A Drain / Johnson	Pasture	2 cfs		Ponds	
	Lateral 3 / Ruffing	Small ponds	10 cfs		Wetlands/pond	
	Lateral 4 Ext. / Quigley	None	2 cfs		Ponds	

LATERAL/DRAIN	PROPERTY OWNER	EXISTING	FLOW (MAX.)	TSS	POTENTIAL	Estimated Additional Removal %
	Lateral 4C / Barinaga	Pond (1)	2 cfs		Ponds	
	E Drain West / Brailsford	None	12 cfs		Ponds	
	Lateral 9 / Silo Ranch	No runoff	2 cfs			
	Lateral 10 Hydro / Kasters	Reservoir	10 cfs		Clean Reservoir	
	Lateral 10 / Stewart	None	3 cfs		Ponds	
A Drain	Cutler	None	16 cfs		Pond	60
A Drain	Hardy-Bushorn	3 acre pond	16 cfs		Enlarge pond	
C50	Lockwood	2 ponds	3 cfs		Enlarge ponds	5
PC1	Robert Grant	1/8 acre pond	1 cfs		Enlarge pond	0
PC	Harold Grant	1 acre pond	1 cfs		Enlarge pond	0
C46	?					
C44	?					
C55	McFarland-BLM	2 acre pond	5 cfs		Assist Cleaning	0
C55	Ehlers	1/8 acre pond	3 cfs		Enlarge pond	
C33	Ehlers	None	10 cfs		Pond	20
C33	McCloud	Small pond	10 cfs		Pond	
K Drain	Golf Course	½ acre pond	2 cfs		Additional pond	5
N34	Lott	Pond & pastures	2 cfs		Enlarge pond	5
N30	Martin-Piland	Reservoir - Hydro	3 cfs			5
N29 & N24	Callen	None	2 cfs		Pond	60
N23	Boer	None	1 cfs		Pond	60
J8	Fleming	Ponds	5 cfs		Clean ponds	10

LATERAL/DRAIN	PROPERTY OWNER	EXISTING	FLOW (MAX.)	TSS	POTENTIAL	Estimated Additional Removal %
S42	Moore	1 acre pond	5 cfs		Enlarge pond	30
S29	Prins	Pasture	2 cfs			0
S	Winds	2 acre pond	5 cfs		Enlarge pond	20
S19	Lemmons	Reservoir-canal	10 cfs		Widen canal	
S19	Winds	2 acre pond	10 cfs		Enlarge pond	
S19	Prins	None	10 cfs		Pond	
W28	Conservatory	None	15 cfs		Pond-Wetlands	60
W26	Williams-Federal	None	10 cfs		Pond	60
W46	Jones	3 acre pond	2 cfs		Assist cleaning	0
W	Malad Gorge Park	None	5 cfs		None	30
W	Marsh	None	5 cfs		Pond	
X10	Justice Ditch-Raven.	None	5 cfs			
X15	Malad Gorge Park	3 acre pond	5 cfs		None	
Z6	Long	Lava Bed	5 cfs		None	
Z9	Hylton	Lava Bed	5 cfs		None	
Z	Kast	Pasture	2 cfs			5
Z	BLM	None	10 cfs		Divert to Kast	
Y13	Parke	2 acre pond	3 cfs		Additional Pond	15
Y Waste	Parke	None	15 cfs		ponds-lava beds	
Y	Parke	None	1 cfs		ponds-lava beds	
Y9	Kast	Pasture	2 cfs		Pond	
Y9	Kast	10 acre pond	15 cfs		Maintain pond	0

LATERAL/DRAIN	PROPERTY OWNER	EXISTING	FLOW (MAX.)	TSS	POTENTIAL	Estimated Additional Removal %
					AVERAGE =	20.5
					WEIGHTED AVERAGE =	27.7

Appendix A-6

PROPOSED WATERSHED REDUCTION PLAN
for
THE WASTEWATER TREATMENT INDUSTRY

Submitted to

Idaho Department of Health and Welfare
Division of Environmental Quality

by

PLAN WRITING SUB-COMMITTEE MEMBERS

Kim Barte, OMI-Twin Falls
John Keady, OMI-Twin Falls
Mike Trabert, City of Twin Falls
Raymond Hyde, City of Hailey
Wayne Heinemann, OMI-Corporate Office
Pete Pleticha
Gary Young

MUNICIPAL WASTEWATER WATERSHED MANAGEMENT PLAN

THE GOALS OF THE MUNICIPAL WASTEWATER INDUSTRY:

1. Develop a public education program.
2. Develop a database.
3. Recommend all plants along the Mid-Snake test their influent and effluent for nutrients.
4. Reduce Ammonia by 50% and Phosphorus by 34% with five years of plan implementation and maintain for an additional five years.

MANAGEMENT ACTIONS:

1. Survey Municipal Treatment Plants.
2. Municipal Adoption of Watershed Management Plan.
3. Develop and Implement Public Information Program.
4. Initiate Nutrient Sampling of Influent and Effluent.
5. BMPs for Operation and Maintenance.
6. Promote Land Application.
7. Promote Storm Water Pollution Prevention.
8. Promote Water Conservation.
9. Develop Pre-Treatment Agreements with Industry.

COMPLIANCE ACTIONS:

1. DEQ Public Recognition Awards.
2. NPDES Permit Requirements.
3. Plant and Facility Upgrade Incentives.
4. Consent Orders with Recalcitrant Operators.

IMPLEMENTATION EFFECTIVENESS:

1. Monitoring Program
2. Annual Reports

LIST OF ABBREVIATIONS

AASAR - Agricultural Application Site Approval Requests

BMPs - Best Management Practices

BOD- Biological Oxygen Demand

DEQ - Idaho Department of Health and Welfare Division of Environmental Quality

DMR - Discharge Monitoring Report

EPA - Environmental Protection Agency

IDHW - Idaho Department of Health and Welfare

MGD - Million Gallons per Day

NPDES - National Discharge Elimination System permits

OJT - On the Job Training

O&M - Operation and Maintenance

POTW - Publicly Owned Treatment Works

TKN - Total Kjeldahl Nitrogen

USGS - United States Geological Survey

TABLE OF CONTENTS

INTRODUCTION

The wastewater industry established itself on the middle Snake around 1959 when it became apparent that the pollution generated from a growing population had to be controlled. Most of the wastewater treatment plants were built in the mid 60s and early 70s. In 1972 the EPA put into effect, a law that required wastewater treatment plants to meet more stringent regulations and lower discharge limitations. Because of this law, most of the larger plants have gone through several upgrades; the smaller plants built since then have also had to conform to the lower limits imposed. Serving over 90 percent of the population in this region, the wastewater industry removes more than 85 percent of the pollutants received at their facilities. The results of the wastewater cleanup effort over the past 30 years can be described as dramatic.

The cost of initial construction, not in 1993 dollars, exceeds $48,000,000. Specific treatment systems include 10 lagoons, 5 aerated lagoons, 9 activated sludge plants and 2 aerated cells, one equipped with a microscreen.

Attachment A is a map showing the general location of the wastewater treatment plants along the middle Snake. Attachment B contains a summary of the information gathered from a survey conducted in March 1993, which is the basis for this introduction. Attachment C contains descriptions of the various types of biological wastewater treatment processes used in the systems that discharge into the middle Snake. Attachment D contains descriptions of selected treatment systems in the middle Snake watershed. Attachment E contains the actual numbers obtained from the survey in tabular form.

Since 1959 the industry has grown to treat about 16.3 million gallons per day (mgd). The current rate of population growth for most areas is between 1 and 5 percent. An average urban growth rate has not been projected now because of the lack of city population estimates needed to properly weight these figures.

All discharging wastewater plants have National Pollutant Discharge Elimination System (NPDES) permits issued by the Environmental Protection Agency (EPA) and land application processes have permits issued by the State of Idaho. All facilities are required to report their discharges to the EPA in Seattle, Washington, as well as the state Department of Environmental Quality.

The industry has changed considerably since 1959. The increasing technologies and applications have precipitated a tremendous emphasis on training. The training needs have been met through various state programs, On-the-Job Training (OJT), correspondence courses, seminars and conferences. This training is backed by a voluntary certification program which combines education, experience and testing to certify one's ability.

Through the years, many cities have taken proactive measures to improve overall treatment effectiveness as demonstrated below (as of March 1993):

1) Four facilities had intentionally changed their practices to reduce nutrient loadings to the river.

2) Pretreatment Programs were in effect at the larger facilities to help control industry loadings to the Publicly Owned Treatment Works (POTW).

3) There had been a effort to reclaim the biosolids produced at the POTWs for use in land application programs. This reclamation effort, working together with local farmers, has reduced the loadings to the landfills and are providing nutrients for crops.

The following is a list of goals that we expect to achieve from this management plan.

1) We will develop a public education program to inform others of the progress and improvements made over the years.

2) We will develop a database outlining the wastewater industry contribution of nutrients to the middle Snake.

3) We will make a recommendation for all plants along the mid-Snake to test their influents and effluents for nutrients in an effort to enhance the database. This testing will occur on a monthly basis for smaller facilities and more often for larger facilities. The detailed testing schedule is outlined in the Management Actions section.

4) We will look at the nutrient loadings contributed by POTWs and develop a criteria for reduction.

5) We will set a target of a 50% reduction from 1991 levels in pounds of Ammonia(NH4) and a 34% reduction in pounds of Total Phosphorus. This target reduction applies to total wastewater industry loading by mass in the Middle Snake River.

IDENTIFICATION OF INDUSTRY SPECIFIC POLLUTANTS

The planning committee gathered an abundance of information to determine the nutrient loadings to the mid-Snake. The resources include:

1) A study performed to determine the level of nutrients in the mid-Snake (Middle Snake River Water Quality Study, Phase I, Brockway & Robison).

2) Discharge Monitoring Reports (DMRs) and NPDES permits from the Department of Environmental Quality at the Twin Falls office. Some NPDES permits require nutrient monitoring and/or reporting.

3) A survey of all treatment plants along the mid-Snake conducted in March 1993 by Wayne Heinemann of Operations Management International, representing the planning committee.

4) Unreported data available at some of the POTWs. This data was identified in the survey.

A summary of all the data collected follows as Attachment A. It is also recognized that the entire industry needs to perform additional background studies to determine a more precise loading to the river.

Based on the above information, the Wastewater industry as a whole, contributes to the water quality conditions on the mid-Snake. Table 1, taken from the Middle Snake River Water Quality Study Phase I, identifies the total loading of nutrients in the mid-Snake. The data collected from the survey indicates that the industry, representative of all POTWs along the mid-Snake, introduces about 1.5 per cent of the Total Phosphorus, 6.6 per cent of the Ammonia, 0.13 per cent of Nitrate/Nitrite, and 0.87 per cent of the Organic Nitrogen to the mid-Snake. See Table 2 for calculations.

The survey also indicates that it may be possible to reduce some of the nutrient loadings to the river. Some facilities indicated that they will require major capital expenditures to provide for nutrient removal while some may simply be able to adjust process controls. Phosphorus, however, is particularly difficult to remove from any of the treatment plants without capital improvements or the excessive use of chemicals.

Although there is a potential to increase nutrient loadings to the Mid-Snake, capacity exists at all of the POTWs to accommodate for the growth. All of the capacity allocated to the POTWs is allocated through the NPDES permits. Theoretically, an increase in nutrient loadings may be tied to the increase in population. The growth rate for all cities along the mid-Snake currently is about 1.5 percent per year. An increased loading of nutrients could be expected on a per anum basis of 0.022 percent of the Total Phosphorus, 0.099 percent of the Ammonia, 0.002 percent of Nitrate/Nitrite, and 0.013 percent of the Organic Nitrogen to the mid-Snake. See Table 2.

Digested municipal sludge, termed "biosolids", is the result of treating industrial, commercial and domestic wastes under controlled conditions. This treatment reduces the potential for odors and the spread of disease. This material is well suited as a soil amendment and for supplementing crop nitrogen requirements.

Table 1. Total nutrient loads for Snake River instream stations June 1990 through July 1991 (Dr. Brockway Study)

Snake River Location	Ammonia Nitrogen tons	NO^2+NO^3 Nitrogen tons	Organic Nitrogen tons	Total Phosphorus tons	Ortho Phosphorus tons
at Murtaugh	44	369	154	60	49
above Twin Falls, Falls	44	1,009	203	80	77
below Twin Falls, Falls	46	1,076	241	75	73
below Shoshone Falls	67	1,182	270	72	68
at Blue Lakes	55	1,579	420	101	78
below Warm Creek	334	1,854	796	199	174
at Clear lakes	235	4,584	1,004	289	276
at Gridley Bridge	644	9,031	2.028	525	509
below Upper Salmon Falls	557	9,038	1,864	539	516
below Lower Salmon Falls	598	8,643	1,878	497	459
below Bliss Dam	641	11,069	2,303	630	573
at Bliss Ridge	524	10,005	1,962	552	511
at King Hill	425	10,903	2,167	615	567
TOTAL MONITORED LOAD	**4,215**	**70,343**	**15,291**	**4,235**	**3,930**

Table 2. Contributions in Pounds Per Day

Parameters	Total Loadings from all Sources Between Murtaugh and King Hill From Table 1	Municipal Loadings From Declo To King Hill From Attachment B	% Contribution from Municipal*	Additional lbs/yr From Municipal Growth At 1.5%/Year	Additional % Contribution From Growth Per Year**
Ammonia	23,096	1,517	6.57%	23	0.099%
$NO^2 + NO^3$	385,443	500	0.13%	8	0.002%
Organic N	83,786	727	0.87%	11	0.013%
Total P	23,205	348	1.50%	5	0.022%
Ortho P	21,534	379	1.76%	6	0.026%

* Contribution From Municipal Sources Divided by Total Loading as Percent
** Pounds From Growth of Municipal Divided by Total Loading as Percent

The application of biosolids on agricultural land is managed to utilize its fertilizer value to the maximum extent possible. Sludge application rates for agriculture are calculated based on crop needs, permissible sludge constituent concentration (based on health and environmental effects), and soil characteristics. Application rates are designed so that the most limiting constituent sets the appropriate application rate for the sludge. The two constituents that are usually most important to control are nitrogen and zinc. Nitrogen is typically the first sludge component to limit the rate of sludge application.

It is important to use only the amount of nitrogen, either from sludge or from commercial fertilizer, that the crop requires. The amount of commercial fertilizer used must be reduced by the amount available in the sludge to be applied on the land. If too much nitrogen is applied, whether from sludge or commercial fertilizer, it can leach into groundwater and cause pollution.

Determining the proper amount of sludge to be applied is the responsibility of the wastewater treatment plant staff using information supplied by the landowner and soils analysis results and metals and fertilizer testing of the biosolids. Therefore, it is important that the landowner provide accurate information on the crop to be grown, so that proper applications rates can be determined.

The guidelines for land application of municipal sewage sludge have been prepared as part of The State of Idaho Clean Water Program Title 39, Chapter 1, Idaho Code and the EPA 40 CFR §503 regulations. The publication "Guidelines for Land Application of Municipal Sewage Sludge" and the EPA §503 regulations provide the guide under which a land application plan is formulated.

Sludge application is done in accordance with IDHW Division of Environmental Quality (DEQ) regulations and guidelines or by EPA §503 regulations, whichever is more stringent. This requires the permitting of beneficial use sites, and is accomplished by the submission of Agricultural Application Site Approval Requests (AASAR) to DEQ. When a potential beneficial use site is identified, the permitting process begins by securing an Agreement with the land owner and/or controller. They must read, understand and agree to the information before taking the next step in the permitting process. Once this initial step is completed, the following can take place:

1) Complete the AASAR form and calculate the agronomic loading rate and site life.

2) Submit the information and materials identified above to DEQ for approval of the site prior to the application of sludge.

An analysis of the site's soil must be completed in order to calculate site life as required by the AASAR and to calculate agronomic loading rates as required by the AASAR. This is done by collecting one (1) soil sample per 50 acres and analyzing for nutrient and heavy metal constituents. Soil samples are collected and analyzed upon permitting new sites, and whenever sludge application approaches 80% of the maximum metal addition allowable.

Twin Falls sludge, for example, is beneficially applied to agricultural land and has value as a soil conditioner and fertilizer. This practice is encouraged by the U.S. Environmental Protection Agency (EPA) and DEQ. When properly managed, sludge can be safely applied to agricultural land with maximum benefit to the environment.

MANAGEMENT ACTIONS

Municipal wastewater treatment plants in the mid-Snake region will take the following short-term management actions.

1) Conduct a survey of all municipal wastewater treatment plants in the mid-snake region. Determine the impact of municipal wastewater discharges on the river and its tributaries. Categorize facilities by flows, types, and cost to date that municipalities have incurred.

2) Enhance the reduction of nutrients discharged into the mid-Snake river by adopting, by resolution, the Nutrient Management Plan and supporting ordinances. If a municipality fails to adopt this plan the nutrient management committee will request, through IDHW-DEQ, that consent orders be issued to recalcitrant municipalities.

