Mid Snake River/Succor Creek Subbasin Assessment and Total Maximum Daily Load

April 2003

Executive Summary

The federal Clean Water Act (CWA) requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 USC § 1251.101). States and tribes, pursuant to section 303 of the CWA are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. Section 303(d) of the CWA establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list of impaired waters, currently every two years. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. This document addresses the water bodies in the Mid Snake River/Succor Creek Subbasin that have been placed on what is known as the "§303(d) list."

This subbasin assessment and TMDL analysis has been developed to comply with Idaho's TMDL schedule. This assessment describes the physical, biological, and cultural setting; water quality status; pollutant sources; and recent pollution control actions in the Mid Snake River/Succor Creek Subbasin located in southwest Idaho. The first part of this document, the subbasin assessment, is an important first step in leading to the TMDL. The starting point for this assessment was Idaho's current §303(d) list of water quality limited water bodies. Twenty-one segments of the Mid Snake River/Succor Creek Subbasin were included on this list. The subbasin assessment portion of this document examines the current status of §303(d) listed waters, and defines the extent of impairment and causes of water quality limitation throughout the subbasin. The loading analysis quantifies pollutant sources and allocates responsibility for load reductions needed to return listed waters to a condition of meeting water quality standards.

The Mid Snake River/Succor Creek Watershed Advisory Group (WAG) and the designated agencies played a significant role in the TMDL development process. The WAG and the designated agencies were involved in developing the allocation processes and their continued participation will be critical while implementing the TMDL.

Subbasin at a Glance

Table A and Figure A show the §303(d) listed water bodies within the basin and the Mid Snake River/Succor Creek watershed boundaries.

Table A. 303(d)[1] Listed Segments in the Mid Snake River/Succor Creek Subbasin.

Water Body	Boundaries	WQLS & AU[3]	303(d) Pollutants
Snake River	CJ Strike Reservoir (below dam) to Castle Creek	WQLS: 2670 AU: 006_07	Sediment
Snake River	Castle Creek to Swan Falls	WQLS: 2669 AU: 006_07	Sediment
Snake River	Swan Falls to Boise River	WQLS: 2668 AU: 006_07, 001_07	Bacteria, dissolved oxygen, flow alteration, nutrients, pH, sediment
Birch Creek	HW to Snake River	WQLS: 2684 AU: 021_02, 03, 04	Sediment
Brown Creek	HW to Catherine Creek	WQLS: 2682 AU: 019_02, 03, 04	Sediment, temperature
Castle Creek	T5SR1ES28 to Snake River	WQLS: 2680 AU: 014_03, 04, 05	Temperature, sediment, flow alteration
Corder Creek	HW to Snake River	WQLS: 2685 AU: 025_02	Sediment
Cottonwood Creek	HW to Succor Creek	WQLS: none AU: 003_02	Temperature
Hardtrigger Creek	HW to Snake River	WQLS: 2675 AU: 008_02	Sediment
Jump Creek	Headwaters to Snake River	WQLS: 2673 AU: 005_02,03	Habitat alteration
McBride Creek	Headwaters to Oregon Line	WQLS: 2672 AU: 004_02,03	Flow alteration, sediment, temperature
North Fork Castle Creek	HW to Castle Creek	WQLS: 2680 AU: 014_02a	Temperature
Pickett Creek	T5SR1WS32 to Catherine Creek	WQLS: 2681 AU: 016_02, 03	Sediment
Pickett Creek	Headwaters to T5SR1WS32	WQLS: 6681 AU: 016_02	Flow alteration, sediment, temperature
Poison Creek[2]	Headwaters to Shoofly Creek	WQLS: 2687 AU: 006_02, 03	Sediment
Rabbit Creek	HW to Snake River	WQLS: 2677 AU: 026_02	Sediment
Reynolds Creek	Diversion to Snake River	WQLS: 2676 AU: 009_04	Sediment

Sinker Creek	Diamond Creek to Snake River	WQLS: 2679 AU: 006_03	Flow alteration, sediment, temperature
South Fork Castle Creek	HW to Castle Creek	WQLS: 2683 AU: 014_02	Bacteria
Squaw Creek	HW to Snake River	WQLS: 2674 AU: 007_02, 03	Temperature
Squaw Creek	Unnamed tributary 3.9 km upstream to Snake River	WQLS: 2674 AU: 007_03	Sediment
Succor Creek	Oregon line to Snake River	WQLS: 2671 AU: 002_04	Sediment
Succor Creek	HW to Oregon line	WQLS: 6671 AU: 002_02, 03	Flow alteration, sediment, temperature

[1]Refers to a list created by the State of Idaho (using monitoring data) in 1998 or water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303subsection "d" of the Clean Water Act.
[2]Poison Creek appears on the 303(d) list under HUC 17050103. This is a mistake. The Poison Creek that is in HUC 17050103 is not 303(d) listed. However, Poison Creek is evaluated as part of this subbasin assessment
[3]Water Quality Limited Segment & Assessment Unit

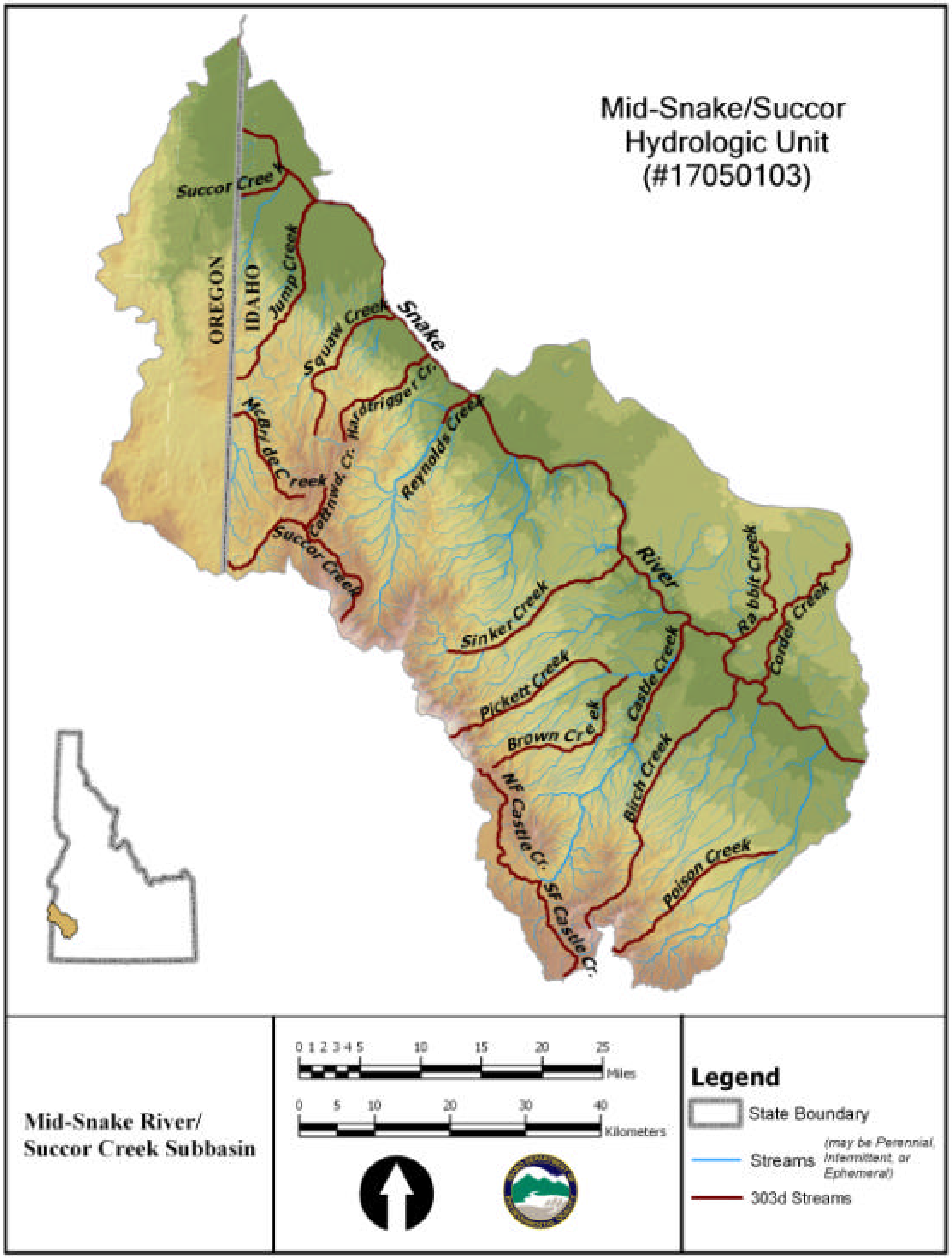

Figure A. Mid-Snake River/Succor Creek Subbasin

Key Findings

The Mid Snake River/Succor Creek watershed is an arid watershed characterized by hot summer temperatures. Tributaries are generally low volume rangeland streams that have a combination of high ambient temperatures, geography, poor shading, low flow volume, flow alteration, and naturally warm springs, which often leads to exceedances of the temperature standard. Even with maximum potential shade, some of the streams in the watershed cannot meet the cold water temperature standard. These streams were evaluated to determine the best achievable temperature based on the maximum potential shade.

Nutrient loading to the Snake River comes from the upstream segment of the Snake River, drains, tributaries, and point sources. The primary nutrient impairing beneficial uses is phosphorus. A total phosphorus target of 0.07 mg/L has been set for the Mid Snake River, based upon the work done in the draft Snake River Hells Canyon (SR-HC) TMDL (DEQ 2001). The critical period for target application is May-September.

Instream channel erosion is the primary source of sediment loading in Castle Creek, Sinker Creek, and Succor Creek. Land management practices contribute to unstable banks and this resultant instability leads to sediment delivery to the stream channel. Eighty-percent bank stability was selected as a surrogate target to achieve 28% depth fines in the creek.

Table B summarizes the outcomes of the subbasin assessment and TMDL. Table C shows the specific stream segments for which TMDLs were set.

Table B. Summary of subbasin assessment and TMDL outcomes.

