# Implementation Plan for the Lower Boise River Total Maximum Daily Load



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# Introduction

Section 303(d) of the federal Clean Water Act (CWA) requires states to develop a Total Maximum Daily Load (TMDL) management plan for waterbodies that are water quality limited. The goal of the CWA TMDL program is to correct water quality impairments and achieve beneficial uses of waterbodies through attainment of water quality standards (WQS). U.S. Environmental Protection Agency (EPA) approved a TMDL for sediments and bacteria for the lower Boise River in 2000. This Implementation Plan has been prepared to provide a framework for the local stakeholders who are ultimately responsible for ensuring that beneficial uses in the lower Boise River are achieved.

Local stakeholders consist of citizens and operators of facilities that generate point and non-point pollution sources. Community representatives of local stakeholders have worked together as part of the lower Boise River Water Quality Plan (LBRWQP), which serves as the watershed advisory group, to best determine how limited resources can be used to reach TMDL goals. This group includes local representatives from all major sectors of the local community (Appendix A). Point source implementation activities have been included directly into this plan and details of non-point source implementation activities are included in Appendices B and C.

## Organization of Plan

This Implementation Plan contains recommended elements as set forth by EPA under various rules. Although EPA issued an earlier watershed rule (EPA, 2000), the 2000 rule was withdrawn in March 2003 because it was viewed as too unwieldy by numerous groups. EPA released a new Draft Watershed Rule (EPA, 2003a), which is viewed as a replacement for the 2000 rule. This plan reflects elements identified by EPA in the 2003 Draft Watershed Rule that are applicable to the lower Boise River watershed and should be included in a watershed plan. These elements are summarized in Table 1, along with the name of the chapter in which the information can be found:

**TABLE 1**
2003 Draft Watershed Rule Implementation Elements

| Required Element | Reference Chapter of this Plan |
|---|---|
| Geographic extent of the watershed covered by the plan | Summary of Basin Assessment, TMDL, and Bacteria DNA Project |
| Applicable WQS | Summary of Basin Assessment, TMDL, and Bacteria DNA Project |
| Identification of causes and sources of pollutants that need to be controlled to achieve the needed load reductions and attain WQS and any threats to other waters | Point Source Pollution Control Efforts,<br>Urban and Suburban Storm Drainage Pollution Control Efforts,<br>Agricultural Non-Point Source Pollution Control Efforts, and<br>Other Non-Point Source Pollution Control Efforts |

**TABLE 1**
2003 Draft Watershed Rule Implementation Elements

| Required Element | Reference Chapter of this Plan |
|---|---|
| Identification of approved TMDL (e.g., allocations) and any adjustments to the wasteload allocation or load allocation | Summary of Basin Assessment, TMDL, and Bacteria DNA Project |
| Description of point and non-point source controls needed to attain WQS and identification of parties responsible for implementation and other water quality management measures needed to attain/maintain WQS, and identification of parties responsible for implementation | Point Source Pollution Control Efforts,<br>Urban and Suburban Storm Drainage Pollution Control Efforts,<br>Agricultural Non-Point Source Pollution Control Efforts, and<br>Other Non-Point Source Pollution Control Efforts |
| Estimate of load reductions expected from each management measure identified | Point Source Pollution Control Efforts,<br>Urban and Suburban Storm Drainage Pollution Control Efforts,<br>Agricultural Non-Point Source Pollution Control Efforts, and<br>Other Non-Point Source Pollution Control Efforts |
| Schedule and interim milestones, for implementation of point and non-point source controls and "…where appropriate" an estimate of the date WQS are expected to be met | Watershed Implementation Schedule |
| Description of interim, measurable milestones for non-point source management measures or "other control actions" | Watershed Implementation Schedule |
| Estimate of costs (point, non-point, and other) to meet WQS | Implementation Funding Plan |
| Identification of technical assistance, education, and outreach needed to implement the plan from local, state, and federal agencies | Watershed Implementation Schedule, Future Management Measures |
| Monitoring plan to determine if implementation and WQS attainment are on schedule | Watershed Monitoring Program |
| "Adaptive implementation process" to identify different/additional controls if attainment of applicable WQS is not expected, including criteria for determination of approved TMDL needs to be modified | Watershed Implementation Schedule, Future Management Measures |

This Implementation Plan will describe the necessary actions that are specific to the lower Boise River within a flexible and adaptive framework. To meet these required elements, this plan has been organized into four basic areas:

1. The *Summary of Basin Assessment, TMDL, and Bacteria DNA Project* provides the framework for the TMDL and this Implementation Plan and includes a summary of the DNA testing program conducted on bacteria sources in the lower Boise River watershed.
2. Specific pollution control efforts are identified in *Point Source Pollution Control Efforts, Urban and Suburban Storm Drainage Pollution Control Efforts, Agricultural Non-Point Source Pollution Control Efforts*, and *Other Non-Point Source Pollution Control Efforts.*

3. *Additional Watershed Issues* focuses on other watershed-specific issues related to this Implementation Plan such as reasonable assurance, effluent trading, land use changes, and other relevant TMDLs.

4. The final area of this plan deals with the remaining administrative pieces, which include implementation milestones / timelines (*Watershed Implementation Schedule*), monitoring goals and activities (*Watershed Monitoring Program*), possible funding sources (*Implementation Funding Plan*), and assessment and revision procedures (*Future Management Measures*).

# Summary of Basin Assessment, TMDL, and Bacteria DNA Project

## Background

Section 303(d) of the CWA requires states to prepare a list of waterbodies not meeting state WQS, otherwise known as the state 303(d) list. Using a priority ranking system, the waterbodies on the 303(d) list are scheduled for TMDL development. The TMDL describes the amount of pollutant a waterbody can assimilate and still meet WQS. EPA-approved TMDL is incorporated in the state's continued planning process as called for in Section 303(e) of the CWA.

Generally speaking, a TMDL is a pollution budget. The TMDL is typically expressed in terms of loads, or the quantity or mass of pollutant discharges contained within a waterbody. The pollution budget takes into account wasteloads from point sources and loads from non-point sources within the watershed. The budget also accounts for natural background loads, which are often uncontrollable. The budget also includes a margin of safety that accounts for any uncertainty in the science and to account for natural variability in the data.

The lower Boise River from Lucky Peak Dam to the Snake River was added to the state 303(d) list in 1992 (Figure 1). The pollutants that were listed differed depending on the segment of river. Table 2 summarizes the 1998 303(d) listed segments of the lower Boise River and the pollutants that were listed for each segment.[1]

**TABLE 2**
Summary of Section 1998 303(d) Listed Stream Segments

| Segment Boundary | Pollutants |
|---|---|
| Lucky Peak to Barber Diversion | Flow Alteration |
| Barber Diversion to Star (town) | Sediment, Oil/Grease, Dissolved Oxygen |
| Star (town) to Notus (town) | Nutrients, Sediment, Dissolved Oxygen, Temperature, Bacteria |
| Notus (town) to Snake River | Nutrients, Sediment, Dissolved Oxygen, Temperature, Bacteria |

NOTE: Flow alteration is not a pollutant and no TMDL is required to address flow alteration.

Since the 1992 and 1998 listings, temperature has been added to the Barber to Star segment. In addition, DEQ has made it clear that flow alteration is not a pollutant and no TMDL is required to address flow alteration. In the final 2002 303(d) list, DEQ is expected to move flow alteration and habitat modification for the Lucky Peak to Barber Diversion into

[1]These segment boundaries represent original "Assessment Units" as delineated in the 1998 303(d) list. The boundaries of Assessment Units have since been modified in the 2002 303(d) list; however, the original boundaries are presented here to be consistent with the 1998 TMDL.

Section 4c, which is reserved for non-traditional pollutants for which a TMDL should not be prepared.

## Subbasin Assessment and TMDL Development

The precursor to TMDL development is the subbasin assessment (SBA) or problem assessment. The SBA describes the geographic boundaries of the watershed, water quality concerns, status of beneficial uses, and the nature and location of pollution sources. The SBA also summarizes past and present pollution control efforts. The SBA is prepared prior to the TMDL to determine whether additional pollution control measures are necessary to meet state WQS (i.e., a TMDL is only developed if additional control measures are necessary).

An SBA describing water quality conditions for temperature, bacteria, sediment, dissolved oxygen (DO), and oil/grease in the lower Boise River was developed in 1998 (DEQ, 2000). The SBA concluded that DO and oil/grease were meeting state WQS and that elevated temperature conditions in the stream were largely natural. Hence, TMDLs were not developed for those pollutants. The SBA also concluded that a TMDL for "flow alteration" was not possible because it is not an allocatable pollutant and could not be addressed in the TMDL arena.

Recognizing that the Snake River and the Hells Canyon Complex TMDL process would have potential nutrient reduction implications on the lower Boise River, the Idaho Department of Environmental Quality (DEQ) elected to re-schedule the lower Boise River nutrient TMDL to 2001 (the issue of nutrients in the lower Boise River is addressed in *Snake River-Hells Canyon TMDL* in this document). The 303(d) listed tributaries in the lower Boise River basin, which include Blacks Creek, Fivemile Creek, Tenmile Creek, Mason Creek, Indian Creek, and Sand Hollow Creek were also re-scheduled for 2001. Therefore, it was concluded that a TMDL would be necessary only for sediment and bacteria in the mainstem lower Boise River at that time.

Prior to the submission of the TMDL, the LBRWQP, in cooperation with DEQ, conducted a series of load allocation workshops to develop a fair and equitable loading scenario for the stakeholders in the lower Boise River basin. The first workshop (held in March 1998) included identification of stakeholder concerns, targets discussion, load allocation concepts and alternatives (focusing on use of control points for load capacity determination), Implementation Plan concepts, and best management practices (BMP) efficiencies. The second workshop (held in May 1998) included understanding the TMDL equation, load capacity discussions, existing loads, load allocation vs. Implementation Plan, load allocation development (allocation methods and hypothetical examples), and potential load allocation methods for the lower Boise River. The final workshop (held in June 1998) included discussion of detailed allocation scenarios for sediment, regulatory basis and targets for bacteria, bacteria problem assessment, and allocation scenarios for bacteria.

Because there was essentially no capacity available in the lower river for bacteria in the mainstem (i.e., the targets were barely met at Glenwood Bridge), the load allocations were simply identified as the percent reductions needed to meet bacteria quality at the mouth of each tributary. For sediment, there was load capacity available (i.e., targets were not exceeded until Middleton) and thus a variety of allocation methods were available,

including equal percent reduction and equal concentration methods. Based on this process, the LBRWQP decided in June 1998 that it preferred the equal percent reduction method that was then used by DEQ to set the allocations. This method assigned an equal load reduction (37 percent) for all non-point sources in tributaries downstream from Middleton.

Based on these workshops, a TMDL was developed and in December 1998, DEQ submitted its TMDL for sediment and bacteria. Comments from EPA were incorporated in the DEQ TMDLs for sediment and bacteria in 1999 and EPA provided final approval of the TMDL in January 2000. A summary of the load and wasteload allocations for sediment and bacteria from the final TMDL is provided in the following sections.

Since the development and approval of the lower Boise River TMDL, federal guidance on how stormwater is addressed in TMDLs and National Pollutant Discharge Elimination System (NPDES) permits has evolved. For the purposes of the TMDL, the LBRWQP and DEQ determined in 1998 that all stormwater runoff should be treated as non-point source pollution (e.g., specific numeric load reductions where appropriate to meet sediment targets and bacteria criteria, BMPs were an acceptable method to meet TMDL goals). This determination was made regardless of whether a specific non-point source was regulated under the NPDES Phase I or Phase II stormwater programs. Part of the rationale for this determination was that stormwater NPDES permits are BMP-based. This Implementation Plan has been developed to support the approved TMDL and addresses Phase I and Phase II stormwater within a non-point framework. As explained in detail in the following sections, stormwater discharge that falls under the NPDES Phase I or II programs must follow the guidelines of these programs in order to meet the goals of the TMDL. This is particularly important in the context of the rapid urbanization that is occurring within the watershed and recent court decisions that have recognized the importance of managing stormwater to protect water quality.

In November 2002, EPA (2002b) issued guidance indicating that NPDES-regulated stormwater discharges to water quality impaired reaches and associated NPDES permits should include:

- Wasteload allocations with BMP controls for stormwater discharges[2].
- No additional controls where BMPs meet wasteload allocation and numeric limits only in rare cases.
- Multiple sources as single allocation where data and information are insufficient to assign each source / outfall an individual wasteload allocation
- Monitoring as necessary to determine compliance with limits, and mechanisms to make adjustments as required in the permits

Thus, LBRWQP and DEQ recognize that the TMDL is not consistent with current TMDL development guidance. However, stormwater improvements contained in this plan rely on BMP-based limits, independent of whether the stormwater is regulated under the NPDES Phase I or Phase II programs. Additionally, monitoring and the opportunity to modify BMPs to meet the goals of the TMDL are important components of this plan.

[2]EPA (2002b) guidance affirms that storm water not regulated within the NPDES program can be addressed by numeric non-point load allocations.

LBRWQP and DEQ recognize that anticipated future TMDLs for the lower Boise River and its tributaries (e.g., phosphorus, temperature, and mercury) will be developed using the applicable state and federal guidance that may treat NPDES-regulated stormwater as a point source. As these TMDLs are developed and guidance evolves, this Implementation Plan will be updated, as appropriate.

## Sediment TMDL Load and Wasteload Allocations

As described in Table 2, three segments of the lower Boise River are listed for sediment. The segments are defined from Barber Diversion to Star, Star to Notus, and Notus to the Snake River. To evaluate sediment conditions in the lower Boise River, surrogate total suspended sediment targets were developed. The targets for total suspended sediment in the Boise River are 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. These targets should be met on an annual basis because the beneficial uses to be protected occur year-round.[3] The targets are designed to provide protection for the mix of cold and warm water species that inhabit the lower Boise River downstream of Lucky Peak. A detailed discussion of the selection of the sediment targets is available in Technical Appendix G of the lower Boise River TMDL (DEQ, 2000).

The subbasin assessment showed that total suspended sediment concentrations in the Barber Diversion to Star segment, as measured at Glenwood Bridge, did not exceed the target. However, total suspended sediment concentrations were exceeded in the lower two segments, as measured at Middleton and Parma. TMDL load and wasteload allocations for total suspended sediments and suspended solids were established so that the target criteria would be met at all locations in the lower Boise River.

### Sediment Load Allocations for Non-point Sources

Twelve tributaries to the lower Boise River and the river riparian corridor received load allocations for total suspended sediment. The allocations were designed to meet the total suspended sediment goals of 50 mg/L and 80 mg/L in the full length of the Boise River, with checkpoints at the Middleton and Parma gage sites. As shown in Table 3, two monitored tributaries and a portion of the riparian load contributed to the overall river load at Middleton, while the remaining tributaries and riparian load contributed to the load at Parma. Because of the extensive system of diversions along the length of the river, suspended sediments input at any given point do not travel in their entirety to the mouth of the river. The loads were designed using a mass balance of inflows and diversions, with the target criteria as the goals.

The goal of the load and wasteload allocations was to create target loads for tributaries and wastewater treatment facilities (WWTFs) that create conditions by which the targets for suspended sediment are met in the river. The load and wasteload allocations were designed such that they will maintain the 50 mg/L and 80 mg/L targets in the Boise River. The application of targets is annual, not seasonal; however, the critical period on which the TMDL was based is seasonal (February 15 through June 14) because this is the period that coincides with when the lowest mainstem flow coincides with the largest sediment inputs to

[3]However, the critical period upon which the TMDL was based is seasonal (February 15 through June 14) because this is the period that coincides with when the lowest mainstem flow receives the largest sediment inputs to the river. Monitoring should, at a minimum, occur in this time frame to determine whether load reductions during this period are being achieved.

the river. Monitoring should, at a minimum, occur in this time frame to determine whether load reductions during this period are being achieved. The loads were developed to ensure that, with a sufficient margin of safety, the 50 mg/L target would be met at all locations in the Boise River given seasonal 30-day minimum flows.

Using the mass balance approach, analysis showed that total suspended sediment targets were met upstream from Middleton. Thus, three contributing areas (the Riparian Area #1, Eagle Drain, and Thurman Drain) upstream from Middleton were assigned sediment loads equal to the 1995 loads used to develop the TMDL (as summarized in Table 3). Implementation of Phase I stormwater requirements (including the application of 12 stormwater BMPs listed in Appendix K of the TMDL) are expected to be sufficient to meet the goals of the TMDL. Likewise, implementation of Phase II requirements above Middleton are expected to be sufficient to meet the goals of the TMDL. For other unregulated non-point sources above Middleton, including those within Riparian Area #1, Eagle Drain, and Thurman Drain, implementing reasonable control activities (e.g., BMPs) to maintain current sediment loads is expected to be sufficient to meet the goals of the TMDL.

Tributary loads below Middleton must be reduced by 37 percent in order to meet the 50 and 80 mg/L targets in the river. Since 1992 had the lowest flows on record since 1928, it represented an extreme, and rare low flow condition that created stringent load reduction requirements. The reduction percent (37) was applied to median year (1995) total suspended sediment loads for each tributary to determine load allocations. The load calculated for the 30-day low flow in 1995 is a critical condition that is conservative, but likely to occur relatively frequently in comparison to the most extreme conditions, and thus is a better basis for establishing load targets than the most extreme condition on record. Table 3 displays the 1995 loads, and the load allocations that represent 37 percent reductions included in the approved TMDL.

**TABLE 3**
Total Suspended Sediment Load Allocations

| Name | 1995 Suspended Sediment Load (tons/day) | Suspended Sediment Load Allocation (tons/day) |
|---|---|---|
| Eagle Drain | 1.61 | 1.61* |
| Thurman Drain | 0.34 | 0.34* |
| Riparian Load #1 | 2.45 | 2.45* |
| Fifteenmile Creek | 28.6 | 18.02 |
| Star Feeder | 2.75 | 1.73 |
| Long Feeder | 0.56 | 0.35 |
| Watts Creek | 0.45 | 0.28 |
| Mill Slough | 11.24 | 7.08 |
| Willow Creek | 3.62 | 2.28 |
| Mason Slough | 1.91 | 1.20 |
| Mason Creek | 34.1 | 21.48 |

**TABLE 3**
Total Suspended Sediment Load Allocations

| Name | 1995 Suspended Sediment Load (tons/day) | Suspended Sediment Load Allocation (tons/day) |
|---|---|---|
| East & West Hartley Gulch | 8.43 | 5.31 |
| Indian Creek | 9.11 | 5.74 |
| Conway Gulch | 11.34 | 7.14 |
| Dixie Drain | 41.12 | 25.91 |
| Riparian Load #2, #3 | 4.90 | 4.90* |

*No load reductions necessary

These loads were analyzed in the TMDL for the very low flow year of 1994 and were shown to protect the targets with a sufficient margin of safety.

## Sediment Wasteload Allocations for Point Sources

Point source discharges (including both municipal WWTFs and industrial discharges) in the lower Boise River watershed also contribute suspended solids to the river. Relative to the mass of sediment entering the river via the tributaries, the point source discharges are quite small. All facilities must meet minimum program, percent removal, and other requirements as stated in their NPDES permits. Because most of the point sources in the valley 1) already remove 85 percent or more of suspended solids, 2) provide treatment beyond the instream targets, and 3) provide additional assimilative capacity, further treatment would have resulted in high costs with little tangible benefit to the river. The wasteload allocations for total suspended solids are based on NPDES permit limitations for each facility, either in current or draft permits, plus a reserve for future growth. The allocations are summarized in Table 4.

**TABLE 4**
Suspended Solids Wasteload Allocations

| Facility Name | Design Flow (MGD) | Suspended Solids Wasteload Allocation (lbs/day) |
|---|---|---|
| Lander Street | 15 | 3,400 lbs / day monthly[1]<br>5,000 lbs / day weekly[1]<br>2,500 lbs / day monthly[2]<br>3,750 lbs / day weekly[2] |
| West Boise | 24 | 6,200 lbs / day monthly<br>9,300 lbs / day weekly |
| Meridian | 2.82 | 710 lbs / day monthly<br>1,065 lbs / day weekly |
| Nampa | 11.76 | 3,000 lbs / day monthly<br>4,500 lbs / day weekly |

**TABLE 4**
Suspended Solids Wasteload Allocations

| Facility Name | Design Flow (MGD) | Suspended Solids Wasteload Allocation (lbs/day) |
|---|---|---|
| Caldwell | 8.48 | 2,125 lbs / day monthly<br>3,183 lbs / day weekly |
| Star | 0.33 | 193 lbs / day monthly<br>290 lbs / day weekly |
| Middleton | 1.83 | 1,070 lbs / day monthly<br>1,605 lbs / day weekly |
| Notus | 0.056 | 33 lbs / day monthly<br>50 lbs / day weekly |
| Armour | 0.475 | 125 lbs / day monthly<br>154 lbs / day weekly |

[1]April 1 through September 30
[2]October 1 through March 31

Included in the sediment wasteload allocation is a 3.62-tons / day reserve for growth to account for the expected increase in population in the valley. The reserve for growth for each treatment plant is the sum of the expected suspended solids loads that will occur in a 20-year build-out scenario, relative to the wasteload allocations. Thus, the size of the reserve represents the difference between current design flows and the flows expected after 20 years of population growth in the Treasure Valley. The reserve for each facility is based on existing flows and currently permitted suspended solids concentrations. While the 3.62-tons / day reserve is watershed-wide, each facility is allocated a portion of the reserve. The reserve, if used by the treatment plants, will not exceed the sediment targets or affect the allocations for non-point sources established in the TMDL.

## Bacteria TMDL Load and Wasteload Allocations

Two segments of the Boise River, Star to Notus and Notus to the Snake River, required the development of bacteria TMDLs. The goal of the bacteria TMDLs for the two segments is to meet applicable state criteria for primary and secondary contact recreation in the river. At the time the TMDL was developed, the TMDL targets for bacteria were based on the state fecal coliform criteria for primary and secondary contact recreation. The compliance points for bacteria loading are Glenwood Bridge, the Middleton gage site, and the Parma gage site. Both primary and secondary contact recreation beneficial uses have associated numeric criteria in Idaho's *Water Quality Standards and Wastewater Treatment Requirements (*IDAPA 58.01.02). When the TMDL for bacteria was developed, these criteria were based on fecal coliform bacteria colonies as follows:

- Primary contact recreation (May 1 through September 30) fecal coliform bacteria colonies (coliform forming units ([CFUs]):
  - may not exceed 500 CFU / 100 ml at any time;

  - may not exceed 200 CFU / 100 ml in more than 10 percent of the total samples taken over a 30-day period; and
  - may not exceed a geometric mean of 50 CFU / 100 ml based on a minimum of five samples taken over a 30-day period

- Secondary contact recreation (all year) fecal coliform bacteria colonies:

  - may not exceed 800 CFU / 100 ml at any time;
  - may not exceed 400 CFU / 100 ml in more than 10 percent of the total samples taken over a 30-day period; and
  - may not exceed a geometric mean of 200 CFU / 100 ml based on a minimum of five samples taken over a 30-day period

In 1998, the Negotiated Rulemaking Committee for the State of Idaho proposed *E. coli* criteria as the WQS and the basis for assessing the support status of contact recreation beneficial uses. Recognizing that the shift to *E. coli* was likely, DEQ added language to the TMDL, indicating that compliance with the TMDL wasteload and load allocations could be demonstrated using *E. coli* data, rather than fecal coliform data. The intent of the bacteria TMDL is to protect human health, as demonstrated by compliance with the most current bacteria criteria. In 2000, the State of Idaho made the shift to *E. coli* in the WQS. The current standards are as follows:

- Primary contact recreation (May 1 through September 30) *E. coli* bacteria colonies:

  - may not exceed 406 CFU / 100 ml at any time;
  - may not exceed a geometric mean of 126 CFU / 100 ml based on a minimum of five samples taken every 3 to 5 days over a 30-day period

- Secondary contact recreation (all year) *E. coli* bacteria colonies:

  - may not exceed 576 CFU / 100 ml at any time;
  - may not exceed a geometric mean of 126 CFU / 100 ml based on a minimum of five samples taken every 3 to 5 days over a 30-day period

Compliance with the lower Boise River bacteria TMDL will be evaluated using the applicable *E. coli* state water quality standards to maintain the intent of the TMDL (to protect human health using the applicable standard). A summary of the TMDL load and wasteload allocations for fecal coliform is provided below. This summary is intended to provide a context for the standards change revision. The TMDL requires 90 percent-plus fecal coliform reduction goals for non-point sources (TMDL-required fecal coliform reductions are summarized below). Smaller reductions will be required when evaluating for compliance using the *E. coli* standards and data. Recognizing these points, the LBRWQP and DEQ evaluated options for meeting the bacteria reduction targets and still providing reasonable assurance that the TMDL goal of restoring contact recreation to full support would be attained. The impacts of the criteria change on the TMDL are discussed in more detail in the *Bacteria DNA Testing Project* chapter of this Implementation Plan.

In addition, in May 2002 EPA issued a public review draft Implementation Guidance for Ambient Water Quality Criteria for Bacteria (EPA, 2002a). Key items in this guidance applicable to the lower Boise River include:

- Rely on current *E. coli* biological criteria even if pathogens include non-human sources. This policy statement revises EPA's previous policy (EPA, 1994) that allowed high concentrations of non-human bacteria to justify a decision not to apply bacteriological criteria.
- Recommend use of seasonal recreational criteria in climates where swimming is not a year-round activity. The recommended seasonal criteria are based on geometric means, or using the least restrictive risk level associated with protection of primary contact.

Once the final EPA guidance document is issued (expected in 2004), this guidance is expected to be useful in refining the monitoring goals and requirements for bacteria and determining allowable loads to meet the revised *E. coli* standards and the goals of the TMDL.

At the same time the change was made to *E. coli* in the WQS, the LBRWQP applied for and received a federal 319 grant to use DNA fingerprinting to help delineate the bacteria sources in the watershed. The purpose of the study was to provide better information for prioritizing the application of bacteria BMPs within the watershed. The results of this analysis and its impact on TMDL goals are presented later in the *Bacteria DNA Testing Project* chapter of this Implementation Plan.

### Bacteria Load Allocations for Non-point Sources

The TMDL concluded that the tributaries to the lower Boise River are significant sources of bacteria loading to the river, and generally will have to reduce bacterial counts to levels close to the state bacteria criteria in order to protect contact recreation beneficial uses. The TMDL indicated that the tributaries and drains below Glenwood Bridge should be able to meet a geometric mean of 50 coliform forming units (colonies) per 100 mL (CFU / 100 mL) where they enter the river. This is because downstream of Glenwood Bridge, the river exceeded the existing bacteria standards and no in-river dilution was available for other sources.

Table 5 shows the primary contact recreation season (May 1 to September 30) geometric mean load allocations for tributaries as written in the TMDL. The current strategy for achieving these reductions within the context of the new *E. coli* standards will be discussed later.

**TABLE 5**
Bacteria Load Allocations (Fecal Coliform)

| Name | Primary Geo-Mean (CFU/100 mL) | Primary Load Allocation (CFU/100 mL) | Primary Percent Reduction |
|---|---|---|---|
| Eagle Drain | 604 | 50 | 92 |
| Thurman Drain | 758 | 50 | 93 |
| Fifteenmile Creek | 992 | 50 | 95 |
| Willow Creek | 803 | 50 | 94 |
| Mill Slough | 1,282 | 50 | 96 |
| Mason Slough | 3,507 | 50 | 99 |
| Mason Creek | 1,407 | 50 | 97 |
| East & West Hartley Gulch | 2,296 | 50 | 98 |
| Indian Creek | 770 | 50 | 94 |
| Conway Gulch | 723 | 50 | 93 |
| Dixie Drain | 2,987 | 50 | 98 |
| Riparian Corridor (Bubb)[1] | 237 | 50 | 79 |
| Riparian Corridor (Mason-Catlin)[2] | 170 | 50 | 70 |

NOTE: Fecal coliform colonies as summarized in TMDL.
[1]Represents reduction goals upstream of Glenwood Bridge
[2]Represents reduction goals downstream of Glenwood Bridge

One of EPA's concerns with the draft submission of the lower Boise River bacteria TMDL was the lack of a bacteria load reduction target for the riparian corridor (lands immediately adjacent to the river). DEQ agreed to initiate a riparian corridor-sampling program to determine the extent of non-point bacteria loading from the corridor. While the two monitored tributaries and the riparian areas that contribute to the overall bacteria loads at Glenwood Bridge were not found to impair the Boise River, these pollutant sources were still assigned a load reduction allocation.