3) Research, develop and implement a public information and education program. Any or all of the following actions to decrease ammonia, nitrite and nitrate, and total phosphorus from municipal wastewater discharges may be used:

   A) Preparing public service announcements and videos for public use that inform them of the need for Nutrient management and the methods they can use to help.

   B) Distribute pamphlets and brochures that address the problem and propose solutions.

   C) Educate city council members to obtain support, explain the need for nutrient reduction, where contaminants originate, and effective ways to treat the problem.

   D) Use the news media (radio, T.V., and newspapers) to inform the public and keep them updated.

   E) Promote public tours and school lectures.

   F) Use explanatory messages in billing statements.

4) Municipal wastewater treatment plants will initiate additional sampling of wastewater to identify the makeup of systems influent and effluent in addition to NPDES discharge monitoring requirements.

   A) Samples will include testing for ammonia, nitrite and nitrate, TKN and total phosphorus. Samples will be a minimum eight hour composite either manual or automatic.

   B) Sampling will start on adoption of the nutrient management plan by the municipalities and as soon as physically and financially possible.

   C) The minimum amount of monitoring for the first year of the program will be weekly for plants with flows greater than 2.0 million gallons per day, (MGD), twice monthly for plants with flows greater than 1.0 MGD and less than 2.0 MGD, and monthly for plants with flows less than 1.0 MGD.

   D) An annual review may result in adjustments to the monitoring schedule.

5) Listed below are some operation practices that can be used for reduction of nutrient levels in wastewater treatment. Not all practices apply to all plants. The operators could use any of the following practices that best suit their plants.

   A) Operate wastewater treatment plants in the extended aeration mode to promote nitrification.

   B) Increase sludge age for ammonia removal.

   C) The addition of lime at plant influent to control Ph and remove phosphorus.

   D) The use of alum and polymer for phosphorus removal.

   E) Stop using chemicals for treatment processes that may add nutrients. For example, adding ammonium nitrate to lagoons to raise D.O. levels.

F) Facilities with industrial contributions greater than 10% of average daily flow or loadings should have an industrial users' agreement that limits the amount of ammonia, nitrite and nitrate, and phosphorus that the industry may discharge.

G) Any other appropriate treatment practice.

6) Municipalities in the mid-Snake River region should initiate or continue with water conservation plans.

7) Promote land application of treatment plants' effluents in accordance with the IDHW-DEQ permits and guidelines for land application of municipal and industrial wastewater.

8) Promote land application of Bio Solids.

9) Promote storm water pollution prevention.

10) Create a sub-committee to meet at least annually to implement the plan, review monitoring data, assist operators, and encourage compliance with the plan.

Municipal wastewater treatment plants in the mid-Snake River region will implement the following long term management actions.

1) Promote the reduction of nutrient discharges into Municipal wastewater facilities through public information and education.

2) Municipalities may enact a ban on all domestic products that contribute heavily to phosphorus loadings if the volunteer program does not result in significant reduction of nutrients into the wastewater stream.

3) Request from EPA with concurrence of IDHW-DEQ that all future NPDES permits include minimum influent and effluent testing requirements, for ammonia, nitrite and nitrate, TKN, and total phosphorus.

4) Target plants with high discharges of nutrients. The sub-committee will help them develop better operation and maintenance (O&M) plans and best management practices (BMPs) to reduce nutrient discharges.

5) Research and develop a monitoring plan for receiving waters. Plans will be tailored to each individual plant and consist of a minimum of upstream and downstream monitoring.

6) Consider plant upgrades if BMPs and better O&M plans do not significantly lower effluent nutrient levels.

7) Review the monitoring results and at that time set target nutrient reduction levels and percentages.

COMPLIANCE

1) City councils should adopt the Wastewater Nutrient Management Plan within one year of adoption of IDHW-DEQ's Nutrient Management plan. IDHW-DEQ will track municipal adoption of wastewater nutrient management plans. When the state adopts The Nutrient Management Plan, IDHW-DEQ has a mechanism to limit NPDES nutrient parameters and/or develop consent agreements with municipalities.

2) IDHW-DEQ will acknowledge adoption of the plan with public recognition awards. (Although awards have yet to be formalized, discussion has included certificates, plaques, press releases, points on facility plans for Grant and Loan packages, and signs posted at town boundaries.)

3) Upon adoption of the plan, the sampling and analysis data shall be submitted quarterly to DEQ.

4) If the voluntary sampling quarterly report is not received, the selected Municipal Wastewater Committee will recommend that the DMR be changed to incorporate nutrient reporting.

5) IDHW-DEQ will recognize individual facilities for one year of data collection with recognition awards to municipal wastewater plants.

6) If the target nutrient reductions are not met through implementation of the management actions, the selected Municipal Wastewater Committee will reconvene to consider additional measures and alternatives to the Nutrient Management Plan for the Wastewater Treatment Industry.

7) IDHW-DEQ will recognize individual communities for special efforts to comply with the Nutrient Management Plan.

8) If plan target are not met, municipalities with industrial facilities contributing greater than 10% of average daily flow or 5% of nutrient loadings to the treatment plant will have an Industrial Waste Agreement (IWA) that limits nutrients that the industry may discharge. Limits will be placed on ammonia, nitrite/nitrate, and phosphorus when found in concentrations 50% greater than the domestic sewerage background levels. Municipalities with such industries that are currently without EPA mandated Industrial Pretreatment Programs will adopt Industrial Pretreatment Ordinances (Sewer Use Ordinance, SUO) based on EPA Region 10's SUO model. Adoption of the SUO will precede issuance of IWAs. For each community the model may be modified, with EPA review, to include only the portions of the model required for the community's needs except that each SUO shall contain the provisions for enforcement. A municipality may elect (and is encouraged to but is not required) to construct initial IWA limits through mutual agreement between the municipality, the POTW, and the industry based on BMPs, Pollution Prevention (P2) methods, or other options. Permits that contain limits will have reopener clauses to provide for more stringent limits if the municipality fails to meet the Watershed Management Plan target reduction levels. If nutrient reductions are not met, municipalities may construct local nutrient limits as per EPA methodology found in the Technical Support Document (TSD) "Guidance Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Program" (The "Green Book," December 1987). Limitations on phosphorus shall follow methodology for conservative pollutants while nitrogen bearing nutrients shall follow methodology for non-conservative pollutants. Both methodologies are found in the aforementioned TSD. As an option and at the discretion of the municipality, with review and approval from the EPA, a municipality may explore alternative options to more stringent limits. Options could include such ideas as the municipality partnering with industry to upgrade POTWs to provide for nutrient removal, pollutant trading within the community's treatment system, pollutant trading from outside the community's system, or other options as they become available through the Common Sense Initiative (CSI) or future EPA actions that allow the enhancement of the community's ability to meet the nutrient reductions.

WASTELOAD ALLOCATION TABLE

In the spring of 1996 the municipal wastewater treatment plants in the Mid-Snake Region developed a Wasteload Allocation Table to assist the DEQ and the EPA to better estimate the load limits for the Mid-Snake River Region. The City of Twin Falls was the only plant originally reviewed for pollution loads in the RBM10 Model. **TABLE 22** in the Middle Snake River Watershed Management Plan states that 1030 lbs/day of Total Phosphorus (TP) was the combined loadings of the City of Twin Falls and those industries discharging to the City of Twin Falls. It should be noted that this TP load value is orthophosphate, not TP. The additional 32 facilities are in the process of developing a baseline to achieve their 34% reduction in TP. Within three years, the baseline will be fully developed and implementation of their reductions can begin. The City of Twin Falls has achieved a 34% reduction in TP and it is suggesting that the remaining 32 facilities achieve the same reductions before further reductions are necessary at Twin Falls. The wasteload allocation is an estimate at this time and will be updated on an annual basis as data become available. The municipalities will attempt to maintain a "0" increase in TP after the 34% reductions are achieved.

The municipal wastewater treatment industry consists of 33 municipalities with a variety of treatment systems. They are classified into four categories: direct dischargers into the Middle Snake River, direct dischargers into canals and tributaries, land application facilities, and total containment lagoons. The wasteload allocation will be arranged into these categories.

The goal of the municipal wastewater treatment plants is to reduce the TP entering the Middle Snake River from their industry by 34 percent. The following assumptions were incorportated into the developed TMDL for municipalities:

1. If the municipalities that are total containment lagoons or totally land application, then their allocation will be zero. Total containment implies no discharge, therefore zero allocation.

2. Attachment E of the Wastewater Industry's Watershed Management Plan is the 1990-1991 baseline for TP, except for the City of Twin Falls. The 1033 lbs/day is the estimate load only for the City of Twin Falls.

3. The values in Attachement E are low by at least 10%. The sample period was only from late summer and early fall and not for the full year. In addition, the effluent samples tested were for orthophosphate and not TP.

Based on these assumptions and the best estimates of TP and allocated loads per facilities, the 1991 baseline load for TP is:

Facility Type	Number of Facilities	TP, lbs/day	% of TP Load
No Discharge	17	0.0	0.0
Seasonal Dischargers	4	36.5	2.22
Dischargers to Tributaries or Canal System	10	473.3	28.76
Discharge into Middle Snake River	1	1136.3	69.02
TOTAL =	32	1646.1	100.00

The TP load of 1646.1 lbs/day is greater than the estimate of 1033 lbs/day from **TABLE 22**. Both values represent an estimate and 1033 lbs/day represents an estimate for the City of Twin Falls only. The following table shows the estimated 1991 baseline (with a 10% adjustment from Attachment E) net reduction and load allocation for each municipal facility.

Facility	1991 Baseline Load lbs/day	Net Reduction lbs/day	Load Allocation lbs/day
FACILITIES THAT DO NOT DISCHARGE:			
ALBION	0	0	0
CAREY	0	0	0
CLEAR LAKES	0	0	0
RUPERT	0	0	0
FAIRFIELD	0	0	0

Facility	1991 Baseline Load lbs/day	Net Reduction lbs/day	Load Allocation lbs/day
HAILEY-W	0	0	0
KIMBERLY	0	0	0
PAUL	0	0	0
PAUL HOUSING	0	0	0
DECLO	0	0	0
EDEN	0	0	0
GOLDEN RAIL	0	0	0
CASTLEFORD	0	0	0
WENDELL	0	0	0
MURTAUGH	0	0	0
SPRING CREEK	0	0	0
BELLEVUE	0	0	0
SUBTOTAL =	0	0	0
FACILITIES THAT SEASONALLY DISCHARGE:			
FILER	24.0	8.2	15.8
GOODING	10.7	3.6	7.1
MINIDOKA	0.0	0.0	0.0
RICHFIELD	1.8	0.6	1.2
SUBTOTAL =	36.5	12.4	24.1
FACILITIES THAT DISCHARGE TO TRIBUTARIES & CANALS:			
BUHL	25.3	8.6	16.7
BURLEY	68.9	23.4	45.5
HAGERMAN	8.3	2.8	5.5
HAILY-RIVERSIDE	23.0	7.8	15.2
HANSEN	4.9	1.7	3.2
HEYBURN	7.7	2.6	5.1
JEROME	298.1	101.3	196.8
KETCHEM	20.9	7.1	13.8
MEADOWS	1.1	0.4	0.7
SHOSHONE	15.1	5.1	10.0
SUBTOTAL =	473.3	160.8	312.5

Facility	1991 Baseline Load lbs/day	Net Reduction lbs/day	Load Allocation lbs/day
FACILITIES THAT DISCHARGE TO THE MIDDLE SNAKE RIVER:			
TWIN FALLS	1136.3	386.3	750.0
SUBTOTAL =	1136.3	386.3	750.0
GRAND TOTAL =	1646.1	559.5	1086.6

STATEMENT BY MUNICIPAL INDUSTRY RELATIVE TO WLA TABLE

We believe that the WLA table is fair and equitable allocation for all the municipal facilities. We also believe that it achieves the goals of the WMP for the Middle Snake River. We believe that at this time there is no justification to do a further reduction to account for growth within the industry because of the lack of data on the Middle Snake river. To date there has been no year-round sampling of the Middle Snake River and its tributaries and no consistency or standard on how and when the samples should be taken. Furthermore, most of the facilities have just started to sample for TP. It is our recommendation that the DEQ and the EPA accept the WLA table for the industry. We also recommend that over the next three years that the DEQ and the EPA clarify where the pollutant sources are and develop a better sampling program. At this time the RBM10 Model has to many unknowns to be effective as a TMDL estimator. Those unknowns should be identified and quantified before any more reductions are made.

ATTACHMENT B

Summary of Data Base For Mid-Snake Nutrient Management Committee

by Wayne Heinemann, Operations Management International, Inc.

The data base that follows is constructed using a telephone questionnaire and numeric values drawn from DEQ records. The following plants were contacted:

Buhl
Burley
Carey
Declo
Eden
Fairfield
Filer
Golden Rail Trailer Park
Gooding
Hagerman
Hailey Riverside
Hailey Woodside
Hansen
Hazelton
Heyburn
Jerome
Ketchum
Meadows Mobile Home Park
Murtaugh
Paul
Paul Housing Authority
Richfield
Rupert
Shoshone
Twin Falls
Wendell

The survey identified 1959 as the earliest date for plant construction. Most plants were built in the mid 60s and early 70s. Additionally most of the larger plants have gone through several upgrades since their construction. The cost for construction of all facilities included in the survey exceeds $47,719,483.00. Six of the respondents could not provide this information, eight provided partial information and most of the figures are not in 1993 dollars.

The identified average daily flow currently is 16.3 MGD with the true average slightly higher since 3 respondents were unable to provide this information. These three respondents are identified as follows: Fairfield discharges to Soldier Creek, Paul Housing has one discharge per year to Mindoka Canal, and Hazelton has basin evaporation. Rate of growth for population ranged from a slight population loss of 100 people in Shoshone in 20 years, to an estimated 17% increase for Ketchum. An average urban growth rate has not been projected now because of lack of City populations needed to properly weight these figures. Note that a rate will be supplied in the final draft.

Treatment processes include 10 lagoons, 5 aerated lagoons, 9 activated sludge plants, and 2 aerated cells one equipped with a microscreen. Five plants identified their process as having ammonia removal capabilities and 1 plant is practicing phosphorus removal. Of the plants surveyed, 9 responded that they "Don't Know" if their plant has nutrient removal capabilities.

Four facilities had at the time of the survey changed their practices to reduce nutrient loadings, changes identified include the following:

One plant stopped using Ammonium Nitrate to raise DO in lagoons; Three plants increased Sludge age to remove ammonia; One plant started using lime at the headworks to control pH and remove phosphorus; One plant uses alum and polymer for phosphorus removal.

Twenty two industries feeding into 9 plants are identified in the base as potential nutrient contributors. Of these industries, 6 are regulated under an approved EPA mandated Pretreatment Program. Additionally, 7 are regulated under Pretreatment Programs which have not been EPA mandated.

In answer to the question "Have background studies been performed to identify water quality problems related to your discharge?" five respondents answered "Yes". All respondents interpreted the question in terms of nutrient testing.

Eleven facilities can perform composite sampling. Six of the facilities surveyed were willing to consider nutrient testing. Three facilities have decided to test nutrients since the forming of the mid Snake Nutrient Management Committee.

One nutrient awareness campaign has been conducted. The campaign identified was not used for the public but was conducted in the industrial community. Additionally a phosphate ban is under consideration in the community of Ketchum. Interest, by respondents of the survey, in a public nutrient awareness campaign was very evident.

Data supplied on each discharge in the attached spreadsheets below were acquired from records on file at DEQ. Three cities, Ketchum, Jerome, and Twin Falls have undertaken additional tests, the results are on file in their offices. Most plants have only a small number of test points for each parameter. These test points are reportedly State drawn samples for one test in most cases and is included on pages 5 through 9 in the data base.

According to the data base, this industry puts a minimum of 348 lbs of Total Phosphorous, 1517 lbs of Ammonia, 365 lbs of Nitrate/Nitrite, and 727 lbs Organic N per day into the middle Snake. It is obvious from the data sheets that additional testing should be done to completely account for the industry.

One city along the mid-Snake has taken proactive measures to reduce nutrient loadings to the river before mandated by the EPA. Ammonia contributions from the Twin Falls facility have dropped significantly since February 1993. The Twin Falls plant has implemented steps to encourage nitrification/denitrification before ammonia limits in their next NPDES permit become effective. Actual discharges of ammonia have been in the range of 0.1 to 5.0 mg/l. The higher numbers are a result of continuous experimentation to explore each avenue of treatment that the facility might be capable of. Permit limits are expected to be about 3 mg/l summer and 5 mg/l winter. The limits and subsequent discharge will represent an 87% reduction over the ammonia value shown in the data base.