Water Body	Boundary	Listed Pollutants	Proposed Action
Snake River WQLS: 2670 AU: 006_07	CJ Strike Reservoir (below dam) to Castle Creek	Sediment	De-list sediment List TDG
Snake River WQLS: 2669 AU: 006_07	Castle Creek to Swan Falls	Sediment	De-list sediment
Snake River WQLS: 2668 AU: 006_07, 001_07	Swan Falls to Boise River	Bacteria, dissolved oxygen, nutrients, sediment, pH, flow alteration	De-list bacteria, sediment, pH TMDL for nutrients Dissolved oxygen will be addressed by the nutrient TMDL No action for flow alteration List temperature

Water Body	Boundary	Listed Pollutants	Proposed Action
Birch Creek WQLS: 2684 AU: 021_02, 03, 04	Headwaters to Snake River	Sediment	De-list sediment
Brown Creek WQLS: 2682 AU: 019_02, 03, 04	Headwaters to Catherine Creek	Sediment, Temperature	De-list sediment, temperature
Castle Creek WQLS: 2680 AU: 014_03, 04, 05	T5SR1ES28 to Snake River	Temperature, sediment, flow alteration	TMDL for sediment, Delay TMDL for temperature to collect additional data No action for flow alteration
Corder Creek WQLS: 2685 AU: 025_02	Headwaters to Snake River	Sediment	De-list sediment
Cottonwood Creek WQLS: none AU: 003_02	Headwaters to Succor Creek	Temperature	De-list temperature
Hardtrigger Creek WQLS: 2675 AU: 008_02	Headwaters to Snake River	Sediment	De-list sediment
Jump Creek WQLS: 2673 AU: 005_02,03	Headwaters to Snake River	Habitat Alteration	TMDL for sediment No action for habitat alteration
McBride Creek WQLS: 2672 AU: 004_02,03	Headwaters to Oregon Line	Temperature, sediment, flow alteration	De-list temperature, sediment No action for flow alteration
North Fork Castle Creek WQLS: 2680 AU: 014_02a	Headwaters to Castle Creek	Temperature	Delay TMDL for temperature to collect additional data
Pickett Creek WQLS: 2681 AU: 016_02, 03	T5SR1WS32 to Catherine Creek	Sediment	De-list sediment

Water Body	Boundary	Listed Pollutants	Proposed Action
Pickett Creek WQLS: 6681 AU: 016_02	Headwaters to T5SR1WS32	Temperature, sediment, flow alteration	De-list temperature, sediment No action for flow alteration
Poison Creek WQLS: 2687 AU: 006_02, 03	Headwaters to Shoofly Creek	Not Listed, See Chapter 1	No Action
Rabbit Creek WQLS: 2677 AU: 026_02	Headwaters to Snake River	Sediment	De-list sediment
Reynolds Creek WQLS: 2676 AU: 009_04	Diversion to Snake River	Sediment	De-list sediment
Sinker Creek WQLS: 2679 AU: 006_03	Diamond Creek to Snake River	Temperature, sediment, flow alteration	TMDL for temperature, sediment No action for flow alteration
South Fork Castle Creek WQLS: 2683 AU: 014_02	Headwaters to Castle Creek	Bacteria	Delay bacteria TMDL to collect additional data
Squaw Creek WQLS: 2674 AU: 007_02, 03	HW to Snake River	Temperature	De-list temperature
Squaw Creek WQLS: 2674 AU: 007_03	Unnamed tributary 3.9 km upstream to Snake River	Sediment	De-list sediment
Succor Creek WQLS: 2671 AU: 002_04	Oregon line to Snake River	Sediment, flow alteration	TMDL for sediment, bacteria No action for flow alteration
Succor Creek WQLS: 6671 AU: 002_02, 03	Headwaters to Oregon line	Temperature, sediment	TMDL for sediment Delay TMDL for temperature to collect additional data

Table C. Streams and pollutants for which TMDLs[1] were developed.

Stream	Pollutants
Snake River (Swan Falls to Oregon Line)	Nutrients, Dissolved Oxygen (as part of nutrient TMDL)
Castle Creek	Sediment
Jump Creek (Mule Creek to Snake River)	Sediment
Sinker Creek	Sediment, Temperature
Succor Creek (Headwaters to Oregon line)	Sediment, Temperature
Succor Creek (Oregon line to Snake River)	Sediment, Bacteria

[1]Total Maximum Daily Loads

5. Total Maximum Daily Loads

A TMDL prescribes an upper limit on the discharge of a pollutant from all sources so as to assure water quality standards are met. It further allocates this load capacity (LC) among the various sources of the pollutant. Pollutant sources fall into two broad classes: point sources, each of which receives a waste load allocation (WLA); and nonpoint sources, which receive a load allocation (LA). Natural background (NB), when present, is considered part of the LA, but is often broken out on its own because it represents a part of the load not subject to control. Because of uncertainties regarding quantification of loads and the relation of specific loads to attainment of water quality standards, the rules regarding TMDLs (40 CFR §130) require a margin of safety (MOS) be a part of the TMDL.

Practically, the MOS is a reduction in the load capacity that is available for allocation to pollutant sources. The NB load is also effectively a reduction in the LC available for allocation to human made pollutant sources. This can be summarized symbolically as the equation: LC = MOS + NB + LA + WLA = TMDL. The equation is written in this order because it represents the logical order in which a loading analysis is conducted. First the LC is determined. Then the LC is broken down into its components: the necessary MOS is determined and subtracted; then NB, if relevant, is quantified and subtracted; and then the remainder is allocated among pollutant sources. When the breakdown and allocation is completed we have a TMDL, which must equal the LC.

Another step in a loading analysis is the quantification of current pollutant loads by source. This allows the specification of load reductions as percentages from current conditions, considers equities in load reduction responsibility, and is necessary in order for pollutant trading to occur. Also a required part of the loading analysis is that the LC be based on critical conditions – the conditions when water quality standards are most likely to be violated. If protective under critical conditions, a TMDL will be more than protective under other conditions. Because both LC and pollutant source loads vary, and not necessarily in concert, determination of critical conditions can be more complicated than it may appear on the surface.

A load is fundamentally a quantity of a pollutant discharged over some period of time, and is the product of concentration and flow. Due to the diverse nature of various pollutants, and the difficulty of strictly dealing with loads, the federal rules allow for “other appropriate measures” to be used when necessary. These “other measures” must still be quantifiable, and relate to water quality standards, but they allow flexibility to deal with pollutant loading in more practical and tangible ways. The rules also recognize the particular difficulty of quantifying nonpoint loads, and allow “gross allotment” as a load allocation where available data or appropriate predictive techniques limit more accurate estimates. For certain pollutants whose effects are long term, such as sediment and nutrients, EPA allows for seasonal or annual loads. This document represents the loading analyses for the pollutants addressed by the Mid Snake River/Succor Creek subbasin assessment. The determination of targets and the critical season for the Snake River is largely based upon the work done in the SR-HC TMDL, not only because the work is applicable to this segment but also so that this segment meets the established targets where it enters the SR-HC reach.

Nonpoint sources are generally those sources that discharge over a diffuse area. They are generally not permitted and are more difficult to quantify than point sources due to the disperse nature of their discharges. Nonpoint source discharge occurs in all segments of the Mid Snake River/Succor Creek reach and includes agriculture, urban/suburban, storm water, ground water, and natural loading.

5.1 Instream Water Quality Targets

Instream water quality targets were selected such that they will restore full support of designated beneficial uses. Important considerations in target selections were critical periods for target application, recovery time for the water body, and appropriateness of surrogates.

Target Selection

The following section describes the water quality targets used to develop TMDLs. In some cases, surrogates are used as the target. In the temperature TMDLs (Table 53), riparian potential (shading) is used as a surrogate for the excess heat in the water, which is expressed in terms of joules. In the bank sediment TMDLs (Table 46), bank stability is used as a surrogate for maintaining less than 30% fine material in the riffles. In the nutrient TMDL (Table 51), total phosphorus is used as a surrogate for the narrative nutrient standard. Additional details regarding how each surrogate is used are located in the following sections.

Temperature
Temperature targets are established on a stream-by-stream basis and are based upon the lowest possible temperature that can be expected given practical stream shading, width/depth conditions, and monitored atmospheric conditions. These targets were established using the SSTEMP model to determine instream temperatures based on site potential shade parameters and width/depth measurements. The numeric standards do not apply in all cases because they realistically **cannot be met** throughout the reach, even under ideal shading and width/depth situations. In these cases, the "best achievable temperature" is used as the target. The best achievable temperature is based on the practical amount of shading possible as defined in the TMDL. Stated another way, in instances where the best achievable temperature is used as the target, there is no anticipation that the water quality standard(s) will be achieved.

Site potential shading characteristics are derived from riparian community information for the particular area. Site potential shading is not an estimate of pre-settlement conditions. The Owyhee drainages have seen changes as a result of anthropogenic impacts (i.e., channel armoring, straightening, entrenchment) and the historic condition is no longer attainable. Thus, site potential shading is based upon maximum vegetation heights, maximum density, and optimal vegetative offset of the most likely and optimal riparian community group for the particular stream segment. Potential changes in width/depth ratios are also taken into account for the particular channel type, but changes in the existing channel type are not modeled.

In instances where the numeric standards **can be met**, the respective cold water aquatic life and salmonid spawning criteria are used as the target. The application of the criteria to the data takes into account the critical period for each respective beneficial use.

The designated reaches provide habitat for fish (including salmonids in some cases) and other cold water aquatic life. Therefore, it is important that temperature levels be appropriate to support them. The targets determined by SSTEMP are appropriate because information from surrounding watersheds (data as well as anecdotal) indicates that streams historically have temperatures over this target, even when aquatic species were present in healthy populations (USFWS 1957, 1958).

The Mid Snake River/Succor Creek watershed has always had high summer air temperatures, high solar radiation, and low summer flows. Temperatures are exacerbated by certain land use practices including flow diversion, but water temperatures have most likely never been cold during the hottest periods of the year. Native fish have either physiologically adapted to the high temperatures or have been able to find colder water refugia in deep pools and by springs during periods of high stream temperatures. Factoring in these natural conditions, the temperature targets are based upon the temperature decrease expected under optimal habitat conditions, which, while above the state numeric criteria in some cases, are protective of the native fish and their reproductive cycle.

The TMDL must account for seasonal variation. The majority of temperature exceedances and low flows occur in July and August. Since it is not possible to change allocations of shade over a year, allocations were set based on the critical summer period.

The Mid Snake River/Succor Creek drainage is subject to both fires and flash flood events. Depending upon land management practices, it may take at least 10-15 years (maybe up to 25 years) to reestablish vegetation and reach site potential shade after such events.