Because the natural riparian area acts as a filter, and overland flow is often not present, DEQ personnel concluded the best way to characterize riparian runoff was to sample smaller drains that only drained the riparian area. In order to delineate between the various uses in the watershed, DEQ chose to focus on the two land uses most represented in the riparian corridor: urban / suburban and rural transitional / agricultural.

As shown in Table 5, the riparian concentrations are notably smaller than the tributary concentrations. The analysis shows that the Bubb Canal riparian sources upstream of Glenwood Bridge would need to reduce current concentrations by 79 percent to meet the TMDL standard as determined by the former fecal coliform water quality criteria. Below the Glenwood Bridge, the Mason-Caitlin riparian sources would need to reduce bacteria loads

by 70 percent to meet the TMDL goals as determined by the former fecal coliform water quality criteria.

Similar to sediment, allocations were assigned on a geographic basis. Regulated and unregulated stormwater did not receive an allocation. Under the Phase I program, the TMDL anticipated that the application of 12 stormwater BMPs listed in Appendix K (developed as part of the Ada County Highway District Management Plan and the Boise City Stormwater Management Plan) would produce further additional reductions in bacteria. Because the bacteria criteria have changed since the TMDL was developed and submitted, implementation of Phase I and II requirements is expected to be sufficient to meet the goals of the TMDL (e.g., significant reductions in bacteria concentrations). For other unregulated non-point sources, implementing reasonable control activities (e.g., BMPs) to achieve reductions in bacteria loads is expected to be sufficient to meet the goals of the TMDL (e.g., significant reductions in bacteria concentrations).

Actual *E. coli* load reductions required to protect human health as specified in the current WQS will vary from load reductions identified in the approved TMDL. Since the TMDL was approved, additional *E. coli* data have been collected and are summarized here to provide a preliminary indication of how the load reductions specified in the TMDL may change within the 5-year review process.

Boise City has compiled *E. coli* data collected by the U.S. Geological Survey (USGS), local agencies complying with NPDES permit requirements, and other interested stakeholders. A summary of recent *E. coli* bacteria monitoring (1999 through 2002) conducted by the USGS and NPDES permittees for the Boise River and local drains is presented in Figure 2 and Table 6. The USGS collects samples at four mainstem stations (Diversion Dam, Glenwood Bridge, Middleton, and Parma), while Boise City currently conducts NPDES-required *E. coli* monitoring at three mainstem sites (Veteran's Bridge, Glenwood Bridge, and South Channel at Eagle Bridge); the cities of Caldwell, Middleton, and Meridian currently are not required to conduct mainstem river sampling for *E. coli* under their respective NPDES permits. The Boise City NPDES monitoring data are included in Figure 2 and Table 6.

**TABLE 6**
Summary of Currently Available *E. coli* Monitoring Data

| USGS Gage Number | Description | Type | Sample N | *E. coli* Concentration (CFU/100 mL) | |
|---|---|---|---|---|---|
| | | | | Geomean | Max |
| 13203510 | DIVERSION DAM | River | 36 | 2 | 37 |
| 13204000 | VETERAN'S BRIDGE | River | 33 | 29 | 190 |
| 13206000 | GLENWOOD BRIDGE | River | 70 | 30 | 308 |
| 13206305 | EAGLE BRIDGE S CHNL | River | 33 | 30 | 310 |
| 13210007 | STAR BRIDGE | River | 7 | 61 | 140 |
| 13210050 | MIDDLETON | River | 29 | 38 | 4,800 |
| 13213000 | PARMA | River | 36 | 89 | 1,000 |
| 13206400 | EAGLE DRAIN | Drain | 19 | 191 | 730 |
| 13208750 | THURMAN DRAIN | Drain | 19 | 218 | 2,400 |

**TABLE 6**
Summary of Currently Available *E. coli* Monitoring Data

| USGS Gage Number | Description | Type | Sample N | *E. coli* Concentration (CFU/100 mL) | |
|---|---|---|---|---|---|
| | | | | Geomean | Max |
| 13210660 | TENMILE CREEK | Drain | 26 | 109 | 800 |
| 13210795 | FIVEMILE CREEK | Drain | 27 | 271 | 12,000 |
| 13210815 | FIFTEENMILE CREEK | Drain | 19 | 280 | 2,100 |
| 13210835 | WILLOW CREEK | Drain | 19 | 287 | 2,000 |
| 13210850 | MASON SLOUGH | Drain | 18 | 909 | 9,200 |
| 13210985 | MASON CREEK | Drain | 45 | 401 | 8,000 |
| 13210986 | W HARTLEY GULCH | Drain | 19 | 404 | 2,500 |
| 13210987 | E HARTLEY DRAIN | Drain | 19 | 447 | 3,200 |
| 13211445 | INDIAN CREEK | Drain | 44 | 203 | 3,200 |
| 13212550 | CONWAY GULCH | Drain | 19 | 166 | 20,000 |
| 13212890 | DIXIE DRAIN | Drain | 19 | 594 | 20,000 |
| 132108247 | MILL SLOUGH | Drain | 18 | 420 | 2,900 |

This dataset includes provisional USGS data through September 2002.

Similar to fecal coliform trends, the data suggest that average *E. coli* levels in the mainstem lower Boise River increase in the downstream direction. Specifically, average *E. coli* levels range from 5 CFU / 100 mL at Diversion Dam to an average value of 177 CFU / 100 mL at Parma. (Although Middleton does have one reported value at 4,800 CFU / 100 mL, this value appears to skew the dataset and does not accurately reflect the typical conditions during other sample events.)

The section of the lower Boise River that runs through the urban city area does not have any recorded levels of *E. coli* that exceed current state WQS. This reach of the river also has a more comprehensive dataset for *E. coli* available, with more samples available than for those stations that represent the downstream rural areas. In addition, Boise City initiated weekly *E. coli* data collection at five locations within the urban areas in April 2003 to better characterize concentrations and to evaluate whether the primary contact recreational bacteria standard is being met in the urban corridor. These data are being collected consistent with EPA (2002a) draft bacteria guidance.

Based on samples collected in the USGS-monitored creeks and drains (n values range from 5 to 22), higher average levels of *E. coli* ranging from 298 to 2,261 CFU / 100 mL are evident as compared to the mainstem.

The same dataset was also examined for seasonality of *E. coli* levels. Figures 3 and 4 show the monthly *E. coli* levels for the combined river and drain sites, respectively. The monthly river values (Figure 3) appear to meet the applicable state WQS in all months and at all locations. The data show a small increase during the irrigation season, but are still within the applicable standard for protection of human health. The monthly drain values (Figure 4) exceed applicable state WQS for protection of human health at the mouth of nearly all

drains. The drains show a pattern of increased bacteria levels during the irrigation season, similar to the river sites but more pronounced.

The monthly river values appear to show a small increase during the irrigation season, while the monthly drain values show a relatively larger increase during the irrigation season.

In addition to the mainstem sites, five NPDES stormwater permit drain sampling sites are sampled by the MS4 co-permittees (these outfalls are listed in downstream order):

- 001 51-N at Walnut Street
- 002 Lucky Drive
- 003 Koppel's
- 004 Franklin Road
- 005 Production Avenue

Of these storm drains, only the Walnut and Koppel's sites enter the lower Boise River directly; the remaining sites discharge to other canals and ditches.

The available *E. coli* data from the wet weather sampling are highly variable and currently of limited sample size. Thus, an accurate characterization of the data can be completed only when additional monitoring data become available, including data that can be compared against the geometric mean standards.

Local agriculture stakeholders have also conducted a monitoring program to fill in the temporal gaps in the USGS program. Sample collection for this program includes a number of the drains and creeks that the USGS is monitoring. Because the data are preliminary, none of the data collected from this effort have been included in this evaluation.

Review of the *E. coli* monitoring data reported indicates that there are a number of drains that exceed the current water quality criteria for *E. coli*. In general, the excursions occur during irrigation season with the highest reported values occurring in the June to October period. There are no follow-up sampling events reported for any of the values that exceed the current water quality criteria.

Although there are data for *E. coli* for the lower Boise River and associated drains, the temporal and spatial distribution is limited. The data period for all records is limited to 2.5 years maximum, and in some cases only part of 1 year. There is also a lack of sampling data against which to compare a 30-day geometric mean value based on a minimum of five samples for most sites, the exception being the five river sites monitored weekly by Boise City beginning in April 2003. In addition, the sites that have monitoring data are limited to primarily the upper reaches of the lower Boise River. There is currently insufficient data to support a TMDL evaluation for the lower reaches of the Boise River. However, the preliminary data suggest that the revised load reductions based on *E. coli* monitoring data are likely to be lower than load reductions specified in the TMDL and summarized in Table 5. A sampling program to collect enough data to be able to characterize the temporal and spatial variability is addressed in the *Watershed Monitoring Program* section of this plan.

For those sources that are required to comply with NPDES Phase I or Phase II stormwater requirements, implementing stormwater protections included in these NPDES permits is

expected to be sufficient to meet the bacteria-reduction goals of the TMDL. For other non-point stormwater sources that are not required to comply with NPDES stormwater requirements, implementing either reasonable control activities (e.g., meeting appropriate components of the six minimum measures, as described more completely in later sections of this plan or proposing reasonable activities to reduce bacteria loads) is expected to be sufficient to meet the bacteria-reduction goals of the TMDL.

### Bacteria Wasteload Allocations for Point Sources

Wasteload allocations for bacteria, in general, are based on the concentration requirement equal to existing NPDES WWTF permit limits. Based on the effluent fecal coliform geometric mean for each facility, no reductions are necessary for the NPDES WWTF permitted facilities, as shown in Table 7.

**TABLE 7**
Mean Bacteria Levels for WWTF Point Source Discharges

| Facility Name | Average Fecal Coliform Geometric Mean (CFU/100 mL) |
|---|---|
| Lander Street | 12 |
| West Boise | 16 |
| Meridian (discharge to Boise River) | 9 |
| Meridian (discharge to Fivemile Creek) | 9 |
| Nampa | 65 |
| Caldwell | 4 |
| Middleton | 21 |
| Star | 24 |
| Notus | 47 |
| Wilder | 16 |
| Armour | 10 |

NOTE: Fecal coliform colonies as summarized in TMDL. For comparison, the previous average fecal coliform standard for primary contact recreation was 50 CFU/100 ml, which means that (with the exception of Nampa) these values are between 1.1 and 12.5 times lower than the former standard.

Wasteload allocation for municipal NPDES discharges were included as permit limits, which are the water quality criteria in effect at the time of permit issuance. For wasteload allocations that are part of NPDES WWTF permits, the wasteloads for fecal coliform should remain through the duration of a 5-year permit cycle. Because *E. coli* are used as the new Idaho criteria for contact recreation, the new *E. coli* criteria will be incorporated into the re-issued permits in place of fecal coliform requirements.

## Bacteria DNA Testing Project

In some locations in the lower Boise River watershed, more than 90 percent reductions were required for fecal coliform bacteria in the TMDL (Table 5). The LBRWQP received a federal 319 grant to conduct a bacteria DNA testing program to better focus the efforts for bacteria reduction through BMPs. The DNA testing defined the actual sources of bacteria at selected

sampling locations in the Boise River and major tributaries. The complete final report can be downloaded from the LBRWQP website (http://www.lbrwqp.boise.id.us/dna.htm).

### Sampling and Testing Program

The first step in this program was to assemble a database of fecal DNA. *E. coli* cultures were grown from the fecal samples of cows, sheep, humans, ducks, and geese, and the DNA from these samples were identified. Dr. Mansour Samadpour (Institute for Environmental Health [IEH], Seattle, Washington) developed a library of DNA fingerprints of *E. coli* strains isolated from various sources, to identify the sources of *E. coli* strains within water samples. This DNA testing was used to identify potential sources of bacteria at selected sampling locations in the lower Boise River, two tributaries, two drains (i.e., the riparian corridor discussed previously), and two stormwater discharges. In addition, stakeholders in the lower Boise River watershed collected scat samples of animals and wildlife within the watershed for IEH to develop a local bacteria DNA fingerprint. The cities of Boise and Nampa also provided several bacteria cultures developed from their WWTF effluent to develop local human bacteria DNA fingerprints.

The second step involved collecting grab samples of river water from the sample sites, isolating a portion of the sample to determine the concentration of fecal coliform, and sending these to IEH for DNA fingerprinting analysis. At IEH, the fecal coliform was removed from the water sample and the DNA was isolated and identified. This DNA was matched to the DNA "fingerprints" to identify the source.

### Testing Results and Analysis

Overall, a collection of 1,564 *E. coli* colonies was established from water and storm drain samples taken from the main stem of the Boise River (Glenwood Bridge and Parma Bridge), the two tributaries (Indian Creek and Dixie Slough), two riparian stations (Ann Morrison Park and Eagle Island), and two urban stormwater stations (Walnut Street and Americana Boulevard). Of the total number of isolated *E. coli* colonies (1,564), a bacteria source for 1,079 (69 percent) was able to be positively identified. Although the absolute numbers of unidentified sources vary by location depending on how many total samples were collected, unidentifiable colonies consistently occur throughout the watershed.

The results for those *E. coli* colonies that could be positively identified for the watershed as a whole are presented in Table 8. The percent match column in Table 8 represents the percent of positively identified *E. coli* colonies attributed to a particular source (1,079).

**TABLE 8**
Summary of DNA Results for Lower Boise River Watershed

| Source | Number of Matches | Percent Match | Controllable Source | Uncontrollable Source |
|---|---|---|---|---|
| **Total Pet** | 233 | 21.6% | | |
| Cat | 29 | 2.7% | X | |
| Dog | 197 | 18.3% | X | |
| Dog-Cat (Pet) | 7 | 0.6% | X | |
| **Total Human** | 185 | 17.1% | X | |

**TABLE 8**
Summary of DNA Results for Lower Boise River Watershed

| Source | Number of Matches | Percent Match | Controllable Source | Uncontrollable Source |
|---|---|---|---|---|
| **Total Livestock** | 118 | 10.9% | | |
| Cow | 75 | 6.9% | X | |
| Goat | 2 | 0.2% | X | |
| Horse | 25 | 2.3% | X | |
| Pig | 5 | 0.5% | X | |
| Poultry | 1 | 0.1% | X | |
| Sheep | 10 | 0.9% | X | |
| **Total Avian / Waterfowl** | 377 | 34.9% | | |
| Avian | 319 | 29.6% | | X |
| Duck and Goose | 58 | 5.4% | | X |
| **Total Wildlife** | 166 | 15.4% | | |
| Deer and Elk | 34 | 3.2% | | X |
| Feline | 36 | 3.3% | | X |
| Canine | 23 | 2.1% | | X |
| Fox | 2 | 0.2% | | X |
| Opossum | 4 | 0.4% | | X |
| Rabbit | 4 | 0.4% | | X |
| Raccoon | 11 | 1.0% | | X |
| Rodent | 51 | 4.7% | | X |
| Squirrel | 1 | 0.1% | | X |

The results indicate that human sources comprise 17 percent of total identifiable bacteria throughout the watershed. The other 83 percent is made up of pets (22 percent), avian and waterfowl (35 percent), wildlife (15 percent), and livestock (11 percent).

As discussed in detail in the complete final DNA report, because the identifiable sources only comprise 69 percent of the total number of sampled colonies, the actual contributions from each of these source groups may be different than these values. The exact distribution of unidentifiable sources cannot be determined because the DNA fingerprinting method used in this study is not predictive. However, the results of those source groups that could be positively identified should be used to begin to decide how to best allocate existing resources to reduce bacteria loads to the system.

Table 9 provides a summary of results for each specific sampling station. These results have been grouped together by major classification, as specified in Table 8.

**TABLE 9**
Summary of Grouped DNA Results by Sampling Location

| Location | Human | Pets | Livestock | Avian / Waterfowl | Wildlife | Unknown |
|---|---|---|---|---|---|---|
| *Mainstem Stations* | | | | | | |
| Glenwood Bridge | 18% | 17% | 0% | 27% | 8% | 31% |
| Parma Bridge | 13% | 6% | 18% | 25% | 9% | 29% |
| *Drains and Tributaries* | | | | | | |
| Walnut Street | 10% | 29% | 0% | 29% | 15% | 17% |
| Ann Morrison | 13% | 14% | 0% | 26% | 14% | 34% |
| Americana | 21% | 35% | 0% | 13% | 4% | 28% |
| Eagle Island | 13% | 11% | 2% | 39% | 13% | 23% |
| Indian Creek | 9% | 13% | 8% | 20% | 11% | 39% |
| Dixie Slough | 3% | 8% | 16% | 23% | 14% | 36% |

In general, these data show that human influences (including pets) decrease and agricultural influences increase throughout the watershed in the downstream direction. Avian and waterfowl sources are the largest contributors (between 13 and 39 percent), with no large differences between the upstream urban and downstream rural areas. These two sources have been lumped relative to the other sources, even though they each have somewhat different indicators of habitat use. Avian sources make up 84 percent of this lumped category (and are the largest singular contributor overall), while duck/goose wastes make up 16 percent in this category. That is, for every duck/goose source identified throughout the watershed, more than five avian sources were identified. Wildlife sources consistently range from 4 to 15 percent throughout the watershed.

## Potential Impact on Bacteria TMDL Goals

The DNA source identification project indicates that of the identifiable colonies, more than 50 percent originates from sources such as waterfowl and wildlife. Of those colonies that could be positively identified, the total human contribution to bacteria appears to decrease somewhat as the river and its tributaries flow from predominantly urban areas to more rural areas in the downstream direction. If pets are included in this category, the combined contribution of humans and pets follows the same decreasing trend, while the influence of livestock increases. In urban areas, pet waste contributions are even higher than human waste. In rural areas associated with agricultural sources, cow wastes contribute the highest percentage, perhaps from livestock grazing along banks or an increase in density of concentrated animal feeding operations (CAFOs) and animal feeding operations (AFOs). This suggests that available resources should be spent controlling human and pet sources in the upper reaches and human, pet, and agricultural sources in the lower reaches.

The LBRWQP and DEQ evaluated the options for meeting the bacteria reduction targets and still providing reasonable assurance that the TMDL goal of restoring contact recreation to full support would be attained. In evaluating the options, the LBRWQP and DEQ determined that re-writing the approved bacteria TMDL to reflect the *E. coli* standard was

not necessary. While the TMDL is based on the former fecal coliform standard, compliance can be based on *E. coli* because the bacteria TMDL is based on protecting public health. Therefore, complying with the *E. coli* standard ensures that public health is protected. Re-writing the TMDL would require re-initiating the public comment process and would require re-approval by EPA. Both of these processes would be time consuming and unnecessary given that a shift to the *E. coli* standard in the Implementation Plan is expected to achieve the same result. Although it is premature to use preliminary monitoring data to determine support status, the revised load reductions based on *E. coli* criteria are likely to be lower than load reductions specified in the TMDL.

As part of these discussions regarding the new *E. coli* standard, the option of changing the applicable recreational beneficial uses was also raised because of the seasonality of recreational uses in the system. However, the LBRWQP and DEQ determined that seeking to change the primary contact recreation beneficial use in the river to secondary contact recreation was not possible because primary contact recreation is an existing use. Therefore, changing the use would have been precluded under the CWA. It is important to reiterate that EPA's draft Implementation Guidance for Ambient Water Quality Criteria for Bacteria (2002a) recommends use of seasonal recreational criteria in climates where swimming is not a year-round activity. The recommended seasonal criteria are based on geometric means, or using the least restrictive risk level associated with protection of primary contact. This approach may be appropriate for the lower Boise River and will be evaluated within the context of the Adaptive Management strategy outlined in this plan.

The option that surfaced as the most appropriate is to recognize that while the DNA source identification data suggest there is a large percentage (more than 50 percent) of avian / waterfowl / wildlife bacteria sources in the watershed, the data also show that there are controllable sources (e.g., humans, livestock, and pets). To address the controllable sources, the respective source groups have outlined methods to develop and / or enhance management practices to control these sources specifically. Concurrently, the LBRWQP, DEQ, and USGS will implement an iterative process by which *E. coli* data will continue to be collected and bacteria levels will continue to be monitored. These data will be reviewed by DEQ on a 5-year schedule (as outlined in the *Watershed Monitoring Program* section) to revise the locations and level of bacteria load reductions that will be required to comply with the current *E. coli* standards. It is expected, based on the preliminary data presented in Figures 2, 3, and 4, that the required reductions for *E. coli* are likely to be lower than those stipulated for fecal coliform. In addition, many of the lower Boise River tributaries are scheduled for bacteria TMDLs (as noted below in *Lower Boise River Tributary TMDLs*); these future TMDLs should provide revised tributary load allocations based on additional monitoring data.

In addition, as the management practices that limit the controllable sources are implemented and become effective, the number of anthropogenic *E. coli* organisms in the water will reduce, leaving other sources as background. This approach is consistent with IDAPA 58.01.02.070.06, which states that where natural background conditions exceed any applicable water quality criteria, the background level shall become the applicable site-specific water quality criteria. Changes to this standard include additional language specifying that "where both natural and anthropogenic factors cause exceedence of criteria, anthropogenic sources shall be responsible for that portion of the exceedence caused by anthropogenic sources" (DEQ, 2001a).

# Point Source Pollution Control Efforts

Within the lower Boise River watershed, point sources discharge into the Boise River and its tributaries under NPDES permits[4]. Sources discharging to the lower Boise River include Boise City (Lander Street WWTF and West Boise WWTF), City of Star WWTF, City of Middleton WWTF, City of Caldwell WWTF, and City of Notus WWTF (DEQ, 2000). In addition to these sources, the City of Meridian WWTF discharges to Fivemile Creek and the City of Nampa WWTF and Armour Meats both discharge to Indian Creek. Each source discharges both suspended solids and bacteria into the river.

In addition to the requirements stipulated in their respective NPDES permits, pollution prevention efforts by municipal and industrial entities are encouraged within the watershed as another mechanism to control pollutants entering the treatment systems prior to discharge to the lower Boise River. Pollution prevention is considered to include any activity (including the use of materials, processes, or practices) that reduce or eliminate the creation of pollutants or wastes at the source. Also called source reduction, these efforts reduce waste volumes and/or toxicity of wastes generated. It is recognized that pollution prevention efforts may also reduce pollutants that are not specifically addressed by this TMDL but may be in the future.

Finally, all point sources are generally required to properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) used to achieve compliance with the conditions of the NPDES permits. This Implementation Plan encourages point sources to also conduct proper maintenance and replacement of conveyances to the treatment plants. Leaky conveyances (for example, older sewer lines) can potentially release pollutants to the underlying groundwater, as well as provide a pathway for impacted groundwater to infiltrate the sewer systems and eventually reach the lower Boise River. This issue will intensify as land and water uses change in the rapidly urbanizing watershed and the conjunctive uses between groundwater and surface water management increase.

## Sediment Control Actions

For suspended solids, all of these facilities must meet minimum percent removal requirements as stated in their NPDES permits. Therefore, the wasteload allocations for suspended solids were based on NPDES permit limitations for each facility, either in current or draft permits, as summarized in *Summary of Basin Assessment and TMDL*. Monthly average suspended solids permit limits range from 30 to 70 mg/L, and the associated suspended solids wasteloads vary according to the design flows for each discharger.

The TMDL states that "...changes in loads from treatment plants have negligible effects on the Boise River itself, since sediment contributions come largely from tributaries. For

[4]As discussed previously, storm water sources that are regulated under NPDES Phase I or Phase II programs are treated as non-point sources in this Implementation Plan, which is consistent with the approved TMDL for sediment and bacteria in the lower Boise River.

example, a 35 percent reduction in suspended solids loads from the two Boise City facilities results in only a 1 percent net change in the river. Since most of the treatment plants in the valley already remove 85 percent or more of suspended solids, further treatment at this time would result in high costs with little tangible benefit to the river" (DEQ, 2000).

Therefore, in order to meet the TMDL suspended solids targets, point sources are being required to treat their effluents to meet their existing permit limits. The most recent permit limits for suspended solids for all point sources to the lower Boise River can be accessed via the EPA Region 10 website (http://www.epa.gov/region10/).

## Bacteria Control Actions

As summarized in *Summary of Basin Assessment and TMDL*, wasteload allocations for bacteria contain a concentration requirement, that is equal to existing permit limits. In order to meet the TMDL bacteria targets, point sources are required to treat their effluents to meet their existing permit limits, which are equal to the standards at the end-of-pipe (i.e., with no dilution allowance). Thus, no additional reductions of bacteria are necessary for NPDES-permitted facilities.

NPDES permit limits for bacteria are currently expressed in fecal coliform terms because the current permits were developed prior to the adoption of the *E. coli* standard. However, all facilities are required to monitor for *E. coli* before the current permits expire and it is anticipated that future permits will include revised bacteria limits to reflect the *E. coli* standard. The most recent permit limits for bacteria for all point sources to the lower Boise River can be accessed via the EPA Region 10 website (http://www.epa.gov/region10/).

## Schedule for Implementation

Because all of these facilities operate under current NPDES permits, and are expected to do so into the indefinite future, these control actions have already been implemented. Monitoring the effectiveness of point source control actions is addressed later in this plan.

## Costs of Implementation

Because all of these facilities operate under current NPDES permits, and are expected to do so into the indefinite future, no additional costs for these control actions associated exclusively with this TMDL are anticipated. However, additional significant costs will likely be incurred as a result of other watershed activities, such as complying with the Snake River-Hells Canyon TMDL (e.g., phosphorus, temperature, mercury).

# Urban and Suburban Storm Drainage Pollution Control Efforts

To address urban and suburban storm drainage pollution control efforts, a contractor to DEQ developed an Implementation Plan on behalf of the Urban Residential Stormwater Work Group. The Urban/Suburban Implementation Plan, included as Appendix B, identifies implementation activities designed to reduce non-point pollutants in discharges to the lower Boise River and its tributaries from urban and suburban land use activities. Although this plan does not specifically address non-point issues in the rural areas of the watershed, many of the same principals and ideas can be applied as appropriate. Rural communities and sources are encouraged to adopt similar control measures to meet the TMDL requirements.

The following objectives have been identified to achieve the goal of pollutant reduction:

- Integration of TMDL implementation activities and the federal Phase II stormwater requirements
- Adaptive management through the use of BMPs and measurable goals with built-in milestones for determining effectiveness and making adjustments
- Partnerships to improve efficiency through shared resources and optimize effectiveness by focusing on watershed priority areas

The effects of stormwater runoff on the beneficial uses of receiving waters are difficult to isolate and characterize because of the nature of urban runoff. Stormwater discharges are short-term and intermittent, not continuous. Likewise, the relationship between outfall discharges and the sources of pollutants is complicated by several factors. The drainage patterns in the lower Boise River watershed have been altered by irrigation systems. Water does not follow natural drainage paths in much of the lower Boise valley. Stream alterations and man-made waterways have created new drainage areas that are significantly different from the natural sub-watershed areas (DEQ, 2000).

Many existing drainage ways were built over and downstream outlets eliminated, which created situations where there were no options for surface discharge of runoff. As a consequence of limited disposal options and the costs associated with developing a public storm drain system, many local governments in the lower Boise River watershed require on-site control of post-development runoff. In many areas, it is now the responsibility of the developer to control drainage and stormwater runoff on his property. The short-term intermittent nature of runoff, the lack of connectivity of many drainage systems, and the on-site detention requirements must all be considered in evaluating stormwater runoff and its impacts.