ATTACHMENT C

DESCRIPTION OF WASTEWATER TREATMENT

Most living creatures need oxygen to survive, including fish and other aquatic life. Although most streams and other surface waters contain less than 0.001% dissolved oxygen (10 milligrams of oxygen per liter of water, or 10 mg/l, most fish can thrive if there are at least 5 mg/l and other conditions are favorable. When oxidizable wastes are discharged to a stream, bacteria begin to feed on the waste and decompose or break down the complex substances in the waste into simple chemical compounds. These bacteria also use dissolved oxygen (similar to human respiration or breathing) from the water and are called aerobic bacteria. As more organic waste is added, the bacteria reproduce rapidly; and as their population increases, so does their use of oxygen. Where waste flows are high the population of bacteria may grow large enough to use the entire supply of oxygen from the stream faster than it can be replenished by natural diffusion from the atmosphere. When this happens, fish and most other living things in the stream which require dissolved oxygen die. Therefore, one of the principal objectives of wastewater treatment is to prevent as much of this "oxygen-demanding" organic material as possible from entering the receiving water. The treatment plant actually removes the organic material the same way a stream does, but it accomplishes the task much more efficiently by removing the wastes from the wastewater. Secondary treatment units are designed and operated to use natural organisms such as bacteria "in the plant" to stabilize and to remove organic material. Another effect of oxygen depletion, in addition to the killing of fish and other aquatic life, is the problem of odors. When all the dissolved oxygen has been removed, anaerobic bacteria begin to use the oxygen which is combined chemically with other elements in the form of chemical compounds, such as sulfate (sulfur and oxygen), which are also dissolved in the water. When anaerobic bacteria remove the oxygen from sulfur compounds, hydrogen sulfide (H2S), which has a rotten egg odor, is produced. This gas is very odorous and is capable of forming explosive mixtures with air. Other products of anaerobic decomposition (putrefaction) also can be objectionable. Initially treatment plants in the Magic Valley were constructed to counter the problems of oxygen depletion. A short descriptive narrative follows below which explains the processes utilized by municipalities along the Middle Snake River.

Lagoons and Aerated Lagoons (Ponds)

The first wastewater collection systems in the ancient Orient and in ancient Europe discharged wastewater into nearby bodies of water. These systems accomplished their intended purpose until overloading, as in modern systems, made them objectionable. In ancient times, ponds and lakes were purposefully fertilized with organic wastes to encourage the growth of algae which, in turn, greatly increased the production of fish due to the food supply provided by the algae. This practice still continues and is a recognized art in Germany. The first ponds constructed in the United States were built for the purpose of keeping wastewaters from flowing into places where they would be objectionable. Once built, these ponds performed a treatment process that finally became recognized as such. The tendency over the years has been to equate pond treatment efficiency with the non-emission of odors. Actually, the opposite is true as the greatest organic load destroyed per unit may be accompanied by objectionable odors. Since 1958 engineers have designed and constructed a great number of ponds using research by qualified biological consultants, current scientific knowledge and the experience of past successes and failures. Current literature generally classifies ponds as aerobic, anaerobic, and facultative.

AEROBIC PONDS are characterized by having dissolved oxygen distributed throughout their contents practically all of the time. They usually require an additional source of oxygen to supplement the rather minimal amount that can be diffused from the atmosphere at the water surface. The additional source of oxygen may be supplied by algae during daylight hours, by mechanical agitation of the surface, or by bubbling air provided by compressors through the pond (aerated lagoons).

ANAEROBIC PONDS usually are without any dissolved oxygen throughout their entire depth. Treatment depends on fermentation of the sludge at the pond bottom. This process can be quite odorous under certain conditions, but it is highly efficient in destroying organic wastes. Anaerobic ponds are mainly used for processing industrial wastes, although some domestic-waste ponds become anaerobic when they are badly overloaded.

FACULTATIVE ponds are the most common type in current use. The upper portion (supernatant) of these ponds is aerobic, while the bottom layer is anaerobic. Algae supply most of the oxygen to the supernatant. Facultative ponds are most common because it is almost impossible to maintain completely aerobic or anaerobic conditions all the time at all depths of the pond.

In aerobic ponds or in the aerobic layer of facultative ponds, organic matter contained in the wastewater is first converted to carbon dioxide and ammonia (by bacteria) and finally, to algae in the presence of sunlight. Algae release oxygen from the water molecule during photosynthesis which is then taken up in the further bacterial breakdown of wastewater components. Organic matter that finds its way to the anaerobic sections of a lagoon are subject to decomposition by methane fermentation, to carbon dioxide, water and methane.

Primary Treatment

In most municipal wastewater treatment plants (except those utilizing ponds), the first major treatment which the waste water undergoes is a sedimentation unit. This unit may be called a settling tank, sedimentation tank, or clarifier. The most common name is primary clarifier, since it helps to clarify or clear up the wastewater. Solids which settle to the bottom of a clarifier are usually scraped to one end (in rectangular clarifiers) or to the middle (in circular clarifiers) into a sump. From the sump the solids are pumped to the sludge handling or sludge disposal system. Systems vary from plant to plant and include anaerobic sludge digestion, vacuum filtration, incineration, land disposal, lagoons and burial.

Secondary Treatment

In order to remove the very small suspended solids and dissolved solids not removed by primary treatment most waste treatment plants built today include secondary treatment. Secondary treatment is a process which converts dissolved or suspended materials into a form more readily separated from the water being treated. The process commonly is a type of biological process followed by secondary clarifiers that allow the solids to settle out from the water being treated. This additional process increases overall plant removal of suspended solids and BOD to 90 percent or more. The two most common secondary treatment processes are trickling filters and activated sludge.

Trickling Filters

Most trickling filters are large-diameter, shallow, cylindrical structures filled with stone and having an overhead distribution. Many variations of this design have been built. When natural media (stones) are used the trickling filter is usually cylindrical with a shallow bed; when synthetic media (plastics) are used, the filter could be cylindrical or rectangular with a much deeper bed. Some recent designs have used redwood packing and a deep bed (an example of a rectangular redwood packed filter is found in Twin Falls). Square or rectangular filters have been constructed with fixed sprinklers for wastewater distribution. The media provides a large surface area upon which a biological growth develops. This growth, sometimes called a zoogleal film, contains the living organisms that break down the organic material not removed by primary sedimentation. Organic materials caught by the film is converted to carbon dioxide, water and additional bacterial growth. Sloughing of this growth occurs on a continuous basis and is caught in a secondary sedimentation tank.

Activated Sludge

Activated sludge consists of sludge particles produced in raw or settled wastewater by the growth of organisms in aeration tanks in the presence of dissolved oxygen. The term "activated" comes from the fact that the particles are teeming with bacteria, fungi, and protozoa. The activated sludge process is a biological treatment that uses microorganisms to speed up decomposition of wastes. When activated sludge is added to wastewater the microorganisms feed and grow on waste particles in the wastewater. As the organisms grow and reproduce, more and more waste is removed, leaving the wastewater partially cleaned. The activated sludge process is aimed at oxidation and removal of soluble or finely divided suspended materials that were not removed by primary sedimentation. Aerobic organisms do this in a few hours as wastewater flows through an aeration tank. The organisms convert these materials to carbon dioxide and water along with sulfate and nitrate compounds. Any remaining solids are changed to a form that can be settled and removed as sludge during secondary sedimentation. To assure that adequate treatment is occurring solids caught during secondary sedimentation are returned to the activated sludge process thus returning the bacterial population. Activated sludge requires the addition of air due to the large population of organisms. Oxygen may be supplied by mechanical beaters or by discharging air through diffusers at the bottom of tanks.

Many variations of the activated sludge process exist. Systems which hold bacteria in the process for long periods of time (greater than 10 days) are referred to as extended air. Some systems hold bacteria in a separate tank after secondary sedimentation for a short period before returning them to the activated sludge process. This practice called contact stabilization assures that the microorganisms are "hungry" and causes the system to take up waste material more quickly.

One system called and "oxidation ditch" uses mechanical aerators to push the water down a channel. The channel then returns back to supply water to the intake side of the aerator thus forming a loop with continuous flow occurring.

When insufficient organic material is present to sustain the bacterial population in an activated sludge tank a condition is created which favors the growth of organisms which can utilize ammonia for energy. Thus the process can be modified to achieve conversion of ammonia to nitrate. Ammonia is implicated in vertebrate toxicity. Removal of nitrogen can be caused to occur if the flow in the activated sludge process is allowed to go to a zero oxygen content for a short period of time. Bacteria then utilize the oxygen in the nitrate molecule for their oxygen supply and release elemental nitrogen gas to the atmosphere.

MICROSCREENS

Ponds and lagoons are subject to the growth of algae which can cause treatment plants to violate their solids limitations. For that reason such facilities are sometimes followed by a screening apparatus. One type of screen is called a microscreen (an example is located in Burley). The microscreen is a large rotating drum. Fixed to the drum are grids which contain screens with a 1 to 10 micron pore size. As water exits the lagoon it is channeled through the rotating drum which allows water to pass but not algae or other particles. A backwash feature on the drum returns the solids to the lagoons for additional treatment.

ATTACHMENT D
DESCRIPTIONS OF SELECTED TREATMENT PLANTS FOUND ALONG THE MID-SNAKE

The cities of Twin Falls, Buhl and Rupert have provided a more complete description of their respective processes and are included in this report. The city of Twin Falls has provided a flow schematic which shows the various processes and their relationship to one another.

CITY OF THE TWIN FALLS
WASTEWATER TREATMENT PLANT

WASTEWATER TREATMENT

The Twin Falls wastewater treatment plant is a 7.84 mgd facility which provides secondary treatment utilizing the activated sludge process.

Wastewater enters the plant via the collection system and five lift stations. Preliminary treatment provides for the removal of debris and inorganics. Flow is routed to a set of primary clarifiers then to an activated bio-filter or directly to the aeration basins for processing. After the wastewater is biologically treated in the aeration basin, the biomass exits the aeration basins and flows by gravity to secondary clarifiers where liquid solids separation of the biomass occurs. Concentrated solids from the bottoms of the secondary clarifiers is pumped back to the aeration basins or wasted from the system as necessary. The clear liquid overflows by gravity from the secondary clarifiers to the chlorine contact basin where disinfection occurs prior to discharge to the Snake River.

Figure 1 shows details associated with the liquid processing stream.

Overall Flow Schematic Plan of the Treatment Plant

Primary Clarifier and Headworks

Pump Station

Filter Tower and Aeration Basins

Secondary Clarifiers

Chlorine Contact Chambers

SLUDGE TREATMENT

Primary and biological sludges are stabilized in two anaerobic digesters. The sludge digestion system consists of one primary digester and one secondary digester and a sludge holding tank. The primary digester is completely mixed and heated to 95-98 degrees Fahrenheit in order to maximize volatile solids destruction and to provide reduction of pathogenic organisms. Sludge is pumped from the primary digester to the secondary digester for additional treatment. Sludge is then pumped from the secondary digester to the sludge holding tank where it is then sent to the belt presses, dewatered and trucked to the sludge disposal site. Volatile solids reduction ranges from 40% to 60%.

Sludge generated by the POTW is stabilized and applied to beneficial use sites located primarily in the Twin Falls area.

One of the most valuable elements found in Twin Falls sludge is nitrogen. The nitrogen is primarily organic nitrogen which is gradually mineralized so that it can be used for its nutrient value over an extended period of time. Phosphorous, potassium, and trace metals are also important nutrients which can be used by vegetation. Sludge contains organic material which adds to the soil humus content. This increases its moisture retention capacity and its cation exchange capacity.

The anaerobic sludge digestion process utilized at the POTW is recognized by the EPA as an acceptable process to "Significantly Reduce Pathogens"; therefore, it is reasonable to assume that the occurrence of pathogens is of minor concern provided the anaerobic digestion process is properly operated and necessary volatile solids reduction takes place.

Toxic organic compounds have not been found to inhibit the anaerobic digestion process; therefore, it is also reasonable to assume that toxic organic compounds are of minor concern under current conditions.

CITY OF BUHL WASTEWATER TREATMENT FACILITY

The Buhl wastewater treatment plant is a secondary treatment facility involving preliminary treatment, aerated lagoons, polishing lagoons, disinfection, and discharge to a nearby receiving stream. The system consists of two aerated lagoons and two polishing lagoons with a total surface area of 10.9 acres which contain 15.9 million gallons. Preliminary treatment consists of influent flow measurement and recording and an in line comminutor to cut up solids.

Following preliminary treatment, the influent flows into the primary aerated lagoon for biological treatment of the wastewater on a continuous basis. The mechanical surface aerators in the system supply supplemental oxygen to the system for more effective treatment.

The aerators also facilitate partial lagoon mixing, however, a fraction of the incoming solids and biological solids produced from waste conversion will settle to the bottom of the cell and undergo anaerobic decomposition. The second aerated cell will employ tapered aeration, ie., the amount of mechanical aeration is gradually reduced as the wastewater flows through the facility, thereby allowing the solids to gradually settle out.

Prior to disinfection, and after aeration, the partially treated wastewater enters a series of polishing cells which allow for further biological treatment and settling of the solids. These ponds are lightly loaded with organic material and complete the BOD removal process.

All wastewater discharged from the Buhl facility is measured, recorded, and disinfected prior to being discharged. The wastewater is passed through a chlorination system that has been designed to provide proper detention time and mixing to ensure adequate exposure to chlorine, effectively killing bacteria and other pathogenic organisms.

After passing through the chlorine system, the treated and disinfected wastewater gravity flows to Mud Creek for eventual transmission to the Snake River.

CITY OF RUPERT WASTEWATER TREATMENT FACILITY

The City of Rupert has an extended aeration plant and land application system to treat the city's wastewater. Daily flows vary from 1 to 3.5 million gallons per day. Wastewater enters the plant at the pretreatment portion where it goes through the bar screen which removes sticks, rags, etc. The wastewater enters the diversion box to be put into cell 1 and 2 aeration basins. The wastewater is aerated in the cells to a dissolved oxygen level of 2.5 mg/l. The effluent is pumped 7 miles north to the lagoons. Water is transferred from one lagoon to another until it reaches the third lagoon. Water is stored in the third lagoon during the winter and used for irrigation in the summer. Two chlorinators disinfect the water before use for irrigation.

ATTACHMENT E

CITY	TYPE	FLOW mgd	OP mg/L	OP lbs/day	TP mg/L	TP lbs/day
Burley	AC & MS	1.20	3.22	32.23	6.28	62.85
Carey	L	0.02			12.80	2.14
Filer	AL	0.17			7.90	11.20
Hagerman	L	0.20			4.50	7.51
Hailey Riverside	AS-EA	0.30			4.35	10.88
Hansen	AC-OD	0.09			6.25	4.69
Heyburn	AS	0.20			4.20	7.01
Jerome	AS-EA	0.66			4.94	27.19
Ketchum	AS-EA	1.60			0.67	8.94
Meadows MHP	AS	0.03			4.02	1.01
Richfield	L	0.02			6.50	1.08
Shoshone	AL	0.19			9.14	14.48
Twin Falls	AS	6.50	15.8*	856.52	15.80**	856.52

Additional Facilities That Did Not Monitor: Buhl (AL), Declo (L), Eden (L), Fairfield (L), Golden Rail MHP (AC), Gooding (AS-OD), Hailey Woodside (AC-CS), Hazelton (L), Murtaugh (L), Paul (L), Paul Housing (AL), Rupert (L-EA), and Wendell (AL).

AL = Aerated Lagoon, AC & MS = Aerated Cell and Microscreen, AS = Activated Sludge, L = Lagoon, OD = Oxidation Ditch, EA = Extended Air, CS = Contact Stabilization, OP = Orthophosphate, TP = Total Phosphorus

* = Value changed to 1991 data. 1993 data was previously incorrectly stated in the spreadsheet.
** = Orthophosphate value is used in place of Total Phosphorus data. Total Phosphorus was not being tested in 1991 and would have been slightly higher.

Average Monthly Flows for 1993-1996
Twin Falls Average Nutrient and Flow Values

YEAR	Influent OP mg/L	Effluent OP mg/L	Influent TP Load lbs/day	Effluent TP Load lbs/day	Flow, mgd (Influent & Effluent)
1993	6.4	7.9	310	397	5.9
1994	10.6	10.6	534	549	6.25
1995	13.8	9.1	721	457	6.2
1996 (Jan to June)	14.3	9.6	787	542	6.65

APPENDIX B
Middle Snake River Watershed Management Plan Advisory Committee Members

Executive Advisory Committee

Twin Falls Canal Company
North Side Canal Company
Hagerman Valley Citizen's Alert
Ore-Ida Food Processing Company
J.R.Simplot Food Processing Company
Idaho Conservation League
Idaho Aquaculture Association
Idaho Dairy Association
Soil Conservation Districts
City of Twin Falls
Municipal Wastewater Treatment Plants
Idaho Power Company
LB Industries
Idaho Rivers United
Idaho Department of Agriculture
U.S. Environmental Protection Agency
Congressional Representatives
The Times-News Newspaper
KMVT-TV
CH2M Hill
County Commissioners
University of Idaho Extension Agents
Idaho Association of Commerce & Industry
The River Center
Idaho Wildlife Federation
Magic Valley Fly Fishers
Field Crop Representatives
Fertilizer Representatives
Middle Snake Study Group
Twin Falls Chamber of Commerce
Middle Snake Regional Water Resource Commission

Technical Advisory Committee

Twin Falls Canal Company
North Side Canal Company
Hagerman Valley Citizen's Alert
Ore-Ida Food Processing Company
J.R.Simplot Food Processing Company
Idaho Conservation League
Idaho Aquaculture Association
Idaho Dairy Association
Soil Conservation Districts
U.S. Soil Conservation Service
Soil Conservation Commission
City of Twin Falls
Municipal Wastewater Treatment Plants
Idaho Power Company
Idaho Rivers United
U.S. Environmental Protection Agency
Idaho Department of Water Resources
Idaho Department of Fish and Game
U.S. Bureau of Reclamation
U.S. Fish and Wildlife Service
U.S. Bureau of Land Management
U.S. Geological Survey
Idaho Department of Parks and Recreation
Idaho Department of Agriculture
Idaho State University
University of Idaho
University of Idaho Reserach & Extension Center
University of Idaho Extension Specialists
The Times-News Newspaper
KMVT-TV
Congressional Representatives

Historical Review and Summary of The Middle Snake River Watershed Advisory Group and Its Executive and Technical Advisory Committee Activities

[Minutes defined in this review and summary are in repository with the DEQ-SCIRO office. They are public documents and available for view to the public.]