Sediment

Sediment conditions as they relate to the water quality standards are assessed through the interpretation of the narrative criteria based on impacts to aquatic life. Current guidelines established by other TMDL efforts recommend less than or equal to 80 mg/L suspended sediment for acute events lasting less than 14 days, and less than or equal to 50 mg/L for acute events lasting less than 60 days. These targets are based on the work of Newcombe and Jensen (1996). The Lower Boise River Sediment TMDL (DEQ 1998) established these concentrations for support of designated beneficial uses in the lower Boise River drainage; these targets were also established for the SR-HC TMDL. These are the targets that will be used for the mainstem Snake River. Based in part on the work of several authors, it is the opinion of DEQ that these targets will be protective of both aquatic life (EIFAC 1964, NAS/NAE 1973, Miller 1998, Newcombe and Jensen 1996) and water quality, and should meet the requirements of the CWA. The identification of the acute 80 mg/L target will allow natural runoff and storm events (for which aquatic life in the Snake River are adapted) to be accommodated by the TMDL.

Jump Creek and Succor Creek (from the Oregon line to the Snake River) contain elevated suspended solids concentrations as a result of agricultural return water. Using the available data, site-specific TSS targets have been developed for these tributaries. The targets are linked to conditions that will ensure the water quality standards are met in each respective tributary. In lower Succor Creek, the average irrigation season TSS concentration in the stream above Sage Creek will be considered the TSS target for the remainder of the stream. This value is 22 mg/L and will be applied during the irrigation season (critical period) as the irrigation season is when nearly all of the loading occurs to the stream. The target of 22 mg/L represents the TSS conditions in the stream during a time of year when loads are the highest, yet, as discussed in the subbasin assessment portion of this document (Chapter 2), aquatic life beneficial uses can remain supported.

In Jump Creek, monitoring data were used to develop a regression of TSS as a function of turbidity. The linear regression equation is based on 88 data pairs from the four longitudinally spaced monitoring locations in the stream. The irrigation season was determined to be the critical period because that is when nearly all of the loading occurs to the stream. For that reason, only data from the irrigation season were used to develop the regression. By solving for TSS with a turbidity of 25 NTU an instream TSS target of 65 mg/L is established. By maintaining 65 mg/L TSS in the stream, a turbidity of 25 NTU will be maintained. Additional details regarding the regression and the method by with the target was established can be found in the subbasin assessment portion of this document under the analysis of the Jump Creek data (Chapter 2).

The primary source of sediment in the remaining listed tributaries to the Snake River is instream erosional processes. For these tributaries where the largest amount of sediment is produced from instream processes, a target of greater than 80% stream bank stability is recommended. This surrogate measure has been used in other TMDLs, such as the Pahsimeroi TMDL (DEQ 2001a), and is based on findings by Overton et al. (1995). Using NRCS (1983) derived equations, erosion rates and total tons of eroded sediment/year can be calculated using bank inventory ratings. This 80% bank stability target has been linked to 28% fines in both the Blackfoot and Pahsimeroi TMDLs (DEQ 2001 a and b). This percent fines target has been shown to support salmonids and, thus by corollary, is protective of coldwater aquatic life.

To qualify the seasonal and annual variability and critical timing of sediment loading, climate and hydrology must be considered. The sediment analysis characterizes loads using average annual or seasonal rates determined from empirical characteristics that developed over time within the influence of peak and base flow conditions. While deriving these estimates it is difficult to account for seasonal and annual variation within a particular time frame; however, the seasonal and annual variation is accounted for over the longer time frame under which observed conditions have developed.

Annual erosion and sediment delivery are functions of a climate, where wet water years typically produce the highest sediment loads. Additionally, the annual average sediment load is not distributed equally throughout the year. Most of the erosion typically occurs during a few critical months. For example, in the Mid Snake River/Succor Creek watershed, most stream bank erosion occurs during spring runoff. The sediment analysis uses empirically derived hydrologic concepts to help account for variation and critical time periods. First, field-based methods consider critical hydrologic mechanisms. For example stream bank erosion inventories account for the fact that most bank recession occurs during peak flow events when banks are saturated. Second, the estimated annual average sediment delivery from a given watershed is a function of bankfull discharge or the average annual peak flow event.

Reduction of stream bank erosion prescribed within this TMDL is directly linked to the improvement of riparian vegetation density and structure to armor stream banks, reduce lateral recession, trap sediment, and reduce the erosive energy of the stream, thus reducing sediment loading. In reaches that are down-cut, or that have vertical erosive banks, continued erosion may be necessary to re-establish a functional floodplain that would subsequently be colonized with stabilizing riparian vegetation. This process could take many years. It is also expected that improvement of riparian vegetation density and structure may reduce the potential for temperature and bacteria loading in the future.

Nutrients

The Mid Snake River/Succor Creek watershed is directly above the Hells Canyon reach of the Snake River. The Mid Snake River/Succor Creek segment of the Snake River must meet the loading targets of the SR-HC TMDL at the Oregon state line. Because both the SR-HC TMDL and the Mid Snake River/Rock Creek TMDL derived similar nutrient targets, the research for those TMDLs was applied to this TMDL. The more conservative target from the SR-HC TMDL (DEQ 2001) was selected for Mid Snake River/Succor Creek TMDL. The following is a discussion of target selection adapted from both the aforementioned TMDLs.

Nutrient conditions in streams as they relate to the water quality standards are assessed through the interpretation of the narrative criteria based on excessive or nuisance aquatic growth. Numeric targets established to support designated beneficial uses within the tributaries are based on an understanding of nutrient transport and processing within this system; research carried out in systems with similar climate and geology; and the linkage established between inflowing nutrient concentrations, organic growth and decay, and water chemistry processes (affecting DO, pH, nutrient desorption, etc). This target will be protective of recreation and aquatic life uses and of water quality, thereby meeting the requirements of the CWA. Attaining the target should result in full support of the designated beneficial uses within the system.

The TP target for this segment has been set at 0.07 mg/L based on upstream and downstream targets set by the SR-HC and Mid Snake River/Rock Creek TMDLs. The Mid Snake River/Succor Creek reach is directly above the SR-HC reach and, thus, must meet the SR-HC 0.07 mg/L TP target where the two reaches meet. The critical period for application of this target is May through September.

Since phosphorus has been shown to be the limiting nutrient for algal growth in the Snake River system and because many of the BMPs for this area will be efficient for both nitrogen and phosphorus, instream targets are based on TP. Total phosphorus, rather than ortho-phosphate, was chosen because although ortho-phosphate is more biologically available, TP is more stable, represents all phosphorus that may become available for biological uptake, and is more reproducible in the lab on a method to method basis (DEQ 2001).

A water quality target of 0.075 mg/L TP was established for two separate reaches analyzed by the Twin Falls Regional Office of DEQ as part of their TMDL effort on the Mid Snake River/Rock Creek. The first analysis was derived from the EPA's recommended targets for various water bodies (USEPA 1986). In free-flowing rivers, the TP recommended target is 0.100 mg/L, for lake tributaries the recommended target is 0.050 mg/L TP, and for lakes and reservoirs the recommended target 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 water management plan (1988 to 1992), DEQ concluded that the best reasonable, preliminary target value for water column TP would be 0.075 mg/L.

The second analysis was derived from RBM10 model simulations. 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 has also been used as a decision support tool in the Spokane River and on the Snake River above Milner Dam (Yearsley 1991, 1996).

There have been four, 10-year model simulations performed using flow data from 1930-1939, which represent the lowest flow years of 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 10 years of BMP implementation, proposed nutrient reductions should attain the instream TP target goal. The modeling results gave a value of 0.0728 mg/L at the compliance point.

The modeling also showed the resultant plant biomass decrease for macrophytes and epiphytes in response to nutrient reduction of TP. Upon reductions, the plant biomass was reduced by 20-30% and would therefore improve reduced impacts to beneficial uses of the Middle Snake River caused by nuisance/excessive aquatic vegetation.

The 0.07 mg/L target was chosen for the entire Mid Snake River/Succor Creek reach because it is a more conservative target than the 0.0725 mg/L target for the Middle Snake River and because this reach has connectivity with the SR-HC reach. The Snake River from King Hill to CJ Strike Reservoir (HUC 107050101) TMDL has not been completed and, thus, a more conservative target is appropriate in case these TMDLs determine a target lower than 0.075 mg/L is necessary.

Bacteria
Bacteria targets are consistent with the numeric water quality standards for the protection of human health. As described in Table 6, the targets are expressed in terms of an instantaneous maximum and a 30-day geometric mean. If the instantaneous maximum is exceeded in a single sample, 4 additional samples must be collected within a 30-day period to calculate the geometric mean.

Monitoring Points

Monitoring points for each water body were discussed in detail in Section 2.3. Refer to that section for the location of monitoring points for each water body. An attempt was made in each subwatershed to monitor a representative sections of the streams, including a downstream compliance point for temperature and water chemistry measurements.

5.2 Load Capacity

The LC is the amount of pollutant a water body can receive without violating water quality standards. Seasonal variations and a MOS to account for any uncertainty are calculated within the LC. The MOS accounts for uncertainty about assimilative capacity, the precise relationship between the selected target and beneficial use(s), and variability in target measurement. The LC is based on existing uses within in the watershed. The LC for each water body and specific pollutant are tailored to both the nature of the pollutant and the specific use impairment.

A required part of the loading analysis is that the LC be based on critical conditions – the conditions when water quality standards are most likely to be violated. If protective under critical conditions, a TMDL will be more than protective under other conditions. Because both LC and pollutant source loads vary, and not necessarily in concert, determination of critical conditions can be more complicated than it may appear on the surface.

Temperature
In the stream segments shown in Table 38 requiring temperature TMDLs, the temperature water quality standard has not been met and the pollutant is excess heat. The primary source of temperature increases under anthropogenic control are those that increase the amount of solar radiation reaching the stream surface. Thus, the load of this resultant excess "heat" is calculated in joules per square meter per second (joules/m^2/sec). The LC is the amount of heat in the stream when the criteria or the best achievable temperature are met.

Stream shading is used as a surrogate for solar radiation. Therefore, the LC can also be expressed as the amount of shade needed to attain temperature standards. Where the numeric criteria cannot be met, naturally achievable conditions apply and full site potential shade is necessary.

Nutrients
The LC for nutrients was determined by calculation using the target of 0.07 mg/L TP and average flow values (calculated from 1999 and 2000 flow data, as described in Chapter 2).

Flow values for the Snake River at river mile 409 were determined using a flow budget developed for the SR-HC TMDL and applying the calculated proportional flow increase on a per mile basis.