Entities with responsibilities for the management of stormwater are located in Ada and Canyon counties, and the communities of Boise, Garden City, Eagle, Meridian, Star, Kuna, Nampa, Caldwell, Middleton, Notus, and Parma. Stakeholders have been identified as

entities that operate systems that receive stormwater runoff from or have jurisdiction over urban and suburban land use activities that have the potential to contribute pollutants to urban runoff. Stakeholders also include local governments (e.g., counties, municipalities, highway districts[5], drainage districts) and the State of Idaho (e.g., Idaho Transportation Department [ITD], Boise State University [BSU]).

Federal stormwater requirements are a phased approach to the regulation of discharges from separate storm sewer systems (MS4s) through the NPDES permitting program. An MS4 means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) designed or used for collecting or conveying stormwater (40 CFR 122.26(b)(8)). The NPDES stormwater program currently has two phases: the Phase I stormwater regulation covers medium and large MS4s and the Phase II stormwater regulation covers a certain subset of small MS4s.

Within the Boise area, a Phase I NPDES Stormwater Permit was issued in November 2000. Co-applicants include Boise City, the Ada County Highway District (ACHD), Ada County Drainage District 3 (DD3), Garden City, BSU, and ITD District 3 (ITD3). The permit obligations for these entities go beyond the requirements that must be addressed by Phase II MS4s.

The timing of Phase II of the federal stormwater regulations and the lower Boise River TMDL provides an opportunity for stakeholders to create a stormwater program designed to achieve the objectives of both sets of requirements. As indicated earlier, the Phase II stormwater regulation covers a certain subset of small MS4s. Entities other than local governments may be regulated, including ITD, highway districts that operate within regulated areas, universities, hospitals, prisons, drainage districts, and irrigation districts if they meet the definition of a MS4. EPA considers MS4s with load allocations through an EPA-approved TMDL as significant contributors of pollutants to waters of the United States. EPA's preliminary list of candidate communities that are within regulated Urban Areas for Phase II includes the following local governments in the Treasure Valley[6]:

- Portions of Ada County
- Caldwell
- Portions of Canyon County
- Eagle
- Meridian
- Middleton
- Nampa

Star, Kuna, Notus, and Parma are not identified but the list of candidates is subject to change based on U.S. Census Bureau Urbanized Area maps and/or other information. Again, because the permit obligations for Phase I entities go beyond the requirements that

[5]The Urban/Suburban Implementation Plan does not specifically address rural roads because these roads are generally outside of the jurisdiction of stakeholders in urban and suburban areas. However, many of the same principals outlined in this source plan apply to rural roads as discussed further under *Other Non-Point Source Pollution Control Efforts*.

[6] Although Boise City and Garden City meet the size requirements for Phase II stormwater, these entities are already covered under the Phase I stormwater program.

must be addressed by Phase II MS4s, Boise City and Garden City are not required to submit Phase II documentation.

Not all of the entities listed above own or operate a MS4 system (for example, Ada County Development Services, Eagle, and Meridian notified EPA that they do not fall under the Phase II program because they do not own or operate a MS4 system). However, all of the entities within the Urban Areas will likely enter into cooperative agreements eventually, as appropriate, because land use planning is a critical tool in stormwater management. As such, entities that do not fall under the Phase II NPDES program are still an integral part of the effort to help reduce the discharge of pollutants into the local waterways that reach the lower Boise River.

Thus, the control measures identified in the Phase II rule for reducing pollutants in stormwater runoff are the same activities that communities not subject to the Phase II Rule should consider in determining how to meet the lower Boise River TMDL requirements. For those sources that are not required to comply with NPDES Phase II stormwater requirements, implementing either similar control measures (e.g., meeting appropriate components of the six minimum measures) or proposing reasonable activities to maintain current sediment loads is expected to be sufficient to meet the goals of the TMDL. These activities include those actions that are required of all entities that are subject to NPDES general permits. Most notably, EPA recently reissued a revised General Permit for Construction Activities that regulates stormwater discharges associated with large construction activities (disturbance of 5 or more acres), as well as small construction activities (disturbance of between 1 and 5 acres). All entities within the watershed must meet these EPA stormwater requirements to meet the goals of the TMDL.

## Sediment and Bacteria Control Measures

Because of the intermittent nature of stormwater discharges, there is often a need for additional pollutant load characterization information (e.g., seasonal or representative event-mean pollutant loads) to identify appropriate control measures to meet WQS. For example, available stormwater characterization data were submitted in the initial Phase I stormwater NPDES permit application in 1994, along with a monitoring plan that described additional stormwater pollutant load and characterization data to be collected during the first permit cycle. As the permit application for the second permit cycle is developed, the co-permittees are to review the additional stormwater data and reassess the overall planning strategy, selected controls, policies, and programmatic measures. This approach reflects how stormwater management plans, and associated BMPs, adapt over time in subsequent permits to provide for the attainment of WQS, where necessary.

The Phase II stormwater requirements require a MS4 operator to design a stormwater management plan so that it:

- Reduces the discharge of pollutants to the “maximum extent practicable” (MEP);
- Protects water quality; and
- Satisfies the appropriate water quality requirements of the CWA.

The main requirement of the Phase II permits will be for the MS4 operator to develop and implement six stormwater management programs, or minimum measures (40 CFR Parts 9, 122, 123, and 124; Federal Register Pg. 68722 Vol. 64 No. 235). These measures are:

1. Public education and outreach
2. Public participation / involvement
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post-construction stormwater management
6. Pollution prevention / good housekeeping for municipal operations

Each stakeholder will select appropriate BMPs after considering their situation and objectives for each minimum measure. The BMPs chosen should work toward one or more common program objectives related to stormwater quality improvement and should reduce pollutants to the MEP. These objectives and subsequent program implementation activities should reflect TMDL requirements. The objectives should be based on what is known about existing pollutant sources and problems in the watershed(s) and what is required by the minimum measure. The objective can be something that can be quantified, or it can be a goal or purpose statement.

MS4s covered under Phase II are not required to show numerical results to substantiate that they are improving their water quality. Instead, they are allowed to rely on the use of BMPs to meet the required minimum measures to the MEP.

There is no regulatory definition of MEP in order to allow the permitting authority and regulated MS4s maximum flexibility in their interpretation of it as appropriate. Compliance with the technical standard of MEP requires the successful implementation of approved BMPs. The Phase II Final Rule considers narrative effluent limitations that require the implementation of BMPs and the achievement of measurable goals as the most appropriate form of effluent limitations to achieve the protection of water quality, rather than requiring that stormwater discharges meet numeric effluent limitations.

Measurable goals are described in the Phase II rule as BMP design objectives or goals that quantify the progress of program implementation and the performance of BMPs. They are milestones used to track the progress and effectiveness of BMPs in reducing pollutants to the MEP. They can be used to assess compliance with both NPDES permit and TMDL requirements. Measurable goals will enable local governments, DEQ, and EPA to gauge administrative compliance and measure water quality improvements. Measurable goals contain descriptions of actions taken to implement each BMP, what will be achieved by each goal, and the frequency and dates for such actions to be taken. A baseline is established against which future progress at reducing pollutants to the MEP can be measured.

The implementation strategy for controlling sediment and bacteria levels relies on a tiered approach that accounts for:

1. Existing activities that control pollutants in stormwater runoff;

2. The pollutant reductions inherent in land use changes associated with the conversion of agricultural land;

3. Pollutant reductions associated with the development and implementation of programs required by the federal stormwater regulations; and

4. Specific projects or activities designed to achieve additional reductions in identified priority areas.

Because the resources to achieve the TMDL pollutant reduction requirements are limited, there is a need to prioritize activities and sub-watersheds for implementation of additional BMPs to achieve pollutant reductions beyond those that result from existing activities, pollutant reductions associated with land conversion, and Phase II activities.

The prioritization approach is based primarily on a consideration of subbasin location, existing loads, and growth patterns. It provides an objective framework for identifying where projects or activities will be most cost-effective. The subbasins identified that best met the criteria of location, loads, and growth (in alphabetical order) are the Dixie Slough, Fifteenmile Creek (which includes Lower Fivemile and Tenmile Creeks in the consideration of pollutant loads), Indian Creek, and Mason Creek. These subbasins are considered as priority areas for the implementation of activities beyond the requirements of Phase II because they provide opportunities to achieve the largest pollutant reductions and the largest benefit for the resources invested relative to other areas. In addition, these tributaries discharge into the mainstem, where flows are relatively low because of irrigation withdrawals, which suggests that these loads have a particularly important impact on mainstem water quality. The BMP projects tracking database (discussed in more detail under the *Watershed Monitoring Program*) can also be used as a decision-support tool for prioritizing projects.

## Schedule for Implementation

Stormwater Phase I NPDES permittees have been implementing programs and activities for improving stormwater runoff quality for several years. The first year of their 5-year NPDES permit began November 29, 2000. Annually, and at the end of each 5-year permit period, permittees evaluate programs and activities and make adjustments as needed.

Plan implementation is based on a schedule related to the proposed timeframes associated with the Phase II stormwater requirements. The schedule is based on the assumption that TMDL compliance and reporting activities will coincide with Phase II permit requirements to facilitate the development of stormwater management programs that integrate and achieve the requirements of both simultaneously.

Activities and milestones are expected to occur over a 5-year time period, beginning in 2003. These activities and milestones are described in more detail in Appendix B and under the *Watershed Implementation Schedule* section of this plan. Load reductions required to meet TMDL requirements will be achieved over a 10-year time period with activities to meet the Phase II six minimum measures phased in over the first 5 years. Milestones are based on the assumption of full implementation in the first 5 years with mid-course corrections to programs and activities based on annual evaluations of the progress made toward the measurable goals identified in each jurisdiction's stormwater management plan. This approach is consistent with the adaptive management strategy presented later in this Implementation Plan.

# Costs of Implementation

Costs to implement Phase I stormwater requirements have been estimated by the five co-permittees. On an annual basis, combined costs for Boise City, ACHD, Garden City, DD3, BSU, and ITD3 range between $959K and $982K. Over the 5-year cycle for the current permit, total combined costs for these permittees are estimated at between $5.2 million and $6.1 million. Additional costs are anticipated as the Phase I permit is renewed past the current 5-year cycle.

Although the cost of implementing Phase II stormwater requirements is difficult to estimate at this time, EPA has developed cost estimates for the six minimum measures for local municipalities. These costs range from $1.33/capita to $7.73/capita. Other analyses have further refined EPA cost estimates and determined that costs could range from $1.37/capita per year (during the initial 5-year permit cycle) for smaller communities (10,000 people, for an annual cost of $13,700) to $10.96/capita per year (during the initial 5-year permit cycle) for larger communities (50,000 people, for an annual cost of $548,000). These estimates do not include additional costs that would be incurred by contractors, developers, and other entities. In addition, these estimates do not consider existing activities that may already be occurring but are not accounted for in a specific NPDES permit.

Additional discussion of implementation costs is included in the Urban/Suburban Implementation Plan (Appendix B) and funding strategies are discussed in more detail in the *Implementation Funding Plan* section of this document.

# Agricultural Non-Point Source Pollution Control Efforts

The State of Idaho uses a non-regulatory approach to control agricultural non-point sources. Under the CWA and State law, source controls from irrigated agriculture are voluntary. The CWA specifically excludes "return flows from irrigated agriculture" from the definition of "point source" [33 U.S.C. Sec. 1362(14); CWA Sec. 502(14)] and NPDES permit requirements [33 U.S.C. Sec. 1342(l)(1); CWA Sec. 402(l)(1)].

The Idaho Agricultural Pollution Abatement Plan (IDEQ, IDL, SCC, 1991) was developed to provide direction to the agricultural community IDAPA 58.01.02.054.07). A portion of this abatement plan outlines responsible agencies or elected groups, such as the soil conservation districts, that are necessary to address non-point source pollution problems. To address agricultural non-point source pollution control efforts, the Ada Soil & Water Conservation District (Ada SWCD), Canyon Soil Conservation District (Canyon SCD), U. S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), Idaho Soil Conservation Commission (SCC), and the Idaho Association of Soil Conservation Districts (IASCD) voluntarily developed an Implementation Plan for Agriculture (Appendix C) [7]. The effort to reduce pollutants of concern and achieve WQS and targets is expected to continue for the long-term through the use of feasible and cost-effective BMPs.

IDAPA 58.01.02 specifies that if WQS are not being met, even with the use of BMPs, the state may request that the designated agency evaluate and/or modify the BMPs to protect beneficial uses.[8] However, it is expected that a voluntary approach will be able to achieve the necessary non-point load allocations. Public involvement and agricultural community participation demonstrates a willingness to implement BMPs and protect water quality.

The Implementation Plan for Agriculture, included as Appendix C, includes a summary document for the watershed as a whole and separate sub-appendices for each major tributary sub-watershed that was assigned a wasteload allocation in the TMDL.

Objectives of the Implementation Plan for Agriculture include:

- Restore the chemical, physical, and biological integrity of the lower Boise River
- Achieve the total suspended sediment target in the lower Boise River of 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days
- Achieve the bacteria target in the Lower Boise River for fecal coliform colonies (not to exceed 800/100 ml at any time for secondary contact recreation, and not to exceed 500/100 ml at any time for primary contact recreation)

[7] Because phosphorus reductions will be required in the lower Boise River watershed to meet the final Snake River-Hells Canyon TMDL, the Implementation Plan for Agricultural includes phosphorus controls.

[8] The standards also provide that the state may seek injunctive relief for those situations that may be determined to be an imminent and substantial danger to public health or environment (IDAPA 58.01.02.350.02(a)).

- Achieve the bacteria target in the lower Boise River for *E. coli* colonies (not to exceed 576 CFU / 100 ml at any time for secondary contact recreation, and not to exceed 406 CFU / 100 ml at any time for primary contact recreation)
- Maintain current no-net-increase target for total phosphorus loading to the lower Boise River until a phosphorus target is established at the mouth of the Boise River through the Snake River-Hells Canyon TMDL process
- Reduce soil losses on treated cropland to the soil loss tolerance level "T" for the crop rotation[9]
- Improve salmonid spawning habitat within the applicable reaches of the lower Boise River
- Preserve and enhance agricultural lands within the lower Boise River watershed
- Educate agricultural landowners and operators in the lower Boise River watershed regarding the TMDL process and water quality

Of the total watershed acreage of 839,835 acres, approximately 508,798 acres drain directly to the lower Boise River and potentially impact water quality. The remaining acres are located either in Upper Fivemile, Upper Tenmile, Upper Indian, and Sand Hollow watersheds that do not drain directly to the lower Boise River or in Lake Lowell that will be dealt with under a separate TMDL process scheduled for 2006. Of the 508,798 acres that drain directly into the lower Boise River, 167,689 acres (32.5 percent) are classified as agricultural and are addressed by the Implementation Plan for Agriculture in Appendix C. Table 10 provides a summary of the agricultural land uses for the watershed.

**TABLE 10**
Summary of Agricultural Land Uses

| Land Use | Acres [a] | Percent of Watershed Area [b] |
|---|---|---|
| Surface-Irrigated Cropland | 115,798 | 22.8 |
| Surface-Irrigated Pasture | 20,212 | 4.0 |
| Sprinkler-Irrigated Cropland and Pasture | 23,084 | 4.5 |
| Non-Irrigated Pasture | 2,495 | 0.5 |
| Feedlots and Dairies | 3,208 | 0.4 |
| Orchards and Vineyards | 2,892 | 0.3 |
| Total | 167,689 | 32.5 |

[a]SCC compiled these acreage values in 2000-2001.

[b]SCC calculated these percentage values based on total watershed acreage of 508,798 acres that does not include Upper Fivemile, Upper Tenmile, Upper Indian, Sand Hollow, or Lake Lowell watersheds.

9"T" values are defined by the average annual rate of soil erosion (tons/acre/year) that could occur without causing a decline in long-term soil productivity. Values range from 1 to 5 depending on soil properties and prior erosion.

It is important to note the rapid conversion of agricultural lands into urban uses is occurring within the watershed. This conversion affects the contributing load, as well as the fate and transport of sediment and other pollutants to the lower Boise River. This issue is discussed in detail under *Land Use Changes*.

In the Implementation Plan for Agriculture, the key agricultural land uses that are addressed include surface-irrigated cropland and pasture, sprinkler-irrigated cropland and pasture, non-irrigated (riparian) pasture, and feedlots and dairies.

In order to allocate available resources most effectively, funding should be focused within the highest priority tributary sub-watersheds. Furthermore, within the tributary sub-watersheds, funding should be allocated according to a tiered method. Within each sub-watershed, critical acres are prioritized for treatment based on their location to a waterbody of concern and the potential for pollutant transport and delivery to the receiving waterbody. It is difficult to determine pollutant delivery potential in a watershed with extremely modified surface hydrology systems. In the lower Boise River watershed, one farmer's wastewater often becomes another farmer's irrigation water. Accordingly, the following is a general rule that applies to the prioritization of critical acres within each tributary sub-watershed:

- Tier 1: Fields directly adjacent to either the tributary of concern or a drain to the tributary of concern; or fields having a direct and substantial influence on the tributary of concern
- Tier 2: Fields in the sub-watershed with an indirect, yet substantial influence on the tributary of concern
- Tier 3: Fields upland in the sub-watershed that indirectly influence the tributary of concern

The Implementation Plan for Agriculture identifies sources of pollutants within the watershed, critical acres contributing pollutants to the Boise River, and priority areas for treatment and BMPs that will have the greatest effect on water quality when applied on agricultural land.

Specifically, the plan focuses on land treatment through application of BMPs. It is important to note that the Implementation Plan for Agriculture is not intended to identify which specific BMPs are appropriate for specific farm fields, but rather it provides a watershed approach for addressing water quality problems attributed to runoff from agricultural lands. Specific source and BMP information for sediments and bacteria is provided in the following sections.

## Sediment Control Actions

In terms of total suspended sediments, surface-irrigated croplands are the most critical and highest priority agricultural lands for treatment. Significant soil movement can occur under surface irrigation practices, where water has been diverted, applied, and allowed to run off a field for reuse or as waste. The most erosive irrigation land use occurs on surface-irrigated

cropland fields with soil slopes ranging from 1 to 7 percent and planted with low-residue row crops such as sugar beets, commercial onions, dry beans, and field corn.

In addition to surface erosion, storm events great enough to cause erosion and runoff are sources of sediment from all land uses where exposed soils are present and riparian grazing also occurs along many drains and canals. River bank erosion is most significant in the spring runoff period during flood control and during storm events, and may be enhanced by soil-disturbing activities in and adjacent to the river. Although the amount of soil loss has not been calculated, the loss of in-channel sediment is still evident and part of the load at the mouth of the river. Soils deposited on the river bottom from upstream bank erosion or tributary loads are susceptible to further transport during higher flows. Bedload sampling has been identified as a data gap that would likely provide insight into the amount of in-channel erosion that is occurring.

Sediment high priority areas include Fifteenmile Creek (including lower Fivemile and Tenmile Creeks), Mason Creek (including Noble and Solomon Drains), and Dixie Slough. Medium priority areas include Mason Slough, Conway Gulch, Mill Slough, Lower Indian Creek, Willow Creek, and E. & W. Hartley Gulch.

The following sediment BMPs (Table 11) are available for use by landowners within the Boise River TMDL agricultural implementation area.

**TABLE 11**
Sediment BMPs for Agriculture

| Sediment BMPs | Sediment and/or Erosion Control Effectiveness | Installation Costs | Maintenance Costs |
|---|---|---|---|
| Sediment Basin | High | Low | Moderate |
| Underground Outlet | High | High | Low |
| Buried Pipeline | High | High | Low |
| Surge Irrigation System | High | High | Moderate |
| Sprinkler Irrigation System | High | High | Moderate |
| Drip Irrigation System | High | High | Moderate |
| Pipeline | High | High | Low |
| Polyacrylamide (PAM) | Moderate | Moderate | Moderate |
| Straw Mulching | Moderate | Moderate | Moderate |
| Irrigation Water Management | Moderate | Low | Low |
| Filter Strips | Moderate | Low | Low |
| Conservation Tillage | Moderate | Low | Low |
| Conservation Cropping Sequence | Moderate | Low | Low |

NOTE: These sediment BMPs, as well as others, are discussed in the Appendix C (Sub-Appendix 1 under Best Management Practices of Southwest Idaho) and the Agricultural Pollution Abatement Plan (1991).

The most important BMP for addressing water quality concerns is Irrigation Water Management (IWM) because controlling irrigation water effectively is the key to reducing soil erosion and sedimentation losses.[10] IWM involves providing the correct amount of water at the right time, to not only optimize crop yield but also to minimize excess surface water runoff and deep percolation. However, without advanced irrigation systems, such as surge, sprinkler, or drip irrigation, water management is often difficult, time consuming, and labor intensive. Reducing soil losses under conventional surface irrigation systems requires a commitment from the farm operator to use proper IWM techniques at all times.

From a water quality protection standpoint, sprinkler and drip irrigation methods have been shown to be very effective at controlling runoff. However, these methods may not be appropriate or feasible for every farm. In addition, conversion to sprinkler and drip irrigation methods may have consequences on water quantity and groundwater return flows. These are issues that will continue to be addressed as the water resources in the Treasure Valley are managed for future growth.

## Bacteria Control Actions

For bacteria (*E. coli*), irrigated pasture, dairy operations, feedlots, and pasture are the most critical and highest priority agricultural lands requiring treatment. Sources of bacteria from agricultural land use include dairies, feedlots, and pasture. Dairies and feedlots are under state regulations or strict recommendations to eliminate runoff for up to a 25-year, 24-hour storm event, as well as average 5-year runoff rates from feeding and milking facilities. Where animal wastes are applied to lands, existing NRCS standards are being applied to dairy operations to ensure manure applications are balanced to match crop uptake.[11] There is very little potential for bacterial losses from cropland that is not receiving land applications of animal waste. Maximum bacteria losses are not quantified in the NRCS state standards, but it is strongly recommended that runoff with potential bacterial contamination be contained on facilities and croplands. Again, IWM is one of the most critical BMPs for reducing pollutant losses from agricultural land.

From a water quality protection standpoint, sprinkler and drip irrigation methods have been shown to be very effective at controlling runoff. However, these methods may not be appropriate or feasible for every farm. In addition, conversion to sprinkler and drip irrigation methods may have consequences on water quantity and groundwater return flows. These are issues that will continue to be addressed as the water resources in the Treasure Valley are managed for future growth.

In addition, grazing exists along many drains and canals. Livestock that have unimpeded access to the water throughout pastures increase the chance of depositing fecal matter into or near the water.

[10] IWM is the most important BMP that can used to address water quality concerns because although it has moderate effectiveness, the installation and maintenance costs are low. Thus, the overall benefit-cost for this BMPs is good.

[11] Recent court cases, including the 9th Circuit ruling in the Bosma case, determined that CAFO wastes applied to fields should be included in NPDES permit-controlled “facilities”. Because the watershed remains primarily surface-irrigated, the lands available for application of CAFO regulated solids/liquids could be limited. The approach outlined in this plan will continue to be refined as legal actions are resolved and regulations evolve.

Bacteria high priority areas include Dixie Slough and Mason Slough. Medium priority areas include Mason Creek (including Noble and Solomon Drains), Mill Slough, Lower Indian Creek, Willow Creek, E. & W. Hartley Gulch, Fifteenmile Creek (including lower Fivemile and Tenmile Creeks), Boise River Riparian Corridor, Mammon Gulch, and Eagle Drain.

The following bacteria BMPs (Table 12) are available for use by landowners within the Boise River TMDL agricultural implementation area.

**TABLE 12**
Bacteria BMPs for Agriculture

| Bacteria BMPs | Bacteria Control Effectiveness | Installation Costs | Maintenance Costs |
|---|---|---|---|
| Livestock Exclusion | High | Moderate | Low |
| Nutrient Management | High | Moderate | Low |
| Dike | High | High | Low |
| Waste Management System | High | High | Moderate |
| Waste Storage Pond | High | High | Low |
| Filter Strips | Moderate | Low | Low |
| Wetland Development and Restoration | Moderate | High | Moderate |
| Pasture and Hayland Management | Moderate | Moderate | Moderate |
| Irrigation Water Management | Moderate | Low | Low |
| Livestock Watering Facility | Moderate | Low | Low |
| Prescribed Grazing | Moderate | Low | Low |
| Fencing | Low | Moderate | Low |

# Schedule for Implementation

Specific activities and milestones are described in more detail in Appendix C and under the *Watershed Implementation Schedule* section of this plan. The proper time to revisit the sub-watersheds for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

Several factors, including the following, affect BMP implementation for irrigated agriculture:

***Financial*** **—** The primary constraint on BMP implementation is limited availability of funding. Low commodity prices result in very limited margins (revenues after farm operating and family living expenses) available to commit to BMP implementation. Although cost-sharing opportunities are often available to farmers through local, state, and

federal entities, the cost-sharing rates are often not adequate enough to ensure widespread funding for BMP implementation. Changes in commodity prices, operating expenses, and federal and state funding priorities may further constrain the availability of funds for water quality projects.

Many non-structural BMPs described in the subwatershed implementation plans involve annual treatment expenses (such as application of PAM). Structural BMPs such as sprinkler systems require substantial initial capital expenditures to purchase and install equipment and construct structures. Both non-structural and structural BMPs require annual operation and maintenance in order to function properly. The cost estimates in the subwatershed implementation plans do not include operation and maintenance or replacement costs.

Under the CWA in Idaho, implementation of control strategies to reduce discharges from irrigated lands is voluntary. It is not reasonable to expect farmers to commit financial resources to BMP implementation if those resources are essential to continue operations or to support their families.

***Crop Requirements*** **—** Onions and seed crops are more appropriately produced using furrow irrigation than with sprinkler irrigation. Onions and seed crops are adversely affected by overhead sprinkler irrigation. The comparative climatic advantage for onion and seed crop production in the Treasure Valley is directly associated with the absence of rainfall, which promotes high quality. If onions receive regular rainfall or sprinkler irrigation, they become inoculated with fungal and bacterial diseases. These diseases can cause both losses before harvest, and tend to make the crop decompose during storage. Subsurface drip irrigation, however, is an appropriate method for irrigating onions, but requires significant start-up and annual operating expenses to remain effective.

***Hydrologic*** **—** Many irrigation systems utilize, and may rely entirely, upon return flows from upstream or upgradient irrigation. Recharge from delivery and use of irrigation water replenishes the shallow aquifer in the Boise Valley. The majority of water flows in the Boise River below Star are generated by return flows. For these reasons, eliminating or significantly reducing return flows will significantly impact water use, recharge, and the hydrologic balance in the Lower Boise River watershed.

***Value of Land in the Treasure Valley*** **—** As a result of the rapidly increasing Treasure Valley population, much of the acreage currently in agricultural production is increasing in value for urban and suburban development. Land that would previously have sold for $3,000 / acre for farming is now being sold for up to $30,000 / acre for housing. Consequently, many farmers who own and farm land within the watershed have decided not to invest in additional farm improvements (i.e., BMPs for water quality), and are instead awaiting offers from developers.

# Costs of Implementation

The costs to install BMPs on agricultural lands have been estimated to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Overall costs to reduce sediment, bacteria, and phosphorus transport from agricultural lands to the Boise River are difficult to estimate due to a variety of factors, including the variability in crops and existing irrigation methods.

Based on typical costs to install moderate level BMPs (i.e., moderately effective BMPs) on critical acreage within the agricultural portion of the watershed, it is estimated that agricultural BMP installation may cost as much as $73.7 million if all three tiers of surface-irrigated cropland in addition to surface-irrigated pasture, non-irrigated pasture, and CAFO / AFO units are addressed. If BMPs are only installed on Tier 1 surface-irrigated cropland and surface-irrigated pasture, and CAFO / AFO units, the agriculture implementation cost is significantly lower ($28.8 million).

Additional discussion of implementation costs are discussed in the Implementation Plan for Agriculture (Appendix C) and funding strategies are discussed in more detail in the *Implementation Funding Plan* section of this document.