1990

September 28, 1990: Problem assessment & priority/schedule list for TMDL development of the Snake River reach between Shoshone Falls and Lower Salmon Falls Dam.

1991

No Defined Date: Mid-Snake Nutrient Management Plan---Issues to Bring Into Focus: Shoshone Falls to Clear Lakes Bridge, Total Phosphorus & Flow.

No Defined Date: Total Phosphorus loads from 1990 to 1991 at the Buhl Bridge.

August 21, 1991: EPA's Problem Assessment (Executive Summary) for the Middle Snake River, from Shoshone Falls to Lower Salmon Falls Reservoir.

October 1991: Middle Snake River Update, Issue No. 1.

1992

No Defined Date: Mid-Snake Nutrient Management Plan, IACI Food Processors.

No Defined Date: Executive Summary of Idaho Aquaculture Association Nutrient Management Plan.

January 14, 1992: Minutes of Mid-Snake Meeting for development of a Steering Committee to address Mid-Snake water quality issues.

February 7, 1992: Letters to various groups in watershed to formalize a steering committee to address Mid-Snake basin water quality issues.

February 14, 1992: Minutes of Mid-Snake Meeting to cooperatively develop a plan to improve water quality conditions in the Mid-Snake River. Four committees would be established and DEQ would act as liaison between them: General Membership Committee, Executive Advisory Committee (Public Advisory Committee), Technical Advisory Committee, and Legal Committee.

March 30, 1992: Minutes of Technical Advisory Committee.
Minutes of Executive Advisory Committee.

April 13, 1992: Minutes of the Executive Advisory Committee with a draft list of water quality concerns being developed relative to beneficial uses impacted.

April 27, 1992: Minutes of the Executive Advisory Committee.

April 29, 1992: Minutes of the Technical Advisory Committee

May 20, 1992: Agenda for Mid-Snake River Tour

May 29, 1992: Proposed EPA Agenda for meetings of June 9 and 10, 1992.

June 9, 1992: Minutes of the Executive Advisory Committee to discuss the EPA modeling effort for the

	Middle Snake River.
June 10, 1992:	Minutes of the Technical Advisory Committee to discuss the EPA modeling effort for the Middle Snake River.
July 14, 1992:	EPA's Consolidated Work Plan on the Middle Snake River.
July 29, 1992:	Minutes of the Executive & Technical Advisory Committees to discuss components of nutrient management plan that are required by EPA for acceptance as a TMDL.
July 30, 1992:	Middle Snake River Water Quality Issues.
August 27, 1992:	State Budget Development for FY 1994.
December 7, 1992:	Minutes of the Executive Advisory Committee.

1993

No Defined Date:	Total Phosphorus, Mean Potamogeton, Mean Ceratophyllum, Mean Cladophora by River Mile on the Middle Snake River.
January 1993:	Proposed Nutrient Management Plan for Mid-Snake River Basin Confined Animal Feeding Operations.
January 12, 1993:	Mid-Snake Decision Unit & Additional Proposed Funding.
January 12, 1993:	Mid-Snake Work Summary.
January 25, 1993:	Agenda for Executive Advisory Committee Meeting.
January 25, 1993:	Minutes of the Executive Advisory Committee to discuss the Consolidated Work Plan and various industry nutrient management plans.
February 10, 1993:	U.S. Bureau of Reclamation Upper Snake River Reservoir System with storage summaries.
February 22, 1993:	Agenda for Executive and Technical Advisory Committees' meetings.
February 22, 1993:	Minutes of Executive & Technical Advisory Committee.
March 1993:	Proposed Nutrient Management Plan for Middle Snake Irrigated Agriculture.
March 15, 1993:	Agenda for Executive Advisory Committee.
March 15, 1993:	Minutes of Executive Advisory Committee.
April 5, 1993:	Agenda for Technical Advisory Committee with Animal Industry Perspective for Middle Snake River Management, Nutrient Management Plan Outline for Individual Industry Groups, and Effective Participation on Public Review and Comment (dated March 2, 1993).
April 5, 1993:	Minutes of the Technical Advisory Committee.
April 13, 1993:	Notice of Upcoming Meeting & List of Mid-Snake River Nutrient Management Planning Committees: Executive & Technical Advisory Committees.
May 10, 1993:	Agenda for Technical Advisory Committee.
May 10, 1993:	Minutes of Technical Advisory Committee with Meeting Notice & Mid-Snake Planning Process (dated May 7, 1993, Draft).
May 11, 1993:	EPA's Conditional Approval of Idaho's 1992 §303(d) List.
May 13, 1993:	Publication of Legal Notice on a Request for Public Comment on the Idaho 1992 Water Quality Limited Stream Segment List.
June 7, 1993:	Agenda for Executive and Technical Advisory Committees.
June 7, 1993:	Minutes of Technical and Executive Advisory Committees.
June 22, 1993:	Open Meeting Law (date May 28, 1993).
July 1993:	Aquaculture Nutrient Management Plan draft.

July 19, 1993:	Agenda for Executive and Technical Advisory Committees.
July 19, 1993:	Minutes of Technical and Executive Advisory Committees & Meeting Notice.
August 18, 1993:	Approval of Idaho's 1992 §303(d) List.
September 13, 1993:	Agenda for Executive Advisory Committee & Proposed Fall Meeting Schedule for Technical Advisory Committee & Tentative Fall Meeting Schedule for Executive Advisory Committee.
September 13, 1993:	Minutes of Executive Advisory Committee & Summary of University of Idaho Middle Snake River Water Quality Studies, Phase II.
September 14, 1993:	Agenda for Technical Advisory Committee.
September 14, 1993:	Minutes of Technical Advisory Committee & Presentation by BLM of Resource Management Plan for Bennett Hills Area.
September 20, 1993:	Mailer to Executive and Technical Advisory Committee members & Meeting Notice.
September 29, 1993:	Budget Development for FY 1995.
October 1, 1993:	Draft Management Actions and Implementation for Middle Snake Nutrient Management Plan.
October 4, 1993:	Agenda for Executive Advisory Committee.
October 4, 1993:	Minutes of Executive Advisory Committee
October 5, 1993:	Minutes of Technical Advisory Committee.
October 18, 1993:	Agenda for Executive Advisory Committee.
October 19, 1993:	Agenda for Technical Advisory Committee.
October 19, 1993:	Minutes for Technical Advisory Committee.
November 22, 1993:	Agenda for Executive Advisory Committee.
November 22, 1993:	Minutes for Executive Advisory Committee.
November 23, 1993:	Agenda for Technical Advisory Committee.
December 1993:	Aquaculture Nutrient Management Plan.
December 13/14, 1993:	Questions and Answers by Executive & Technical Advisory Committees.
December 13, 1993:	Agenda for Executive & Technical Advisory Committees.
December 13, 1993:	Minutes of Executive Advisory Committee & Meeting Notice.
December 14, 1993:	Minutes of Technical Advisory Committee.

1994

January 1994:	Status Report of Middle Snake River Nutrient Management Plan.
January 3, 1994:	Request for Information for Budget Hearing.
January 10, 1994:	Agenda for Executive & Technical Advisory Committees.
January 10, 1994:	Minutes for Executive & Technical Advisory Committees.
February 15, 1994:	Idaho Power Company's summary of Shoshone Falls Recreational Studies.
February 16, 1994:	Attorney General Opinion No. 94-2 on review of Board of Health and Welfare and Legislature of Nutrient Management Plan prior to adoption and implementation.
February 22, 1994:	Agenda of Executive & Technical Advisory Committees.
February 22, 1994:	Partial Minutes of Executive & Technical Advisory Committees & Meeting Notice.
February 22, 1994:	Minutes of Executive & Technical Advisory Committees.
March 7, 1994:	Mid-Snake Nutrient Management Plan Approval.
March 10, 1994:	Recreational Contact.
March 19, 1994:	Rivers Conference Speech by Larry Echohawk.
March 22, 1994:	Agenda for Executive & Technical Advisory Committees.

March 22, 1994:	Minutes of Executive & Technical Advisory Committees & Executive Summary of the Recovery Plan for Snake River Aquatic Species in South Central Idaho.
March 25, 1994:	Preliminary Information on the Hydro Sites.
April 11, 1994:	Comments on the Mid-Snake Nutrient Management Plan.
April 18, 1994:	Summary of Comments on Draft Nutrient Management Plan.
April 18, 1994:	Meeting with EPA & DEQ.
April 20, 1994:	Mid-Snake Nutrient Management Plan Status Report & Bullet Status Report.
April 25, 1994:	Minutes of Executive & Technical Advisory Committees.
May, 1994:	Letter from David R. Mead to John Bermensolo, Board Health & Welfare.
May 2, 1994:	Mid-Snake River Appropriations Bill.
May 5, 1994:	GIS Maps for the Twin Falls Area.
May 4, 1994:	FERC GIS data.
May 5, 1994:	GIS Map of FERC data.
May 9, 1994:	FERC data Update.
May 12, 1994:	More FERC Info.
May 26, 1994:	Minutes of Technical Advisory Committee & Meeting Notice.
June 1, 1994:	Water Quality Monitoring Porposal for Snake River from Minidoka Dam to Milner Dam.
July 11, 1994:	Agenda for Executive & Technical Advisory Committees.
July 11, 1994:	Minutes of Executive & Technical Advisory Committees.
September 13, 1994:	Lake Walcott Study.
September 14, 1994:	Status of Mid-Snake Nutrient Management Plan.
September 14, 1994:	EPA's Water Policy Report, "State rejects EPA view that mandatory nutrient regs may be needed," "State denies Water Quality certification based on high court ruling," and "EPA to develop new guidelines, but no rule, on beach waters."
September 19, 1994:	NMP Revision.
September 22, 1994:	Board of Health and Welfare.
October 24, 1994:	Agenda of Executive & Technical Advisory Committees & Meeting Notice.
October 24, 1994:	Minutes of Executive & Technical Advisory Committees & Grass Carp Ban.
October 25, 1994:	Mid-Snake Damage Control.
November 21, 1994:	Agenda of Executive & Technical Advisory Committees.
December 21, 1994:	Agenda of Executive & Technical Advisory Committees.
December 21, 1994:	Minutes of Executive & Technical Advisory Committees & Aquaculture NMP.
December 29, 1994:	DEQ Notes from December 21 EAC/TAC Meeting.

1995

January 1995:	Decision Unit Description for FY 1995
January 24, 1995:	Mid-Snake Status Report
February 15, 1995:	Mid-Snake Plan - Implementation Resources
February 22, 1995:	Agenda & Meeting Notice for Executive & Technical Advisory Committees
February 22, 1995:	Minutes of Executive & Technical Advisory Committee Meeting & Public Notice
March 22, 1995:	Agenda for Public Information Meeting

March 22, 1995:	Summary of Questions and Answers of Open House
April 12, 1995:	Municipal Wastewater Plan Writing Subcommittee Meeting
April 26, 1995:	The Issue of the Mid-Snake Nutrient Management Plan
May 4, 1995:	Agenda & Minutes of Executive & Technical Advisory Committee Meeting
May 19, 1995:	Idaho Sportsmen's Coalition, et.al. Versus Carol M. Browner, et.al.
August 22, 1995:	Minutes of Executive & Technical Advisory Committee Meeting

1996

March 8, 1996:	Mid-Snake NMP Meeting Notice & Agenda
March 15, 1996:	Idaho State Senate, John Sandy, District 22, Twin Falls & Gooding Counties
March 28, 1996:	Minutes of the EAC/TAC Meeting & Agenda
March 29, 1996:	Comments on Mid-Snake NMP TAC/EAC Meeting of March 28
April 5, 1996:	Mid-Snake NMP EAC/TAC Meeting Notice
April 10, 1996:	EAC/TAC Writing Committee Minutes
April 22, 1996:	Agenda & Minutes of EAC/TAC Meeting
April 25, 1996:	Irrigators WQ Committee Letter
May 14, 1996:	EAC/TAC Writing Committee Meeting Notice & Notice of next EAC/TAC Meeting
May 17, 1996:	Municipality/POTW/Facility Industry Meeting Minutes
May 21, 1996:	Roll of those attending EAC/TAC Writing Committee Meeting
May 29, 1996:	EAC/TAC Agenda & Minutes
May 30, 1996:	Feedback on May 29 Meeting
May 31, 1996:	Newspaper, "Snake Cleanup Plan Deadline Nears"
June 5, 1996:	Middle Snake River Information
June 6, 1996:	WAG Organization
June 18, 1996:	Press Release for Upper Snake BAG Meeting in Twin Falls to form Mid-Snake WAG
June 26, 1996:	Mid-Snake WAG organizational meeting (directed by Upper Snake BAG)
July 31, 1996:	Mid-Snake WAG organizational meeting (directed by Upper Snake BAG)
September 10, 1996:	Mid-Snake WAG organizational meeting (directed by Upper Snake BAG). Mike Trabert, city of Twin Falls, elected as Mid-Snake WAG Chairman. Bylaws for the WAG to be organized by Bylaws Committee for approval of the WAG.
September 26, 1996:	Mid-Snake WAG Bylaws Committee Meeting. Draft bylaws document presented and discussed by committee members.
October 8, 1996:	Mid-Snake WAG Bylaws Committee Meeting
October 22, 1996:	Mid-Snake WAG Bylaws Committee Meeting
October 23, 1996:	Opening date of Mid-Snake TMDL Public Comment Period.
October 29, 1996:	Mid-Snake WAG Meeting (TENTATIVE).
November 7, 1996:	Mid-Snake WAG Meeting
November 22, 1996:	Closing date of Mid-Snake TMDL Public Comment Period.
November 29, 1996:	Submission of Mid-Snake TMDL to the EPA (TENTATIVE).
December 11, 1996:.	Mid-Snake WAG Meeting

1997

January 14, 1997:	Upper Snake Basin Advisory Group Meeting
January 21, 1997:	Mid-Snake WAG Meeting
February 5, 1997:	Upper Snake Basin Advisory Group Meeting
February 19, 1997:	Mid-Snake WAG Meeting
March 5, 1997:	Upper Snake Basin Advisory Group Meeting
March 19, 1997:	Mid-Snake TAC Meeting
March 19, 1997:	Mid-Snake WAG Meeting
March 20, 1997:	Final Mid-Snake TMDL Submitted to EPA-Boise
April 2, 1997:	Upper Snake Basin Advisory Group Meeting
April 16, 1997:	Mid-Snake TAC Meeting
April 16, 1997:	Mid-Snake WAG Meeting
April 25, 1997:	Acceptance by EPA of Mid-Snake TMDL
May 7, 1997:	Upper Snake Basin Advisory Group Meeting
May 21, 1997:	Mid-Snake WAG Meeting
June 4, 1997:	Upper Snake Basin Advisory Group Meeting
June 19, 1997:	Mid-Snake WAG Meeting: EPA NPDES Permits Presentation
July 2, 1997:	Upper Snake Basin Advisory Group Meeting
July 9, 1997:	Governor's Tour of the Mid-Snake Area
July 16, 1997:	Mid-Snake WAG Meeting
July 30, 1997:	Tour of Twin Falls POTW (OMI)
August 6, 1997:	Upper Snake Basin Advisory Group Meeting
August 7, 1997:	Mid-Snake TAC Meeting
August 20, 1997:	Mid-Snake WAG Meeting
August 23, 1997:	Recreational Snake River Tour from Lower Salmon Dam to Bliss Bridge
August 28, 1997:	BURP Tour of North Cottonwood Creek
September 3, 1997:	Upper Snake Basin Advisory Group Meeting
September 4, 1997:	Mid-Snake TAC Meeting: Glenns Ferry Meeting
September 11, 1997:	Legislative Tour of the Mid-Snake Area
September 17, 1997:	Mid-Snake WAG Meeting
October 1, 1997:	Upper Snake Basin Advisory Group Meeting
October 15, 1997:	Mid-Snake TAC Meeting: internet discussion
October 15, 1997:	Mid-Snake WAG Meeting
November 5, 1997:	Upper Snake Basin Advisory Group Meeting
November 18, 1997:	Idaho Effluent Trading Workshop-Boise
November 19, 1997:	Mid-Snake TAC Meeting
November 19, 1997:	Mid-Snake WAG Meeting
December 3, 1997:	Upper Snake Basin Advisory Group Meeting
December __, 1997:	Mid-Snake WAG Meeting cancelled due to Holidays.