The phosphorus LC is identified for an average flow scenario. While these values are helpful in giving a relative understanding of the reductions required, and will apply reasonably over most water years, it should be noted that the absolute level of reduction required will depend on flow and concentration values specific to a given water year. The target shown to result in attainment of water quality standards and support of designated uses in the reach is an instream concentration of less than or equal to 0.07 mg/L TP. Transport and deposition of phosphorus, and the resulting algal growth within the reach, is seasonal in nature. Therefore, application of the 0.07 mg/L TP target is also seasonal in nature, extending from the beginning of May through the end of September. The length of this period was also determined by when BMPs would be most effective.
Currently, total phosphorus levels are above the target concentration outside this period. However, algal blooms result from a combination of several factors including water temperature. Generally, water temperature precludes major nuisance blooms from occurring in early spring and late fall. In the fall, algal blooms may occur but after BMP implementation, the instream nutrient reductions during the critical period should prevent these blooms. In addition, BMPs are <u>most</u> effective during the critical period, which means that many BMPs will still have a protective effect outside of the critical period.

Due to water column nutrients, particularly TP, being more abundant than plant uptake rates, responses by plant communities 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 sediments, plants that obtain nutrients from the sediments (such as *Potamogeton sp.*) will persist longer. Nevertheless, as reductions in TP (and sediment) continue, sediment bound nutrients will gradually be depleted as plant uptake outpaces recharge rates.

Sediment
The LC for sediment was determined based on the origin of the sediment. In those instances where the sediment generated from stream bank erosion, the LC is based on the load generated from banks that are greater than 80% stable. This load defines the LC for the remaining segments of the stream. In instances where a numeric water column target is defined, the LC is based on the instream load that would be present when the target is met. For example, the instream TSS target for Jump Creek is 65 mg/L. The LC for Jump Creek is based on maintaining 65 mg/L TSS throughout the stream during the critical flow period.

Bacteria
The LC for bacteria is based on the state water quality standard for *E. Coli.* The bacteria LC is expressed in terms of concentration (colonies/ml) because it is impractical to calculate a mass load for bacteria.

5.3 Estimates of Existing Pollutant Loads

Regulations allow that loadings "may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading," (40 CFR 130.2(I)). The type and amount of data available greatly influenced how DEQ calculated existing loads. These methods have been discussed in detail in the Data Assessment Methods section of this document (see Section 2.3).

Temperature
In temperature-listed streams, average daily and maximum temperatures were determined for the monitored period. These temperatures were translated into joules using SSTEMP. The amount of joules in the water represents existing conditions. In addition, SSTEMP was used to determine existing shade conditions for the reach.

Nutrients
The current nutrient load in the Snake River was calculated using an average water year and averaged concentrations from 1999 and 2000 (1999 and 2000 were used because that is the most current data and would reflect any BMPs implemented). A direct average load calculation was utilized, using average nutrient concentration data and average flow data (years 1995, 1999, and 2000).

Sediment
In instances where the primary source of sediment is from bank erosion, existing sediment loads were determined using the bank erosion inventory process. This method provided direct measurement of erosion rates within the reach. This erosion rate was then used to calculate the current instream delivery of sediment within the system. In instances where sediment was generated via agricultural or other nonpoint source activities, the existing loads were calculated using measured water column data.

Bacteria
Where possible, the current bacteria geometric mean concentrations are calculated by collecting 5 samples over a 30-day period. Otherwise, the instantaneous maximum concentrations are evaluated.

5.4 Load Allocations

Margin of Safety

The MOS factored into all load allocations is implicit. The MOS includes the conservative assumptions used to determine existing sediment loads. Conservative assumptions made as part of the loading analysis are discussed below.

Sediment: Instream Channel Erosion
An implicit MOS exists due to a number of reasons: 1) desired bank erosion rates are representative of background conditions; and 2) water quality targets for percent fines are consistent with values measured and as set by local land management agencies based on

established literature values and incorporate an adequate level of fry survival to provide for stable salmonid production. In the case of upper Succor Creek, Castle Creek and Sinker Creek, reference bank conditions are based on banks that are greater than 80% (about 85%) stable. Since the 28% fines target is based on 80% bank stability, an implicit MOS is included.

Sediment: Water Column Targets
Total suspended solids water column targets are used for lower Succor Creek and Jump Creek TMDLs. In the case of lower Succor Creek, the TSS target is 22 mg/L. The 22 mg/L target is linked by reference to a segment target of the lower Boise River containing TSS conditions of 15 mg/L and aquatic life communities that are not impaired by water column sediment. An implicit MOS applies because of the difference in water column materials between the two systems. In the lower Boise River, the TSS load is primarily composed of small sands and large silts. In Succor Creek, the TSS load is primarily composed of silt and other smaller materials. The larger material in the lower Boise River presents a greater threat to aquatic life (primarily due to the abrasion of fish gills), yet the TSS targets are very similar. Thus, using 22 mg/L as a target in Succor Creek is conservative.

In the case of Jump Creek, the TSS target is 65 mg/L. This target is linked to maintaining a turbidity of 25 NTU throughout the stream. An implicit MOS applies because of this link. Twenty-five NTU is the turbidity criterion that must not be exceeded for more than 10 consecutive days in any applicable mixing zone set by DEQ and is by definition more stringent than the instantaneous turbidity criterion of 50 NTU above background. Thus, since the TSS link was made to 25 NTU as opposed to 50 NTU, the target is conservative.

Nutrients
Accurately determining the nutrient loading is primarily dependent upon the accuracy and representativeness of sampling techniques and analytical methods. The SR-HC TMDL determined that a ±13% MOS encompasses this probable range of error as well as the uncertainty in system uptake and assimilative capacity. This MOS was incorporated into the determination of the 0.07 mg/L TP target.

Temperature
By assuming that optimum potential riparian vegetative conditions could be met throughout modeled reaches, an implicit MOS was employed. Soil and topography conditions may preclude 100% attainment of optimum potential.

Bacteria
An implicit MOS is built into the TMDL by assuming that additional dilution does not become available as tributaries enter the stream.

Seasonal Variation

TMDLs must be established with consideration of seasonal variation. In the Mid Snake/Succor Creek hydrologic unit there are seasonal influences on nearly every pollutant addressed. The summer growing season is when concentrations of sediment and nutrients are the highest. This is also when water temperatures are elevated. The increase in temperature is due to a combination of agricultural return flow and warmer air temperatures. Seasonal variation as it relates to development of this TMDL is addressed simply by ensuring that loads are reduced during the critical period (when beneficial uses are impaired and loads are controllable). Thus, the effects of seasonal variation are built into the load allocations.

Critical Period

The critical period for each water body is based on the time when beneficial uses must be protected and when pollutant loads are the highest. Each respective TMDL was developed such that the water quality standards will be achieved year around, yet the critical period defines when loading reductions must occur. Table 43 shows the critical period for each water body.

Table 43. Critical periods for water bodies receiving TMDLs.

Water Body	Pollutant	Critical Period (Time of Year Applicable)
Snake River	Nutrients/Dissolved Oxygen	May 1 –September 30
Castle Creek, Sinker Creek, Succor Creek (Headwaters to Oregon Line)	Sediment	Year round
Succor Creek (Oregon Line to Snake River)	Sediment	May 1 –September 30
Succor Creek (Oregon Line to Snake River)	Bacteria	Year round
Castle Creek, Sinker Creek, Succor Creek (Headwaters to Oregon line)	Temperature	March 1-September 22
Jump Creek	Sediment	May 1 –September 30

Background

Sediment
Background sediment production from stream banks equates to the load at 80% stream bank stability as described in Overton et al. (1995), where stable banks are expressed as a percentage of the total estimated bank length. Natural condition stream bank stability potential is generally at 80% or greater for A, B, and C channel types in plutonic, volcanic, metamorphic, and sedimentary geology types.

The sediment load reductions are designed to meet the established instream water quality target of 28% or less fine sediment (less than 6.35 mm in diameter) in riffle areas suitable for salmonid spawning. Stream bank erosion reductions are quantitatively linked to tons of sediment per year. An inferential link is identified to show how sediment load allocations will reduce subsurface fine sediment to or below target levels. This link assumes that by reducing chronic sources of sediment, there will be a decrease in subsurface fine sediment that will ultimately improve the status of beneficial uses. Stream bank erosion load allocations are based upon the assumption that stream bank erosion is the primary source of sediment.

Nutrients

The following discussion comes from the SR-HC TMDL. The SR-HC TMDL assessed natural phosphorus conditions in the mainstem Snake River by looking at concentrations in the Blackfoot and Portneuf watersheds where there are high naturally occurring concentrations of phosphorus. Natural sources of nutrients include erosion of phosphorus-containing rock and soils through wind, precipitation, temperature extremes and other weathering events.

Natural deposits of phosphorus (Hovland and Moore, 1987) have been identified in the Snake River drainage near Pocatello, Idaho (RM 731.2). Geological deposits in the Blackfoot River watershed (inflow at RM 750.6) contain phosphorus in sufficient concentrations that they have been mined. The Snake River flows through this area some distance upstream of the SR-HC TMDL reach.

In an effort to assess the potential magnitude of natural phosphorus concentrations in the mainstem Snake River due to these geological deposits, total phosphorus concentrations occurring in the mainstem near the Blackfoot and Portneuf River inflows (RM 750.6 and 731.2 respectively) were evaluated. Data was available for the Snake River near Blackfoot, Idaho (USGS gage # 13069500, RM 750.1) and for the Blackfoot and Portneuf Rivers (USGS, 2001a). The mainstem Snake River and these tributary river systems, where they flow through the natural mineral deposits represent a worst-case scenario for evaluation of natural phosphorus loading and were identified as potential sources of naturally-occurring phosphorus to the SR-HC reach. USGS gauged flow data and water quality data from the 1970's to the late 1990's is available for the Blackfoot and Portneuf Rivers ((USGS gage # 13068500, and #13075500 respectively). Because both the mainstem and tributary watersheds have been settled for some time, and land and water management has occurred extensively, the data compiled represent both natural and anthropogenic loading.

Total phosphorus concentrations in the Snake River mainstem, measured near Blackfoot, Idaho (RM 750.1), from 1990 to 1998 averaged 0.035 mg/L (range = <0.01 to 0.11 mg/L, median = 0.03 mg/L, mode = 0.02 mg/L) (USGS, 2001a). Nearly 40 percent (23 samples) of the total data set showed total phosphorus concentrations less than or equal to 0.02 mg/L. Data represents year-round sampling. Winter sampling was slightly less frequent (approximately 19% of the total) than spring, summer or fall.