# Other Non-Point Source Pollution Control Efforts

In addition to the source pollution control efforts previously identified (point sources regulated under the NPDES program, urban and suburban stormwater addressed under the NPDES Phase I and II stormwater programs, and voluntary agricultural non-point sources), there are other minor sources within the lower Boise River watershed. This section addresses sources that were previously identified as orphan sources in earlier versions of this Implementation Plan.

## Rural Roads

The Urban / Suburban Implementation Plan summarized previously and included as Appendix B does not specifically address rural roads because these roads are generally outside of the jurisdiction of stakeholders in urban and suburban areas. However, many of the same stormwater management principals related to urban roads apply to rural roads.

Highway districts within Idaho have the exclusive general supervision and jurisdiction over all highways and public rights-of-way within their highway system (Idaho Code 40-1310). Highways are defined to include necessary stormwater systems that are incidental to the preservation or improvement of the highway (Idaho Code 49-109(5)). However, under Idaho law, highway districts have no land use planning powers and have limited input on this issue. Because land use planning is a critical tool in stormwater management, highway districts must coordinate stormwater management programs with the appropriate cities and counties that do have land use planning powers, and conduct comprehensive planning processes and who have regulatory and enforcement authority. In addition, according to Idaho Code 39-3601 et. seq., ITD is the designated management agency for implementing the TMDL for construction on public roads. In other watersheds, ITD has taken the lead on bringing together the responsible entities (including local highway districts) to address pollutants from rural roads. In the lower Boise River watershed, ITD has relied on the activities of each of the respective highway districts as outlined below primarily because most road-related activities in this watershed deal with road maintenance. ITD3 is open to forming cooperative agreements regarding rural roads to meet the goals of the TMDL.

In the lower Boise River watershed, rural roads within the two counties are being addressed somewhat differently because of jurisdictional constraints. Within Ada County, ACHD operates an MS4 system as a part of the county-wide highway system that it oversees. While a portion of this MS4 system is currently regulated under the NPDES Phase I stormwater program, ACHD has also submitted a NPDES Phase II municipal stormwater permit to address roads in the remaining portion of the county (ACHD, 2003). It is important to note that ACHD intends to apply the BMPs specified in the Phase II permit to the unregulated areas of Ada County to be fair and equitable and to meet the goals of the TMDL. While the requirements for the Phase II program are certainly different than those required under Phase I, ACHD has developed their Phase II Municipal Stormwater Management Plan to

incorporate many of the existing program and activities developed to comply with the requirements of the joint Phase I NPDES permit. Additional BMPs that address the six minimum measures are included based on activities that reduce pollutants addressed by the TMDL, identified problems, local conditions, and existing programs and activities.

Within Canyon County, four highway districts operate separate highway systems. The Canyon Highway District and Nampa Highway District have submitted Stormwater Management Plans under Phase II for those portions of their district that fall within the urbanized areas. These plans outline BMPs designed to meet the six minimum measures over a 5-year period.

Although the Notus-Parma Highway District operates roads that mostly fall outside Phase II regulated areas and the Golden Gate Highway District operates roads that all fall outside Phase II regulated areas, watershed-wide reductions in sediment stipulated in the TMDL will necessitate the involvement of these highway districts on a voluntary basis. (Likewise, the Canyon Highway District and Nampa Highway District may elect to apply the BMPs stipulated in their Phase II permit application to unregulated areas on a voluntary basis at the discretion of their respective boards.) Similar to other stormwater sources that are not yet regulated under the NPDES stormwater program, these districts are being encouraged to voluntarily adopt BMPs similar to those under the Phase II program as appropriate. Thus, the control measures identified in the Phase II rule for reducing pollutants in stormwater runoff are the same activities that communities not subject to the Phase II rule should consider in determining how to meet the lower Boise River TMDL requirements.

Because the Phase II program is expected to improve water quality in the mainstem river, the required milestones for voluntary activities undertaken by stormwater sources not regulated under Phase II are being phased in as discussed further under the *Watershed Implementation Schedule*.

## Septic Systems

The results of the DNA study (summarized in *Bacteria DNA Testing Project*) indicate that human sources are present throughout the watershed. On a percentage basis, the total human contribution to bacteria appears to decrease somewhat as the river and its tributaries flow from predominantly urban areas in Ada County to more rural areas in Canyon County in the downstream direction. However, on a concentration basis, human sources contribute higher levels of bacteria in the rural areas versus the urban areas. Potential human sources are likely recreational users of the river, as well as leaky sewer lines that provide a conduit for untreated sewage to reach the groundwater and potentially nearby surface waterbodies.

In addition, septic systems may be contributing bacteria to surface waterbodies including the mainstem lower Boise River and its tributaries. Compared with other potential bacteria sources in the watershed, the relative contribution from septic drainfields is likely relatively small; however, the potential exists (particularly from older faulty systems) and is addressed in this section of the plan. As expanding urbanized areas influence new developments and incorporate older properties that rely on septic systems, centralized wastewater treatment systems are expected to help reduce future bacteria contamination from this source.

In cooperation with DEQ, the Central District Health Department (CDHD) and the Southwest District Health Department (SWDHD) oversee septic systems within the watershed. These entities assist DEQ in ensuring that new septic systems are designed properly and that older septic systems are repaired as appropriate.

For new subdivisions proposing the use of individual septic systems, the districts require property developers to investigate potential impacts to groundwater and surface water from on-site wastewater treatment systems. The districts rely on guidance contained in the Technical Guidance Manual for Individual and Subsurface Sewage Disposal Systems (DEQ, 2001c). This DEQ manual provides guidance on meeting the state rules for individual and subsurface sewage disposal systems. Because of the dynamic and complex nature of small wastewater disposal systems, this manual serves as an ongoing technical guidance document. First adopted in 1985, the Technical Guidance Manual was most recently updated in 2001.

DEQ also requires that all applicants for large soil absorption systems and some applicants for central septic systems conduct a site investigation that includes a nutrient-pathogen evaluation. Because the lower Boise River watershed incorporates numerous nitrate priority areas, these requirements are generally enforced throughout the watershed. The nutrient-pathogen evaluations are intended to ensure that the effluent from proposed treatment systems will not adversely impact waters of the state. DEQ's guidance document Nutrient-Pathogen Evaluation Program for On-Site Wastewater Treatment Systems (2002) provides direction to those required to perform nutrient-pathogen evaluations either under a district health department's land development program or DEQ's oversight of central septic systems and large soil absorption systems. Because the nutrient-pathogen program uses nitrates as a conservative surrogate for other nutrients and pathogens, it also provides protection against bacteria contamination.

The districts believe that older faulty septic systems are exceptions in the lower Boise River watershed. Generally, when a septic system's failure is evident either through back-ups or surfacing onto the ground, owners contact the districts to remedy the situation relatively quickly. Alternatively, during financing or refinancing processes lenders may require the districts to conduct mortgage survey site evaluations. These surveys include the review of the existing water and sewage facilities and any faulty systems are discovered during this process. Faulty systems are upgraded to the best system possible given the site-specific conditions of the property. Thus, the ongoing activities of the health districts are expected to be sufficient to meet the bacteria-reduction goals of the TMDL for rural septic systems. If long-term monitoring suggests that human sources continue to be contributors throughout unsewered portions of the watershed, it may be appropriate under an Adaptive Management strategy for CDHD and SWDHD to inventory older houses to determine the magnitude of septic system contribution.

## Leaky Sewer Lines

The last former orphan source (as identified in earlier versions of this Implementation Plan) includes leaky sewer lines from wastewater collection and treatment systems. Leaky conveyances (for example, older sewer lines) can potentially release wastes to the underlying groundwater, as well as provide a pathway for impacted groundwater to

infiltrate the sewer systems and eventually reach the lower Boise River. This issue will intensify as land and water uses change in the rapidly urbanizing watershed and the conjunctive uses between groundwater and surface water management increase. Each individual sanitary sewer operator will address proper maintenance and replacement of sewer as part of operation and maintenance issues.

NPDES permit requirements generally include provisions related to the proper operation and maintenance for all facilities and systems of treatment and control (and related appurtenances) that are installed or used to achieve compliance with the conditions of the permit. Although this is generally not interpreted to include the collection system, each NPDES owner and operator typically includes ongoing pipeline maintenance as part of their long-term capital improvement programs.

## Other Rural Orphan Issues

Additional orphan sources associated with the rural portion of the watershed include CAFO / AFO / dairies that are under the size thresholds for consideration by NRCS / SCC; leaky lagoons for regulated and unregulated animal operations; proximity of regulated and unregulated operations to shallow groundwater; “size” of the regulated and unregulated CAFO / AFO / dairies in equivalent human populations; and percent compliance of regulated CAFO / AFO / dairies with application rates.

However, limited financial resources will constrain addressing these sources because they are a lower priority than other agricultural sources. As resources are available and applied to higher-priority agricultural issues, these orphan issues will be addressed as part of the Adaptive Management approach outlined in this plan.

# Additional Watershed Issues

To meet the goals of this plan, it is important to discuss other programs and trends that will affect the success of this plan. Specifically, reasonable assurance, effluent trading within the watershed, the effects of land use changes, potential effects from the Snake River-Hells Canyon TMDL, and potential effects from the lower Boise River tributary TMDLs are presented in this section.

## Reasonable Assurance

For watersheds that have a combination of point and non-point sources where pollution reduction goals can only be achieved by including some non-point source reduction, a reasonable assurance that reductions will be met must be incorporated into the TMDL (EPA, 1991). The load reductions for the lower Boise River TMDL will rely on non-point source reductions to meet the load allocations to achieve desired water quality and to restore designated beneficial uses.

To ensure that non-point source reduction mechanisms are operating effectively, and to give some quantitative indication of the reduction efficiency for in-place BMPs, monitoring will be conducted. The monitoring will not be carried out on a site-specific basis but rather as a suite of indicator analyses monitored at the inflow and outflow of the segments within the lower Boise River TMDL reach and at other appropriate locations such as the inflow of tributaries. Monitoring activities are discussed in more detail in the following chapter of this plan.

If instream monitoring indicates an increasing pollutant concentration trend (not directly attributable to environmental conditions) or a chronic violation of standards despite use of approved BMPs or knowledgeable and reasonable efforts, then BMPs for the non-point sources activity will be modified by the appropriate agency to ensure protection of beneficial uses. This process is known as the "feedback loop" in which BMPs or other efforts are periodically monitored and modified if necessary to ensure protection of beneficial uses.

With continued instream monitoring, the feedback loop process will be used to evaluate the success of BMP implementation and its effectiveness in controlling non-point source pollution. Specifically, trend monitoring following the application of BMPs will be used to assess water quality and determine whether beneficial uses are being met. In the lower Boise River watershed, additional reasonable assurance is expected by means of effluent trading and continued land use changes discussed later in this chapter.

## Effluent Trading Within the Watershed

The lower Boise River Effluent Trading Demonstration Project is the first effluent trading project in the Pacific Northwest. The Effluent Trading Demonstration Project was initiated by EPA Region 10 and DEQ to examine how effluent trading can help improve water quality and lower the overall cost of meeting pollutant-reduction objectives established by

TMDL processes. Participants in the project included wide representation from federal, state, and local agencies with water-quality responsibilities, agriculture, municipalities, industry, and the environmental community.

Effluent trading is a way to help improve water quality by focusing on cost-effective, local solutions to problems caused by pollutant discharges to surface waters. Typically, a party facing relatively high pollutant-reduction costs chooses to compensate another party to achieve an equivalent or better, though less costly, pollutant reduction. The goal of the effluent trading program is to create a proposed trading system that is environmentally and legally sound; works within existing regulatory programs; allows trades to occur in a dynamic, market-based manner; and is grounded in environmentally protective requirements.

Although the pollutant chosen for trading in the lower Boise River watershed demonstration project was total phosphorus, the program could potentially be expanded to include other constituents, as warranted. Analytical efforts during the initial phase of the project determined that the effluent trading market in the lower Boise River watershed will emerge gradually over the next several years, along with TMDL allocation decisions.

In April 2001, a Memorandum of Understanding was signed that defines the roles of the agencies that will verify the credits purchased and used by NPDES-permitted sources choosing to participate in the effluent trading program. In addition, a BMP list is being developed to better define nutrient-reduction credits that could be earned by agricultural interests. In conjunction with these activities, an Idaho trading guidance document is being drafted by the state (DEQ, 2003). Once this document is finalized, the latest information on effluent trading may be incorporated in the lower Boise River framework as appropriate.

In addition, it was recognized that one of the integral parts of the effluent trading framework was the development of a trade tracking and record keeping system. The many local and regional experts that developed the effluent trading program recognized the need for a trade tracking system that ensures accountability of reductions sold and purchased. The key elements of the trade(s) are stored in a trade tracking database, which includes record keeping and reporting elements. The major functions of the trade-tracking database are to track all trades in a central repository, reconcile all trades in the market area to ensure credits are not used more than once, make key trading information and adjusted effluent limits readily available to regulatory agencies and the public, and to produce reports required for permit compliance. The trade tracking database and other administrative functions of effluent trading are to be managed by a local association.

Another key element in effluent trading is the generation and maintenance of records to substantiate the validity of credits. Point sources using credits from non-point source reductions are required to maintain monitoring records to verify the validity of non-point source credits used to adjust an effluent limit. Several tracking methods have been developed and are outlined below:

- *Trade Notification Form*: A trade notification form is required for each trade. This document will officially register the trade, transfer credits from the seller to the buyer, and adjust the effluent limit(s) subject to credit verification for non-point source credits. The trade notification form will be signed and submitted by both parties to a trade.

- *Reduction Credit Certificate*: A reduction credit certificate is required for trades involving non-point source credits. A reduction credit certificate must be submitted by the point source to document the non-point source reduction and 'create' the credit, which can then be transferred to and used by the point source.

Point sources involved in a trade will use modified discharge monitoring reports to report pollutant discharges that are affected by trades. The modified DMR will allow permit holders to report actual discharge and trades for reporting purposes only. The adjusted discharge (actual discharge plus or minus trades) will be reported for compliance purposes and will be compared to the base effluent limit in the permit.

As the effluent trading process proceeds, the association will submit a Trade Summary Report on a monthly basis to the point sources, the point source will in turn submit the Trade Summary Report to EPA along with the modified DMR. In the event of the association not being developed or not fulfilling its duties, DEQ will perform the association activities.

The effluent trading record keeping system as a whole is not only designed to provide an administrative record of trades and a means of accountability for the program, but also adds an essential component of reasonable assurance to the Implementation Plan. The net changes in water quality as a result of effluent trading would not be tractable without an effective trade tracking system.

Finally, the effluent trading program requires funding to be effective. This funding includes BMP funding for non-point sources, including urban runoff and agricultural land uses. Funding is addressed further in *Implementation Funding Plan*.

# Habitat Considerations

The fundamental goal of the TMDL is to ensure that appropriate beneficial uses in the lower Boise River are being met. In addition to efforts to improve water quality that are outlined in this plan, the Boise River Resource Management and Master Plan (adopted by Boise City in 1999) was developed to protect and enhance public safety, health, and resource preservation associated with the recreational use of the river and its riparian area. The plan includes priority projects to improve the lower Boise River environment.

As one tool in an adaptive management process, habitat improvement projects that help restore beneficial uses are supported by the LBRWQP. Appropriate partnerships should be formed to support and complete projects that improve habitat in the mainstem. The Boise River Resource Management and Master Plan identified many such projects that aim to protect and improve riparian and river habitat for the watershed's fisheries and wildlife, as well as enhance water quality. A copy of the plan can be obtained from the Boise City Parks and Recreation Department, Planning and Design Group. Other habitat improvement projects located outside of Boise City are also encouraged to the extent that they help restore beneficial uses within the lower Boise River. [12]

[12] While an increase in riparian habitat along the river corridor may result in more wildlife habitat, a corresponding increase in bacteria concentrations would be speculative.

# Land Use Changes

The Treasure Valley is one of the state's most rapidly urbanizing areas. The conversion of agricultural lands into urban uses affects the contributing load, as well as the fate and transport complexity of sediment and other pollutants to the lower Boise River. Fortunately, there are a number of entities that are studying future growth patterns and projecting land use changes over the next 20 years within the watershed.

To make a preliminary determination of how land use changes may affect pollutant loads within the lower Boise River watershed, current conditions for sediment loading were compared against baseline conditions used to set the TMDL loads. (Sediment was used for this exercise because the sediment dataset is currently more robust than the bacteria *E. coli* dataset.) A schematic of this process is shown in Figure 5.

This comparison was intended to provide a current snapshot of short-term sediment trends within the watershed, in order to provide a preliminary indication of potential long-term future trends. Actual future conditions will need to be determined within the adaptive management approach outlined in this plan.

The TMDL allocated loads to non-point sources based on concentration and flow data collected between 1994 and 1997. The current snapshot is based on concentration and flow data collected between 1998 and 2000. In addition, land uses from 1994 that were presented in the TMDL have been updated to reflect current conditions and determine whether land use changes have contributed to changes in sediment loading. This evaluation will be discussed on a watershed-wide basis, as well as on a sub-watershed level, so that the information can be used by agencies to establish funding priorities or by a stakeholder for setting priorities within its boundaries.

The TMDL loads were derived from the geometric mean concentration for all available total suspended sediment data collected at the mouth of each tributary between February 15 through June 14 and the corresponding 30-day low flow (DEQ, 2000). Current concentrations were calculated in the same manner using data collected by the SCC between 1998 and 2000. Current flows reflect the Idaho Department of Water Resources (IDWR) 30-day low flow over the same period of time. A summary of this analysis is presented in Table 13.

The data in Table 13 suggest that current total suspended sediment loads are an average of 41 percent lower than loads used to set the TMDL target reductions. However, the current load reductions are driven more by decreased flows, rather than improvements in total suspended sediment concentrations. That is, average sub-watershed flows between 1998 and 2000 were approximately 32 percent lower than flows recorded between 1994 and 1997. Because loads are directly related to flows, this reduction in flows incorrectly suggests that total suspended sediment levels have decreased substantially. The current total suspended sediment concentration data show that average watershed total suspended sediment levels are actually only 8 percent lower than total suspended sediment levels used in the TMDL. (In fact, in Lower Indian Creek and Willow Creek, current sediment concentrations are higher than concentrations used in the TMDL.) This means that under periods of flow similar to TMDL conditions, sediment loads may only have decreased by 8 percent. Although this is below the watershed goal of 37 percent, progress is being made.

**TABLE 13**
Summary of Total Suspended Sediment Concentration and Load Calculations

| | Lower Indian Creek | Mason Creek | Fifteen Mile (+5, +10) | Dixie Drain | Willow Creek | Conway Gulch | Mill Slough | Hartley Gulch (E & W) | Watershed Average |
|---|---|---|---|---|---|---|---|---|---|
| TMDL Sediment Conc., mg/L | 57.7 | 158 | 141 | 120 | 74.2 | 120 | 41.2 | 59.0 | - - |
| TMDL Discharge, cfs | 58.6 | 80.0 | 75.0 | 128 | 18.1 | 35.0 | 101 | 53.0 | - - |
| TMDL Sediment Load, tons/day | 9.11 | 34.1 | 28.6 | 41.12 | 3.62 | 11.34 | 11.24 | 8.43 | - - |
| 1998-2000 Conc., mg/L | 69.2 | 140 | 68.4 | 115 | 83.5 | 118 | 32.2 | 55.5 | - - |
| *% Concentration Change from TMDL* | *20%* | *-11%* | *-52%* | *-4%* | *12%* | *-1%* | *-22%* | *-6%* | *-8%* |
| 1998-2000 Discharge, cfs | 27.6 | 70.2 | 66.5 | 121 | 6.75 | 22.3 | 94.0 | 14.9 | - - |
| *% Discharge Change from TMDL* | *-53%* | *-12%* | *-11%* | *-5%* | *-63%* | *-36%* | *-7%* | *-72%* | *-32%* |
| 1998-2000 Load (1998-2000 Sediment X 1998-2000 Discharge), tons/day | 5.15 | 26.6 | 12.3 | 37.4 | 1.52 | 7.12 | 8.16 | 2.23 | - - |
| *% Load Change from TMDL* | *-43%* | *-22%* | *-57%* | *-9%* | *-58%* | *-37%* | *-27%* | *-74%* | *-41%* |

NOTES: These sub-watersheds are shown because they have the most direct impact on the mainstem lower Boise River. Other sub-watersheds that are not shown or discussed are: 1) located upgradient from major canal systems (e.g., Upper Indian Creek is above the New York Canal), 2) contribute a relatively small percentage of the overall watershed loads (e.g., Mason Slough contributed less than 2 percent of the typical TMDL loads), or 3) have no associated monitoring data at the mouth (e.g., Star Feeder).

Sediment load values between 1998 through 2000 were calculated within each sub-watershed based on the geometric mean for all monthly data available for the period February 15 through June 14 to be consistent with the assumptions used to determine the original TMDL sediment concentrations. Thus, the % decrease in sediment loads is a comparison of the TMDL concentrations and the concentrations measured between 1998-2000. The watershed average (-8%) is simply the arithmetic mean value of the individual sub-watershed % changes in sediment concentration. Similarly, the 1998-2000 discharges were calculated using 30-day low flows based on data from February through June of each year to be consistent with the original TMDL discharges. Thus, the % decrease in discharge is a comparison of the TMDL discharges and the discharges measured between 1998-2000. The watershed average (-32%) is the arithmetic mean value of the individual sub-watershed % changes in discharge. Finally, the watershed average % change in load (-41%) is the arithmetic mean of each of the sub-watershed % changes in load based on comparing the TMDL loads with the 1998-2000 loads using the concentration and discharge values described above.

On a sub-watershed basis, Fifteenmile Creek had the largest sediment concentration decrease (52 percent), followed by Mill Slough (22 percent). This suggests that if monitoring activities confirm these trends, funding priorities for these two tributaries may be lower than for tributaries with relatively smaller total suspended sediment decreases (e.g., Dixie Drain and Conway Gulch) or total suspended sediment increases (Lower Indian Creek and Willow Creek).

For comparison during the same two periods (1994 and 1997) and (1998 and 2000), total suspended sediment concentrations in the mainstem lower Boise River also decreased. Table 14 summarizes the available data collected both at the Middleton and Parma USGS gages.

**TABLE 14**
Summary of Total Suspended Sediment Data for Middleton and Parma Gages

| Data | Middleton | Parma |
|---|---|---|
| TMDL Suspended Sediment Concentration, mg/L | 19 | 58 |
| 1998-2000 Suspended Sediment Concentration, mg/L | 14 | 47 |
| *% Concentration Change from TMDL* | *-28%* | *-19%* |
| 1994-1997 Suspended Sediment Load, tons/day[1] | 2,011 | 2,930 |
| 1998-2000 Suspended Sediment Load, tons/day | 457 | 1,913 |
| *% Load Change from TMDL* | *-77%* | *-35%* |

[1] Typical loads were not identified for Middleton and Parma in the TMDL, so USGS data from the TMDL period (1994-1997) are used for comparison to current conditions (1998-2000).

These data are consistent with the tributary data in that the decrease in loads in the mainstem was more substantial than the decrease in total suspended sediment concentrations for the two time periods. Under periods of flow similar to TMDL conditions, sediment concentrations in the mainstem at Parma have only decreased by 19 percent (as shown in Table 14) and sediment loads at Parma have decreased by 35 percent, which is below the watershed goal of 37 percent.

While sediment concentrations on a watershed-wide basis were lower between 1998 and 2000 than between 1994 and 1997, the next step of the analysis involved looking at the current total suspended sediment conditions in relation to land use with each sub-watershed. In the TMDL, loads were not assigned to each land use within the tributaries. For this evaluation, loads between different land uses were evaluated on a sub-watershed basis to determine if changes in land use contributed to decreases or increases in sediment loads.

Land uses in 1994 were published by IDWR and summarized in the TMDL. Recently, updated land uses have been published by IDWR to reflect more current conditions and the results of an extensive on-the-ground inventory of agricultural land uses throughout the lower Boise River watershed conducted by the SCC. The results of these inventories are shown in Table 15.

**TABLE 15**
Summary of Agricultural Land Uses within Major Tributaries

| Sub-watershed | 1994 IDWR Agricultural Acres | 2000 IDWR Agricultural Acres | 2000 IDWR vs. 1994 IDWR | 2000-2001 SCC Agricultural Acres | 2000-2001 SCC vs. 1994 IDWR |
|---|---|---|---|---|---|
| Lower Indian Creek | 33,087 | 30,021 | -9% | 21,317 | -29% |
| Mason Creek | 40,021 | 34,701 | -13% | 23,493 | -32% |
| Fifteenmile (+5, +10) | 29,243 | 19,534 | -33% | 12,391 | -37% |
| Dixie Drain | 33,648 | 33,049 | -2% | 28,263 | -14% |
| Willow Creek | 5,914 | 6,952 | 18% | 4,873 | -30% |
| Conway Gulch | 6,415 | 6,443 | 0% | 5,842 | -9% |
| Mill Slough | 18,066 | 17,554 | -3% | 10,609 | -40% |
| Hartley Gulch (E & W) | 13,421 | 13,352 | -1% | 10,546 | -21% |
| Total or Average | 179,890 | 161,606 | -10% | 117,334 [a] | -27% |

NOTE: This table does not incorporate the river corridor and smaller tributary acres.
Agricultural lands include irrigated croplands, feedlots and dairy, and pasture. In Ada County, small ranches and ranchettes (less than 20 acres) are also included, while in Canyon County, small ranches and ranchettes are considered to be rural residential and farmstead land uses. Thus, these numbers do not coincide exactly with agricultural acres presented in Table 10.
[a] These lands were formerly agricultural lands that have since been taken out of agricultural production.

The IDWR datasets suggest that the proportion of agricultural lands decreased by an average of 10 percent throughout the watershed between 1994 and 2000. A portion of the decrease overall in the watershed likely can be attributed to original classification errors in the 1994 IDWR dataset, including no land use classification for rural roads.[13]

The remaining portion of the decrease reflects land use conversions from agricultural land uses to rural subdivisions and to commercial and industrial properties. The SCC survey suggests that the proportion of agricultural lands decreased by an average of 35 percent, as compared to the 1994 land uses that were published by IDWR. The SCC generally estimates that the agricultural lands are being converted to residential subdivisions (80 percent), and commercial and industrial properties (20 percent), although these percentages certainly vary somewhat between sub-watersheds (Griswold, pers. comm., 2002).

With the exception of the two sub-watersheds with an increase in total suspended sediment concentrations (Lower Indian Creek and Willow Creek), in general, those tributaries that experienced the highest relative conversion from agricultural land uses also had the largest decreases in total suspended sediment concentrations. For example, tributaries associated with decreases in total suspended sediment concentrations ranging between 11 and 52 percent (Fifteenmile Creek [which includes Fivemile and Tenmile Creeks], Mill Slough,

[13]Based on Geographic Information Systems (GIS) information, the NRCS estimates that current road coverage in the watershed may be at least 17,000 acres (Griswold, pers. comm., 2002). The current road system is not believed to be markedly different from the road system that was in place during the TMDL development.

and Mason Creek in Table 13) all experienced a reduction in agricultural lands of more than 30 percent (Table 15).

The apparent relationship between elevated total suspended sediment loads and agricultural land uses, which was discussed in detail in the TMDL, is supported by a recent study conducted by the U.S. Bureau of Reclamation (2001). This study suggests that there is a significant positive correlation between agricultural land use and total suspended sediment levels. The USBR concluded that it was not possible to determine if elevated sediment concentration in stormwater runoff from predominantly agricultural lands are caused by sub-watershed land use practices or by watershed irrigation water management.

For future land use projections from 2000 to 2020, estimates developed by COMPASS and the Treasure Valley Futures was used. Population data from the 2000 census and projections for the year 2020 were used to identify those areas where future household and business growth may occur. A summary of these data is provided in the Urban/Suburban Implementation Plan (Appendix B). These projections suggest that of the same sub-watersheds presented previously, the greatest urban growth is expected to occur in Mason Creek, Fifteenmile Creek (including Fivemile and Tenmile Creeks), and Mill Slough. Figures 6 through 11 show both projections for the lower Boise River watershed as a whole, as well as the five tributaries listed above (Boise River Corridor, Fivemile Creek, Tenmile Creek, Mason Creek, and Lower Indian Creek). This conclusion is based on the greatest absolute and/or relative increase for households, businesses, and developed acres, all of which are believed to drive the conversion of agricultural lands to residential subdivisions in the watershed. In terms of determining which watersheds should receive priority for funding, Dixie Slough, Fifteenmile Creek, and Mason Creek best meet the criteria of location, loads, and potential growth.