1998

January 12, 1998:	Grazing-DEQ Meeting on 319 Grant Proposal in Southern Idaho
January 21, 1998:	Mid-Snake TAC Meeting
January 21, 1998:	Mid-Snake WAG Meeting

APPENDIX C

SUMMARY OF PUBLIC COMMENT LETTERS

Public Comment Period:
October 23, 1996 thru November 22, 1996

Public comments have been incorporated into the main document of the Middle Snake River Watershed Management Plan.

Comments relative to the Aquaculture WLA Tables are found at the DEQ-TFRO and are available for public viewing.

Only those comments pertinent to the main document (Chapters 1 through 5) are included in this appendix:

1. **Rosholt, Robertson & Tucker, Letter of November 21, 1996**
2. **U.S. Department of Interior, BOR, Letter of December 2, 1996**
3. **Ringert Clark, Chartered Lawyers, Letter of December 4, 1996 with memorandum enclosure from Clear Lakes Trout Company**
4. **Clear Springs Foods, Letter of November 21, 1996**
5. **Armand M. Eckert, Letter of November 18, 1996**
6. **U.S. EPA, Letter of November 22, 1996**
7. **U.S. Department of Interior, FWS, Letter of December 9, 1996**
8. **Irrigators' Water Quality Committee, Letter of November 22, 1996 with comments as enclosure**
9. **Rosholt, Robertson & Tucker, Letter of November 22, 1996**
10. **University of Idaho Cooperative Extension Service, Letter of November 22, 1996**

ROSHOLT, ROBERTSON & TUCKER
Chartered
ATTORNEYS AT LAW

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November 21, 1996

Dr. Balthasar B. Buhidar
Mid-Snake Technical Planner
DEQ/SCIRO
601 Pole Line Road, Suite 2
Twin Falls, Idaho 83301-3035

Dear Dr. Buhidar:

I represent Blue Lakes Trout Farm, Inc., and Pisces Investments, Inc., and in that capacity have been asked to forward to you my clients' comments and relating to the proposed Middle Snake River Watershed Management Plan, Phase 1 TMDL regulating total phosphorus (Draft No. 2 dated October 23, 1996). I am requesting that the contents of this letter be considered my clients' official comments, and that you lodge them with the appropriate offices within DEQ.

My clients are concerned with the following issues:

1. In a general sense, the aquaculture industry has been somewhat duped throughout this process. At various meetings attended by representatives of DEQ over the past few years, a nutrient management plan was advocated as an alternative to total maximum daily loads for phosphorus. The industry, through the Idaho Aquaculture Association, and its individual members, including my clients, were encouraged to prepare and participate in a plan looking only at goals and objectives to be pursued, rather than fixed and enforceable limits represented by the TMDL process. Representatives of DEQ, at meetings which I attended, assured members of the IAA that the exercise was intended to establish goals which would be evaluated from time to time both in the context of their impact on total phosphorus concentrations within the mid-Snake River, but also on the basis of whether were realistically attainable. This is the process wherein the 20 percent and 40 percent total phosphorus reductions were developed. Since those numerical reductions were simply to be goals to strive for, too little attention was paid to determining whether they were actually possible to attain without curtailing current levels of production, or instituting cost prohibitive operational changes. To see those numbers now seized upon by DEQ as the basis for an enforceable TMDL represents not only a rather devious change of position on the part of DEQ, but is seen by my clients as a bureaucratic "gotcha". It is

submitted that the 20 percent and 40 percent reductions have not been properly evaluated to determine whether they are realistic or even necessary, and I see nothing in the draft document that would lead me to believe that any scientific analysis of those reduction numbers has been undertaken.

2. We see nothing in the draft document which justifies the proposed reductions for other point source and non-point source phosphorus contributors. On what basis, for instance, can DEQ support a 20 percent reduction from food processors, while assessing a 40 percent reduction for aquaculture. If the answer is simply that the reductions represent the goals suggested by these two industries during the nutrient management plan phase, predating the imposition of TMDLs, I would reiterate the objections set forth in paragraph 1 above. Further, it is ludicrous to suggest that confined feeding operations contribute nothing to the phosphorus load in surface waters, particularly such surface water sources as the Thousand Springs.

3. Inequities in allocations between individual aquaculture facilities is perhaps the most glaring error in the draft. The requirements of due process and equal protection certainly make inequitable allocations untenable, and they will be strenuously resisted by my clients, and I am sure by other aquaculture companies as well, if they are imposed in the manner set forth in the current draft. Our comments concerning these inequities include the following:

a. Working from the numbers listed on Table 23, it appears to us that the pounds of phosphorus allocated under the column entitled "20 Percent Reduction in Year 1" accounts for only 1556.85 pounds as the baseline load. In other words, if the total pounds of phosphorus in the Year 1 reduction column equals 80 percent of X, X appears to equal 1556.85 pounds, leaving 60.15 pounds unallocated. To the extent that it is the intention of DEQ to allocate the additional 60.15 pounds, or 80 percent of that in Year 5, to new or expanded permittees, we believe that to be unfair, and would also point out that it represents an effective reduction on the listed facilities greater than 20 and 40 percent.

b. It appears that those facilities involved in warm water aquaculture have in some cases been treated differently, and more favorably, than the cold water facilities. In the context of the Clean Water Act, we are unaware of any justification for those differences.

c. Among the cold water facilities, substantial and unjustified differences exist. In 1991 and 1992, a small number of facilities voluntarily monitored phosphorus levels and reported them to DEQ. I have been told by DEQ staff that as part of the process those participating facilities were "promised" that any subsequent reduction in phosphorus output would be based on the actual, reported concentrations. For those facilities which did not participate, the concentration of the reporting group was averaged, and applied. The first concern over that approach is the validity of using such a small sampling base to obtain an average applicable to all facilities that did not participate in the voluntary reporting. The second statistical shortcoming was the use of several negative net values reported in calculating the average. Third, and most distressing, is the fact that the approach used actually rewards those facilities which (a) voluntarily reported concentrations, and (b) had the highest phosphorus concentration at that time. In other words, it appears that the worst phosphorus polluters involved in the 1991 and 1992 study emerged smelling like the proverbial rose. We support a process which would treat all permittees in 1991 and 1992 equally, on the basis of reported water flow volumes, as that appears to provide the most equitable means of allocation. The entire exercise is predicated on the industry producing 1617 pounds of phosphorus in 1991/1992, a number which, as we understand it, was an estimate of all of the phosphorus then being discharged into the river by the facilities in operation at that time.

d. The proposed allocations for the processing plants are totally unacceptable, and without any rational basis. For example, the baseline allocation for Facility 69 (Clear Springs Foods) is 10 pounds, while that allocated to Facility 68, belonging to my client, Blue Lakes Trout Farm, Inc., is 1 pound. A tenfold differential is simply not justified on the basis of the comparative pounds process by each of those two facilities. It cannot be determined from the draft plan exactly how those allocations were determined, or how they can be justified.

4. The draft is unclear exactly how the proposed TMDLs will be incorporated in the NPDES permits, and whether violations will be determined on instantaneous excesses of flow concentrations, or some other means. To my knowledge, this issue has not been answered in the meetings held between DEQ and the aquaculture industry.

Sincerely,

J. EVAN ROBERTSON

JER:jc
11219601.jer

United States Department of the Interior

BUREAU OF RECLAMATION
Snake River Area Office - East Unit
1359 Hansen Avenue
Burley, Idaho 83318-1821

RECEIVED
DEC 03 1996
DEQ-SCIRO

IN REPLY REFER TO:

SRA-6433
RES-3.20

DEC -2 1996

Dr. Balthasar Buhidar
Department of Health and Welfare
601 Pole Line Road, Suite 2
Twin Falls, ID 83301-3035

Subject: Water Quality - Middle Snake River Watershed Management Plan

Dear Dr. Buhidar:

Thank you for the opportunity to review the second draft of "The Middle Snake River Watershed Management Plan". We have a few comments on the background information in section 2.02.02 - THE MIDDLE SNAKE RIVER.

In the first paragraph, the assumption is made that irrigation diversions are the only major withdrawal from the river system. It should be pointed out that a significant amount of the river flow below Heise is lost to groundwater and naturally recharges the Eastern Snake Plain Aquifer. Also, a portion of the water that is diverted for agriculture percolates into the aquifer. Some of this groundwater 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.

In the second paragraph of this section, the discharge from Milner Dam is referred to as "bypass flows". This term, used at Milner Dam, could be confusing to some readers. The one mile stretch of river from Milner Dam down to where the Idaho Power powerplant discharges to the Snake River is commonly called the "bypass reach" by boaters and water managers. The plan refers to the total discharge at Milner Dam, but some readers may think that the plan is talking about the discharge in the "bypass reach".

The Idaho State Water Plan states that the minimum release past Milner Dam, once irrigation demand exceeds natural flow, is to be zero. The FERC license for the Idaho Power powerplant does require that Idaho Power provide a minimum flow of 200 cfs in the "bypass reach" 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. 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 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 required by the National Marine Fishery Service biological opinion issued for Endangered Species Act listed species in the Lower Snake River.

The text and Table 6 is somewhat misleading because of the time periods used and the use of average flows. Define summer? What is the source of the 700 cfs number? The average discharge from the start of the irrigation season (April 1) to the end of the season (October 31) will be much greater than the average of July to October 31. The eighth sentence of the second paragraph states that late summer flows are typically in the range of 1000 to 2000 cfs. This is true, while augmentation flows are being released and after the end of October. The following table may represent Milner Dam releases better.

Approximate Flows and Corresponding Dates for Milner Dam

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

* Idaho Power 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.

In the first paragraph, second sentence, below Table 7, the words, "conspicuously absent" should be change to: "lack of winter precipitation and snowpack caused the absence". This had been corrected in the public review draft of "The Middle Snake River Nutrient Management Plan", but somehow reverted back to the old language in this draft.

If you have any questions about our comments, or need further information, please contact Mark Croghan or Mike Beus, of my staff, at (208) 678-0461.

Sincerely,

Allen E. Inman
Acting Area Manager

RINGERT CLARK
CHARTERED
LAWYERS

Laura E. Burri
Jeffrey R. Christenson
D. Blair Clark
Michael J. Doolittle
Patrick D. Furey
David Hammerquist
Joseph B. Jones
James P. Kaufman
James G. Reid
William F. Ringert
Daniel V. Steenson
Allyn L. Sweeney

Samuel Kaufman (1921-1986)

December 4, 1996

BY HAND DELIVERY

Mr. Kevin Beaton
Deputy Attorney General
Division of Environmental Quality
Department of Health and Welfare
1410 N. Hilton, 2nd Floor
Boise, ID 83706

Re: Comments of Clear Lakes Trout Company on "The Middle Snake River Watershed Management Plan, Phase 1 TMDL, Total Phosphorus," Public Draft #2

Dear Kevin:

Enclosed is the first section of the comments of Clear Lakes Trout Company (Clear Lakes) on "The Middle Snake River Watershed Management Plan, Phase 1 TMDL, Total Phosphorus," Public Draft #2 (TMDL Draft #2). The second section containing the remainder of our comments will be delivered to you tomorrow morning, and I am requesting that you add them to the enclosed pages at that time.

Just this morning, Regan Armstrong of Clear Lakes Trout Company spoke to Mr. Robert Sharpnack of DEQ's Twin Falls office and confirmed two additional errors in the waste load allocation for the Clear Lakes hatchery which we had not previously discovered. Evaluating these errors and integrating a discussion of them into our comments has delayed our completion of our comments, and this is the reason for the additional delay in submitting our full comments to you.

I wanted to assure you that we are working diligently toward completing our comments by submitting this letter and the enclosed portion of our comments today, as I promised.

Yours very truly,

Daniel V. Steenson

cc: DEQ-SCIRO Twin Falls Office (by facsimile)
Clear Lakes Trout Company

To: Idaho Department of Health & Welfare, Division of Environmental Quality
Re: Comments Regarding "The Middle Snake River Watershed Management Plan, Phase 1 TMDL, Total Phosphorus," Public Draft #2
From: Clear Lakes Trout Company

These are the comments of Clear Lakes Trout Company (Clear Lakes) on "The Middle Snake River Watershed Management Plan, Phase 1 TMDL, Total Phosphorus," Public Draft #2 (TMDL Draft #2).

In these comments Clear Lakes:

1. identifies errors in the calculation of the waste load allocation (WLA) for the Clear Lakes hatchery, and requests that these errors be corrected and the Clear Lakes WLA be recalculated; and,

2. identifies aspects of the allocation of waste loads proposed in the TMDL for Total Phosphorus (TP) which are inequitable and improperly distribute the burden of achieving the instream TP target to certain water users and industries, and requests that the allocation be determined on a basis which is rational and equitable for all water users and industries.

Mr. Earl Hardy, owner of Clear Lakes Trout Company, has presented information and raised issues regarding the proposed Nutrient Management Plan and TMDL for the Middle Snake River through an administrative action concerning Mr. Hardy's proposed Box Canyon hatchery and prior comments on drafts of the Nutrient Management Plan. The information previously presented continues to be relevant, and we refer those involved in the Mid-Snake TMDL to that information as development of the TMDL continues.

1. <u>Errors in the calculation Clear Lakes WLA</u>

Our understanding of the method used to calculate the waste load allocation for the Clear Lakes Hatchery is based on the September 17, 1996 Memorandum by Robert Lupton, attached to these comments as Attachment A. The proposed WLA for the Clear Lakes Hatchery is 41.2 pounds per day. The WLA was calculated using the following formula:

WLA = MeanDMR[TP] * Max Flow * 8.334

The Mean TP DEQ used is .046, based on TP net concentrations reported in Clear Lakes' DMRs for May, 1991 through April, 1992. This morning, we confirmed with Mr. Robert Sharpnack of DEQ's Twin Falls office that the .046 figure is incorrect, and that the actual mean is .0495.

The Max Flow DEQ used in calculating the WLA for the Clear Lakes hatchery is 107.41 mgd. We understand from this morning's discussion with Mr. Sharpnack and from Mr. Lupton's Memorandum that the Max Flow figure was to have been the maximum flow reported in Clear Lakes DMRs during May, 1991 through 1995. The maximum flow during this period is 112.9528 mgd reported in October, 1991. We cannot determine the origin of the 107.41 figure, but this too appears to be an obvious error.

The difference these errors make in the WLA calculation is:

41.2 = .046 * 107.41 * 8.334
46.6 = .0495 * 112.95 * 8.334

In addition to these errors which apparently occurred within DEQ's Twin Falls office, Clear Lakes Trout Company has discovered errors in the net TP concentrations reported in four DMRs for its Clear Lakes hatchery during the twelve month sampling period from May, 1991 to April, 1992. Attachment B shows the DMR data for the Clear Lake Hatchery during the 91/92 monitoring required by EPA. The erroneous net TP concentrations are:

11/91	-0.006
1/92	0.01
3/92	-0.01
4/92	0.01

Recognizing that this data might be used in developing a TMDL, Clear Lakes requested that Rangens Aquaculture Research Center begin analyzing TP net concentrations in Clear Lakes' discharge monitoring samples in August, 1995. Rangens determined TP net concentrations using the samples collected by Clear Lakes to report TSS concentrations as required by Clear Lakes' NPDES permit. These samples were collected pursuant to the eight hour composite procedure required by EPA. The results of Rangens analysis during the twelve month period August, 1995 through July, 1996 are summarized in Attachment C (Analytical Labs determined TP net concentration for Clear Lakes in May, 1991 to check the concentration reported by Rangens for that month).

It is obvious that the extremely low TP net concentrations of 0.01 mg/l reported in January and April, 1992, and the negative concentrations reported in November, 1991 and March, 1992, are in error. All of Clear Lakes other DMR TP net concentrations during the 91/92 and 95/96 sampling range from a low of .03 mg/l (one DMR) to a high of .13 mg/l. The average TP net concentration during the 91/92 sampling, excluding the four erroneous results, is .07375 mg/l. The average for the 95/96 sampling is .0775 mg/l. The error in the negative TP concentrations is obvious for the additional reason that it is impossible for a hatchery to feed and raise fish without generating phosphorus. It is equally impossible for a hatchery to utilize spring water and discharge a lower concentration of TP than was in the water prior to use.

The following table summarizes the average (mean) TP concentrations in the samples collected for the Clear Lakes hatchery.

	Average	Range
11/91 - 4/92 (with errors)	.0156	-0.006 - .05
5/91 - 10/91	.083	.05 - .105
91/92 (w/o errors)	.07375	.04 - .105
95/96	.0775	.03 - .13
91/92 & 95/96 (w/o errors)	.076	.03 - .13

There was no appreciable change in Clear Lakes fish inventory and feeding during the period May, 1991 through April, 1992 which would explain the dramatic differences in TP net concentrations which were reported during the last six months of the period beginning in November. Monitoring samples were collected using the same procedure required by EPA during each month.