Natural phosphorus concentrations were not assessed as part of the Blackfoot River TMDL (IDEQ, 2001b). Total phosphorus concentrations in the Blackfoot River, measured near the mouth, from 1990 to 1999 averaged 0.069 mg/L (range = <0.01 to 0.43 mg/L, median = 0.04 mg/L, mode = 0.03 mg/L) (USGS, 2001a). Nearly 23 percent (12 samples) of the total data set showed total phosphorus concentrations less than or equal to 0.02 mg/L. Data represents year-round sampling. Winter sampling was less frequent (approximately 13% of the total) than spring, summer or fall.

Natural phosphorus concentrations were not assessed for the Portneuf River TMDL (IDEQ, 1999d). Total phosphorus concentrations in the Portneuf River, measured near the mouth, from 1990 to 1998 averaged 0.085 mg/L (range = <0.01 to 0.28 mg/L, median = 0.069 mg/L, mode = 0.03 mg/L) (USGS, 2001a). Nearly 21 percent (6 samples) of the total data set showed total phosphorus concentrations less than or equal to 0.02 mg/L. Data represents year-round sampling. Winter sampling represented approximately 22 percent of the total.

The fact that very low total phosphorus concentrations were observed routinely (more than 20% of the time) in the mainstem Snake River, the Blackfoot River and the Portneuf River, all watersheds with a high level of use and management show that the natural loading levels are likely below detection limit concentrations. The additional fact that these low concentrations were observed in watersheds in much closer proximity to the rich geological phosphorus deposits indicates that these deposits likely do not represent a significant source of high, natural loading to the Mid Snake River/Succor Creek TMDL reach, located well downstream from the mineral deposits identified.

Given the above discussion, the natural background concentration for total phosphorus in the mainstem Snake River has been estimated as at or below 0.02 mg/L for both the Mid Snake River/Succor Creek and SR-HC TMDL reaches. This value is based on the available data set. Data from the Snake River upstream of RM 409 was included in this data set to address the concern of enrichment of surface waters by the phosphoric deposits located in central and eastern Idaho (Hovland and Moore, 1987). Due to the fact that there are substantial anthropogenic influences in Snake River Basin, the lower 15th percentile value for total phosphorus concentration was selected as a conservative estimate of natural phosphorus concentration. In this manner, natural concentration levels for the mainstem Snake River were calculated conservatively. This initial estimate will be reviewed as additional data become available and revisions will be made as appropriate.

The estimated natural background loading concentration for the mainstem Snake River (0.02 mg/L) is most likely an overestimation of the natural loading but represents a conservative estimate for the purposes of load calculation. In addition, this concentration correlates well with other studies that have been completed and closely approximates the total phosphorus concentration identified for a reference system (relatively unimpacted) by the US EPA (US EPA, 2000d; Dunne and Leopold, 1978). Because phosphorus concentrations had dropped to below the detection limit in the Blackfoot watershed after implementation of BMPs, background was assessed at 0.02 mg/L based on the lowest 15th percentile value for phosphorus. This choice of percentile addressed bias introduced by using a lower percentile that contained values below the detection limit and lack of data located directly below the natural source of phosphorus.

Background concentrations of TP in the tributaries and drains as they relate to the overall load in the river were estimated to be negligible and were not accounted for in loading calculations.

Temperature
Background for temperature is considered to be the amount of heat in the water when the maximum riparian potential is met. Thus, the background temperature is the same as the loading capacity.

Sediment Allocations

The targets for TSS in lower Succor Creek and Jump Creek are 22 mg/L and 65 mg/L, respectively. The 22 mg/L target for lower Succor Creek is intended to provide protection for the mix of aquatic life species that inhabit the stream. The target is designed based on the TSS conditions in a segment of the lower Boise River that contains aquatic life unimpaired by suspended sediment. The 65 mg/L target for Jump Creek is based on maintaining a turbidity of 25 NTU throughout the stream. Jump Creek is not §303(d) listed for sediment. Therefore, the 65 mg/L target is not necessarily driven by aquatic life impairment, but rather, is driven by exceedances of 25 NTU during the irrigation season. A detailed discussion of the selection of the targets can be found in the subbasin assessment portion of this document (Chapter 2).

Tables 44 and 45 show the LAs for Sage Creek and for each of the major sources of sediment to Jump Creek. The sources were identified at a 1:24,000 scale. The allocations are designed to meet the TSS goals of 22 mg/L (lower Succor Creek) and 65 mg/L (Jump Creek) in the full length of the streams, with checkpoints near end of each stream. The lower Succor Creek load is calculated using the standard pollutant mixing equation: *mixed conc.* = $(conc_1 * flow_1) + (conc_2 * flow_2) / (flow_1 + flow_2)$ (Hammer 1986). The Jump Creek loads are calculated using the same mixing equation based on a mass balance of inflows and diversions, with the target as the instream goal. Fixed load targets were selected because the management practices that affect sediment loading to the streams are not expected to change on a day-to-day basis. Thus, the management practices should be developed to meet the load goals, which meet the target even when very low flow conditions occur in the stream. No point sources discharge to Succor or Jump Creeks. Additionally, there is no reserve for growth built into the allocations. Any additional point sources discharging to Succor or Jump Creek would receive a wasteload allocation of zero.

As described in section 5.2, the loading capacity for lower Succor Creek and Jump Creeks is based on maintaining the instream target at all locations in the stream. As such, the actual mass load capacity changes at any given location in the stream as flows increase (or decrease with diversions). In addition to the load allocations, Tables 44 and 45 show the load capacity for each stream at the final downstream compliance point. As shown in the tables, if the load allocations are met, the loading capacity will be met.

Table 44. Total suspended solids load allocations for Succor Creek.

Name	Typical Existing Load: 2001-2002 (tons/day)	Load Allocation (tons/day)	Percent Reduction from Existing Load
Succor Creek above Sage Creek	1.19	1.19	0%
Sage Creek	8.79	1.84	79%
Succor Creek at Homedale	Load Capacity: 3.03	Load achieved with reductions: 3.03	--

Table 45. Total suspended solids load allocations for Jump Creek.

Name	Typical Existing Load: 2001-2002 (tons/day)	Load Allocation (tons/day)	Percent Reduction from Existing Load
Mule Creek	10.67	2.13	80%
Field Scale near B-Line Canal	3.38	0.09	97%
B-Line Canal	1.19	0.88	26%
Kora Canal	5.08	0.35	93%
B-4 Lateral	0.41	0.18	57%
Hortsman Drain	15.83	8.22	48%
Jump Creek at Railroad Trestle	Load Capacity: 12.06	Load achieved with reductions: 11.25	--

The analysis of sediment inputs into lower Succor and Jump Creeks focuses on a critical condition from May through September, the standard irrigation season. It is within that season that the most significant loads of sediment are generated.

The analysis for lower Succor Creek shows that the irrigation season TSS load in Sage Creek must be reduced by 79% in order to maintain 22 mg/L throughout the stream. The mass balance analysis for Jump Creek shows that the irrigation season tributary TSS loads must be reduced anywhere between 26% and 97% in order to maintain 65 mg/L throughout the stream. Figure 5.1 shows the mixed concentration of Sage Creek and lower Succor Creek with a 79% reduction in TSS load from Sage Creek. Figure 5.2 show the mass balance for Jump Creek, which is based on an equal concentration allocation scenario for the 1993 data. Working with DEQ, the WAG concluded that an equal concentration allocation scenario is the most equitable for all sources in Jump Creek. One of the primary drivers for this decision is the fact that an equal concentration allocation scenario does not penalize those sources that have already implemented best management practices.

Figures 5.1 and 5.2 show that based on the LAs, the target concentrations, and hence the load capacities, are never exceeded in the stream. Since these years represent typical flow conditions in the basin, the LAs will be applied to all years. The loads are not particularly conservative, but are likely to occur relatively frequently in comparison to the most extreme conditions, and thus are a better basis for establishing load targets than the most extreme condition on record. Tables 44 and 45 display the current and typical existing loads (based on the years described above), and the LAs that represent reductions. The loads derived from this process ensure that the targets for suspended solids are met throughout the streams. Note that the mixed concentrations in Figures 5.1 and 5.2 do not exceed the respective targets for each stream.

	Flow	TSS (mg/L)	Mixed Flow in Succor Creek	Mixed Conc. in Succor Creek	Load Allocation (tons/day)	Current Load	% Reduction
Succor Creek above Sage	20.00	22.00			1.19	1.19	0
Sage Creek	31.00	22.00	51.00	22.00	1.84	8.79	79
Succor near Homedale			51.00	22.00			

Figure 5.1. Mixed Concentration of Total Suspended Solids in lower Succor Creek, Based on Sage Creek Load Reduction

	Flow	TSS (mg/L)	Mixed Flow in Jump Creek	Mixed Conc. in Jump Creek	Load Allocation (tons/day)	Current Load	% Reduction
Jump above Mule Creek	16.30	32.12					
Mule Creek	12.11	65	28.41	46.14	2.13	10.67	80
Field Scale near B-Line	0.50	65	28.91	46.46	0.09	3.38	97
B-Line Canal	5.00	65	33.91	49.20	0.88	1.19	26
Town Canal Withdrawal	-15.00	49	18.91	49.20			
Kora Canal	2.00	65	20.91	50.71	0.35	5.08	93
B-4 Lateral	1.00	65	21.91	51.36	0.18	0.41	57
Hortsman Drain	46.84	65	68.75	60.65	8.22	15.83	48
Jump at RR Trestle			68.75	60.65			

Figure 5.2. Total Suspended Solids Mass Balance for Jump Creek, Based on Equal Concentration Allocations

The remaining stream segments in the Mid Snake River/Succor Creek basin that are receiving sediment allocations are receiving them due to excess stream bank erosion. Table 46 shows the load allocations for these segments. The worksheets used to derive these load allocations are located in Appendix H. The current erosion rate is based on the bank geometry and lateral recession rate (as describe in Appendix G) at each measured reach. The target erosion rate is based on the bank geometry of the measured reach and the lateral recession rate at the reference reach. The reference reach is an area that contains greater than 80% bank stability and less than 28% fine substrate material. The loading capacity is the total load that is present when banks are at least 80% stable. As such, the loading capacity and the load allocations are the same. Note that these are the overall decreases necessary in the stream, but only apply to areas where banks are less than 80% stable. The determination of the reference reach was based solely on the water quality surrogates (e.g. bank stability, percent fines) at the reference site. The determination did not evaluate the land management activities that are contributing to the water quality.