Although the exact relationship between conversion of agricultural lands and increases in households or businesses cannot be derived from the COMPASS or Treasure Valley Futures data, if agricultural lands in Mason Creek, Fifteenmile Creek (including Fivemile and Tenmile Creeks), and Mill Slough are converted at the predicted rates, total suspended sediment concentrations will likely continue to decrease. That is, if long-term monitoring confirms the short-term snapshot, additional agricultural land use conversions will likely help the watershed meet the TMDL goals of 37 percent reduction in total suspended sediment loading, in addition to the implementation of BMPs on agricultural lands. Potential effects from land use changes on bacteria and other constituents (e.g., phosphorus and temperature) are less clear.

## Snake River-Hells Canyon TMDL

The final Snake River-Hells Canyon TMDL was submitted to EPA on July 17, 2003. Load allocations were assigned to tributaries that discharge to this reach of the Snake River, including the lower Boise River for nutrients, sediment, pesticides, and temperature (the mercury TMDL has been deferred until 2006). These loads will be distributed to point and non-point sources throughout the watershed as part of the TMDL/Implementation Plan process. The original lower Boise River TMDL for nutrients was never completed because no impairment was found. However, the SBA recognized the scheduled SR-HC TMDL would likely result in allocation for nutrients to address impairments in the Snake River and

Brownlee Reservoir. The SBA included a no-net-increase provision for nutrients (Appendix J of the TMDL). DEQ performed a more detailed subbasin assessment for nutrients in 2001 and concluded that nutrients are not impairing aquatic life or recreational beneficial uses in the lower Boise River (DEQ, 2001b).

Phosphorus reductions and potentially trading will be required in the lower Boise River watershed to meet a total phosphorus load allocation included in the final Snake River-Hells Canyon TMDL. The TMDL concludes that nutrients that originate within the tributaries to the Snake River, including the lower Boise River watershed, are contributing to the impairment of beneficial uses in the Snake River and Brownlee Reservoir. Because DEQ must take into consideration the water quality and standards of downstream waters, nutrient reductions driven by the Snake River-Hells Canyon TMDL will be necessary. The Snake-River Hells Canyon TMDL allocates a total phosphorous load to the mouth of the lower Boise River to help restore the impaired beneficial uses in the Snake River and Brownlee Reservoir to full support. The final TMDL nutrient load is based on a goal for total phosphorus target of 0.07 mg/L, which translates to a total phosphorus load allocation of 256 kg/day for the lower Boise River (a 77 percent reduction from existing loads). Language is anticipated to be added to the final TMDL that to indicates load allocations can be revised based on updated flow data.

The load and wasteload allocations for phosphorous sources within the lower Boise River watershed will be determined within 18 months of EPA approval of the SR-HC TMDL. An Implementation Plan will be developed by LBRWQP and supporting agencies in accordance with state and federal guidance. Upon approval of the LBR nutrient TMDL, NPDES permits in the watershed will be modified or reissued to include a phosphorus limit with authorization for effluent trading provisions.

The Snake River-Hells Canyon TMDL may also drive pesticide reductions in the lower Boise River watershed. EPA has banned the use of pesticides (DDT and Dieldrin) and residual concentrations are believed to partially originate from legacy non-point sources. Load allocations for non-point sources will likely be zero (because they are banned compounds), while potential sources are to be identified so that reasonable and prudent measures can be implemented to remove or reduce the transport and availability of the pesticides.

The Snake River-Hells Canyon TMDL concluded that temperature is primarily influenced by natural (atmospheric) conditions. The tributary inflows (including the lower Boise River) may also contribute to elevated temperatures within the Snake River. The TMDL stipulates that DEQ will evaluate anthropogenic loads when the lower Boise River temperature TMDL is completed and load allocations may be required. Because EPA has remained silent on approving the temperature conclusions in the lower Boise River TMDL (i.e., they only approved the sediment and bacteria TMDLs), this issue will likely affect the lower Boise River watershed.

## Lower Boise River Tributary TMDLs

The tributaries listed on the 1998 303(d) list that drain to the lower Boise River include Fivemile Creek, Tenmile Creek, Mason Creek, and Indian Creek. These waterbodies underwent assessment to determine if TMDLs were necessary in 2001. Three additional

tributaries added to the 1998 303(d) list in January 2001 (Dixie Drain and Willow Creek were added for temperature and Cottonwood Creek was added for unknown pollutants) are anticipated to go through the TMDL process in 2006. Since the 1998 303(d) list, a revised 2002 303(d) list has been developed (this draft list incorporates 305(b) information and if the 2001 subbasin assessments had been prepared under the 2002 list, portions of these tributaries would have been included in other sections of the revised 305(b) / 303(d) list).

These subbasin assessments indicate that while TMDLs in the individual tributaries will probably not be required (except for bacteria), the provisions of the mainstem lower Boise River TMDL and the wasteload allocations still necessitate reductions in sediment and bacteria concentrations within each of the tributaries. The effects of the revised integrated 2002 303(d) / 305(b) list on these conclusions are undetermined at this time. Results from each of the tributaries that underwent subbasin assessment in 2001 (which was based on the 1998 303(d) list) are summarized below (DEQ, 2001b).

- **Fivemile and Tenmile Creek** — Although these streams are currently designated as supporting cold water biota and secondary contact recreation, based on the results of a beneficial use evaluation, DEQ has recommended that the beneficial uses be changed to a modified aquatic life use[14]. The Idaho legislature has adopted this new use, but it is awaiting EPA approval. The subbasin assessment for these tributaries indicates that modified aquatic life and secondary contact recreation are fully supported in Fivemile Creek and Tenmile Creek because the data do not indicate impairment by nutrients, sediment, or DO. Because beneficial uses are being met, DEQ will recommend de-listing sediment, nutrients, and DO during the next 303(d) listing cycle and TMDLs will not be required for Fivemile Creek and Tenmile Creek. Bacteria are not listed as a pollutant of concern in Fivemile Creek or Tenmile Creek. However, the data show that *E. coli* are exceeding the state standard at all locations in the stream. DEQ recommended listing Fivemile Creek and Tenmile Creek for bacteria on the 2002 303(d) list and establishing a TMDL schedule.

- **Indian Creek** — Although this tributary is currently designated as supporting cold water biota, salmonid spawning, and secondary contact recreation, based on the results of a beneficial use evaluation, DEQ has recommended that the beneficial uses be changed to a modified aquatic life use in the upper reaches of the tributary (above the calopy gates where the New York Canal separates from the historic creek bed). The Idaho legislature has adopted this new use, but it is awaiting EPA approval. The subbasin assessment for these tributaries indicates that modified aquatic life and secondary contact recreation are fully supported in Upper Indian Creek and cold water biota and secondary contact recreation are fully supported in Lower Indian Creek because the data do not indicate impairment by nutrients or oil / grease. Therefore, DEQ will recommended de-listing nutrients and oil / grease as pollutants of concern from the next 303(d) list. Surface sediment (substrate) fine material is in excess below the New York Canal, but DEQ did not recommend a TMDL for sediment at this time. While no TMDL is required for sediment, DEQ did not recommend de-listing sediment from Indian Creek until the 37 percent suspended sediment reductions stipulated in the lower Boise River TMDL are implemented. DEQ did not recommend a DO TMDL because

[14] The modified aquatic life use describes streams that are limited in aquatic life diversity because of factors such as ephemeral or intermittent flow, naturally occurring pollutant levels, or long-standing hydrologic modification.

conditions have remained above the criteria for the past 3 years; however, continued monitoring is recommended to track current conditions. Bacteria are not listed as a pollutant of concern in Indian Creek. However, the data show that *E. coli* are exceeding the state standard at all locations in the stream. DEQ recommended listing Indian Creek for bacteria on the 2002 303(d) list and establishing a TMDL schedule.

- **Mason Creek** — Although this tributary is not currently designated, for undesignated waters, the presumed uses are cold water biota and secondary contact recreation, unless analysis shows other uses are more appropriate. Based on the results of a beneficial use evaluation, DEQ has recommended that the beneficial uses be changed to a modified aquatic life use. The Idaho legislature has adopted this new use, but it is awaiting EPA approval. The subbasin assessment for these tributaries indicates that modified aquatic life and secondary contact recreation are fully supported in Mason Creek because the data do not indicate impairment by nutrients, sediment, or DO. Because of the lack of beneficial use impairment, TMDLs for sediment, nutrients, and DO are not required for Mason Creek and DEQ will recommend de-listing during the next 303(d) listing cycle. Bacteria are not listed as a pollutant of concern in Mason Creek. However, the data show that *E. coli* are exceeding the state standard at all locations in the stream. DEQ will recommended listing Mason Creek for bacteria on the next 303(d) list and establishing a TMDL schedule.

# Watershed Implementation Schedule

## Adaptive Management

The implementation schedule for this TMDL is designed to be flexible within an adaptive management framework. The federal CWA and the *Idaho Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02) indicate that all feasible steps shall be taken to achieve the highest quality water attainable. However, in watersheds where non-point sources are a major pollutant contributor, the feasible steps may be difficult to identify and implement. The concept of adaptive management as it applies to TMDL implementation plans allows for on-the-ground implementation to proceed where uncertainty exists about how and when reduction targets will be met. The adaptive management approach acknowledges that beneficial uses may not be restored for a long period of time, but provides a short-term pathway by which to gauge progress toward that goal.

For the lower Boise River Implementation Plan, the designated agencies and/or entities will assist in the development and oversight of the source-specific implementation plans. Each respective source plan outlines how pollutant load reductions are expected to take place. DEQ recognizes that it may take some period of time to fully implement the appropriate management practices. This is commonly the case in non-point source-dominated watersheds, and is particularly exemplified in the lower Boise River watershed because of the rapidly changing land use pattern. Many producers are reluctant to commit to financing long-term pollutant management activities because of the rapid land use transitions that are occurring. DEQ also recognizes that even after full implementation has been accomplished, water quality goals may not be reached immediately. There are numerous in-stream biological and habitat complexities that may prevent the river from immediately meeting WQS. Additionally, DEQ recognizes that the technology for controlling non-point 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 BMPs, TMDLs, or their associated targets and surrogates may not be achieved as originally established. Additional uncertainty lies with natural events beyond the control of humans. Events such as severe floods or drought, fire, insect infestations, or other natural disasters may preclude the attainment of the TMDL in a reasonable time period.

All of these reasons indicate that an adaptive management approach to implementation is appropriate. The stakeholders involved in developing the lower Boise River TMDL have remained committed to ensuring implementation and have expressed the willingness to continue toward meeting the water quality goals outlined in the TMDL.

The implementation of TMDLs is enforceable under the applicable provisions of the WQS for point and non-point 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. Enforcement is costly and provides little flexibility for the stakeholders, particularly for non-point source

contributors. Should the need for additional effort emerge, it is expected that the responsible agency will determine a solution to overcome obstacles to progress through education, technical support, or enforcement where necessary (for example, in instances of insufficient action toward 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 WQS.

## Roles and Responsibilities

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

- DEQ intends to review the progress of TMDL implementation on a 5-year cycle.
- In conducting this review DEQ will evaluate the progress toward achieving the TMDLs and the associated WQS and targets.
- DEQ expects that the stakeholders or designated agencies will monitor and document their progress in implementing the provisions of their respective implementation plans. This information will be provided to DEQ on an annual basis for use in reviewing the progress toward meeting the TMDL.
- DEQ expects that the stakeholders will identify benchmarks for the attainment of TMDL targets and load allocations. As implementation proceeds, these established benchmarks will be used to measure progress toward the goals outlined in the TMDL.
- Where implementation is ineffective or management techniques are found to be inadequate, DEQ expects the stakeholders to revise the components of their Implementation Plan to address these deficiencies.
- If DEQ, in consultation with the stakeholders and agencies, concludes that all feasible steps have been implemented to meet the TMDL and its associated targets, and that the TMDL, or the associated targets are not practicable, the TMDL may be reopened and revised as appropriate. The final decision to reopen the TMDL lies solely with DEQ and will be based on input from the LBRWQP.

To meet these expectations a diagram and matrix table have been developed that identify specific tasks and roles and responsibilities for the annual and 5-year progress reviews. These are presented in Figure 12 and Table 16 (in Table 16, R means Required and V means Voluntary).

It is in the interests of stakeholders for the LBRWQP to take a voluntary lead in the various tracking and reporting tasks. This role for the LBRWQP will be contingent on available funds, and funding sources beyond contributions from LBRWQP members will be sought. As part of this process, the various sub-groups (municipal/industrial, stormwater, and agriculture) also will be re-convened on a regular basis again and integrated into the implementation process.

# Milestones

As part of implementation, DEQ expects that milestones will be specified to ensure that sufficient progress is made toward TMDL goals. Within the framework of the LBRWQP, stakeholders from each source group determined their own respective milestones based on available resources. This is consistent with IDAPA 58.01.02.054, which indicates designated agencies and landowners should participate in developing pollution control strategies (which has been interpreted to include setting milestones). The LBRWQP reviewed these activities and made recommendations as appropriate.

## Point Sources Pollution Control Efforts

Milestones for point sources are specified in their respective NPDES permits. As the TMDL goals change (particularly in relation to new requirements from the Snake River-Hells Canyon and tributary TMDLs), NPDES permit requirements will be revised as appropriate.

## Urban and Suburban Storm Drainage Pollution Control Efforts

For Phase I NPDES sources, milestones are specified in the Boise MS4 permit. As the TMDL goals change (particularly in relation to new requirements from the Snake River-Hells Canyon and tributary TMDLs), the existing Phase I MS4 NPDES permit requirements will be revised as appropriate.

For Phase II NPDES sources, milestones are specified in the form of measurable goals and are described in the Phase II rule. These milestones are described as BMP design objectives or goals that quantify the progress of program implementation and the performance of BMPs. Load reductions required to meet TMDL requirements will be achieved over a 10-year time period with activities to meet the Phase II six minimum measures phased in over the first 5 years.

**TABLE 16**
Roles and Responsibilities for Review Process

| | DEQ | EPA | LBRWQP | USGS | BOR | NPDES Point Sources | NPDES Stormwater Phase I | NPDES Stormwater Phase II | SCC / NRCS | Other Agricultural Entities | Cities | Counties | Health Districts | Highway Districts | COMPASS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Annual Process** | | | | | | | | | | | | | | | |
| Submit progress and/or monitoring reports | | | | | | | | | | | | | | | |
| NPDES Discharge Monitoring Reports | | | | | | R | | | | | V | V | | | |
| Annual reports for Phase I | | | | | | | R | | | | V | | | | |
| Periodic updates for Phase II | | | | | | | | R | | | V | V | | | |
| Annual reports for government-funded agricultural BMPs | | | | | | | | | R | | | | | | |
| Periodic reports for privately funded agricultural BMPs | | | | | | | | | V | | | | | | |
| Periodic updates for non-Phase II sources | | | | | | | | | | | V | V | V | V | |
| Monitoring data reports | | | | R | V | | | | | V | | | | | |
| BURP data reports | R | | | | | | | | | | | | | | |
| Other monitoring data | | | | V | V | | | | V | V | V | | | | |
| Evaluate progress reports and monitoring data | | | V | | | | | | | | | | | | |
| Compare progress vs. milestones | | | V | | | | | | | | | | | | |
| Summarize progress | | | V | | | | | | | | | | | | |
| Suggest revised milestones as needed | | | V | | | | | | | | | | | | |
| Public outreach as needed | | | V | | | | | | | | | | | | V |
| Review summary of progress | R | V | | | | | | | | | | | | | |

**TABLE 16**
Roles and Responsibilities for Review Process

| | DEQ | EPA | LBRWQP | USGS | BOR | NPDES Point Sources | NPDES Stormwater Phase I | NPDES Stormwater Phase II | SCC / NRCS | Other Agricultural Entities | Cities | Counties | Health Districts | Highway Districts | COMPASS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **5-Year Process** | | | | | | | | | | | | | | | |
| Summarize TMDL progress | | | | | | | | | | | | | | | |
| Compile annual summaries | | | V | | | | | | | | | | | | |
| Compare progress vs. milestones | | | V | | | | | | | | | | | | |
| Summarize progress | | | V | | | | | | | | | | | | |
| Evaluate attainment of TMDL targets and beneficial uses | | | V | | | | | | | | | | | | |
| Suggest revised milestones as needed | | | V | | | | | | | | | | | | |
| Public outreach as needed | | | V | | | | | | | | | | | | V |
| Determine if progress is adequate to meet TMDL | R | V | V | | | | | | V | | | | | | |
| If inadequate, revise Implementation Plans | | | R | | | R | R | R | R | V | V | V | V | V | |
| OR | | | | | | | | | | | | | | | |
| Determine whether TMDL needs to be reopened and revise as appropriate | R | R | R | | | | | | | | | | | | |

NOTES: R = Required Action
V = Voluntary Action

Activities and milestones are expected to occur over a 5-year time period, beginning in 2003. Milestones listed in Table 17 are based on the assumption of full implementation in the first 5 years with mid-course corrections to programs and activities based on annual evaluations of the progress made toward the measurable goals identified in each jurisdiction's stormwater management plan. This approach is consistent with the adaptive management strategy presented in this Implementation Plan.

**TABLE 17**
Phase II Permittee Plan Implementation Schedule

| Activity/Milestone | Year 1 | Year 2[1] | Year 3 | Year 4 | Year 5 | Year 6 |
|---|---|---|---|---|---|---|
| Continued implementation of existing programs. | | | | | | |
| Stakeholders assess systems, existing authorities and programs. | | | | | | |
| Stakeholders form local and/or regional partnerships. | | | | | | |
| Stormwater management plans prepared. | | | | | | |
| Plan approval by local decision makers. | | | | | | |
| Phase II NPDES permit application submitted (if applicable). | | | | | | |
| Local advisory groups established. | | | | | | |
| Public education developed. | | | | | | |
| Stormwater systems mapped. | | | | | | |
| Stormwater authorities in place. | | | | | | |
| Priority subbasins assessed for additional load reduction opportunities. | | | | | | |
| Structural controls for development in place. | | | | | | |
| O&M plans for public facilities in place. | | | | | | |
| Initiate planning and implementation of additional pollutant reduction activities in subbasins. | | | | | | |
| Construction site controls in place. | | | | | | |
| Nonstructural controls for development enacted. | | | | | | |
| All illicit connections fixed. | | | | | | |
| Submittal of Annual Reports. | Same date each year (determined by NPDES Permit) | | | | | |

[1]Year 2 is assumed to be year 1 of the Phase II NPDES permit.

## Agricultural Non-Point Source Pollution Control Efforts

In order to set milestones that were both attainable and reasonable, available information from stakeholders and the SCC was used to the extent possible. These milestones are based on voluntary actions that are dependent on anticipated state, federal (e.g., Farm Bill), and local funding sources and private investment, as well as the determination of the most appropriate and effective BMP implementation strategies for specific locations and land use activities. Thus, these goals will be periodically reassessed within the adaptive management framework based on the actual level of available funding and private investment.

The currently available funding level is the factor that most limits the schedule of TMDL implementation. Currently, there is approximately $354,000 of cost-share funding available annually for BMP implementation in Ada and Canyon Counties (see Appendix C). With 50% cost share from landowners (provided through their time, labor, materials) and financial contributions, an equivalent total of $708,000 is currently available annually for BMP installation within Ada and Canyon Counties. Although it is unlikely that every acre within the 163,270 total acres addressed in the Implementation Plan for Agricultural will require BMP implementation in order to achieve TMDL objectives, at the current funding level it would take over 100 years to treat all surface-irrigated cropland (Tier 1, Tier 2, and Tier 3), surface-irrigated pasture, and all CAFO / AFOs. If only the highest priority sediment sub-watersheds (Dixie Slough, Mason Creek, and Fifteenmile Creek) were treated at the current funding level, it would take over 40 years.

These projections assume that the current levels of funding for BMP implementation in Ada and Canyon Counties continue, and that funding doubles at least every 20 years to pay for replacement of equipment. Substantial increases in federal and state funding for BMP installation will be necessary to compress these projected time frames.

It is important to note that the program currently providing the largest amount of funding to the agricultural stakeholders (EQIP) does not initially rank projects based on TMDL goals or priority areas. The current EQIP application process accepts voluntary producers on a county-wide basis and supports conservation plan development on a first come first served basis. As a result, in order to accurately reflect the current dominant funding process, the milestones outlined below do not distinguish between Tier 1, Tier 2, or Tier 3 areas. These milestones may be re-evaluated as available funding from TMDL specific programs such as 319 and the State Water Quality Program for Agriculture (WQPA) increases.

- Perform status review and report results on BMPs installed with state or federal funding assistance on private agricultural lands on an annual basis.
- Develop a method for tracking and reporting privately funded improvements (e.g., using certified contractor surveys or questionnaires distributed by Federal Services Agency during the crop reporting period) by the end of Year 1.
- Develop water quality plans / contracts and / or other BMP improvements for 25 percent of agricultural producers (owners or renters) by Year 10.
- Initiate implementation of water quality plans and / or contracts on the initial agricultural acres as soon as contracts are approved.

- Complete implementation of water quality plans and/or contracts on the initial agricultural acres within 5 years from contract approval.
- Develop water quality plans/contracts and/or other BMP improvements for the next 25 percent of agricultural producers (owners or renters) by Year 20.

## Other Non-Point Source Pollution Control Efforts

Preliminary BMPs for highway district entities that are not included in the Phase II program:

- Incorporate Checklist to Determine the Need for SWPPP or Erosion Control Plans — The highway districts will utilize the ITD checklist to determine whether a SWPPP or Erosion Control Plan is required for highway maintenance projects. This checklist should be in use within the first year of this Implementation Plan.
- Staff Training for Development of SWPPP or Erosion Control Plans— The highway districts will attend local training events for plan designers in order to develop suitable plans related to road maintenance activities. This training should be completed for 50 percent of staff within the first year of this Implementation Plan and the remaining 50 percent of staff within the second year.
- Develop Management Plan for Cooperative Agricultural Activities — Within the first 3 years of this Implementation Plan, the highway districts would like to determine a process with local agricultural interests for managing sediments and bacteria resulting from agricultural land uses that impact rural roads (e.g., management of ditch water that accepts stormwater from rural roads, irrigation runoff from adjacent agricultural lands, and additional soil conservation plan elements addressing over-spray onto adjacent roads and track-out activities).
- Form Cooperative Agreements with Appropriate Agencies — To address the gap between jurisdiction for operation and maintenance of the MS4 and lack of enforcement authority, the highway districts will develop a list of items needed to be resolved via cooperative agreements with appropriate municipal and county agencies/departments. This list will be developed within the first 2 years of this Implementation Plan. Follow-up agreements will be negotiated as appropriate within the first 5 years of this Implementation Plan.
- Development of BMP Manual for Road Maintenance Activities — In coordination with the Local Highway Technical Advisory Council (LHTAC) and DEQ, a BMP manual targeted at road maintenance activities will be developed based on both the existing ACHD and ITD manuals within the first 3 years of this Implementation Plan.

# Watershed Monitoring Program

## Overview

Water quality monitoring is an important component of this Implementation Plan and will be used to measure the success of both individual implementation activities and the overall effort to determine beneficial use status. Two types of monitoring (BMP Effectiveness Monitoring and Water Quality Monitoring) will be used as inputs into a tracking database that has been developed by DEQ as a mechanism to determine whether beneficial uses are being achieved.

Because the lower Boise River has a combination of point and non-point sources, this monitoring program provides reasonable assurance that pollutant reductions will be achieved (responsibilities are also outlined in Figure 12). Operators of point sources will perform monitoring as required by their NPDES permits. Non-point monitoring activities will be the responsibility of both agricultural non-point sources and urban/suburban stormwater monitoring groups, as follows:

- Idaho State Department of Agriculture (ISDA), through the Idaho Association of Soil Conservation Districts (IASCD), local Soil Conservation Districts, the Idaho SCC, and the Natural Resources Conservation Service (NRCS) will monitor results of implementation actions on agricultural lands. Annual reports on progress toward TMDL implementation will be prepared by ISDA, which will include evaluations of implementation activities and effectiveness at pollution reduction.
- ACHD, Boise City, DD3, BSU, and ITD3will monitor the results of their joint NPDES Phase I stormwater (MS4) permit issued in 2000.
- Phase II requirements for smaller stakeholders do not rely on monitoring activities; however, volunteer monitoring activities may occur as part of public outreach and education (one of the six minimum measures required by EPA).

Monitoring will evaluate short-term achievement of BMPs and the long-term improvements to water quality within the lower Boise River watershed. BMP effectiveness monitoring will function as a feedback loop for adaptive management and possible adjustments in pollutant targets throughout the implementation phase of the TMDL. Adaptive management allows for on-the-ground implementation to proceed where uncertainty exists about how and when reduction targets will be met. The adaptive management approach acknowledges that beneficial uses may not be restored for a long period of time, but provides a short-term pathway with established milestones to gage progress toward that goal. Stakeholders or designated agencies will monitor and document their progress in implementing the provisions of their respective implementation plans. This information will be provided to DEQ on an annual basis for use in reviewing the progress toward established benchmarks and meeting the TMDL.

DEQ is responsible for the long-term monitoring on the Boise River and has contracted the USGS to evaluate the lower Boise River and its tributaries. DEQ, the LBRWQP, and USGS provide joint funding for this monitoring. DEQ will summarize four issues on a 5-year cycle: agricultural implementation effectiveness; stormwater implementation effectiveness; point source compliance with NPDES permits; water quality of lower Boise River and its tributaries; and overall status of beneficial use attainment of the lower Boise River.

Based on monitoring data that are collected, if DEQ determines that a voluntary approach does not succeed in abating the pollutant problem, then the state may seek injunctive relief for those situations that may be determined to be an imminent and substantial danger to public health or environment (IDAPA 16.01.02.350.02(a)).

# Monitoring Objectives

The following objectives have been identified as part of the TMDL monitoring program.

## BMP Effectiveness Monitoring

- Evaluate specific treatment to verify BMPs are properly installed, maintained, and working as designed.
- Evaluate the effectiveness of implementation actions for reducing pollutant loading to the lower Boise River and its tributaries.
- Gather information to fill data gaps to more accurately determine pollutant loading in the lower Boise River.
- Make effectiveness monitoring results available to the public.

## Watershed Monitoring

- Evaluate water quality and biotic integrity of the lower Boise River and its twelve tributaries (with focus on bacteria and sediment).
- Evaluate bacteria and sediment discharges within the lower Boise River drainage.
- Evaluate the collective long-term effectiveness of implementation actions for reducing pollutant loading to the lower Boise River and its tributaries.
- Evaluate beneficial use attainment.

# BMP Effectiveness Monitoring

For non-point sources, BMP-specific monitoring will be included as part of specific treatment projects to verify that the BMPs are properly installed, being maintained, and working as designed. Source groups constructing BMP projects should include budget allowances for a monitoring program. The results of the monitoring program will be used to recommend or discourage similar projects in the future.

## Urban/Suburban BMP Monitoring

The Phase I monitoring and reporting requirements are identified in the NPDES permit. Among other items, co-permittees are required to report on the status of the stormwater management BMP implementation, proposed changes to the stormwater management plan or assessment of controls, a summary of the data accumulated throughout the reporting year, and an identification of water quality improvements or degradation. Water quality monitoring required by the Phase I permit includes wet weather storm event monitoring for event-mean concentrations and annual and seasonal pollutant loads. Additional monitoring requirements include stormwater catch basin sediment / decant sampling, floatables (litter) sampling, and dry weather discharges.

For Phase II stakeholders, monitoring of BMPs may be conducted on a voluntary basis as part of a public outreach and education effort, but it is not required.