Although we have been unable to discover the precise cause(s) of these errors, we suspect they occurred in the process of laboratory analysis of Clear Lakes' monitoring samples. Clear Lakes sent its monitoring samples to Analytical Labs until October, 1991. In June, 1991, Rangens Aquaculture Research Center began analyzing nutrient concentrations in aquaculture monitoring samples, and Rangens offered to perform analysis of discharge samples as part of its charge for the feed which Clear Lakes purchased from Rangens. Clear Lakes took advantage of this service, and began sending its monitoring samples to Rangens Aquaculture Research Center for analysis in November, 1991.

We believe that the extremely low and negative net TP concentrations reported by Rangens lab during November, 1991 through April, 1992 may be attributable to the start-up of Rangens nutrient analysis procedures. The net concentrations of the Clear Lakes samples reported by the Rangens lab were substantially lower than those which were previously reported by Analytical Labs. The average TP net concentration reported by Analytical Labs for the months of May, 1991 through October, 1991 was .083, whereas the average TP net concentration reported by Rangens for the months of November, 1991, through April, 1992 was .0156.

Doug Ramsey supervises Rangens' analysis of aquaculture monitoring samples. Mr. Ramsey informs us that the Rangens lab initially used a colorimeter to analyze nutrients. Rangens became dissatisfied with the accuracy of the colorimeter (because of its age and its margin for error), and began using a spectrophotometer in December, 1992. We can only assume that the errors during the 91/92 monitoring are attributable to the fact that nutrient analysis was relatively new to the Rangens lab, the difficulties they encountered with the colorimeter method, and their switching to a new technology midway through the monitoring period.

Mr. Ramsey is confident that the .01 mg/l and negative TP net concentrations reported during November, 1991 through April, 1992 are in error. There are no negative values for TP net concentrations in the Rangen lab reports during 1995 and 1996. Mr. Ramsey informs us that he does not recall finding any other negative values for any other aquaculture facility, and, to his knowledge, it is not possible for an aquaculture facility to produce a discharge with a negative TP net concentration, particularly where the hatchery utilizes spring water.

In Mr. Ramsey's experience, TP net concentrations of .01 mg/l (essentially no net increase) occur only in situations where the inflow to a hatchery is unusually high because source water is reuse from another facility, or has been impacted by unusual biological factors. As the DMRs démonstrate, the inflow to the Clear Lakes hatchery is not within this category.

Clear Lakes cannot operate under the proposed TP WLA of 41.2 pounds per day, which is the lowest allocation of all the commercial trout farms involved in the TMDL. We request that DEQ correct the WLA for the Clear Lakes Hatchery. The "Control Measures" in the "Wasteload Allocation Table for the Aquaculture Industry" state: "This allocation is still under development and will be revised, if necessary, based on data provided by facility operators/owners during the Public Comment Period."

To correct the errors in DEQ's computation of Clear Lakes' Mean DMR for TP, Max Flow, and in the DMR data itself, we request that DEQ recalculate the WLA for the Clear Lakes Hatchery using the correct Max Flow for the hatchery and either the correct TP net concentration data from the 91/92 sampling or the 95/96 sampling (Attachment C), or a combination of both data sets. Given the errors and uncertainty in the TP net concentration data during the 91/92 monitoring, we request that the 95/96 data be used in calculating the Clear Lakes waste load and its reductions within years 1 and 5. Mr. Ramsey is confident in the accuracy of the TP net concentrations which the Rangens lab reported for the Clear Lakes hatchery in 1995 and 1996.

Using these data, the Max Flow used in the WLA formula would be 112.95 mgd and the mean TP concentration used in the WLA formula would be .0775 mg/l, resulting in a WLA of 72.95 pounds per day:

$$72.95 = .0775 * 112.95 * 8.334$$

Pursuant to Robert Lupton's September 16, 1996 Memorandum (p. 4), Clear Lakes would not be required to reduce its TP discharge within year 1 (because its TP discharge is less than .08 mg/l) and would be required to reduce its TP discharge to .06 mg/l within year 5. The concentration of Clear Lakes TP discharge, as corrected, will still be one of the lowest of all aquaculture facilities within year 1, and will be consistent with other aquaculture facilities within year 5 (TP concentrations for all aquaculture facilities are listed in Attachment D).

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November 21, 1996

Dr. Sonny Buhidar
DEQ-SCIRO
601 Pole Line Road
Suite 2
Twin Falls, ID 83301-3035

RE: Second Draft Middle Snake Watershed Management Plan

Dear Dr. Buhidar:

We appreciate the opportunity to comment on the second draft of the Middle Snake River Watershed Management Plan.

The Middle Snake River Watershed Management Plan is a considerable forward step toward improving water quality in the Middle Snake River. The plan appears to be enforceable, rigorous and encompassing of the major industries or activities contributing to water quality degradation. The phased approach allows for data collection with subsequent improved understanding of a complex ecosystem, and it stipulates that other stressors besides phosphorus will be addressed. There are several points of clarification we believe would further strengthen the plan as follows:

Pg. 1 You correctly identify several factors as the cause of eutrophic conditions in the Middle Snake River. These include excess total phosphorus and sediments, and altered water flows. You go on to state that total phosphorus is <u>one</u> of the principal causes of existing conditions. We agree that phosphorus is a significant factor but suggest altered water flows are equally the cause of current riverine conditions. The reasons for this belief are the considerable scientific information (Don Chapman, Consultants 1991; Falter and Carlson 1994) on the Middle Snake River, and in the scientific literature (e.g., Haslam 1978; Chambers et al. 1991; Biggs and Gerbeaux 1994; Biggs 1995; and Biggs 1996) that indicates the biomass of periphyton and macrophytes are directly related to the hydraulic characteristics of a stream or river; specifically, water velocity and the frequency of flow disturbance (velocity instability). Prevailing scientific understanding is that the long-term flow regime and substrate stability dictate the types of aquatic plants dominating the community. This, and the spatial scale, strongly contribute to the relative competitive success of different taxa and finally the biomass (Biggs 1996). Aquatic plants are simultaneously influenced by nutrient concentrations. Nutrients influence the overall rate of production while hydraulic factors influence the rate of plant destruction and organic stability to establish biomass and species composition. Final biomass is an equilibrium dependent on the rate of production and the rate of destruction. The Middle Snake River ecosystem is subject to human mediated water velocity control and forced stability. Natural water velocity instability is absent. Thus, water velocity or the lack of it and its variation, becomes another <u>one</u> of the <u>principal</u> causes of existing conditions in the Middle Snake River. Increased water velocity and its variation had a dramatic and positive impact on plant biomass (it was visibly less) in the Middle Snake River during the 1996 aquatic plant growing season. Our concern is that the community must not maintain a singular focus on phosphorus, but complement phosphorus reduction with improved water flow management. We assume the Watershed Advisory Group (WAG) will completely address this issue and develop sound recommendations to DEQ, as they move to further phases of the Watershed Management Plan. While water flow is to be addressed in Phase IV, we suggest it be included in Phase II because of its importance to this ecosystem.

Pg. 7 Chemicals and nitrogen are identified as factors to address in other phases of the watershed management plan. To our knowledge, chemicals (pesticides) have not been identified as an issue in the Middle Snake River. Similarly nitrogen, at least in past drafts of the Nutrient Management Plan, has not been suggested as a limiting factor for plant growth. While the Watershed Management Plan is not the best place to present scientific evidence, further elaboration seems appropriate.

Pg. 24 The Middle Snake River is designated for Coldwater Biota and Salmonid Spawning. Factors identified as negatively impacting these beneficial uses are nutrient loading, sedimentation and organic solids deposition. Unfortunately you fail to identify one of the more important stressors, elevated water temperature. Elevated water temperature (we documented 22°C in our studies), has a pronounced positive impact on aquatic plant growth rate. How to deal with elevated water temperatures is poorly addressed in this watershed management plan. Factors responsible for the elevated temperatures are poorly identified. Possible factors include dams (with low water velocity and increased retention times), irrigation returns (directly to the river or via tributaries) and springs. It should be noted that the natural water temperature for many of the springs is 15°C, not the 9-13°C stipulated for salmonid spawning. We assume the WAG will address this issue as well, but consideration should be given to redesignating the beneficial uses of the Middle Snake River.

Pg. 26 Groundwater Quality Standards are addressed but it is not clear why this section is in this part of the Watershed Management Plan. Idaho has other rules to address groundwater quality standards. Groundwater may impact the Middle Snake River because it contributes phosphorus but this is addressed in other sections of the Watershed Management Plan. We suggest eliminating this section or provide better explanation as to its relevance to this part of the Watershed Management Plan.

Pg. 40 In your discussion of aquaculture facilities you state that aquaculture "by-products pollute receiving waters." Why is aquaculture identified as the only industry that "pollutes receiving waters"? All of the industries involved in this watershed management plan "pollute the receiving waters" with ammonia, phosphorus, and organic solids yet they are not accused of polluting. Is there a bias being expressed?

Pg. 48 In this section you define the waste load allocation for aquaculture. The large and diverse aquaculture industry, with several different types of facilities, was presented with a difficult task, to allocate a scarce resource (phosphorus) amongst themselves. Further, you required the aquaculture industry to arbitrarily reduce by 40% its total load from a poorly defined base load. The waste load allocation became very contentious within our industry with different philosophical foundations amongst producers, and with different levels of understanding and knowledge of individual operations contributing to the contention. Thus, we were unable to reach a unanimous consensus and DEQ assumed the waste load allocation responsibilities. We believe, under the circumstances, that IDHW-DEQ took a reasonable approach to developing the waste load allocation for our industry. The waste load allocation is scientifically and legally based since it relies, at least in part, on the 1991-92 DMR's supplied by individual facilities. These reports are required by law to be accurate and thus they provide the best scientific data available from which to make allocations. We do however, remain very skeptical of the total industry flow used for phosphorus allocation amongst Type B, C and D producers, and consequently total phosphorus load estimates for the industry. The arbitrary nature of the phosphorus base load and subsequent reduction requirements is illustrated in Table 23. While the table is incomplete, the total phosphorus representing a 20% reduction in year one (1253.4 lbs) would assume a base load of 1566.8 lbs or about 50 lbs less than the assumed base load. Subsequent data collected over the next several years should address our skepticism, and, as verbally stated by the EPA in early 1996, if our base load estimate is found in excess, industry-wide percentage reductions could be reduced. For this to happen, it is incumbent on the aquaculture industry to provide accurate data.

We believe this watershed management program is a valuable step. We are concerned that a focus just on phosphorus is too simplistic. But, this plan gives us reason for optimism since the plan is phased to tackle the additional major causes of water quality degradation, sedimentation and lack of water velocity.

Respectfully submitted,

John R. MacMillan

John R. MacMillan, Ph.D.
Director, Research & Development

Cited References:

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November 18, 1996

DEQ-SCIRO Office
601 Pole Line Road
Suite 2
Twin Falls, Idaho 83301-3035

Re: Public Review Draft #2, The Middle Snake River Watershed Management Plan (Mid-Snake TMDL)

Gentlemen

I am resubmitting a letter dated March 24, 1995 regarding my initial comments on the first draft of the above-mentioned plan. In regards to Draft #2, the comments in that letter are still applicable.

In particular to Draft #2, I take major exception to Chapter 2, section 2.02.01, the last sentence which states: "Excluding the tributaries, overland runoff into the Middle Snake River directly from snow melt or precipitation is relatively small." That statement is a gross misrepresentation of the facts, is in error, not backed up by research, and simply misleading. Further, this document does not address a major contributor of nutrient flow into the mid-snake from precipitation runoff, nor from what I can tell, has anyone in the DEQ or other Federal or State agency tested for nutrient runoff during the period of times of that runoff. Nor does this Draft #2 address it as an issue in sections 2.03 and 2.04. Further, it does not address how that runoff might be managed and/or reduced.

This draft #2 does also not address precipitation runoff from urban development.

Until that issue is addressed as a significant factor of nutrient flow into the Mid-Snake river, this document plan should not be finalized.

I again stress that the DEQ needs to notify affected parties to insure that those people have a chance to respond.

Sincerely

Armand M. Eckert

cc: Senator Laird Noh

Enclosure

March 24, 1995

Vickie Traxler
Idaho Department of Health and Welfare
Division of Environmental Quality
South Central Idaho Regional Office
601 Poleline Road
Twin Falls, Idaho 83301

Re: The Middle Snake River Nutrient Management Plan

Dear Vickie

I respectfully submit several comments regarding "The Middle Snake River Nutrient Management Plan". I believe the DEQ and related committees have made a good effort in developing a reasonable plan. Please consider my comments in the further development of that plan.

As I mentioned to you the other night, I was somewhat surprised by the magnitude of the geographic area that the plan includes. The DEQ has done a good job of advertising that the plan is being developed but they have failed to advertise the geographic area. I strongly suspect that a lot of affected parties don't have a clue that they are included in it. When you take an area from the middle of the state to the Nevada border, it is quite a big area. The DEQ needs to somehow advertise and specifically notify the parties that truly will be affected by this plan and allow them to comment as well.

The plan does a good job of identifying the major parties or industries that contribute to the pollution of the middle snake. It does not, however, identify one of the biggest causes of sediment in the Snake River itself. That sediment comes from land owned by the public and administered by the Bureau of Land Management. For example, on March 23, 1995, if one had driven by King Hill and saw King Hill creek or Clover creek (I'm not sure exactly what it is called) you would have seen a creek with a normal flow of 100-200 cfs (I'm guessing) with probable 1000 cfs or greater. It was extremely brown and dirty. Were these sediments coming from private ground - no. Were these sediments caused by irrigation - no. Were these sediments caused by animals or other human caused factors - no. I guess I'm significantly surprised that with an agency such as the Bureau of Land Management and other related federal agencies such as the Fish and Wildlife Service, advocating clean water, less nutrients and with all the five species of snails that they have identified as being endangered in that reach of the snake, that they haven't looked in their own back yard. I don't mean to be derogatory against them or anyone, but the fact is, it is a major area of sediment return.

With all the resources, including caterpillars the BLM uses for fire fighting, and with them on the search for wetlands, I simply don't understand why they don't undertake the responsibility of identifying the many draws located on public land and live up to the responsibility of building sediment ponds which would allow rain runoff to periodically settle in ponding areas to significantly reduce sediment load into the Snake River. For the Federal government not to do their part is somewhat discriminatory. I would be more than happy to discuss this with you further but the issue needs addressed in this document. I suspect the sediment runoff from publicly-owned land is significantly greater than from privately owned land.

With the huge geographic area that you have identified, I think the DEQ needs to identify or classify the more critical areas versus those areas less critical and give the parties who already have taken steps to reduce runoff credit for their work. I don't think it is fair to generally identify a huge area and not identify those areas more critical than other areas.

Under the caption "Tributaries" (page 43) the DEQ has not identified all of the tributaries in the geographic area.

On page 61, under "Recreation", I seriously doubt "recreational swimming has declined due to the objectionable water quality". The question is, how many people really swim in the ever dangerous Snake River - I doubt not very many. Secondly, "Water skiing has also experienced a decline due to poor water quality and navigational difficulties mentioned previously". These are general statements and are not backed up with any data. I have been skiing by Sligars Resort for twenty five years. The last five years, the number of skiers has increased drastically to the point it becomes dangerous on weekends. And I haven't noticed an increase in navigational difficulties, short of a broken tree occasionally getting stuck and causing a buildup of moss behind it. Regarding whitewater rafting and kayaking, there is a mention of statistics but I'm not sure how accurate they would be. I guess I would like to know exactly where you can't whitewater raft or kayak on the Snake River because of "available flow"?

Under "Regional Economy" (page 62), I would believe the economic loss calculation is theoretical and the DEQ should say that.

On page 74, in the discussion of groundwater, the DEQ should identify the groundwater sources and classify the critical and noncritical areas relating to quality and land use practices.

Under FERC licensing requirements, I would hope the DEQ has different standards and is flexible in mitigation measures when evaluating each hydroelectric facility. Each is different and some are good projects though they aren't on the main Snake River but rather on a tributary.

On flow augmentation on page 124, how does flow augmentation help when dams on the Snake River are already in place?

Vicki, thank you for allowing me to make these comments. Overall, the plan is well written and the DEQ has done a fairly good job. Again, if you want to discuss further, my comments in the third paragraph above, please call me.

Sincerely

Armand M. Eckert

cc: State Senator Laird Noh
State Representative Cecilia Gould
State Senator Joyce McRoberts

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
IDAHO OPERATIONS OFFICE
1435 N. Orchard St.
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November 22, 1996

Doug Howard
Division of Environmental Quality
Twin Falls Regional Office
601 Pole Line Road, Suite 2
Twin Falls, ID 83301

Dear Mr. Howard,

Thank you for the opportunity to review the most recent version of the Middle Snake Watershed Management Plan (WMP). We appreciate the extra time and effort your staff took, particularly Sonny Buhidar, to revise the document to meet the requirements of a TMDL. Since the document was extensively re-written, we could not simply focus our review on our previous comments, making our review within the comment period difficult. We have many comments, only the most critical of which are discussed below.