Table 46. Stream bank erosion load allocations for Sinker Creek, upper Succor Creek, and Castle Creek.

Water Body	Current Erosion Rate (tons/mile/year)	Target Erosion Rate (tons/mile/year)	Current Total Erosion (tons/year)	Target Total Erosion (tons/year) Load Allocations Loading Capacity	% Decrease
Sinker Creek	35.26	32.20	352.57	322	8.64
Succor Creek (Granite Creek to Chipmunk Meadows)	214.80	36.52	637.96	108.45	83.07
Succor Creek (Directly below reservoir to Oregon line)	173.87	39.67	768.49	175.36	77.18
Castle Creek	56.35	43.41	704.35	542.63	21

Shaded cells represent existing loads

Bacteria Allocations

Lower Succor Creek is the only stream in Mid Snake River/Succor Creek hydrologic unit that requires a bacteria TMDL. The target for bacteria in lower Succor Creek is based upon the state criteria for primary contact recreation, for which the stream is designated. The entire reach below the Oregon line will accommodate primary contact recreation, therefore the compliance points for bacteria loading are any given location in the stream. The primary contact recreation beneficial use has associated numeric criteria in *Idaho's Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02.251):

Primary contact recreation *E. Coli* bacteria colonies:

- may not exceed 406/100 mL at any time;
- may not exceed a geometric mean of 126/100 mL based on a minimum of five samples taken every three days over a thirty day period.

Contact recreation is presumed to be possible or occurring at any location in the stream, during any time of the year. Thus, no single flow condition is considered a critical flow. Since the bacteria concentration in Succor Creek as it enters from Oregon is unknown, current loads and load reductions from Oregon cannot be determined. However, the data presented in the subbasin assessment show that by the time the stream reaches Homedale, concentrations are well in excess of the state criteria.

Table 47 shows the primary contact recreation geometric mean LAs for the tributaries to Succor Creek. The state of Oregon's allocation is consistent with Idaho's and Oregon's criteria for primary contact recreation. Assuming the stream enters Idaho at 126/100 mL, there will be no dilution available to downstream sources. The short length of the segment means that new dilution does not become available along the length of the stream. Thus, the tributaries to Succor Creek must be able to meet a geometric mean of 126/100 mL where they enter the stream. When dilution becomes available in the stream, tributaries may be able to discharge at slightly higher than the criteria. However, until data are collected to determine this, all sources to Succor Creek must be able to meet a geometric mean of 126/100 mL where they enter the stream. There are no point sources discharging to lower Succor Creek. Additionally, there is no reserve for growth built into the allocations. Any additional point sources discharging to Succor would receive a wasteload allocation of zero.

Table 47. Bacteria load allocations for Succor Creek.

Name	Existing Condition (#/100mL geometric mean)	Primary Contact Recreation Load Allocations (#/100mL geometric mean) Loading Capacity	Percent Reduction from Existing Load
Succor Creek at Oregon Line	Unknown	126	Unknown
Coates Drain	Unknown	126	Unknown
Murphy Drain	Unknown	126	Unknown
Sage Creek	266	126	53%

The bacteria load allocations are intended to target the geometric mean criteria for *E. Coli.* Compliance with those criteria must be judged using an appropriate number of samples. Tributaries should discharge bacteria in quantities that do not exceed state criteria for bacteria assuming little likelihood for dilution and minimal die-off. One measurement of bacteria at the mouth of a tributary that is greater than 126 colonies per 100 mL does not

constitute a violation of the allocation; compliance is determined when a tributary does not cause exceedances of the seasonally applicable criteria in Succor Creek.
While only the sources listed in Table 47 received explicit LAs for bacteria, other nonpoint sources of bacteria loading to the stream, such as pasture lands in the floodplain, wild horses (to the extent possible) and feeding operations, should be managed to prevent the movement of bacteria into the stream.

An implicit MOS is built into the bacteria TMDL for Succor Creek. The analysis assumes no dilution is available to the tributaries in Idaho, when in fact, if the state of Oregon discharges according to the Oregon criteria (126/100 mL), dilution would be available. Since the input flows to the stream are greater than the withdrawals, there is a net gain in volume as the stream flows toward the Snake River. As a result, dilution becomes available every time water enters the stream. Thus, if the sources meet their load allocations, the net bacteria concentration in the stream should consistently decrease in the downstream direction.

Nutrient Allocations

The allocation strategy used for the nutrient TMDL is "equal concentration," meaning that all sources must discharge at a concentration of 0.07 mg/L TP or less where they enter the river. This allocation applies to the Snake River from Swan Falls Dam to the Oregon line. Seasonal variation and critical conditions were accounted for in this allocation and the target applies from May-September. The instream seasonal concentration at River Mile 449.3 (Murphy) is 0.071 mg/L. An allocation for the sections of the river from CJ Strike Reservoir to Castle Creek and from Castle Creek to Swan Falls Dam may be necessary in the future. However, at this time a further delineation of tributary sources and instream concentrations above Swan Falls is necessary to determine where these allocations might need to occur. In addition, the Snake River where it exits CJ Strike Dam must meet the 0.07 mg/L target. Using 1999 and 2000 data, the Snake River below CJ Strike Dam discharges at 0.07 mg/L, meeting the target.

Table 48. Instream Total Phosphorus Average Concentrations

Location	May-September Average Concentration (mg/L)
Snake River below CJ Strike Dam	0.07
Snake River at river mile 449.3	0.071
Snake River at Marsing (river mile 425)	0.082
Snake River at Homedale (river mile 417)	0.087

The Mid Snake River/Succor Creek WAG felt that equal concentration was the most equitable allocation scenario because this method does not require any sources to discharge below the 0.07 mg/L target and it does not penalize those sources that have already implemented best management practices.

Table 49 shows the nonpoint source load allocations but does not specifically distribute them to the individual tributaries. This load was determined using an overall water budget for the Snake River. The flows and the load allocation were calibrated against the existing drain nutrient and flow data.

DEQ was able to delineate the nonpoint source loads from point source wasteloads, but tributary specific information was not available for an entire year for all the tributaries. Pollutant loads vary between years due to cropping patterns, water availability etc., and to use data from 1992, 1995, 1999, and 2000 for tributary/drain specific allocations could potentially overestimate an individual tributary's load.

The 1995 and 2000 flow data and 1999/2000 nutrient data were used to determine loads for the mainstem Snake River. The data were provided by both Idaho Power and USGS (IPC 2002, USGS 2000). These water years were used because they represented average flow years. The 1999 and 2000 nutrient data were used because they represented the most recent data available. The 2001 nutrient data was not used for these calculations because 2001 was an extremely low water year and was not considered representative of average conditions.

The point source wasteloads for the two WWTPs are based on a discharge of 3.5 mg/L of TP (average discharge for unmonitored facilities as determined by SR-HC TMDL) at design capacity. Table 50 shows the current wasteloads not the WLA at design capacity. These current loads are lower than the allocated loads because both of these facilities are currently operating well below design capacity. If the facility expands beyond its design capacity then phosphorus discharge limits will be incorporated into its permit, meaning that the facility must either land apply, upgrade to biological nutrient removal or integrate another phosphorus removal process, and/or engage in pollutant trading as part of expansion in order to meet the TMDL target.

As part of the implementation plan, the wastewater treatment facilities will be required to write a nutrient reduction plan. This allocation does not preclude these facilities from incorporating effluent trading into their nutrient management plans. The wasteload allocations and load allocations presented in this TMDL may be adjusted under a state-approved effluent trading program as long as the loading capacity is not exceeded

Based on the current loads and wasteloads shown in Tables 49 and 50, the LAs and WLAs necessary to meet and maintain 0.07 mg/L TP in the river are shown in Table 51.

Table 49. Loads from nonpoint sources to the Snake River in the Mid Snake River/Succor Creek Subbasin.

Wasteload Type	Location	Load	Estimation Method
Total Phosphorus	Drain and Tributaries	381 kg/day	Direct Load Average

Table 50. Waste loads from point sources to the Snake River in the Mid Snake River/Succor Creek Subbasin.

Wasteload Type	Location	Current Load (kg/day)	Load Allocation (kg/day)	NPDES[1] Permit Number
Total Phosphorus	Marsing WWTP	2 kg/day	4 kg/day	Permit # ID0021202
Total Phosphorus	Homedale WWTP	3 kg/day	5 kg/day	Permit # ID0020427

[1]National Pollutant Discharge Elimination System
[2]Wastewater treatment plant

Table 51. Total Phosphorus load and wasteload non point source allocations based on average water year (Snake River from Swan Falls Dam to Oregon Line).

Water Body	Current Load (kg/day)	Seasonal Load Capacity (kg/day)	Seasonal Background Load (kg/day)	Load Allocation (kg/day)	Reduction Required (%)
Snake River at Homedale	2071	1667	453	1205	19.5
Drains, Tributaries and unidentified sources[2]	381	84	0	84	78

[1]Wastewater treatment plant
[2]Total phosphorus background not determined for drains and tributaries, estimated to be negligible
[3]Seasonal background accounted for in the load capacity

The load allocations can be summarized by the following load allocation equation:

LC (1667)= NB(453)+LA (1205)+WLA(9)
(the MOS is accounted for in the target concentration used to calculate the LC)

Sources of unmeasured load may include nonpoint source runoff from anthropogenic sources and precipitation events, unidentified small tributaries and drains, errors in gauged flow measurements, and ground water sources. Monitoring of both point source discharge loads and instream water column concentrations will be undertaken as part of the implementation process. Instream monitoring will be described in more detail in the site-specific implementation plans that will be completed 18 months following the approval of this TMDL. It is expected that at a minimum such monitoring will include the measurement of water column TP, chlorophyll-a and DO within each segment during time frames that represent high, low, and average flow conditions.

Future Growth
Where applicable, states must include an allowance for future loading in their TMDL that accounts for reasonably foreseeable increases in pollutant loads with careful documentation of the decision-making process. This allowance is based on existing and readily available data at the time the TMDL is established. In the case of the Mid Snake River/Succor Creek TMDL, an allowance for future growth is not recommended until such time as reductions indicate that beneficial uses or state water quality standards have been restored. Therefore, the allowance for future growth is zero. Growth can occur under the following auspices: 1) pollutant trading, 2) no net increase above the instream target parameters, and 3) no discharge where land application is the preferred option.