## Agricultural BMP Monitoring

IDAPA 58.01.02.054.07 refers to the Idaho Agricultural Pollution Abatement Plan (IDEQ, IDL, SCC, 1991), which provides direction to the agricultural community for approved BMPs. If landowners agree to cost share funds and develop conservation plans, implementation monitoring consists of a variety of methods that perform spot checks, periodic project reviews, and photographic documentation to demonstrate that pollution reduction measures have been properly installed, are being properly maintained, and are performing as designed. Implementation monitoring methods have been summarized in more detail in the appropriate agricultural appendices.

Any BMPs installed through a water quality and conservation program will be inspected annually as per the approved conservation plan or the contract agreement with the landowner. The NRCS and SCC can perform these inspections to ensure the BMPs are properly maintained by the landowner / operator throughout the length of the contract. BMP effectiveness monitoring typically consists of a visual inspection and operator record keeping. Some BMPs or projects will also have a quantitative monitoring component as a means to better analyze the benefit in sediment or bacteria reduction. SCC annual reports of contracted agricultural projects and BMPs will be available to DEQ and the public.

Current BMP projects funded through water quality and conservation programs should include budget allowances for a monitoring program; this recommendation is appropriate for future BMP projects, as well. Federally funded agricultural projects will include effectiveness and maintenance monitoring as a component of the grant or loan. The data gathered from these projects will be reviewed by the NRCS and the SCC to access their collective benefit and to recommend or discourage similar projects in the future.

BMP effectiveness studies on erosion and sedimentation have been conducted extensively by the Agricultural Research Service and University of Idaho Extension service. Site-specific BMP effectiveness monitoring and field evaluations of progress within the lower Boise River watershed will be conducted by SCC field staff. Although source groups constructing BMP projects should include budget allowances for effectiveness monitoring, where funds are not provided for BMP effectiveness monitoring applicable default literature values could be used (for example, possibly Rock Creek results). Any BMPs installed through a water quality and conservation program will be annually inspected to ensure the BMPs are

properly maintained by the landowner/operator throughout the length of the contract. BMP effectiveness monitoring typically consists of a visual inspection and operator record keeping.

## Watershed Monitoring

EPA has endorsed the concept of watershed-based permitting for NPDES permit holders (EPA, 2003b). This approach provides a "process for considering all stressors within a … basin, rather than addressing individual pollutant sources on a discharge-by-discharge basis." Watershed-based permitting also considers watershed goals and the impact of multiple pollutant sources and stressors, including non-point source contributions. Much of this process is similar to what is involved in the development of a TMDL, which suggests that the lower Boise River is a good candidate for such an approach. Appropriate watershed monitoring data would become a critical component of any watershed-based NPDES permitting strategy.

Watershed monitoring activities for the mainstem are summarized in Table 18, and monitoring activities for each of the tributaries are summarized in Table 19. These tables summarize currently required parameters (sediment and bacteria), as well as additional parameters that are likely to be required (nutrients). The funding to continue this monitoring is definite as long as each of the funding sources (Table 19) remain committed to the monitoring program.

It is also important to note that even though the sediment TMDL targets are not seasonal, sediment monitoring should be targeted during the critical period of February 15 through June 14 to determine if concentration reductions are being achieved.

## USGS Activities

Since 1994, the USGS has monitored the mainstem lower Boise River and major tributaries at their mouths. A Joint Funding Agreement was signed by the USGS and DEQ initiated a water resources investigation expected to last 8 years. Funding for this monitoring is provided by the DEQ, the LBRWQP, and USGS. This program monitors and assesses the water quality and biotic integrity of the lower Boise River to meet three primary objectives:

1. Identify and describe the current water quality conditions of the river and its tributaries.
2. Describe the current biological conditions and assess the biotic integrity of the river.
3. Monitor the long-term water quality trends and biotic integrity of the river.

The program was designed to be accomplished in three phases. Phase I data were used to determine the major sources and loads of contaminants, identify long-term monitoring sites and sampling frequency, and assess water quality on specific reaches of the river. Phase II activities included more intensive interval water quality sampling, continuation of an annual synoptic survey, and initiation of semi-quantitative aquatic biological and habitat assessment. USGS published two Water Resource Investigation Reports that summarized the data from Phase I and II and the data from the first 3 years of biological monitoring (USGS, 1998; 1999).

TABLE 18.
Water Quality Trend Monitoring on Mainstem Lower Boise River

| Station | Parameters | | | | | | | | | | Schedule | Responsible Entity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Flow | Sediments | | Bacteria | | Nutrients | Temperature | Benthic | Periphyton | | | |
| | | Suspended Solids | Suspended Sediments | Fecal Coliform | E. Coli | | | | | | | |
| Diversion Dam (RM 61.2) | X | | | | | | | | | | Continuous | USGS |
| | | | X | X | X | X | X | | | | 9/year[a] | WAG, USGS, DEQ, BOR |
| | | | | | | | | X | X | | 1/year [b] | WAG, USGS, DEQ, BOR |
| Eckert Road Br. (RM 58.3) | | | | | X | | | | | | 1/week | Boise City |
| Marden St. Footbr. (RM 54.7) | | | | | X | | | | | | 1/week | Boise City |
| | | | | | | | X | | | | Continuous | |
| Veterans Br. (RM 50.1) | | | | | | | | | | | 1/day | Boise City |
| | | X | | X | | | | | | | 1/month | |
| | | | | | X | X | | | | | 1/week | |
| | | | | | | | X | | | | Continuous | |
| Lander Street WWTP (RM 49.9) | X | | | | | | | | | | Continuous | Boise City |
| | | X | | X | X | | | | | | 1/month | |
| | | | | | | X | | | | | 1/week | |
| Glenwood Br. (RM 47.4) | | X | | X | | | | | | | 1/month | Boise City |
| | | | | | X | X | | | | | 1/week | Boise City |
| | X | | | | | | | | | | Continuous | USGS |
| | | | | | | | X | | | | Continuous | Boise City |
| | | | X | X | X | X | | | | | 9/year[a] | WAG, USGS, DEQ, BOR |
| | | | | | | | | X | X | | 1/year [b] | WAG, USGS, DEQ, BOR |
| West Boise WWTP (RM 43.5) | X | | | | | | | | | | Continuous | Boise City |
| | | X | | | X | X | | | | | 1/week | |
| | | | | X | | | | | | | 5/week | |
| South Chan. @ Eagle Br. (RM 42.8) | X | | | | | | X | | | | Continuous | Boise City, USGS |
| | | | | | X | | | | | | 1/week | |
| Eagle Br. (RM 40.8) | | X | | X | X | | | | | | 1/month | Boise City |
| | | | | | | X | | | | | 1/week | Boise City |
| | X | | | | | | | | | | Continuous | USGS |
| Linder Br. (RM 40) | | | | | | | | | | | | Boise City |
| Meridian U/S (RM 39.5) | | X | | | | X | | | | | 1/week | City of Meridian |
| Meridian WWTP (RM 39) | X | | | | | | | | | | Continuous | City of Meridian |
| | | X | | | | | | | | | 2/week | |
| | | | | X | X | | | | | | 5/week | |
| | | | | | | X | | | | | 1/week | |
| Meridian D/S (RM 33.9) | | | | | | X | | | | | 1/week | City of Meridian |
| Middleton (RM 29.1) | X | | | | | | | | | | Continuous | Idaho Power |
| | | | | | | | X | | | | Continuous | Boise City |
| | | | X | X | X | X | | | | | 9/year[a] | WAG, USGS, DEQ, BOR |
| | | | | | | | | X | X | | 1/year [b] | WAG, USGS, DEQ, BOR |
| Middleton U/S (RM 26.5) | | | | | | X | | | | | 1/month | City of Middleton |
| Middleton WWTP (RM 25.4) | X | | | | | | | | | | Continuous | City of Middleton |
| | | X | | | | | | | | | 1/week | |
| | | | | X | X | | | | | | 5/week | |
| | | | | | | X | | | | | 1/month | |
| Darigold | X | | | | | | | | | | Continuous | Darigold Inc. |
| | | X | | | | | | | | | 1/week | City of Caldwell |
| Caldwell U/S | X | X | | X | | X | | | | | 1/week | City of Caldwell |
| Caldwell WWTP (RM 20.4) | X | | | | | | | | | | Continuous | City of Caldwell |
| | | X | | | | X | | | | | 1/week | |
| | | | | X | | | | | | | 5/week | |
| | | | | | X | | | | | | 1/month | |
| Caldwell D/S | | | | | | X | | | | | 1/week | City of Caldwell |
| Parma (RM 3.5) | X | | | | | | | | | | Continuous | USGS |
| | | | | | | | X | | | | Continuous | Boise City |
| | | | X | X | X | X | | | | | 9/year[a] | WAG, USGS, DEQ, BOR |
| | | | | | | | | X | X | | 1/year [b] | WAG, USGS, DEQ, BOR |

NOTES:
[a] Monthly during irrigation season and bimonthly during non-irrigation season.
[b] Scheduled to be completed in FY 2002.
U/S--Sampling location upstream from effluent outfall.
D/S--Sampling location downstream from effluent outfall.
WWTP--Wastewater treatment plant effluent outfall monitoring location.
All monitoring conditions as specified in most recent NPDES monitoring permits. These conditions and schedules are subject to change as specified in each of the respective permits.

TABLE 19.
Water Quality Trend Monitoring on Tributaries/Drains to Lower Boise River

| Station | Parameters | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sediments | | Bacteria | | | | | | | | | | |
| | Flow | Suspended Solids | Suspended Sediments | Fecal Coliform | E. Coli. | Nutrients | Temperature | Benthic | Periphyton | Fish | Habitat Assessment | Schedule | Responsible Entity |
| Walnut Street ACHD | X | X | | | X | X | X | | | | | 3 storm events/year | ACHD, Boise City, ITD, DD#3 |
| Lucky Drive ACHD | X | X | | | X | X | X | | | | | 3 storm events/year | ACHD, Boise City, ITD, DD#3 |
| Koppel's ACHD | X | X | | | X | X | X | | | | | 3 storm events/year | ACHD, Boise City, ITD, DD#3 |
| Franklin Road ACHD | X | X | | | X | X | X | | | | | 3 storm events/year | ACHD, Boise City, ITD, DD#3 |
| Production Avenue ACHD | X | X | | | X | X | X | | | | | 3 storm events/year | ACHD, Boise City, ITD, DD#3 |
| Eagle Drain | | | | | | | | | | | | | |
| Thurman Drain | | | | | | | | | | | | | |
| Fifteen Mile | | | | | | | | | | | | | |
| Five Mile | | | | | | | | | | | | | |
| Meridian U/S | | X | | | | X | | | | | | 1/week | City of Meridian |
| Meridian WWTP | X | | | | | | | | | | | Continuous | City of Meridian |
| | | X | | | | | | | | | | 2/week | |
| | | | | X | X | | | | | | | 5/week | |
| | | | | | | X | | | | | | 1/week | |
| Meridian D/S | | | | | | X | | | | | | 1/week | City of Meridian |
| Along the Length (BURP) | X | | | | X | | X | X | X | X | X | 1/year in 2003 | DEQ BURP Program |
| Ten Mile | | | | | | | | | | | | | |
| Along the Length (BURP) | X | | | | X | | X | X | X | X | X | 1/year in 2003 | DEQ BURP Program |
| Star Feeder | | | | | | | | | | | | | |
| Long Feeder | | | | | | | | | | | | | |
| Watts Creek | | | | | | | | | | | | | |
| Mill Slough | | | | | | | | | | | | | |
| Lawrence-Kennedy Canal | | | | | | | | | | | | | |
| Star WWTP | X | | | | | | | | | | | Continuous | Star Water and Sewer District |
| | | X | | | | | | | | | | 1/week | |
| | | | | X | X | | | | | | | 5/week | |
| | | | | | | X | | | | | | 1/month | |
| Willow Creek | | | | | | | | | | | | | |
| Along the Length (BURP) | X | | | | X | | X | X | X | X | X | 1/year in 2003 | DEQ BURP Program |
| Mason Slough | | | | | | | | | | | | | |
| Along the Length (BURP) | X | | | | X | | X | X | X | X | X | 1/year in 2003 | DEQ BURP Program |
| E&W Hartley Gulch | | | | | | | | | | | | | |
| Indian Creek | | | | | | | | | | | | | |
| ConAgra U/S | | X | | X | | X | | | | | | 1/week | ConAgra, Incorporated |
| ConAgra | X | | | | | | | | | | | Continuous | ConAgra, Incorporated |
| | | X | | | | X | | | | | | 1/week | |
| | | | | X | | | | | | | | 5/month | |
| | | | | | X | | | | | | | 1/month | |
| ConAgra D/S | | X | | X | | X | | | | | | 1/week | ConAgra, Incorporated |
| Nampa U/S | X | X | | X | | X | | | | | | 1/week | City of Nampa |
| Nampa WWTP | X | | | | | | | | | | | Continuous | City of Nampa |
| | | X | | | | X | | | | | | 1/week | |
| | | | | X | | | | | | | | 5/week | |
| | | | | | X | | | | | | | 1/month | |
| Nampa D/S | | | | | | X | | | | | | 1/week | City of Nampa |
| Along the Length (BURP) | X | | | | | | X | X | X | X | X | 1/year in 2003 | DEQ BURP Program |
| Conway Gulch | | | | | | | | | | | | | |
| Notus U/S | X | | | | | X | | | | | | 1/week | City of Notus |
| Notus WWTP | X | | | | | | | | | | | Continuous | City of Notus |
| | | X | | | | X | | | | | | 1/week | |
| | | | | X | X | | | | | | | 5/week | |
| Dixie Drain | | | | | | | | | | | | | |
| Along the Length (BURP) | X | | | | X | | X | X | X | X | X | 1/year in 2003 | DEQ BURP Program |
| Blacks Creek | | | | | | | | | | | | | |
| Along the Length (BURP) | X | | | | X | | X | X | X | X | X | 1/year in 2003 | DEQ BURP Program |
| Sand Hollow Creek | | | | | | | | | | | | | |
| Along the Length (BURP) | X | | | | X | | X | X | X | X | X | 1/year in 2003 | DEQ BURP Program |
| Cottonwood Creek | | | | | | | | | | | | | |
| Along the Length (BURP) | X | | | | X | | X | X | X | X | X | 1/year in 2003 | DEQ BURP Program |

NOTES:
Only the Walnut and Koppel ACHD stormwater sites enter the lower Boise River directly.
U/S--Sampling location upstream from effluent outfall.
D/S--Sampling location downstream from effluent outfall.
WWTP--Wastewater treatment plant effluent outfall monitoring location.
All monitoring conditions as specified in most recent NPDES monitoring permits. These conditions and schedules are subject to change as specified in each of the respective permits.

The monitoring program is finishing Phase III, which consists of continued annual synoptic sampling and semi-quantitative aquatic biological and habitat assessment. The final year of the 8-year USGS monitoring program included compilation, examination, and reporting of data from Phases I through III. This historical data provides the baseline from which to assess the progress of TMDL implementation. The USGS is committed to continuing the monitoring program and refinements to monitoring activities, as directed by the LBRWQP in a shared-cost framework with the LBRWQP and the USBR, have been scheduled for FY 2004. USGS monitoring is expected to continue to occur into the foreseeable future.

The USGS has established four longitudinally spaced monitoring locations in the lower Boise River: Diversion Dam, Glenwood Bridge, Middleton, and Parma Bridge (Table 18). These sites are sampled approximately nine times per year (monthly during the irrigation season and bimonthly during the non-irrigation season) for suspended sediments, bacteria, and nutrients. Benthic and periphyton samples are also collected on an annual basis, usually in November at the same four sites. The monitoring regime is expected to continue indefinitely, as long as funding exists. The data generated by this monitoring effort comprised the core dataset for TMDL development. As additional, post-implementation data is collected, DEQ anticipates using this dataset as the primary measure of TMDL compliance. It is expected that the USGS monitoring program will result in a sufficient database for the continued assessment of standards attainment and additional predictive modeling if necessary.

Following the end of the 8-year monitoring program in 2002, it is expected that continued USGS monitoring on the mainstem and selected tributaries will be performed on behalf of DEQ and LBRWQP. It is anticipated that both USGS and ISDA will both conduct monitoring projects as needed within tributaries to the lower Boise River during the implementation of specific water quality projects in the sub-watersheds. Using these data, success in reducing the current load of sediment and bacteria will be measured partly by comparing individual allocations with the measures contributions monitoring at (or near) the mouths of major tributaries. This type of monitoring will allow for trend analysis of water quality in the tributaries before, during, and after implementation of each water quality project.

Within an adaptive and flexible framework, long-term monitoring will be used to evaluate the changing condition of the watershed and may lead to adjustments in pollution targets throughout the implementation phase of the TMDL. Trend analysis will be performed approximately every 5 years to assess whether the implementation measures are working and determine if changes need to be made either to specific control actions or monitoring requirements.

## BURP Program

In addition to the USGS monitoring of the mainstem, the other significant water quality monitoring activity is scheduled to occur with DEQ's Beneficial Use Reconnaissance Program (BURP). This program is designed to integrate biological and chemical monitoring with physical habitat assessment to characterize stream integrity and water quality. It is an efficient series of field measurements of the physical, chemical, and biological components of the aquatic system as a means to evaluate beneficial uses.

The following tributaries to the mainstem lower Boise River are scheduled for BURP analysis during 2003 (Table 19):

- Fivemile Creek
- Tenmile Creek
- Indian Creek
- Mason Creek
- Dixie Slough
- Sand Hollow Creek
- Cottonwood Creek
- Willow Creek

The BURP assessments are typically conducted at three to four sites along each tributary during a 1- or 2-day period so that a synoptic evaluation of the stream condition can be assessed.

## ISDA Monitoring

In addition, ISDA, along with the SCC and local SWCD, may develop a water quality monitoring plan that will provide trend analysis of water quality, and gauge progress toward meeting the TMDL load reductions on a sub-watershed basis. Water quality monitoring will be carried out at critical points within each subbasin where agricultural projects are implemented. This evaluation will create quantitative connectivity between the collective BMP efforts in a subbasin and changes in water quality. The proper time to revisit the sub-watershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

## NPDES Monitoring

Finally, within the lower Boise River watershed, there are five regulated point source discharges into the Boise River and five into tributaries under NPDES permits. Each source discharges both suspended solids and bacteria into the river, and is thus subject to monitoring requirements for these parameters. Because all of these facilities operate under current NPDES permits, and are expected to do so into the indefinite future, control actions have already been implemented. A summary of required monitoring is provided in Table 18.

Stormwater monitoring also occurs under the Phase I NPDES program. Water quality monitoring required by the Phase I permit includes wet weather storm event monitoring for event-mean concentrations and annual and seasonal pollutant loads, as well as dry weather monitoring. Phase II stormwater permits do not require water quality monitoring.

Under a watershed-based permitting framework, NPDES discharge monitoring requirements could be integrated into a watershed-wide program in order to evaluate receiving water quality and support other watershed management activities. These data could provide the data needed to determine progress of TMDL implementation activities and watershed quality improvement goals.

# Data Analysis and Report

Consistent with EPA guidelines, based on the results of available monitoring data, DEQ will perform data analysis every 5 years to assess whether the implementation measures are working and determine if changes need to be made either to specific control actions or monitoring requirements.

Monitoring from specific projects will be pooled to determine whether management actions are having the desired measurable effect at the subbasin level. This type of monitoring should allow for trend analysis of subbasins. Subbasin monitoring by ISDA and USGS will help direct changes in management actions as load reductions are tracked at the mouth of the tributaries. Reductions in the current load for sediment and bacteria of the individual 12 tributaries will be compared with the expected reductions for the mainstem of the lower Boise River.

Within an adaptive and flexible framework, long-term monitoring will be used to evaluate the changing condition of the watershed and may lead to adjustments in pollution targets throughout the implementation phase of the TMDL.

Results of the 5-year analysis will be used to recommend or discourage similar projects in the future and in which tributary or reach to best apply proven practices. If trend analysis indicates the goals are being met or are going to be met in a reasonable amount of time, then the plan will continue. Projected load reductions will be included in the trend analysis. If analysis shows goals will not be met in a reasonable amount of time, then the TMDL Implementation Plan (including separate source plans) will be revised as needed to include modified objectives and a new strategy for implementation activities.

# Data Gaps

The TMDL assessment identified several data gaps that limited assessment of the effects of the listed pollutants on beneficial uses. Revisions to Idaho WQS may necessitate changes in the TMDL as well. The following is a list of the known data gaps and the efforts that are either underway, have been planned, or are subject to ongoing discussions between EPA, DEQ, LBRWQP, and various stakeholders.

## Additional Monitoring Parameters

In response to changing WQS and requirements from other TMDLs, various entities are in the process of collecting additional monitoring data for *E. coli*, sediment, temperature, mercury, and pesticides. As discussed earlier, these entities include NPDES permit sampling by local municipalities, interested stakeholders, and USGS.

For example, recent *E. coli* monitoring is being conducted to determine waterbody conditions and compliance with the new standards, as well as to assess the need for establishing new target load reductions. Results from point source discharge monitoring indicates that between 1999 and 2001, no exceedances of the new *E. coli* standards have been observed within the urban portion of the watershed. The USGS dataset confirms that the average *E. coli* levels in the river increase downstream between the Diversion Dam and Parma. Additional temporal and spatial collection of *E. coli* data are needed to evaluate

compliance with the current water quality standard, including data collected over a 30-day period that can be compared against the geometric mean standards. As discussed in the *Watershed Implementation Schedule*, as additional monitoring data are collected, the bacteria targets in the TMDL will be re-evaluated on a 5-year schedule by DEQ.

## Substrate Monitoring Plan

DEQ, in cooperation with EPA, the LBRWQP, U.S. Bureau of Reclamation (BOR), USGS, BSU, and U.S. Army Corps of Engineers (COE) evaluated the development and implementation of a long-term sediment monitoring project in the Boise River. Although EPA initially took the lead in developing and implementing the project, with limited support roles coming from the remaining entities, DEQ agreed to limited participation in the project because DEQ felt the sediment TMDL adequately contained the required analysis of sediment conditions in the river. In July 2000, the EPA substrate monitoring plan project lead vacated his position. While a draft monitoring plan had been completed, the plan had not been finalized by the cooperating entities, nor had the field monitoring and sample analysis logistics been finalized. Subsequently, the project was put on hold. As of June 2003, DEQ has not identified the finances or personnel to reinitiate the project. If EPA reinitiates the project in the future, DEQ will resume participation.

## Other TMDL Data Gaps

During TMDL development, the best available data were used to develop the SBA and TMDL load allocations. However, the following other items were identified as data gaps:

- Winter Flows — For tributaries to the lower Boise River
- Fish — Larval and juvenile fish data during high and irrigation flow periods
- Bacteria — Adequate data to calculate 30-day geometric means, particularly in the lower reaches of the mainstem (Boise City is currently conducting *E. coli* monitoring between the Eckert Road Bridge (RM 58.3) and Eagle Island (RM 42.8)
- Sediment — Continuous monitoring of sediment bedload data, stream bank erosion rates, substrate and water column particle size data, long-term channel geometry data, and intergravel DO data (particularly during the critical period of February 15 through June 14)
- Temperature — Daily maximum temperatures and winter daily averages at Middleton and Caldwell, data for winter conditions in drains
- Nutrients — Algae data for hot drought conditions during summer, and associated DO
- Stormwater — Sufficient data to estimate potential impacts from stormwater on the mainstem lower Boise River

These items will be addressed as resources and priorities allow.

# Tracking Database

To assess the effectiveness of non-point source implementation measures, DEQ has developed a database to track BMP and other improvement projects in the watershed. This database was developed based on the model developed for the Cascade Reservoir Implementation Plan (DEQ, 2000b). The tracking system includes the following project characteristics:

- Project identification and description (including agency lead and project coordinators)
- Project location and size (may just include assigned sub-watershed if the BMP is implemented by the SCC)
- Primary source group (includes which source group receives credit for improvement project)
- Estimate of constituent load baseline conditions and expected reductions
- Available project inspection and site-specific monitoring data
- Estimated costs (capital, as well as operation and maintenance)
- Funding description (e.g., source, type, and schedule of funding)
- Potential collateral benefits (e.g., temperature reductions, fisheries, and aesthetics)
- Site photographs (as available)

Example input pages from the DEQ tracking database are provided in Figure 13.

Similar information will continue to be tracked by SCC for the projects on agricultural properties that implement BMPs or other improvements. This information will be provided to DEQ for input into the watershed database tracking system to provide a record of improvements that can be used within the adaptive management framework. The SCC tracks their projects using a similar database, with the exception that specific parcel ownership and contract information remains confidential. It is anticipated that information collected by SCC from the period following TMDL development (i.e., following the baseline conditions used to develop the TMDL load allocations) will be entered into the DEQ database to provide a comprehensive picture of improvement projects that have occurred since the development of the TMDL. The tracking database will be an integral part of the 5-year review of TMDL progress.

# Implementation Funding Plan

Without adequate funding, this plan will be only a document that does not get used. Locating funding and releasing those funds to address the measures identified in this plan is critical to its long-term success.

Implementation funding varies by individual sources. A few of the potential funding programs are discussed below to illustrate the program management activities and scheduling that may be required.

For example, funding from the Idaho legislature must be submitted during the year prior to the applicable legislative session. Projects proposed for funding require a sponsor, or may be submitted as part of the DEQ budget. If the Idaho legislature approves funding for the project, funds are typically available to the state in July of the same year, with allocation to recipients by September. This results in funds being available to implement BMPs / projects very late in the construction season.

As another example, the federal 319 grant program combines 60 percent cost share funds from EPA with 40 percent landowner match. At least one project or practice from the conservation plan must be implemented in the first 12 months of the program. The conservation plan must be sustained for a minimum of 5 years and a maximum of 10 years for reimbursement. The local SWCD often provides annual status reviews and maintains a tracking system for monitoring the program.

As a final example, the NRCS has the Environmental Quality Incentive Program (EQIP) that requires land owners to have a conservation plan and an EQIP contract submitted and approved by the local SWCD board. At least one cost share practice must be implemented in the first 12 months of the program. The conservation plan must be sustained for a minimum of 5 years and a maximum of 10 years for reimbursement. The local SWCD provides annual status reviews and maintains a tracking system for monitoring the program.

Appendix D contains a more comprehensive list of funding programs for stakeholders in the watershed. Programs are sorted according to sponsoring agency and category. Categories include agricultural / non-point source, stormwater urban and suburban / BMP, pollution prevention / point source, other (funding for research, environmental action groups, monitoring, etc.), and all (potential funding sources for any type of improvement). More specific information about programs, contacts, and application deadlines, are available at the agency websites indicated in Appendix D. Specific information is also available from EPA's Environmental Finance Center at BSU. The Directory of Watershed Resources database summarizes most of the national, state, and private financial programs for environmental improvement; the directory can be found on-line at http://sspa.boisestate.edu/efc/ or by calling 1-866-627-9847.

Each of the source-specific implementation plans have identified, to the extent possible, potential sources of funding, the mechanisms by which those sources will be tapped, and who will conduct the fundraising effort. Ideally, each of the implementation plans should contain an economic analysis to compare options and their effectiveness so that limited

resources are properly applied throughout the watershed. Although the individual implementation plans do not currently contain this analysis, it is anticipated that information tracked within the DEQ tracking database can be used to develop cost-benefit comparisons as potential projects are proposed.

For the lower Boise River TMDL, the estimated costs associated with reducing sediment and bacteria levels throughout the watershed are summarized below from each of the source-specific plans.

## Point Source Pollution Control Efforts

Because all of the municipal and industrial WWTF facilities operate under current NPDES permits, and are expected to do so into the indefinite future, no additional costs for these control actions associated exclusively with the lower Boise River TMDL for sediment and bacteria are anticipated. However, additional significant costs will likely be incurred as a result of other watershed activities, such as complying with the Snake River-Hells Canyon TMDL (e.g., phosphorus, temperature, mercury).