Missing details. Unfortunately, we believe this version (WMP) lacks some of the essential details provided in the previous version (2/95 NMP). Examples of missing details are:

1) details of the monitoring plan (NMP, Table 12),

2) specific discussion of acceptable levels of macrophytes, which provides a link between the water quality target (0.075 mg/l TP) and attainment of the nuisance aquatic vegetation standard,

3) potential for developing biological criteria and/or site-specific nutrient criteria for the Middle Snake (p. 83, NMP),

4) a description of the antidegradation policy and capabilities you have with it (p. 11, NMP),

Phased schedule. Flow is a critical component of the water quality problems on the Mid-Snake; we are concerned that it is not scheduled to be addressed until the fourth phase. It will be difficult to reduce the existing bedload sediment levels without addressing flow, so we recommend addressing both flow and sediment in the second phase. Additionally, we recommend that sediment and flow data be collected in Phase I and that steering committees for sediment, flow and groundwater be established during the first phase to begin addressing these concerns.

Documentation. To ensure defensibility, documentation of calculations and assumptions used to develop Tables 22 - 26 should be provided in the TMDL, for example in an appendix (see also comments faxed on 5/21/96).

Loading and load allocations. Accounting of baseline loads and load allocations must be accurate in order to be defensible and support the plan. We found discrepancies between the loads shown in Table 22 and previous loads (NMP 2/95), and loads in the individual industry tables (23-26).

Table 22. Loadings and Goals. Total inputs increased 969 lb/day and the loading goal increased 248 lb/day from the previous draft due to the addition of the food processors, yet the predicted 1991 load and target load at Gridley Bridge remains the same. Since we are unaware of any adjustments to the model, we do not understand why these increased loads have not increased the predicted load.

The discussion of the 65 lb/day margin of safety is misleading, suggesting it can be added or subtracted from the predicted load. A margin of safety should be added to the predicted load to determine whether the predicted load plus the margin of safety will achieve the in stream TP target.

Please clarify that the 1991 loadings and loading goals for all point and nonpoint sources except irrigated agriculture are annual loadings, and loadings and loading goals for irrigated agriculture are for the April - October period.

Table 23. Aquaculture allocation. 1991 baseline loads must be added to this table. By our calculation, the cumulative load allocation is 981.9 lb/day, whereas the target shown in Table 22 is 970 lb/day.

Table 24. Municipal POTW allocation. It is not clear why facilities outside the bounds of the TMDL (HUCs 17040212 and 17040213) are shown in this table as part of the allocation. In addition, the total load for municipalities listed in this table, 1539.8 lb/day, differs from the load for municipalities shown in Table 22, 1030 lb/day. Loads and allocations for all municipalities within the bounds of the TMDL should be accounted for in Table 22.

Appendix A-6. The load listed for Twin Falls in Tables 22 and 24, 1030 lb/day, differs from the load listed in Appendix A-6, 1136.3 lb/day. Furthermore, loads listed for all municipalities are for orthophosphate instead of total phosphorus. This is a serious difference as the plan addresses total phosphorus, and orthophosphorus levels may be significantly less than total phosphorus levels.

Table 25. Food processor allocation. The method of prorating discharge into Milner pool, and calculating allocations for these facilities is unclear. The table makes it appear that these facilities must reduce their discharges by 80%, rather than the industry plan of 20%.

Table 26. Irrigated agriculture allocation. This table shows an industry reduction of 6.7% (40.7 lb/day), whereas Table 22 and the industry plan call for a reduction of 10% (60.9 lb/day). These tables should be consistent, and reflect the industry goal, even though specific plans to achieve the additional 3.3% reduction may not yet be developed. Furthermore, we recommend that the allocation table submitted by the industry on 2/12/96 be included in Appendix A-5.

Linkage to water quality standards. A TMDL must provide assurance that water quality standards will be achieved. In order to do this, it is necessary to demonstrate how reductions in key indicators, such as macrophyte density, are linked to compliance with water quality standards. Key text in the previous draft (p. 16) explained what levels of macrophytes are considered "nuisance", and provided estimates of macrophyte levels following plan implementation. We feel it is crucial to add the missing text to tie the pollutant loads back to both an Idaho water quality standard, and an ecological goal of the TMDL.

Monitoring. Monitoring is a crucial element to the success of a phased TMDL. The monitoring section (4.02) lacks information to provide assurance that adequate data will be collected to assess the effectiveness of this TMDL, fill in key gaps in our knowledge of baseline loads, and provide needed information for later phases. Critical monitoring information, some of which was provided in NMP Table 12 includes the identification of parameters, monitoring frequency, monitoring duration, sample location, and party responsible for monitoring.

We are concerned that your office intends to submit this plan as a final TMDL on November 29. IDEQ committed to submitting a final TMDL for the Mid-Snake by the end of 1996 in response to court order. We strongly encourage you to take this additional time to carefully consider these and other comments. If you feel time is a constraint in responding to our concerns, please notify us immediately.

Several of the missing details and discrepancies may cause us to disapprove the WMP as a TMDL. Both Leigh Woodruff and Carla Fromm would like to discuss solutions to our concerns with you at your earliest convenience.

Sincerely,

M. Lynn McKee
Assistant Regional Administrator

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Snake River Basin Office, Columbia River Basin Ecoregion
1387 South Vinnell Way, Room 368
Boise, Idaho 83709

December 9, 1996

Doug Howard, Regional Administrator
DEQ-SCIRO
601 Pole Line Road, Suite 2
Twin Falls, Idaho 83301-3035

Subject: Review of draft Middle Snake River Watershed Management Plan
(File #: 902.1150)

Dear Mr. Howard:

The Fish and Wildlife Service is writing to provide comment on the draft Middle Snake River Watershed Management Plan (WMP) received in this office November 14, 1996. We have reviewed the WMP in the context of how these actions may further the recovery of listed species in the middle Snake River. The current WMP has provided a greater amount of detail and explanation. We commend the Division of Environmental Quality (DEQ) in that effort. Our previous comments (dated September 14, 1995) indicated several continuing concerns regarding the last draft of this document. One concern regarded the explanation for the 0.075 mg/l target for total phosphorus. The current WMP has adequately addressed this issue, as well as further defined the regulatory and enforcement actions that DEQ can apply to implementation of the WMP.

The Service continues to have concerns with the Irrigated Agriculture Industry Plan (Plan). The Plan appears to rely solely on peer-pressure to assure implementation of the Plan. One option you might consider is greater emphasis on the development of Farm Conservation Plans for all farms in the area, regardless of the status of any federal funding. Such an approach would be sensitive to the operations of an individual farm, but could better demonstrate management actions being taken toward improving water quality and associated conservation measures.

The Service also has concerns with the lack of specific time frames and action items in the WMP associated with ground water restoration and protection. Several WMP meetings in Twin Falls during the past year have provided information that there are elevated levels of nitrogen in the outflow springs of the Snake River Aquifer. The WMP only allows for the organization of a task force to consider ground water issues within Phase 1 of the WMP (a 10-year time frame). We recommend the time frames for this task be accelerated, for example, form the task force within three years of approval of the WMP and include specific target dates to address issues related to ground water management, some scheduled to occur within the next ten years. This will coincide directly with Phase III of the WMP, that requires addressing the effects of nitrogen loadings on water quality in the middle Snake River. Ground water protection has also been raised as a priority one recovery action in the Snake River Aquatic Species Recovery Plan due to the reliance of resident endangered/threatened species on high quality spring habitats.

It is the understanding of the Service that the WMP addresses only phase 1. Is it the intention of DEQ to address the remaining phases (2-3) at a later date with a similar detailed document as the WMP? Will the additional phases include public involvement and review as was the case for phase 1? Due to the lack of information and detail related to the subsequent phases, the Service strongly recommends that DEQ apply a similar plan to future phases.

The Service appreciates the opportunity to provide these comments. If you have further information for our review, please let us know. We continue to be committed to aiding in the recovery of the middle Snake River and resident endangered/threatened species in the area.

Sincerely,

Robert A. Ruesink

Supervisor, Snake River Basin Office

cc: EPA, Boise (Fromm)
EPA, Seattle
FWS, ARD-AFF, Portland (Diggs)
FWS, Hagerman National Fish Hatchery (Kenworthy)

Irrigators' Water Quality Committee

Ted Diehl
Chairman
921 N Lincoln
Jerome, ID 83338

Chuck Coiner
Co-chairman
3866 N. 3800 E.
Hansen, ID 83334

Clarence Robison
Secretary
3793 N. 3600 E.
Kimberly, ID 83341

November 22, 1996

Dr. Balthazar Buhidar
Dept. of Health and Welfare
Division of Environmental Quality
601 Pole Line Road, Suite #2
Twin Falls ID 83301

Dear Sonny:

Enclosed are comments by the Irrigators' Water Quality Committee on the "Public Review Draft #2" of the Middle Snake River Watershed Management Plan.

I hope these comments are helpful in your preparation of the final plan.

Sincerely,

C. W. Robison, P.E., Secretary
Irrigators' Water Quality Committee

CWR:af
cc: Irrigators' Water Quality Committee

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Comments on
Public Review Draft #2
The Middle Snake River Watershed Management Plan
(Mid-Snake TMDL)

by

Irrigators' Water Quality Committee

The Public Review Draft #2 has been considerably revised since the previous draft reviewed by the Committee. A meeting of the Irrigators' Water Quality Committee was held on November 18, 1996 to review the draft, and the following comments are offered:

In general, the Plan is much more comprehensive than previous drafts; data and results are more completely documented. The organization is easier to follow, and specific conclusions relative to findings on water quality standards and beneficial use impacts are concise. This review prepared by the Committee includes comments on specific general information as well as specific items related to irrigated agriculture.

Section 1.00 P 1 Para 2. The statement that the phased approach is necessary primarily because of the uncertainty of phosphorus loadings from various sources: *primarily nonpoint sources* seems to put the onus on irrigated agriculture. The primary reason for the phased approach was that the planning group believed that phosphorus was the primary contaminant that could be controlled, that not enough data and information was available on other contaminants to warrant a multiply-element TMDL. and that flow augmentation was uncertain as well as water quality of springs. We suggest removing the phrase, *primarily nonpoint sources*.

Section 1.02 P 4 Para 5. Relative to DEQ's actions in the event "BMP's for nonpoint sources are not implemented adequately using a voluntary approach." This paragraph states that; "Adequate implementation requires that enough reduction measures be installed and that they be properly maintained." Is it the intent that DEQ will make the determination that *enough reduction measures* have been implemented and, if so, pursue administrative or civil enforcement action? It is not clear who makes the determination that a violation has occurred and what criteria would be utilized. The development of criteria for critical and noncritical agricultural acres for determining adequate implementation is a formidable task. This approach begins to sound like de-facto permitting of irrigation return flows which is contrary to the Clean Water Act.

Section 1.03 P 5 Para 4, Goals. Goal 1, to attain state water quality standards for nuisance vegetation, dissolved oxygen, and temperature for support of cold water biota . . ." was adopted recognizing that attaining the temperature goal was probably not possible in light of the hydrology of the springs and river system. This goal and a future TMDL to address it should be discussed in light of the hydrologic constraints somewhere in the plan.

P 5, Goal 7. The goal of sustainable economic development was adopted and should be a primary consideration in all management procedures. However, economic evaluations are never mentioned again in the plan, other than in the goal. There should be some elaboration on how economic considerations will be factored into management decisions and just what is meant by energy efficiency and maximum utilization of waste product.

P 5 Goal 11. The Irrigators' Water Quality Committee has maintained throughout the planning process that another "Ground water Task Force" is not necessary. There are already a number of groups which could serve this purpose, and we would recommend that the task force should be "selected or established" to allow for adoption or appointment of an established group to assume those duties.

Section 1.04 P 7 2nd Para, last sentence. The direction of advice related to wetlands seems backwards. It makes more sense for irrigated agriculture, which has the most experience with wetlands construction and operation, should be advising DEQ and/or the WAG on wetlands issues. The current structure of the sentence appears to indicate the WAG will tell irrigated agriculture where and which wetlands to develop.

P 8 1st Para. The working committee relative to Snake River flow requirements should be given wide latitude to determine "flow requirements and/or flow augmentation" needs, particularly as it relates to timing of flow enhancement, institutional and contractual constraints, and specific benefits attributable to flow augmentation or alteration. The last sentence of this paragraph is too specific as to the objective of the working committee and should be deleted.

Section 2.02 P 12 Table 5. The general or average summer flows for the Middle Snake River should be in the range of 200 to 1500 cfs. Recent years have been anomolously high. USBR indicates lower average summertime flow. The designation 'surplus years' should be further defined.

The 1605 to 2000 cfs general or average flow for 80 irrigation return flows is in error. It apparently was taken from the Irrigated Agriculture Plan, Appendix A utilizing estimated maximum flows at each inventoried return flow site. Also, it appears that discharges for various sites along a particular return flow stream were added resulting in the error in flow range. Based on the table Appendix II, the estimated maximum flow from the inventoried return flow streams entering directly in the Snake River is 250 cfs from the south side TFCC and 169 cfs from the north side NSCC for a total of 419 cfs. This does not include return flow streams entering the tributaries which is accounted for separately in Table 5.

Section 2.02.01 P 12 Precipitation. The last sentence of this paragraph should be qualified by adding "... small; *however, individual runoff events such as rain-on-snow events contribute significant amounts of sediment and phosphorus to receiving streams.*"

The paragraph on Milner flows should be revised to reflect better estimates of typical flow ranges. The U.S. Bureau of Reclamation will comment on this paragraph.

Section 2.02.03 P 13 last paragraph. The 55-70 cfs of headwater runoff in Rock Creek 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. We suggest deleting sentences or clarifying the hydrology.

Section 2.02.04 P 14, the statement that the 80 agricultural drains may account for from 1605 to 2000 cfs appears to be in error as indicated in Table 5. Appendix II of Appendix A-5 does not indicate these numbers. Again, a better estimate is about 419 cfs.

Section 2.02.05 P16 3rd para, Ground water flow. The reference to 500 cfs entering the river from the south side underlying the Twin Falls tract is an estimate from Luther Kjelstrom of the USGS. However, it appears to have been corroborated by more recent studies by the University of Idaho in the ground water model development for the City of Twin Falls. It is suggested that, if the 500 cfs contribution from the south side is referenced, the same reference should be used for ground water inflow from the northside Snake Plain aquifer.

Section 2.06 P 41 3rd para Food Processors. The calculation of the load attributed to food processing of 17.2% of the total TP is not clear. In Table 21, based on the "measured" Upstream summertime inflow of TP (35 lbs/day), the total TP entering the river from all sources appears to be 5,541 lbs/day. Is there not some double counting relative to the 954.8 contribution of food processors above Milner? Need to explain how the numbers of percentage contribution were calculated.

P 43 2nd para, Irrigated Ag. In all of the descriptions of pollutant sources in this section, only the percentage of TP is calculated and reported since this is a TMDL for phosphorus only. For irrigated ag, however, the percentage of the total sediment load (72.5%) is calculated and reported. Since this is a phosphorus TMDL, we suggest deleting the 72.5% sediment contribution from irrigated ag, or do the same calculation and report it for all sources, or make this a joint sediment/phosphorus TMDL.

Section 2.07 P43. Throughout this section, the food processor load impacting the Middle Snake River is identified as approximately 955 lbs/day and is based upon prorating the load as a function of flow. The mechanism for this loading to impact the Mid Snake is that it has to pass Milner. The background (upstream) loading has been identified as 35 lbs/day during the summer and 623 lbs/day during the winter. These background (upstream) loadings are identified as the median measured load at Murtaugh Bridge during 1990-91. Based upon the measured loads, the 955 lbs/day attributed to food processors ***is not*** entering the Mid Snake River reach. If indeed their load was entering the reach, the loads at Murtaugh would have to be in excess of those measured. In fact, the measured loads at Murtaugh Bridge include the food processors impact on the Snake.

Table 20 lists the percent annual load from major tributaries but fails to list the annual loads or winter time loads from which the percentage calculation was obtained. In fact, nowhere in the plan are the major tributary loadings documented. The percentages reported in Table 20 do not reasonably add up to what was reported in the Brockway and Robison 1992 report. It would be well to add two columns to show how the percentages were obtained.

Section 3.01 P 45 Water Quality Target. The utilization of the RBM10 model as a tool to evaluate or verify the selection of the target TP concentration of 0.075 mg/l recognizes the element of uncertainty and risk in the simulations. However, in selecting the flow regime for the 1930-1939 period, which is the worst case flow scenario, no evaluation of risk is involved. A sensitivity analysis of flow variations to show the response of simulated concentrations to flow changes would assist in evaluating the relative risk involved in management decisions and load allocations. Also, the statement that "... a margin of safety is used in modeling efforts" does not describe the procedure for selecting the "margin of safety" nor does it quantify the margin of safety. Some definition is needed.

Section 3.02 P 47 Table 22. There appears to be an error in the %Reduction per Industry Goal column for Food Processors. The 20% reduction stated should be 80% if the 191 lbs/day is correct. Also, the 1991 loadings from CFO's is listed as zero, but in reality it is unknown. A footnote is in order to show that it is unknown but assumed to be zero.