In regards to the point sources in the watershed, since their current allocation is based on their operation at design capacity, any growth that requires expansion of the existing facility triggers phosphorus removal requirements. A reserve capacity allocation is initially implicit since these facilities are not operating at design capacity. The reserve capacity allocation is therefore the difference between the current discharge and design flow discharge. This allows for expansion of existing sources or addition of new point sources discharge through trading or demonstration of an offset within the system. Above and beyond their capacity, a future growth allowance is not calculated since these facilities will have to implement phosphorus removal strategies that typically decrease phosphorus loads by 80% (DEQ 2002).

Any future point sources will receive a wasteload allocation of zero. A discussion of reasonable assurance can be found in Chapter 4.

Temperature Allocations

Succor Creek and Sinker Creek require temperature TMDLs. The TMDLs for these streams are premised on meeting the state of Idaho water temperature criteria for cold water aquatic life and salmonid spawning. Table 52 shows the criteria and the time of year when the criteria apply.

Table 52. State of Idaho water temperature criteria.

Temperature Criteria	Cold Water Aquatic Life (June 22-Sept 21)	Salmonid Spawning (March 1-June 15)
Instantaneous Maximum	22 °C., 71.6 °F.	13 °C., 55.4 °F.
Maximum Daily Average	19 °C., 66.2 °F.	9 °C., 48.2 °F.

The temperature TMDLs were calculated using the SSTEMP model developed by Bartholow (1999). The SSTEMP model was used to determine a heat loading capacity and reduction requirements based on meeting the numeric criteria in Table 52.

It should be noted that the SSTEMP model provides a gross estimate of the heat lost or gained due to a change in vegetative shade. There are many unknowns when determining the effects of increased vegetation on channel width, channel length, air temperature, relative humidity, wind speed, or other physical/climatic attributes that will affect water temperature. Thus, as more information is collected, the model can be re-calibrated to reflect current conditions.

Where the numeric temperature criteria cannot be met, SSTEMP is used to determine the best achievable temperature. This instance arises when the system potential riparian vegetation for a stream does not achieve the criteria. This is common in the Mid Snake River/Succor Creek hydrologic unit, where the pattern of water temperatures closely tracks air temperatures. The system potential shade is defined as the near stream shade condition that can be expected at a site depending on physical factors such as ecoregion, elevation, topographic shade, soil properties, plant biology, and hydraulic processes. System potential vegetation is a large component of system potential shade.

The system potential for each respective stream segment requiring a temperature TMDL was determined via a combination of literature values and WAG input. The system potential is 70% system potential shade for Sinker Creek and 55% system potential shade for Upper Succor Creek (headwaters to Oregon Line). The value for Sinker Creek is higher than Succor Creek due to the fact that the stream channel is narrower, the vegetation offset is less and Sinker Creek also has more topographic shade. The expectation is that near stream vegetation will reduce direct solar radiation to the stream channel, cool microclimates on the water surface (such as a pool shaded by a willow root wad) and increase bank stability to improve channel morphology. To clarify the definition of system potential vegetation:

- System potential vegetation **is** an estimate of the riparian conditions that should exist without excessive anthropogenic activities that disturb or remove riparian vegetation. For example, 55% of upper Succor Creek should contain near 100% of its system potential.
- System potential **is not** an estimate of pre-anthropogenic conditions. It is unrealistic to expect that conditions will be restored to pre-settlement conditions. However, proper management should allow for an increase in riparian vegetation.

Load capacity is based on a mass/unit/time measurement of joules/m^2/sec. The SSTEMP model was calibrated to measured conditions for each month then utilized to determine the reduction of joules/m^2/sec required to achieve the temperature criteria or the best achievable temperature. The SSTEMP model also generates the amount of shade required to obtain the desired joules/m^2/sec. Thus, the LC will use the mass/unit/time measurement of joules/m^2/sec and the surrogate measure to meet the capacity will be a prescribed increase in percent shading. Appendix I shows the SSTEMP results for each model run for the months in which criteria are exceeded. Appendix G describes in detail the input variables for the model plus the validation methods used prior to each model run.

Table 53 shows the existing percent shade for each stream, estimated system potential shade, shade to meet the temperature criteria, the best achievable temperature, decrease in daily average temperature to meet the standard (or best achievable temperature), current solar load, solar load capacity, solar load decrease to meet the capacity (LA), and the required increase in shade. To increase the precision of the TMDL, each month in which the criteria are exceeded is modeled separately. This is appropriate because SSTEMP assumes all input variables are an average for the month being modeled. There are no point sources discharging to the streams in Table 53. Additionally, there is no reserve for growth built into the allocations. Any additional point sources discharging to the streams would receive a wasteload allocation of zero.

While SSTEMP was used to determine these allocations, it is important to note that during implementation, the vagaries of extreme high flows, intense beaver activity, soil condition etc. all may act individually or in concert to slow or prevent attainment of optimal shading conditions and thus achievement of the temperature standards. DEQ recognizes that these factors may prevent attainment and if in fact conditions beyond landowners reasonable control come into play, targets and/or timelines will be adjusted accordingly.

Table 53. Load allocations for streams requiring temperature TMDLs.

Stream Segment / Month	Existing shade as determined by SSTEMP (Riparian %)	Estimated system potential shade (Riparian %)	Shade to meet numeric temperature standards (Riparian %)	Temperature criteria -or- best achievable temperature (°C)	Decrease in current mean temperature (°C) to meet standard -or- best achievable temperature	Current solar load as per SSTEMP (j/m2/s)	Solar loading capacity (LC) based on shade to meet standard or best achievable temperature (j/m2/sec)	Solar load decrease (j/m2/s) to meet capacity (Load Allocation)	Required increase in shade (%)
North Fork Castle Creek	Insufficient Data to Develop TMDL								
Sinker Creek (July)	58.2	70.4*	70.4	19**	0.85	4.30	3.49	0.81	12 [a]
Succor Creek – Headwaters to Berg Mine									
May	16	55	55[b]	9.52	0.90	109.88	50.61	59.27	39
June	14	55	55[b]	10.67	1.22	183.80	115.26	68.54	41
Succor Creek – Berg Mine to Chipmunk Meadows									
May	14	55	55[b]	10.10	0.52	135.87	63.94	71.93	41
June	13	55	55[b]	11.46	0.71	205.86	120.81	85.05	42
Chipmunk Meadows to Succor Creek Reservoir	Insufficient Data To Develop TMDL								
Succor Creek - Reservoir to the Oregon Line									
May	14	55	55[b]	9.63	0.66	124.57	57.37	67.20	41
June	13	55	55[b]	10.76	0.87	202.35	122.03	80.32	42
July	13	55	24	22	0.20	208.78	184.88	23.90	11
August	14	55	53	22	1.61	87.59	43.34	44.25	39

Shaded Columns Represent Existing Conditions
[a] This percent shading increase starts 0.5 miles South of Hwy 78

[b] Temperature standard cannot be met with maximum potential riparian shading
* Sinker Creek has higher potential shading conditions then other streams due to narrow stream channel and higher topographic shading
**can meet 19 C temperature criteria for critical period with less than 10% of dates exceeding criteria

5.5 Implementation Strategies

Overview

The purpose of this implementation strategy is to outline the pathway by which a larger, more comprehensive, implementation plan will be developed 18 months after TMDL approval. The comprehensive implementation plan will provide details of the actions needed to achieve load reductions (set forth in a TMDL), a schedule of those actions, and specify monitoring needed to document actions and progress toward meeting state water quality standards. These details are typically set forth in the plan that follows approval of the TMDL. In the meantime, a cursory implementation strategy is developed to identify the general issues such as responsible parties, a time line, and a monitoring strategy for determining progress toward meeting the TMDL goals outlined in this document.

The geographic scope of this TMDL effort extends from the CJ Strike Dam outfall to where the river intersects the Oregon/Idaho border (Snake River mile 409) (hydrologic unit code 17050103). Also included are TMDLs for several tributaries to the Snake River, including Castle Creek, Sinker Creek, Jump Creek, and Succor Creek. Chapter 2 of the subbasin assessment describes the basin in more detail.

Responsible Parties

Development of the final implementation plan for the Mid Snake River/Succor Creek TMDL will proceed under the existing practice established for the state of Idaho. The plan will be cooperatively developed by DEQ, the Snake River/Succor Creek WAG, the affected private landowners, and other "designated agencies" with input from the established public process. Of the four entities, the WAG will act as the integral part of the implementation planning process to identify appropriate implementation measures. Other individuals may also be identified to assist in the development of the site-specific implementation plans as their areas of expertise are identified as beneficial to the process.

Designated state agencies are responsible for assisting with preparation of specific implementation plans, particularly for those sources for which they have regulatory authority or programmatic responsibilities. Idaho's designated state management agencies are:

- Idaho Department of Lands (IDL): timber harvest, oil and gas exploration and development, mining
- Idaho Soil Conservation Commission (ISCC): grazing and agriculture
- Idaho Department of Transportation (IDT): public roads
- Idaho Department of Agriculture (IDA): aquaculture, AFOs, CAFOs
- Idaho Department of Environmental Quality: all other activities

To the maximum extent possible, the implementation plan will be developed with the participation of federal partners and land management agencies (i.e., NRCS, U.S. Forest Service, BLM, U.S. Bureau of Reclamation, etc.). In Idaho, these agencies, and their federal and state partners, are charged by the CWA to lend available technical assistance and other appropriate support to local efforts/projects for water quality improvements.

All stakeholders in the Mid Snake River/Succor Creek subbasin have a responsibility for implementing the TMDL. DEQ and the "designated agencies" in Idaho have primary responsibility for overseeing implementation in cooperation with landowners and managers. Their general responsibilities are outlined below.

- **DEQ** will oversee and track overall progress on the specific implementation plan and monitor the watershed response. DEQ will also work with local governments on urban/suburban issues.
- **IDL** will maintain and update approved BMPs for forest practices and mining. IDL is responsible for ensuring use of appropriate BMPs on state and private lands.
- **ISCC**, working in cooperation with local Soil and Water Conservation Districts and ISDA, the NRCS will provide technical assistance to agricultural landowners. These agencies will help landowners design BMP systems appropriate for their property, and identify and seek appropriate cost-share funds. They also will provide periodic project reviews to ensure BMPs are working effectively.
- **IDT** will be responsible for ensuring appropriate BMPs are used for construction and maintenance of public roads.
- **IDA** will be responsible for working with aquaculture to install appropriate pollutant control measures. Under a memorandum of understanding with EPA and DEQ, IDA also inspects AFOs, CAFOs and dairies to ensure compliance with NPDES requirements.