## Urban Suburban Storm Drainage Pollution Control Efforts

As one component of storm drainage pollution control efforts, all of the co-permittees under the Phase I NPDES permits currently operate under the existing permit, and are expected to do so into the indefinite future. Because the Phase I permit was partially based on standards and targets set in the lower Boise River TMDL, no additional costs for these control actions associated exclusively with the lower Boise River TMDL are anticipated.

Although the cost of implementing Phase II stormwater requirements are difficult to estimate at this time, EPA has developed cost estimates for the six minimum measures for local municipalities. These costs range from $1.33/capita to $7.73/capita. Other analyses have further refined EPA cost estimates and determined that costs could range from $1.37/capita for smaller communities (10,000 people, for an annual cost of $13,700) to $10.96/capita for larger communities (50,000 people, for an annual cost of $548,000). These estimates do not include additional costs that would be passed onto contractors, developers, and other entities.

## Non-point Source Pollution Control Efforts

The costs to install BMPs on agricultural lands are estimated to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. The costs to reduce sediment, bacteria, and phosphorus levels in the watershed are hard to estimate because of the variability in crops and existing irrigation methods. Results from elsewhere in Idaho (for example, Rock Creek) may be used to compare the cost and performance data obtained in the lower Boise River watershed.

Based on typical costs to install moderate level BMPs on critical acreage within the agricultural portion of the watershed, it is estimated that agricultural BMP installation may

cost as much as $73.7 million if all three tiers of surface-irrigated cropland in addition to surface-irrigated pasture, non-irrigated pasture, and CAFO / AFO units are addressed. If BMPs are only installed on Tier 1 surface-irrigated cropland and surface-irrigated pasture, and CAFO / AFO units, the agriculture implementation cost is significantly lower ($28.8 million). At the present level of funding, the high-end estimate would take over 100 years to implement. For the Tier 1 only estimate, the timeframe is over 40 years. Both of these funding estimates include treating sediment, bacteria, and phosphorus, but do not include maintenance costs.

Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix D and the Implementation Plan for Agriculture (Appendix C). There are several sources of funding for BMP installation, including loans, incentives, and cost-share programs. Currently, state and federal sources provide the majority of the funding for BMP implementation on private agricultural land within the lower Boise River watershed. Some landowners provide a significant source of funding through the voluntary implementation of BMPs using their own time and money. Through USDA-NRCS, EPA, and Idaho SCC programs, funding is available to install BMPs on a larger scale within priority watersheds in order to help meet water quality objectives. Individual landowners or stakeholders should contact the designated agencies for more information on particular programs and to help determine the need to address water quality and other natural resource concerns on their land.

# Future Management Measures

This section of the plan addresses how the TMDL may be revised as future conditions necessitate. This includes how the TMDL progress will be assessed and how NPDES permits may be revised to reflect TMDL requirements.

## Assessment of TMDL Progress

DEQ is the responsible agency for assessing the progress of the TMDL. As discussed in detail previously, this assessment will rely on water quality evaluations and BMP effectiveness monitoring conducted throughout the watershed. DEQ has developed a database to track progress for the watershed, as discussed in the previous section of this plan.

As part of TDML development, DEQ provided funds to the LBRWQP for technical assistance. At this time no additional funding is available for assistance with the implementation phase; however, the most current workplan for the LBRWQP includes technical support for other TMDL issues such as phosphorus and temperature. In addition, additional funding sources are being sought through the Environmental Finance Center at BSU to help defray the costs to the LBRWQP. The outcome of this partnership is expected to provide better information to define and characterize the financial relationship between DEQ and the LBRWQP and various stakeholders throughout the implementation period.

## Revisions to NPDES Permits

The lower Boise River sediment and bacteria TMDLs established load allocations for the tributaries to the river and wasteload allocations for the major point source facilities and Phase I stormwater discharges. While the sediment and bacteria load allocations represent the reductions necessary by non-point sources to meet WQS, wasteload and Phase II stormwater allocations are consistent with current NPDES permits. No further reductions related to sediment or bacteria are anticipated to be necessary. However, as significant nutrient reductions will be required as a result of the Snake River-Hells Canyon TMDL, current NPDES permits will need to be revised. In addition, as the Phase II stormwater program is implemented additional reductions may be required either to meet the requirements of this TMDL for sediment and bacteria or to meet the requirements of the Snake River-Hells Canyon TMDL for temperature and phosphorus.

Chapter 40, §122.62 of the Code of Federal Regulations describes numerous provisions under which NPDES permits can be revised. Generally, only the conditions of the permit subject to revision are re-opened, not the entire permit. As they pertain to TMDL implementation, the portions of the NPDES permit likely to be re-opened are the effluent limits for the listed pollutants and in the event of facility alterations (such as sludge use), the facility plan.

EPA currently has primacy over NPDES permits in the State of Idaho. Therefore, any revision of NPDES permits is subject to EPA's timeline and authority. In incorporating wasteload allocation into NPDES permits, the initial step is to determine the appropriate timing of the revision. Upon approval of TMDLs in Idaho, the EPA permit writers are made aware of any potential changes or updates to permits. If a permit is close to expiration, then the wasteload allocations will most likely be incorporated as a step in the renewal process. If a permit is not close to expiration, then the decision of when to revise the permit lies with EPA and DEQ, and will consider the near-term water quality implications. If rapid water quality degradation as a result of not implementing wasteload allocations is imminent, the incorporation of wasteload allocations will occur as soon as possible. If rapid water quality degradation is not imminent, the permit will likely be revised during the renewal process.

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# Figures

# Lower Boise River Implementation Plan Figures

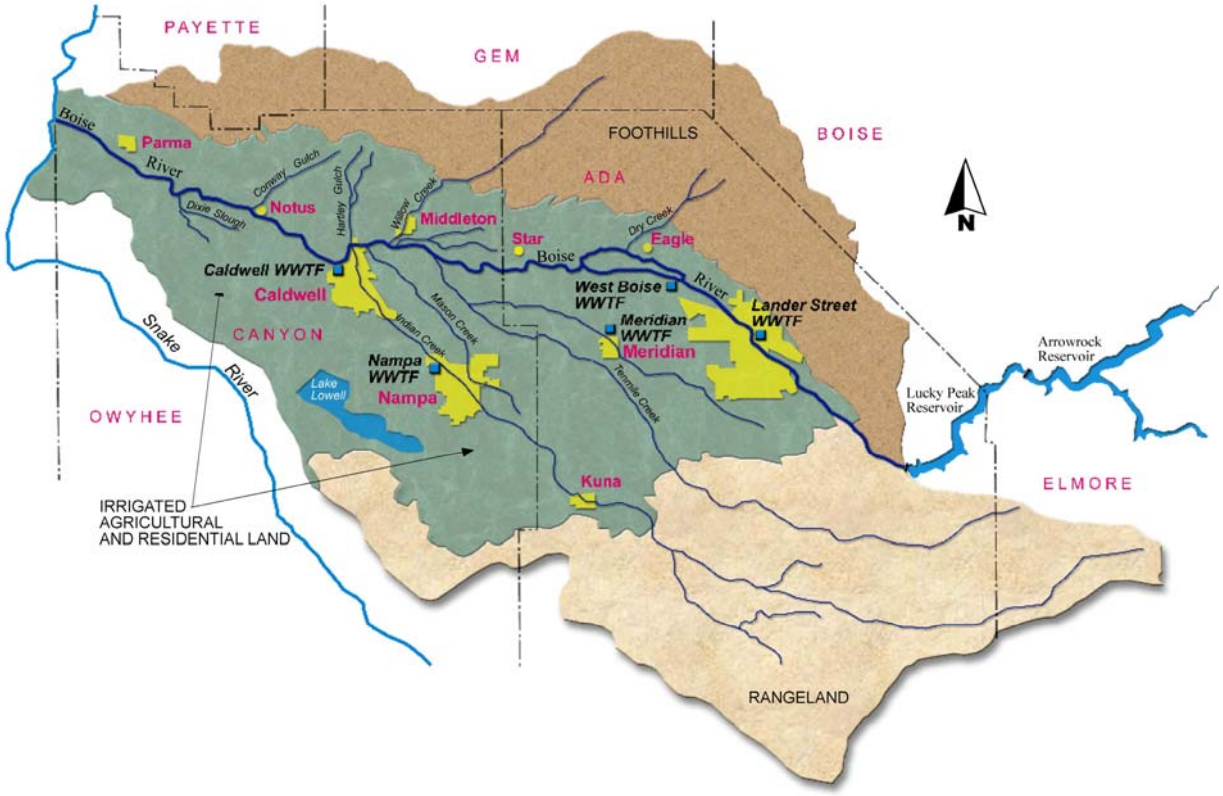



**FIGURE 1.**
Lower Boise River Watershed Map

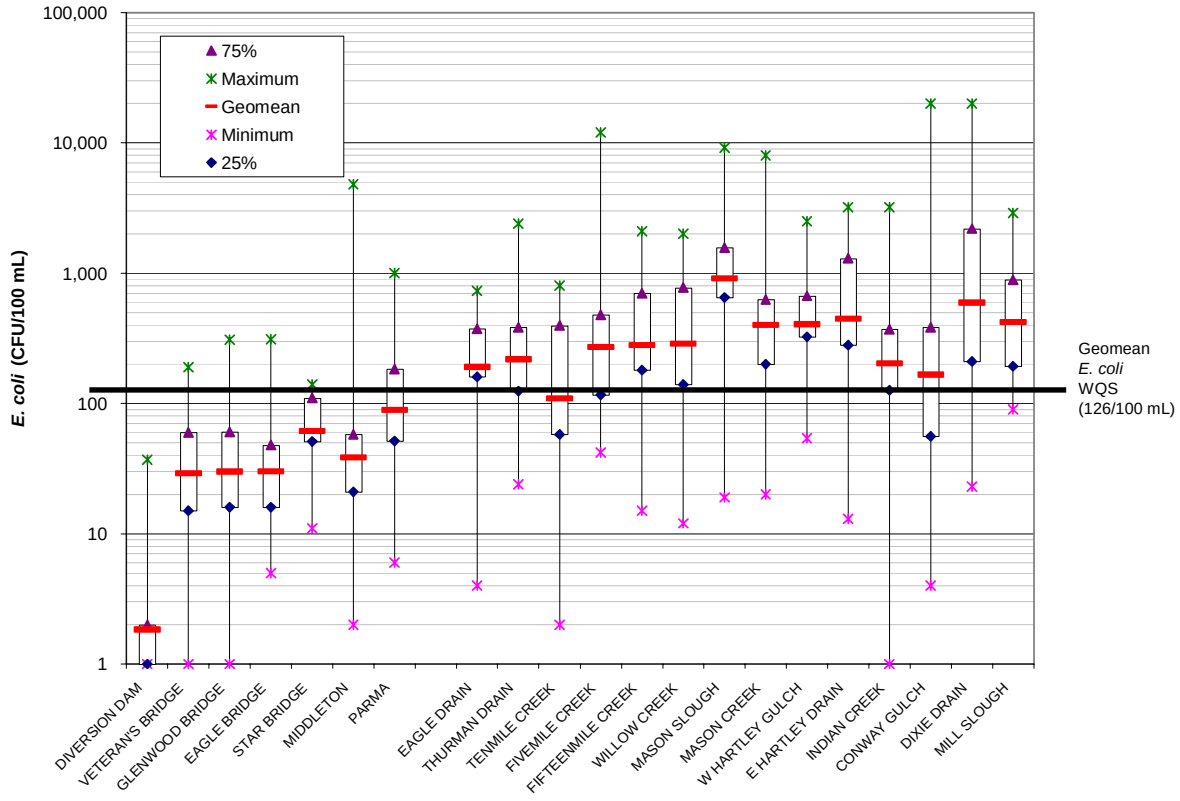



**FIGURE 2.**
Box Plots of *E. coli* Sampling Results for Lower Boise River and Drains

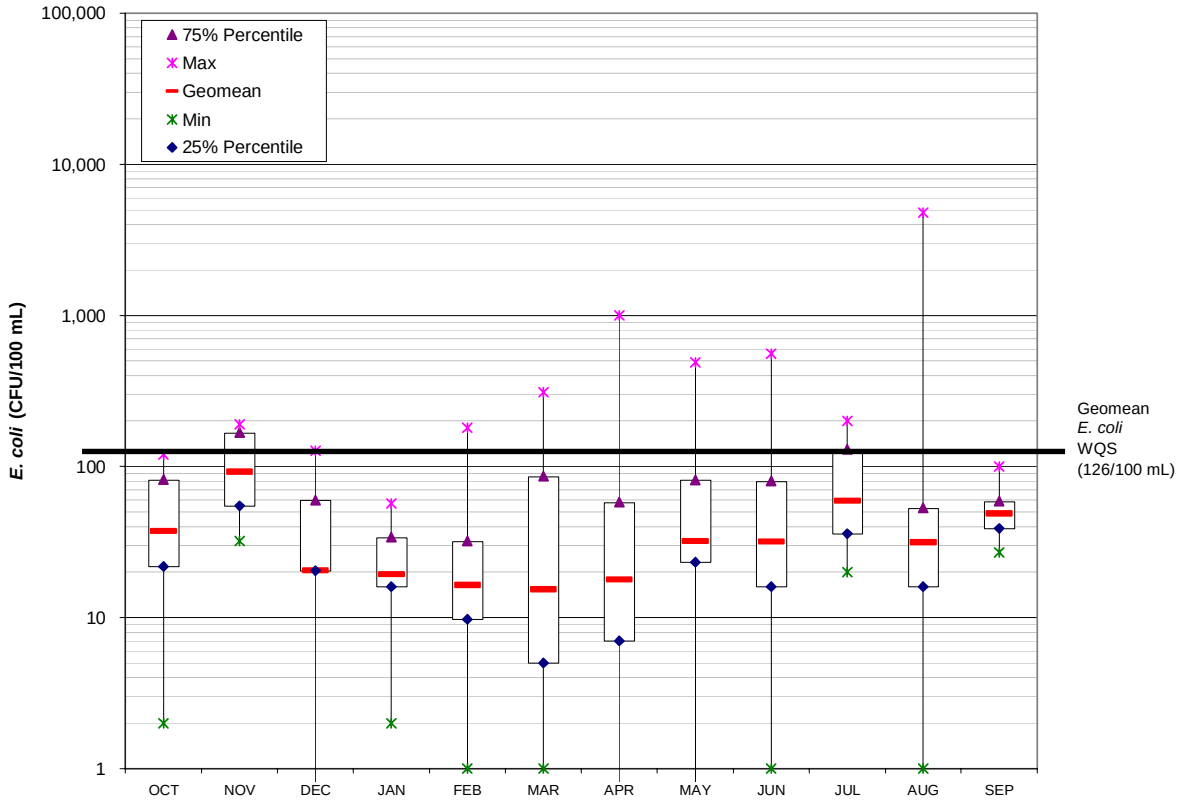



**FIGURE 3.**
Monthly *E. coli* Sampling Results for Lower Boise River

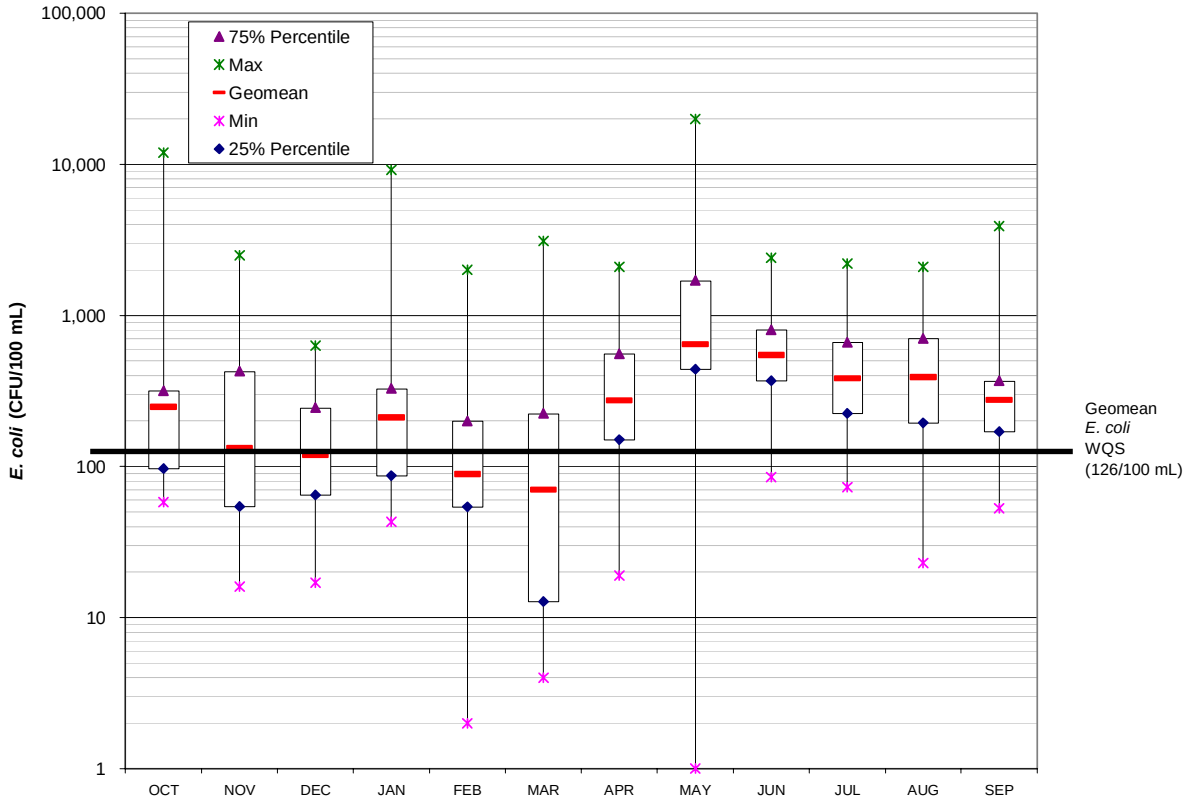



**FIGURE 4.**
Monthly *E. coli* Sampling Results for Drains to Lower Boise River

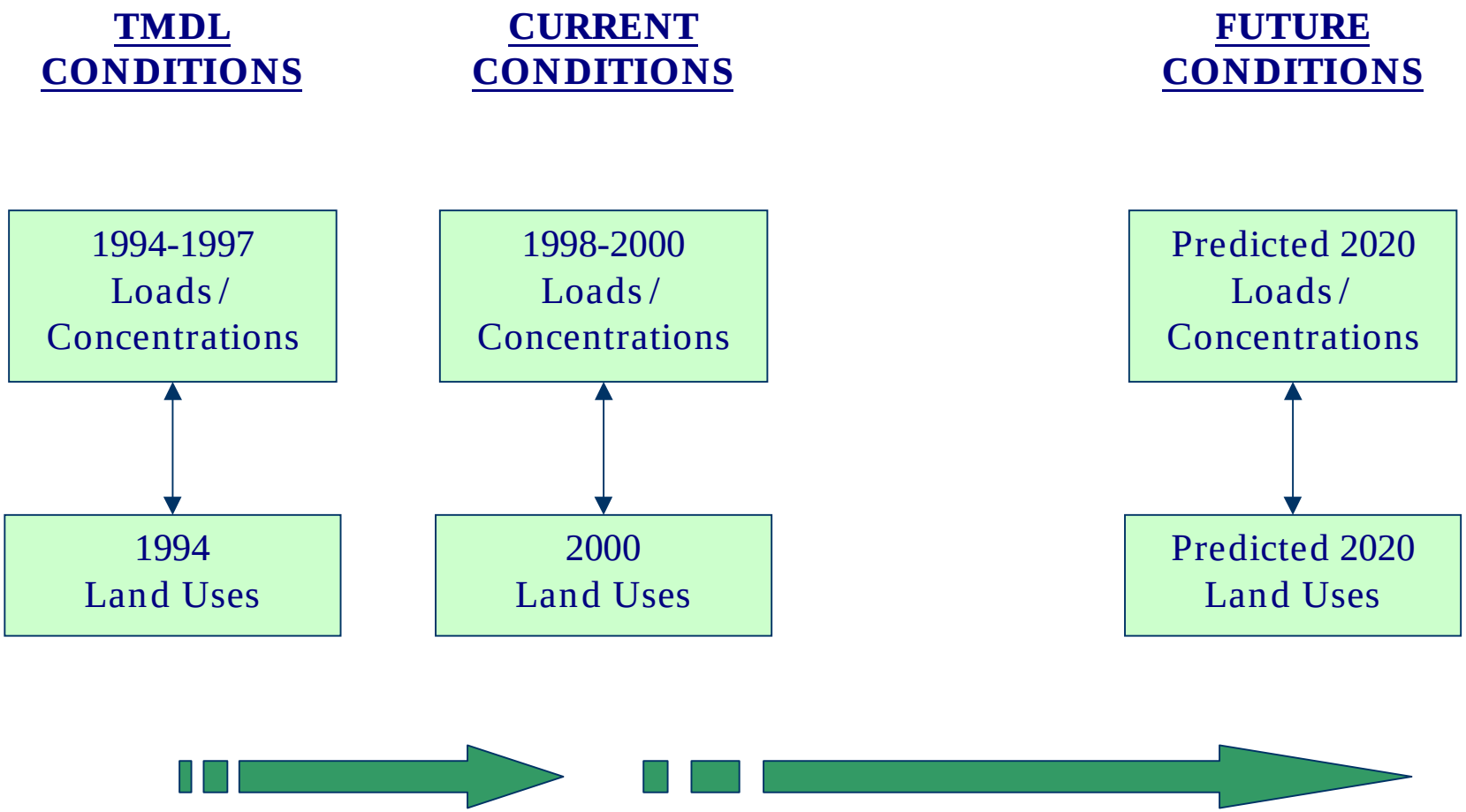
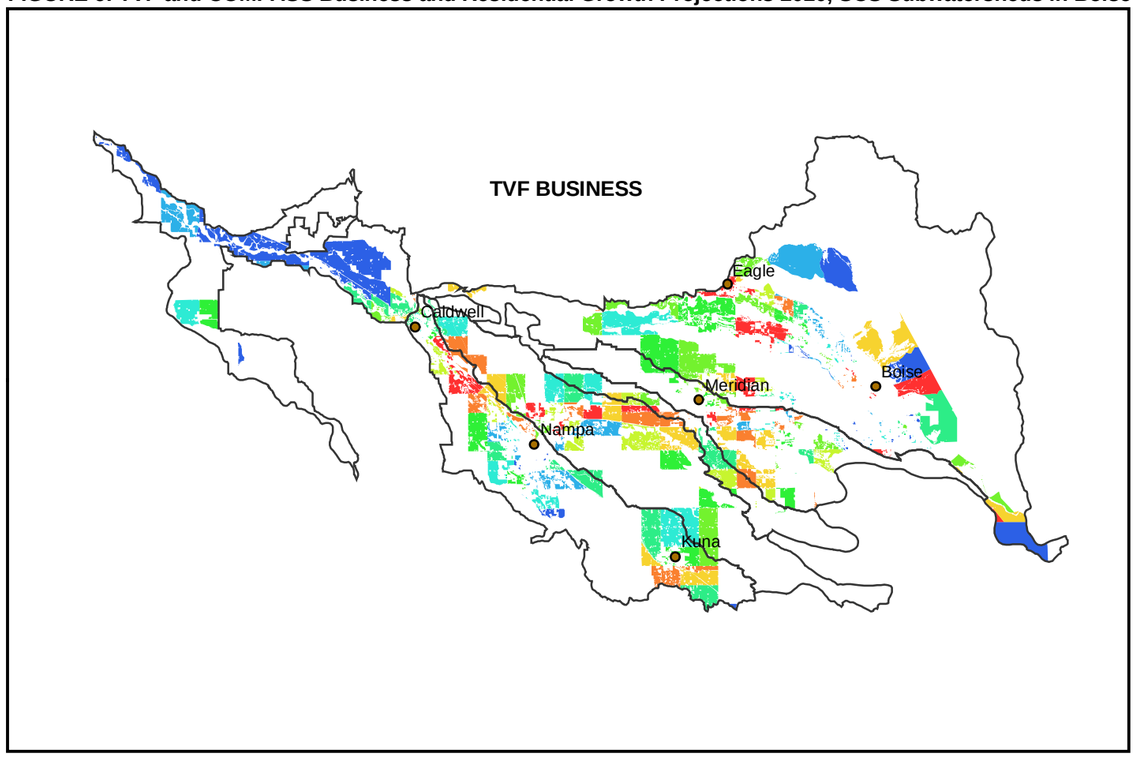
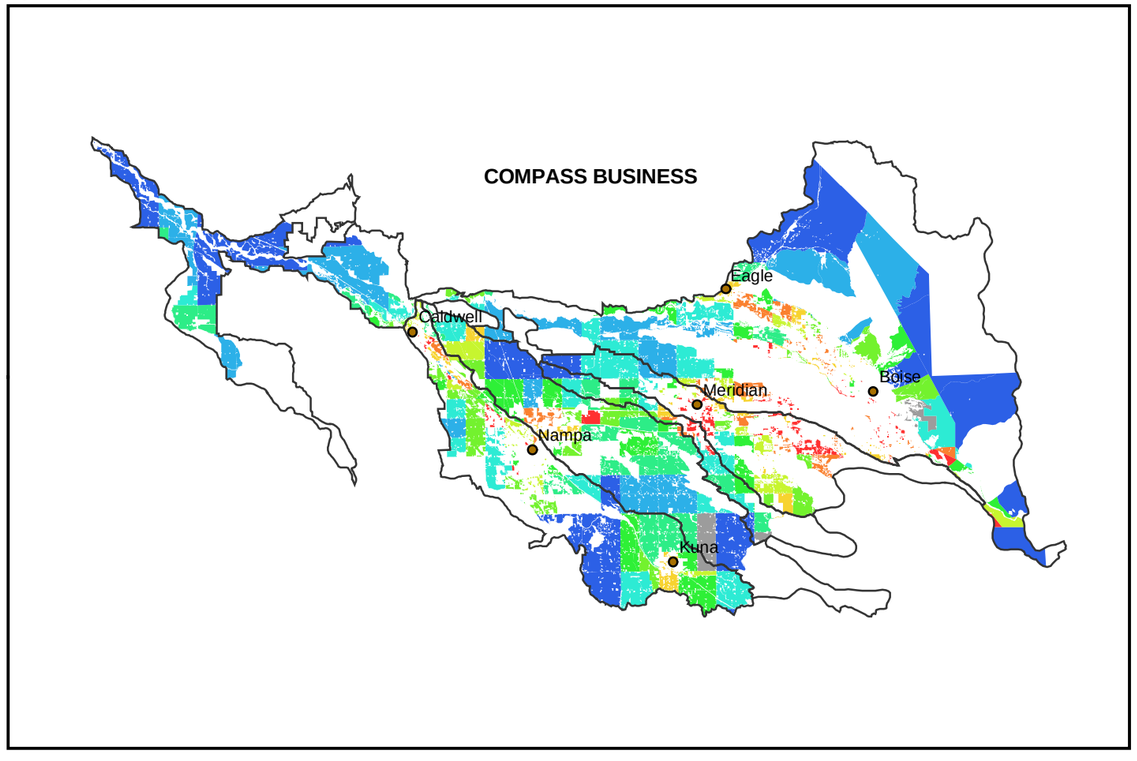
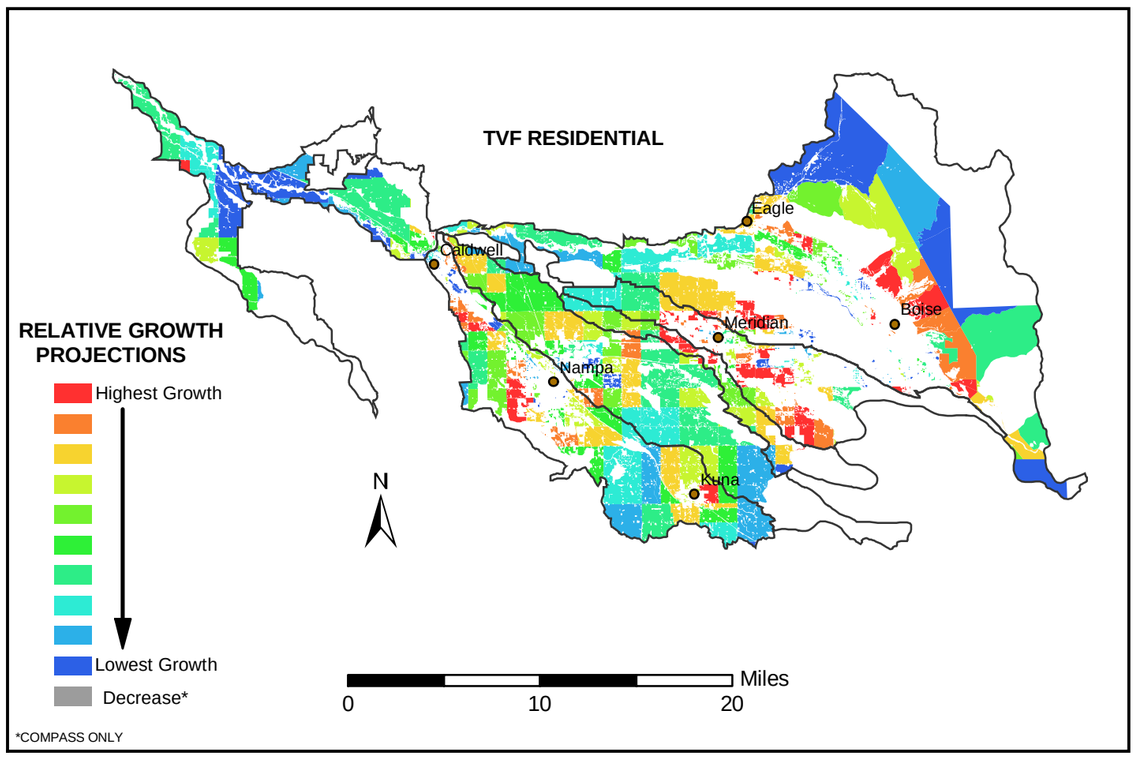