It should also be pointed out in Table 22 that the estimated 548 lbs/day loading goal for Irrigated Ag is predicated on **no additional input from any sources into tributaries or return flow streams.** This is the load allocated to irrigated agriculture effects only.

Section 3.02 p 57, Load Allocation Table-Irrigated Ag. This table has exactly the same format as the waste load allocation tables for industries with point sources and could easily be relabeled since each drain appears to have been treated as a point source. The 16 drains monitored for the 1990-91 base study were identified as ***indicator*** drains for purposes of estimating seasonal aggregated loads entering the river from return flow streams. At no time were they identified as individual sources to which individual daily load allocations were to be appended. In Table 26, the treatment and the implication is that each drain will, at some time, be treated as a point source with a daily load allocation which cannot be exceeded. This was never the understanding nor the intent of Irrigated Ag in utilizing this data in the irrigated ag plan. The information in Table 26 and the treatment of each drain as an individual source can lead to gross misunderstanding by the public and/or agencies as to the nature of ag return flows as non-point sources. This is definitely contrary to the Clean Water Act.

It is strongly suggested that Table 26 be eliminated in its present form. The 1991 baseline loads should be used as an integrated indicator of total contribution from irrigation return flow and the load allocation for the sum of all indicator drains calculated from the sum of the baseline loads.

The calculation of loads from additional tributaries and miscellaneous agricultural returns is not clear. Since the total annual tributary load is not documented, it is impossible to determine how the 146.5 lbs/day was calculated. Based on Table 20, it appears to be 28% of some value.

The footnote to Table 26 relating to modification of the 1991 baseline load of 316.5 lb/day is not clear. It seems to indicate that the Irrigated Agriculture Industry will monitor additional drains and tributaries over the next five years, and then go back and modify 1991 base loads and come up with 609 lbs/day as a new base. If this is the case, the 609 lbs/day base is fixed and no monitoring is required. If Table 26 is not deleted, this footnote should be more fully explained. Also, if Table 26 is not deleted, there is no need to have a column for NPDES permit and then list "NOT APPLICABLE" for each drain.

Section 4.02 Monitoring P 84. Irrigated Ag will continue to maintain a monitoring program as outlined in the Irrigated Ag Plan. The intent of the statement, "ag drains not included in the first phase of the WMP need to establish target goals for seasonal impacts," is not clear. Again, if this is to define target goals for daily loads for each drain, this is contrary to the non-point source designation of these returns.

It is strongly recommended that monitoring of the river, tributaries, and return flows, be coordinated among agencies and industries by DEQ. There should be some mention of DEQ's operation of a Monitoring Coordination Committee to perform this task.

Since violations of the nuisance aquatic growth criteria are cited in the river, some procedure for visual monitoring on a long term basis needs to be developed. It remains a tenuous position for agencies to unilaterally determine that these criteria are not being met when there is no recognized procedure for making the determination. DEQ needs to develop some defensible, quantitative or quasi-quantitative procedure for determining "nuisance aquatic growth." At a minimum, some mention needs to be made in this plan that DEQ is working on developing a procedure or admit it can't be done.

Section 5.01.01 P 87 Table 37. Note that Chapter 1 indicates that wildlife beneficial uses are met whereas Table 37 indicates criteria are being violated. Which is correct?

Miscellaneous items:

Since total phosphorus is the parameter for which the TMDL is prepared, the procedure for determining total phosphorus should be defined, either by some EPA laboratory specification or narrative procedure. Total phosphorus, orthophosphorus, and dissolved phosphorus are all used in the text but are not defined or even listed in the glossary.

Page 37 2nd para. The description of the mechanisms and reactions related to phosphorus in soil systems is either not fully understood or, at the least, not adequately described in this section. This should be clarified. (Comment by Dr. D.T. Westerman, ARS, Kimberly.)

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November 22, 1996

Idaho Department of Health and Welfare
Attn: Dr. Balthasar B. Buhidar, Mid-Snake Technical Planner
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601 Pole Line Road, Suite 2
Twin Falls, ID 83301-3035

VIA FAX and U.S. MAIL

Re: Comments on Mid-Snake Phase 1 TMDL

Dear Sonny:

These comments are submitted on behalf of the Twin Falls Canal Company and North Side Canal Company regarding the Mid-Snake Phase 1 TMDL, Public Review Draft No. 2 (October 23, 1996).

Although we have other significant concerns with the TMDL (most notably, Phase IV/Flow), the immediate concern with the Phase 1 TMDL for total phosphorous is Table 26, located on pages 57 and 58 of the draft TMDL, attached. Table 26 needs to be substantially altered or deleted for the following reasons:

1. Load Allocations for Individual Drains. The Load Allocation for the Irrigated Agriculture Industry referred to in the control measures description is a total amount. It should not be divided into smaller, individual Load Allocations for each and every agricultural drain, as you have done in Table 26. Assigning a Load Allocation to each individual drain smacks of a point source permitting-type of approach. Of course, agricultural return flows are not point sources. 33 U.S.C. Sec. 1362(14).

The canal companies are committed to achieving the total phosphorous reduction related to the total Load Allocation for irrigated agriculture. However, they oppose efforts to assign Load Allocations to each and every drain. The canal companies desire to retain the flexibility needed to reduce their total load. However, this will be difficult, and costly, if a rigid, proportionate reduction is required for each and every drain.

The approach taken in Table 26 runs counter to the "source trading" concept that you include in pp. 69-71, which allows the most cost-effective reductions to be made. In addition, the drain-by-drain approach is not consistent with the Proposed Watershed Management Plan for the Irrigated Agriculture Industry (Appendix A-5). Finally, this approach is not required by Sec. 303(d) of the Clean Water Act, 40 CFR 130.7, or Idaho's water quality laws. Certainly, the state law definition of "Total Maximum Daily Load (TMDL)" contained at I.C. Sec. 39-3602 (27), which concerns itself only with the "sum" of wasteload allocations and load allocations, offers no support for such an approach.

In short, the canal companies should be allowed to determine where the best and most cost-efficient reductions can be achieved in their systems to reach the total reduction and load allocation goals. As a result, we request that you delete Load Allocations for specific drains and include only the total for irrigated agriculture. In addition, the specific reductions identified for each of the canal companies (p. 58, n.2) should be deleted. Again, only the total reduction and load allocation from irrigated agriculture is necessary.

2. Reference to NPDES Permit No. If they are "not applicable", it is obvious that the columns labeled "NPDES Permit No." and "Latitude/Longitude Location" need to be deleted from Table 26. These point source references have absolutely no place in the description of the Load Allocation for irrigated agriculture, a non-point source.

Sincerely,

ROSHOLT, ROBERTSON & TUCKER

NORMAN M. SEMANKO
Attorneys for Twin Falls Canal Company
and North Side Canal Company

11229603.NMS

Attachment

cc: Vince Alberdi, Twin Falls Canal Company
Ted Diehl, North Side Canal Company

TABLE 26. LOAD ALLOCATION TABLE FOR THE IRRIGATED AGRICULTURE INDUSTRY.

IRRIGATED AGRICULTURE INDUSTRY's

Load Allocation Table for the Middle Snake River WMP

Control Measures:

Implementation of BMPs are 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 committed to participation of BMP implementation by operators/land owners/farmers.

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 WMP 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	NOT APPLICABLE	11.6	2.3	9.4
C55 Drain	NOT APPLICABLE	NOT APPLICABLE	5.6	0.0	5.6
N42 Drain	NOT APPLICABLE	NOT APPLICABLE	6.8	0.0	6.8
J8 Drain	NOT APPLICABLE	NOT APPLICABLE	5.2	0.2	5.0
S29 Drain	NOT APPLICABLE	NOT APPLICABLE	2.1	2.1	0.0
S/S19 Drain	NOT APPLICABLE	NOT APPLICABLE	57.4	7.5	49.9
W26 Drain	NOT APPLICABLE	NOT APPLICABLE	12.3	2.4	9.9
		SubTotal:	101.0[1]	14.5	86.6
TWIN FALLS CANAL COMPANY (SOUTH SIDE):					
A Drain	NOT APPLICABLE	NOT APPLICABLE	4.3	0.0	4.3
Twin Falls Coulee	NOT APPLICABLE	NOT APPLICABLE	9.6	0.7	8.9
E. Perrine Coulee	NOT APPLICABLE	NOT APPLICABLE	39.1	2.6	36.5
W. Perrine Coulee	NOT APPLICABLE	NOT APPLICABLE	4.2	0.9	3.3

AGRICULTURAL DRAIN	NPDES PERMIT NO.	LATITUDE/ LONGITUDE LOCATION	1991 BASELINE LOAD Lbs/Day[1]	NET REDUCTIONS Lbs/Day[2]	LOAD ALLOCATION Lbs/Day
Main Perrine Coulee	NOT APPLICABLE	NOT APPLICABLE	22.2	4.3	17.9
43 Drain	NOT APPLICABLE	NOT APPLICABLE	0.3	0.3	0.0
30 Drain	NOT APPLICABLE	NOT APPLICABLE	9.4	1.9	7.5
LQ/LS Drain	NOT APPLICABLE	NOT APPLICABLE	73.3	9.6	63.7
LS2/39A Drain	NOT APPLICABLE	NOT APPLICABLE	17.6	0.7	16.9
39 Drain	NOT APPLICABLE	NOT APPLICABLE	21.6	4.3	17.3
I Drain	NOT APPLICABLE	NOT APPLICABLE	13.9	0.9	13.0
		SubTotal:	215.5[1]	26.2	189.3
ADDITIONAL TRIBUTARY & MISCELLANEOUS AGRICULTURAL RETURNS[1]:					
Tributary	NOT APPLICABLE	NOT APPLICABLE	146.5	0	146.5
Agricultural Returns	NOT APPLICABLE	NOT APPLICABLE	146.0	0	146.0
		SubTotal:	292.5	0	292.5
		TOTAL:	609.0[3]	40.7	568.4

[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 (316.5 Lbs/Day) amounts to 0.77%. Thus, the monitoring program is for 16 agricultural drains for the initial phase of the Mid-Snake WMP.

[3] The 1991 BASELINE LOAD of 316.5 Lbs/Day (16 Drains) will be modified within the first five years of plan implementation and increased to 609 Lbs/Day from additional agricultural returns and tributaries. These will be specified over the next five years by the Irrigated Agriculture Industry to establish baseline loads for other drains and tributaries. The 609 Lbs/Day value is an estimate from the anticipated TSS reductions that will occur over the next ten years, based on final plan implementation. The total reduction in the initial phase is 6.7%. When industry finalizes those additional tributaries and agricultural returns that will be monitored for TP reductions, an additional 3.3% reduction will be targeted to bring the total reduction to 10.0% in the initial phase of the WMP.

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November 22, 1996

Dr. Sonny Buhidar
DEQ-SCIRO
601 Pole Line Road, Suite2
Twin Falls, ID 83301-3035

RE: The Middle Snake River Watershed Management Plan, Draft #2

Dear Dr. Buhidar:

I have the following comments concerning the Middle Snake River Watershed Management Plan:

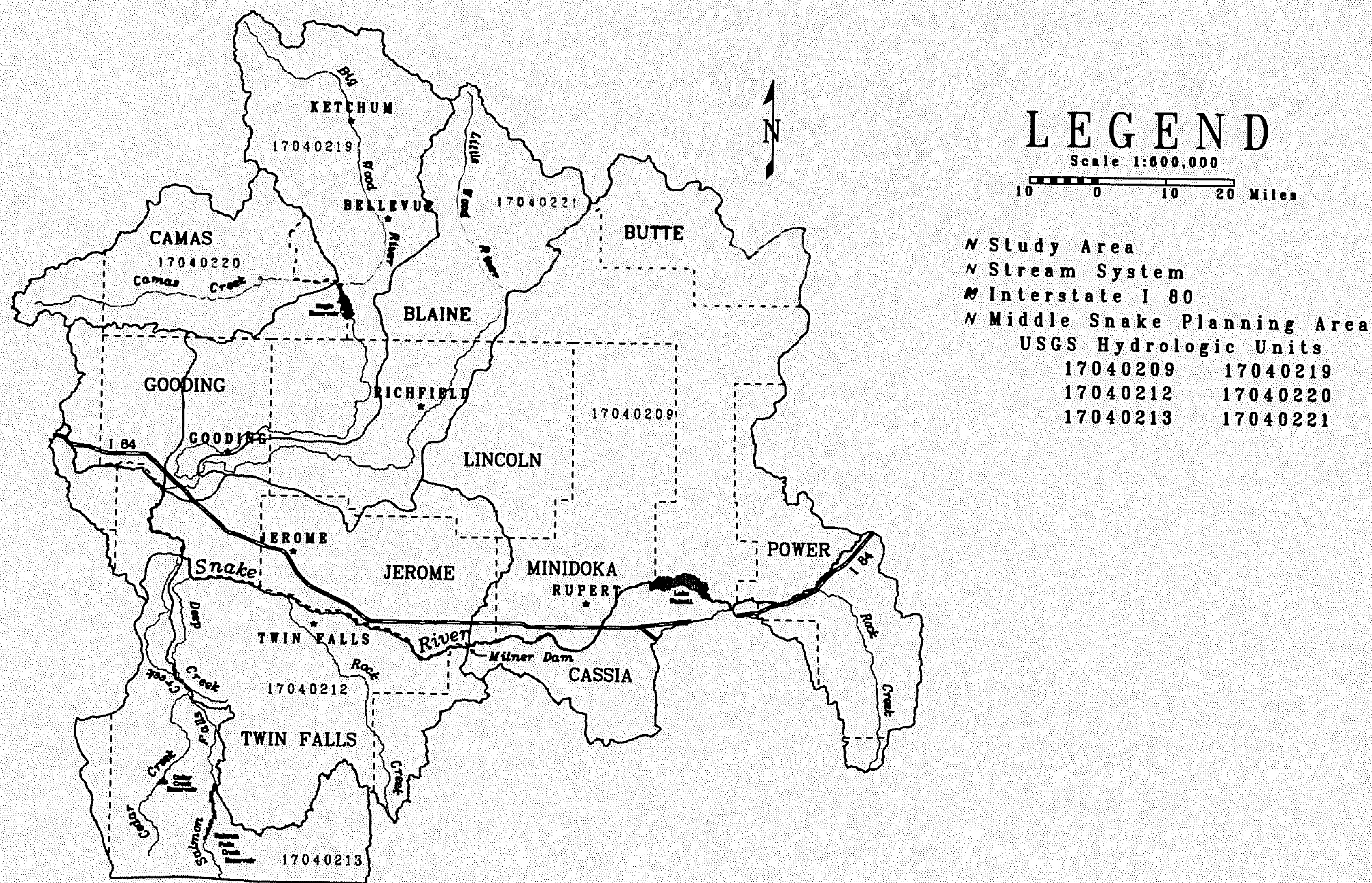
1. Pages 48-51, Aquaculture Waste Load Allocation. The baseline is 1617 pounds total phosphorous per day. Adding the individual allocations presented in the 20% reduction in year 1 column and dividing that number by 0.8 to calculate the baseline shows a shortage of 50.25 pounds (1253.4 ÷0.8 = 1566.75; 1617 – 1566.75 = 50.25). The 1617 baseline was calculated from aquaculture facilities and did not include the fish processing plants. Why aren't the fish processing plants included with the food processors' waste load allocation?
2. Page 53, POTW Waste Load Allocation. Last line under superscript 2; it should read 680, not 630.
3. Page 55, Food Processors Waste Load Allocation. Predicted load below Milner based on flow lbs./day column: it should read 113.8, 123.4, and 237.2 respectively (the current draft shows 80.1% of the load below Milner instead of 19.9%). When the other management areas come on line, specifically the Minidoka/Cassia Watershed (HUC 17040209), will these two point sources be responsible for reducing 20% of the total amount discharged or continue to reduce the calculated load below Milner of 19.9% by 20%?
4. Pages 57-58, Irrigated Agriculture Load Allocation. Only 16 irrigation return flow streams are included in the clean up effort, whereas it is stated on page 14, that there are over 80 agricultural drains. It is not clear if those additional drains will be incorporated into the clean up effort and why they are not part of the phase I effort.

5. Page 59, CAFO Load Allocation. If the baseline is zero and the load allocation per day is zero, then the net reduction is 0%, not 100%. This also applies to table 22 on page 47 and includes hydroelectric power too.
6. There is no scientific basis behind any of the proposed reductions in nutrients and/or sediments for any of the industries. The proposed reductions were originally goals presented to DEQ. Each industry was asked by DEQ what that particular industry thought was a goal they could strive for. Those numbers were then put into the RBM10 model to run simulations to predict future water quality conditions in the river. As I understand it, the data used for the model is highly variable, there are gaps of incomplete data, and the basic assumptions underlying the model are subject to debate within the scientific community. At that time the model had not gone through a scientific peer review process. Has a peer review been completed yet?
7. Serious consideration should be given to eliminating salmonid spawning as a beneficial use. The temperature criteria of 13°C instantaneous and 9°C maximum daily does not apply to this reach where the spring water coming out of the ground averages 14 to 15°C year around.

Sincerely,

Gary Fornshell
Extension Educator/Aquaculture

Middle Snake Watershed Planning



July 1994