The designated agencies, WAG, and other appropriate public process participants are expected to:

- Develop BMPs to achieve LAs
- Give reasonable assurance that management measures will meet LAs through both quantitative and qualitative analysis of management measures
- Adhere to measurable milestones for progress
- Develop a timeline for implementation, with reference to costs and funding
- Develop a monitoring plan to determine if BMPs are being implemented, individual BMPs are effective, LA and WLA are being met, and water quality standards are being met

In addition to the designated agencies, the public, through the WAG and other equivalent processes, will be provided with opportunities to be involved in developing the implementation plan to the maximum extent practical. Public participation will significantly affect public acceptance of the document and the proposed control actions. Stakeholders (landowners, local governing authorities, taxpayers, industries, and land managers) are the most educated regarding the pollutant sources and will be called upon to help identify the most appropriate control actions for each area. Experience has shown that the best and most effective implementation plans are those that are developed with substantial public cooperation and involvement.

Adaptive Management Approach

The goal of the CWA and its associated administrative rules for Idaho is that water quality standards shall be met or that all feasible steps will be taken towards achieving the highest quality water attainable. This is a long-term goal in this watershed, particularly because nonpoint sources are the primary concern. To achieve this goal, implementation must commence as soon as possible.

The TMDL is a numerical loading that sets pollutant levels such that instream water quality standards are met and designated beneficial uses are supported. DEQ recognizes that the TMDL is calculated from mathematical models and other analytical techniques designed to simulate and/or predict very complex physical, chemical, and biological processes. Models and some other analytical techniques are simplifications of these complex processes and, while they are useful in interpreting data and in predicting trends in water quality, they are unlikely to produce an exact prediction of how streams and other waterbodies will respond to the application of various management measures. It is for this reason that the TMDL has been established with a MOS.

For the purposes of the Mid Snake River/Succor Creek TMDL, a general implementation strategy is being prepared for EPA as part of the TMDL document. Following this submission, in accordance with approved state schedules and protocols, a detailed implementation plan will be prepared for pollutant sources.

For the two point sources in the basin (Marsing and Homedale WWTPs), it is the initial expectation that the sources will meet their specific WLAs immediately. This is because their WLAs are based on loads at their design capacity and both plants are discharging at below capacity. For nonpoint sources, DEQ also expects that implementation plans be implemented as soon as practicable. However, DEQ recognizes that it may take some period of time, from several years to several decades, to fully implement the appropriate management practices. DEQ also recognizes that it may take additional time after implementation has been accomplished before the management practices identified in the implementation plans become fully effective in reducing and controlling pollution. In addition, DEQ recognizes that technology for controlling nonpoint source pollution is, in many cases, in the development stages and will likely take one or more iterations to develop effective techniques. It is possible that after application of all reasonable best management practices, some TMDLs or their associated targets and surrogates cannot be achieved as originally established. Nevertheless, it is DEQ's expectation that nonpoint sources make a good faith effort to achieving their respective load allocations in the shortest practicable time.

DEQ recognizes that expedited implementation of TMDLs will be socially and economically challenging. Further, there is a desire to minimize economic impacts as much as possible when consistent with protecting water quality and beneficial uses. DEQ further recognizes that, despite the best and most sincere efforts, natural events beyond the control of humans may interfere with or delay attainment of the TMDL and/or its associated targets and surrogates. Such events could be, but are not limited to floods, fire, insect infestations, and drought. Should such events occur that negate all BMP activities, the appropriateness of reimplementing BMPs will be addressed on a case by case basis. In any case, post event conditions should not be exacerbated by management activities that would hinder the natural recovery of the system.

For some pollutants, pollutant surrogates have been defined as targets for meeting the TMDLs. The purpose of the surrogates is not to bar or eliminate human access or activity in the basin or its riparian areas. It is the expectation, however, that the specific implementation plan will address how human activities will be managed to achieve the water quality targets and surrogates. It is also recognized that full attainment of pollutant surrogates (system potential vegetation, for example) at all locations may not be feasible due to physical, legal, or other regulatory constraints. To the extent possible, the implementation plan should identify potential constraints, but should also provide the ability to mitigate those constraints should the opportunity arise. If a nonpoint source that is covered by the TMDL complies with its finalized implementation plan, it will be considered in compliance with the TMDL.

DEQ intends to regularly review progress of the implementation plan. If DEQ determines the implementation plan has been fully implemented, that all feasible management practices have reached maximum expected effectiveness, but a TMDL or its interim targets have not been achieved, DEQ may reopen the TMDL and adjust it or its interim targets.

The implementation of TMDLs and the associated plan is enforceable under the applicable provisions of the water quality standards for point and nonpoint sources by DEQ and other state agencies and local governments in Idaho. However, it is envisioned that sufficient initiative exists on the part of local stakeholders to achieve water quality goals with minimal enforcement. Should the need for additional effort emerge, it is expected that the responsible agency will work with stakeholders to overcome impediments to progress through education, technical support, or enforcement. Enforcement may be necessary in instances of insufficient action towards progress. This could occur first through direct intervention from state or local land management agencies, and secondarily through DEQ. The latter may be based on departmental orders to implement management goals leading to water quality standards.

In employing an adaptive management approach to the TMDL and the implementation plan, DEQ has the following expectations and intentions:

- Subject to available resources, DEQ intends to review the progress of the TMDLs and the implementation plans on a five-year basis.
- DEQ expects that designated agencies will also monitor and document their progress in implementing the provisions of the implementation plans for those pollutant sources for which they are responsible. This information will be provided to DEQ for use in reviewing the TMDL.
- DEQ expects that designated agencies will identify benchmarks for the attainment of TMDL targets and surrogates as part of the specific implementation plans being developed. These benchmarks will be used to measure progress toward the goals outlined in the TMDL.

- DEQ expects designated agencies to revise the components of their implementation plan to address deficiencies where implementation of the specific management techniques are found to be inadequate.
- If DEQ, in consultation with the designated agencies, concludes that all feasible steps have been taken to meet the TMDL and its associated targets and surrogates, and that the TMDL, or the associated targets and surrogates are not practicable, the TMDL may be reopened and revised as appropriate. DEQ would also consider reopening the TMDL should new information become available indicating that the TMDL or its associated targets and/or surrogates should be modified. This decision will be made based on the availability of resources at DEQ.

Monitoring and Evaluation

The objectives of a monitoring effort are to demonstrate long-term recovery, better understand natural variability, track implementation of projects and BMPs, and track effectiveness of TMDL implementation. This monitoring and feedback mechanism is a major component of the “reasonable assurance of implementation” for the TMDL implementation plan.

The implementation plan will be tracked by accounting for the numbers, types, and locations of projects, BMPs, educational activities, or other actions taken to improve or protect water quality. The mechanism for tracking specific implementation efforts will be annual reports to be submitted to DEQ.

The “monitoring and evaluation” component has two basic categories:

- Tracking the implementation progress of specific implementation plans; and
- Tracking the progress of improving water quality through monitoring physical, chemical, and biological parameters.

Monitoring plans will provide information on progress being made toward achieving TMDL allocations and achieving water quality standards, and will help in the interim evaluation of progress as described under the adaptive management approach.

Implementation plan monitoring has two major components:

- Watershed monitoring and
- BMP monitoring.

While DEQ has primary responsibility for watershed monitoring, other agencies and entities have shown an interest in such monitoring. In these instances, data sharing is encouraged. The designated agencies have primary responsibility for BMP monitoring.

Watershed Monitoring
Watershed monitoring measures the success of the implementation measures in accomplishing the overall TMDL goals and includes both in-stream and in-river monitoring. Monitoring of BMPs measures the success of individual pollutant reduction projects. Implementation plan monitoring will also supplement the watershed information available during development of associated TMDLs and fill data gaps.

In the Mid Snake River/Succor Creek TMDL, watershed monitoring has the following objectives:

- Evaluate watershed pollutant sources,
- Refine baseline conditions and pollutant loading,
- Evaluate trends in water quality data,
- Evaluate the collective effectiveness of implementation actions in reducing pollutant loading to the mainstem and/or tributaries, and
- Gather information and fill data gaps to more accurately determine pollutant loading.

BMP/Project Effectiveness Monitoring
Site or BMP-specific monitoring may be included as part of specific treatment projects if determined appropriate and justified, and will be the responsibility of the designated project manager or grant recipient. The objective of an individual project monitoring plan is to verify that BMPs are properly installed, maintained, and working as designed. Monitoring for pollutant reductions at individual projects typically consists of spot checks, annual reviews, and evaluation of advancement toward reduction goals. The results of these reviews can be used to recommend or discourage similar projects in the future and to identify specific watersheds or reaches that are particularly ripe for improvement.

Evaluation of Efforts over Time
Annual reports on progress toward TMDL implementation will be prepared to provide the basis for assessment and evaluation of progress. Documentation of TMDL implementation activities, actual pollutant reduction effectiveness, and projected load reductions for planned actions will be included. If water quality goals are being met, or if trend analyses show that implementation activities are resulting in benefits that indicate that water quality objectives will be met in a reasonable period of time, then implementation of the plan will continue. If monitoring or analyses show that water quality goals are not being met, the TMDL implementation plan will be revised to include modified objectives and a new strategy for implementation activities.

Implementation Time Frame
The implementation plan must demonstrate a strategy for implementing and maintaining the plan and the resulting water quality improvements over the long term. The final timeline should be as specific as possible and should include a schedule for BMP installation and/or evaluation, monitoring schedules, reporting dates, and milestones for evaluating progress. There may be disparity in timelines for different subwatersheds. This is acceptable as long as there is reasonable assurance that milestones will be achieved.

The implementation plan will be designed to reduce pollutant loads from sources to meet TMDLs, their associated loads, and water quality standards. DEQ recognizes that where implementation involves significant restoration, water quality standards may not be met for quite some time. In addition, DEQ recognizes that technology for controlling nonpoint source pollution is, in some cases, in the development stages and will likely take one or more iterations to develop effective techniques.

A definitive timeline for implementing the TMDL and the associated allocations will be developed as part of the implementation plan. This timeline will be developed in consultation with the WAG, the designated agencies, and other interested publics. In the meantime, implementation planning will begin immediately (2003). The goal is to attain the water quality standards and return beneficial uses to full support in the shortest time possible. DEQ expects full implementation of the TMDL and recovery of the beneficial uses to take upwards of 20 years. Some subwatersheds may take less time and some may take more, depending on the complexity of the system.