**FIGURE 5.**
Schematic of Land Use Change Analysis

**FIGURE 6: TVF and COMPASS Business and Residential Growth Projections 2020, SCS Subwatersheds in Boise River Watershed**



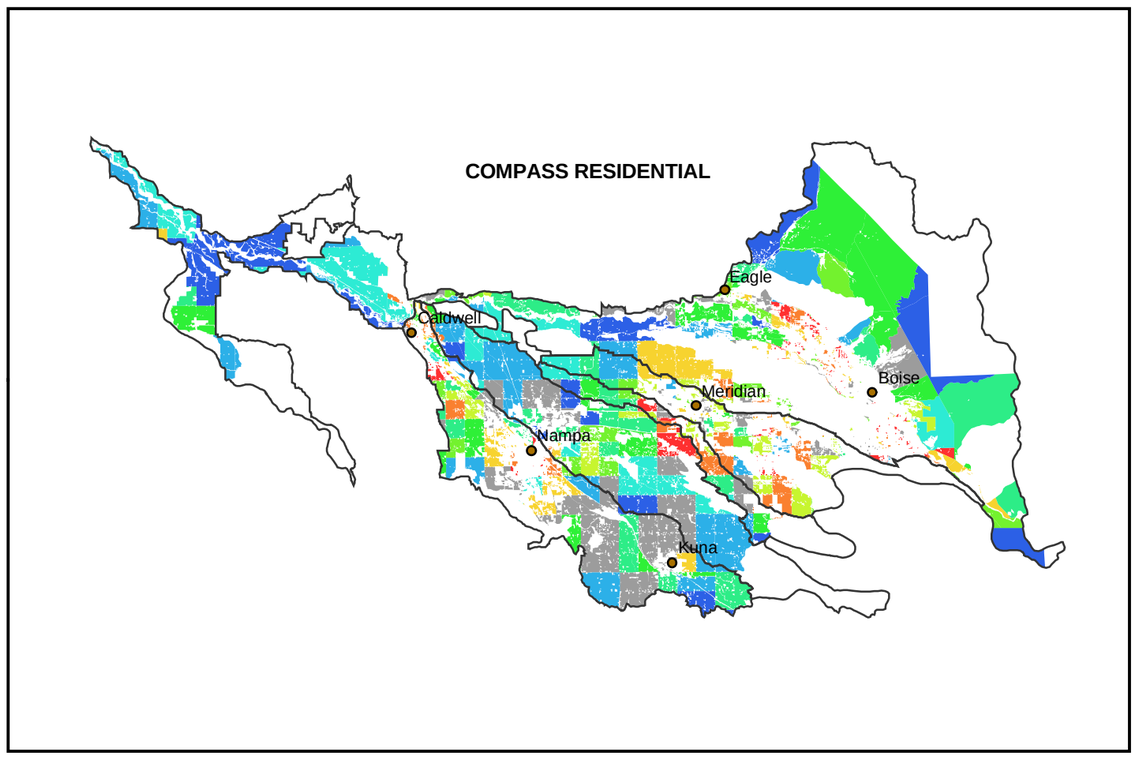
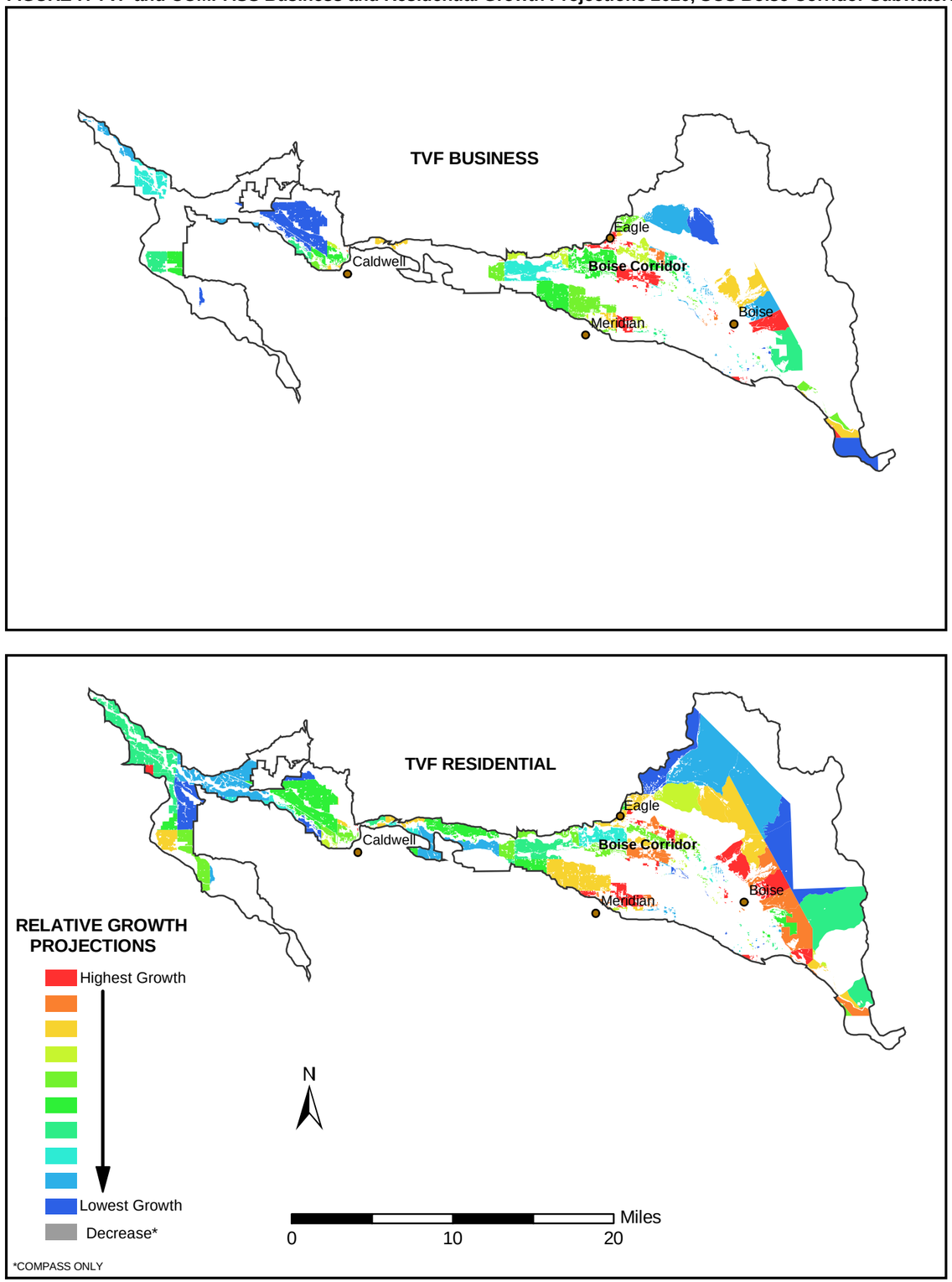



**FIGURE 7: TVF and COMPASS Business and Residential Growth Projections 2020, SCS Boise Corridor Subwatershed**



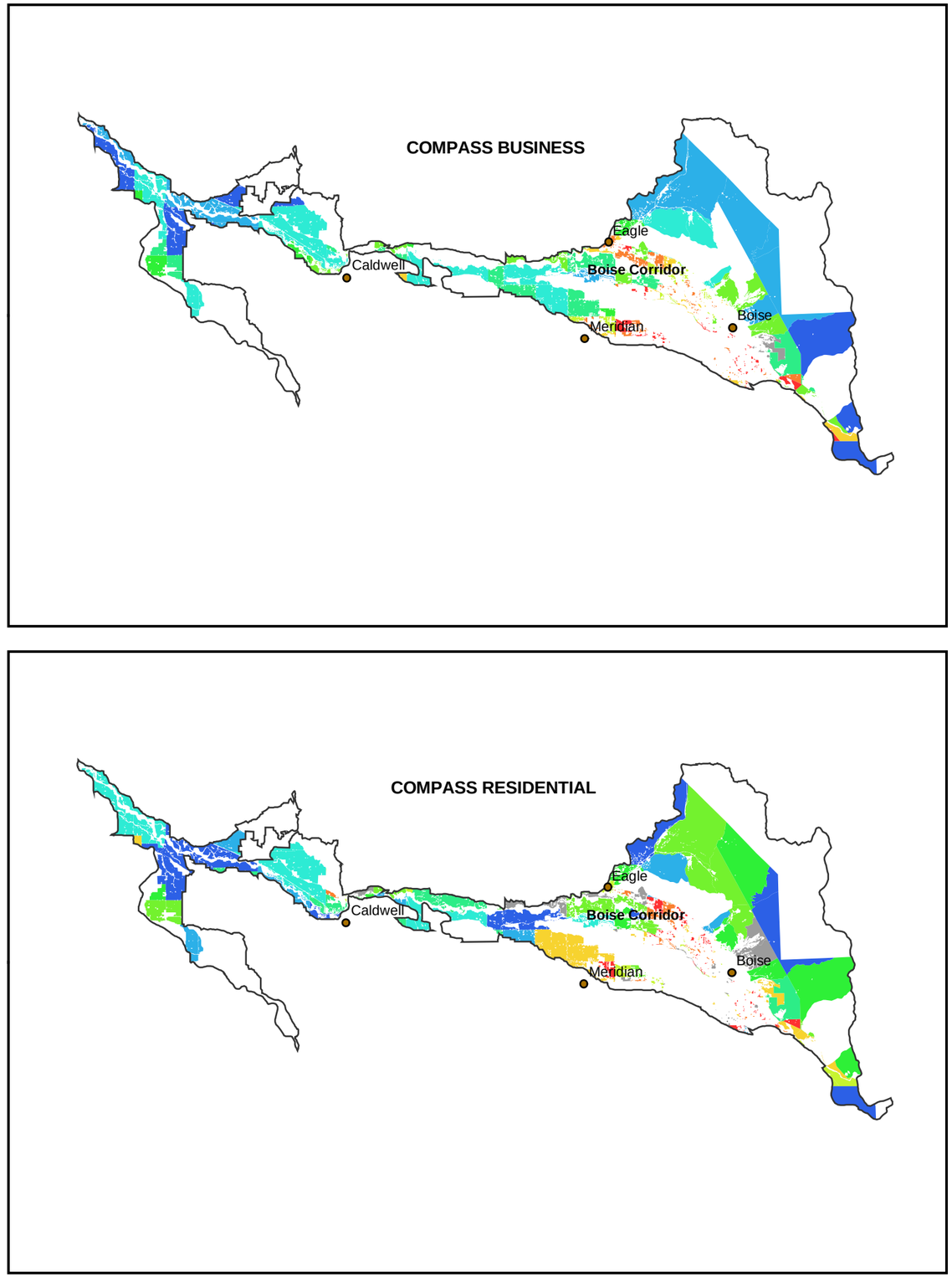
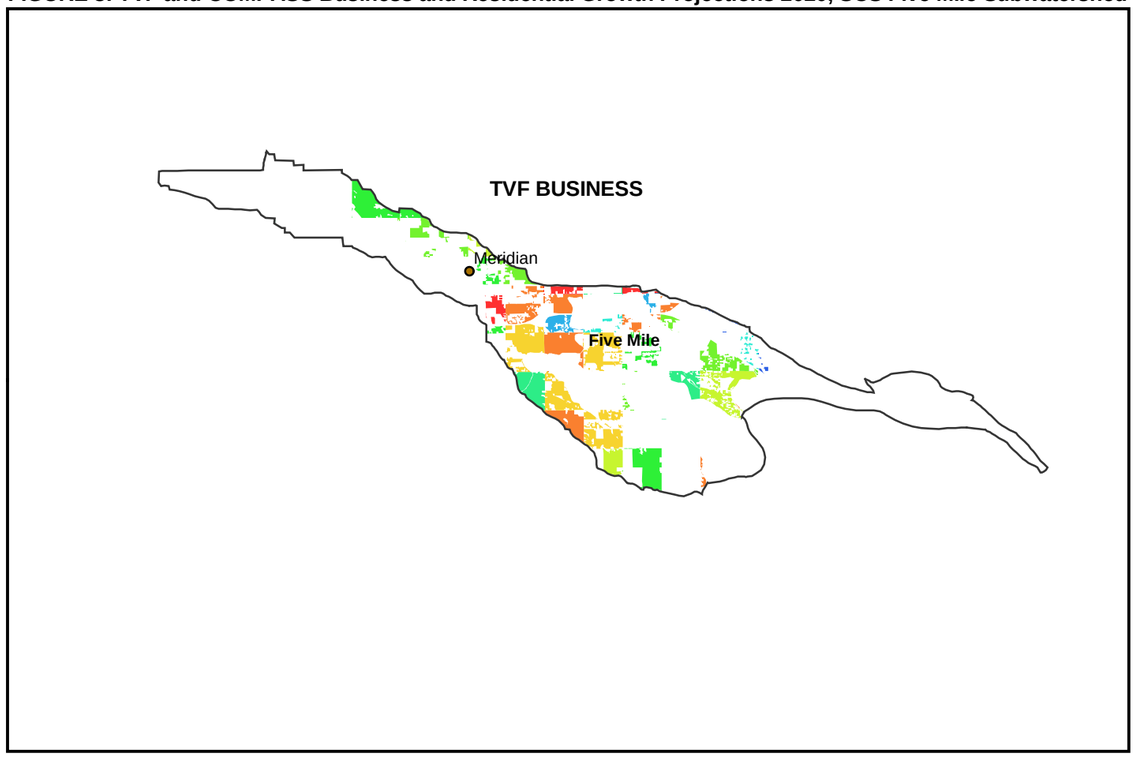
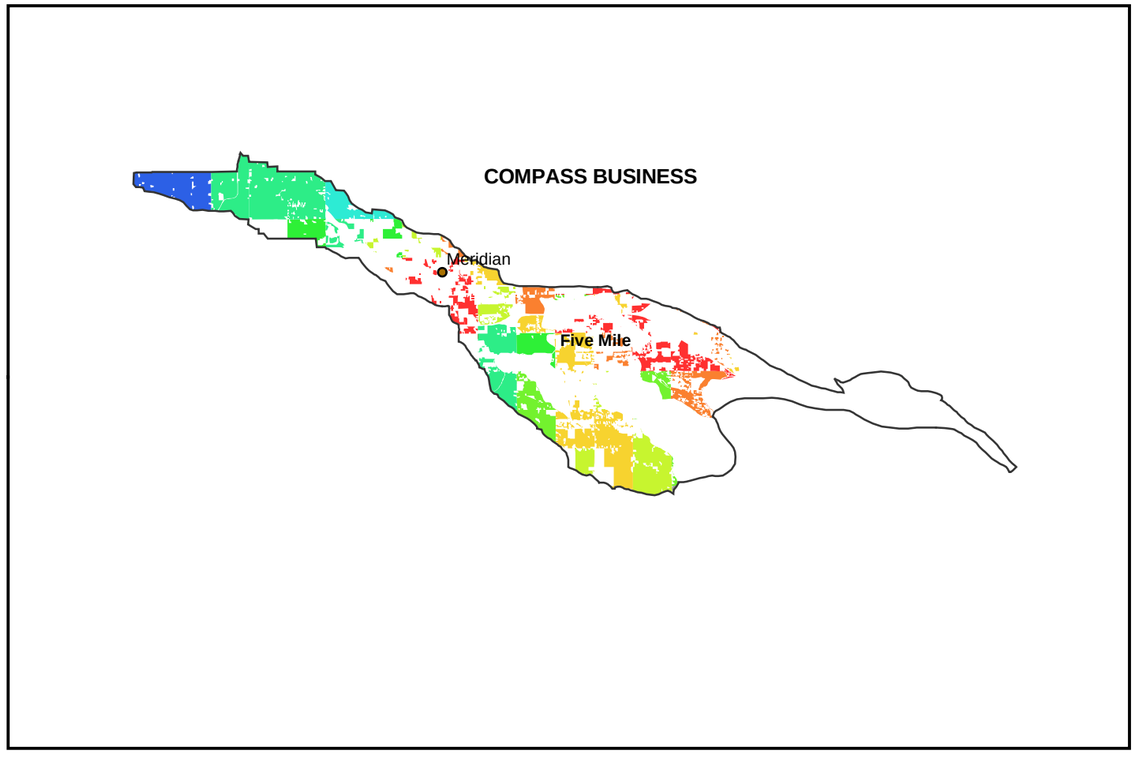
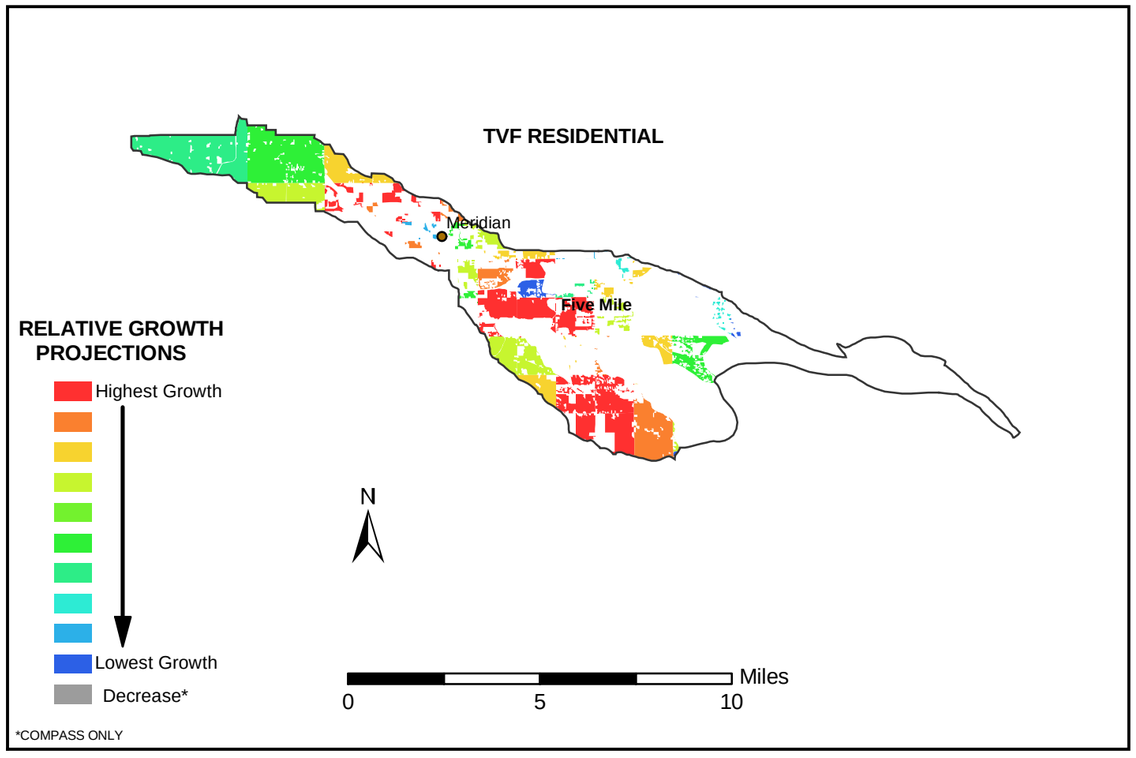



**FIGURE 8: TVF and COMPASS Business and Residential Growth Projections 2020, SCS Five Mile Subwatershed**



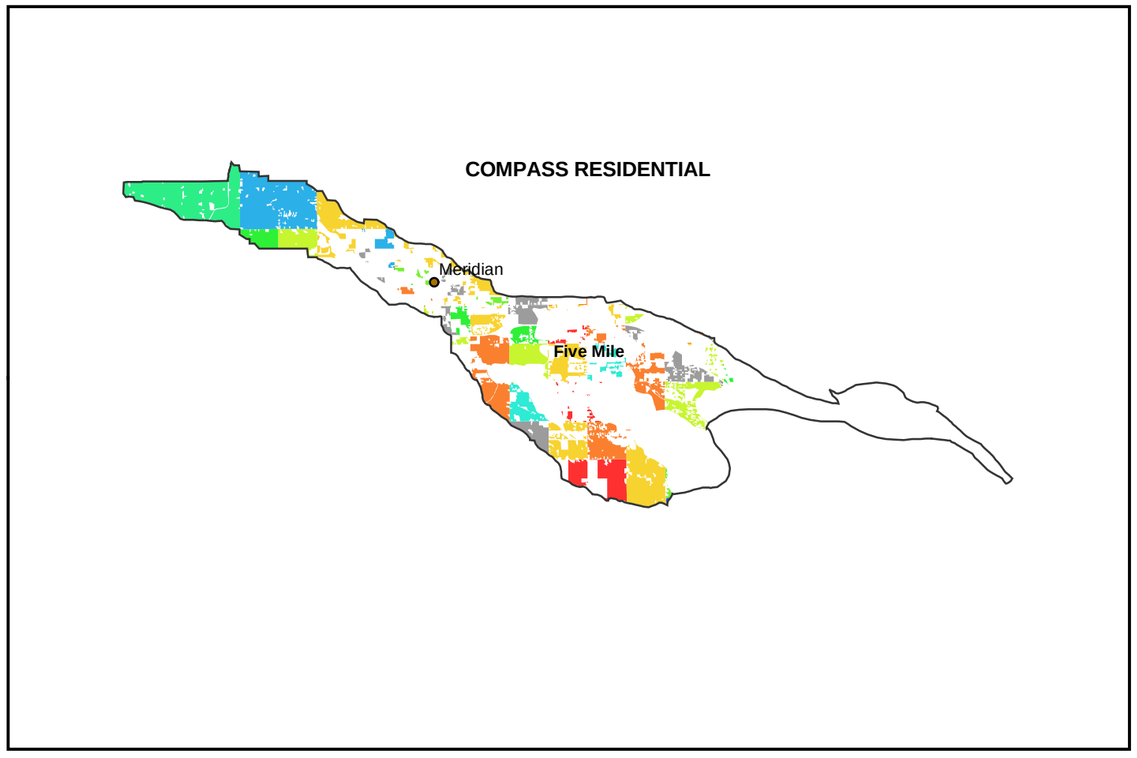



**FIGURE 9: TVF and COMPASS Business and Residential Growth Projections 2020, SCSTen Mile Subwatershed**

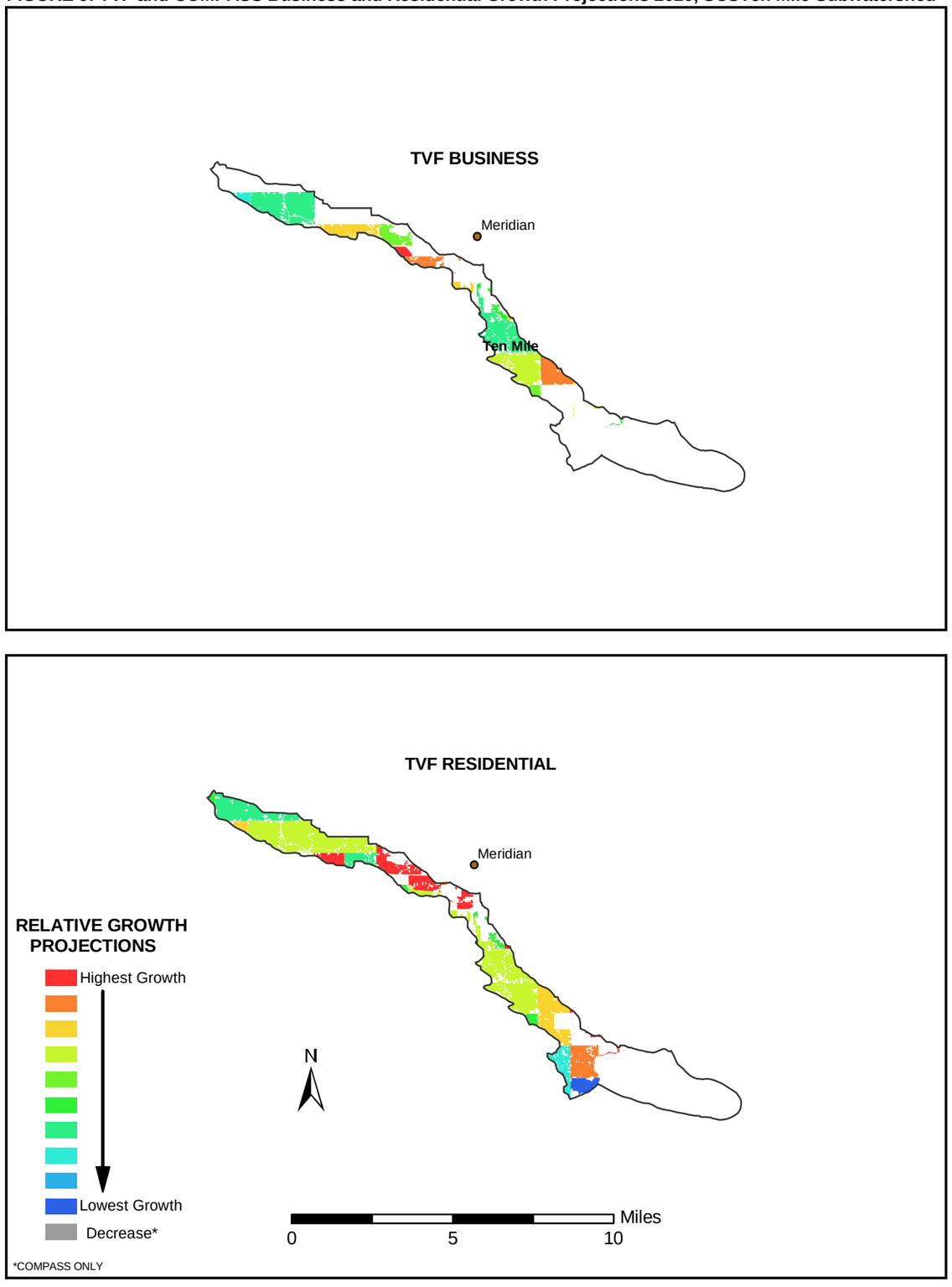
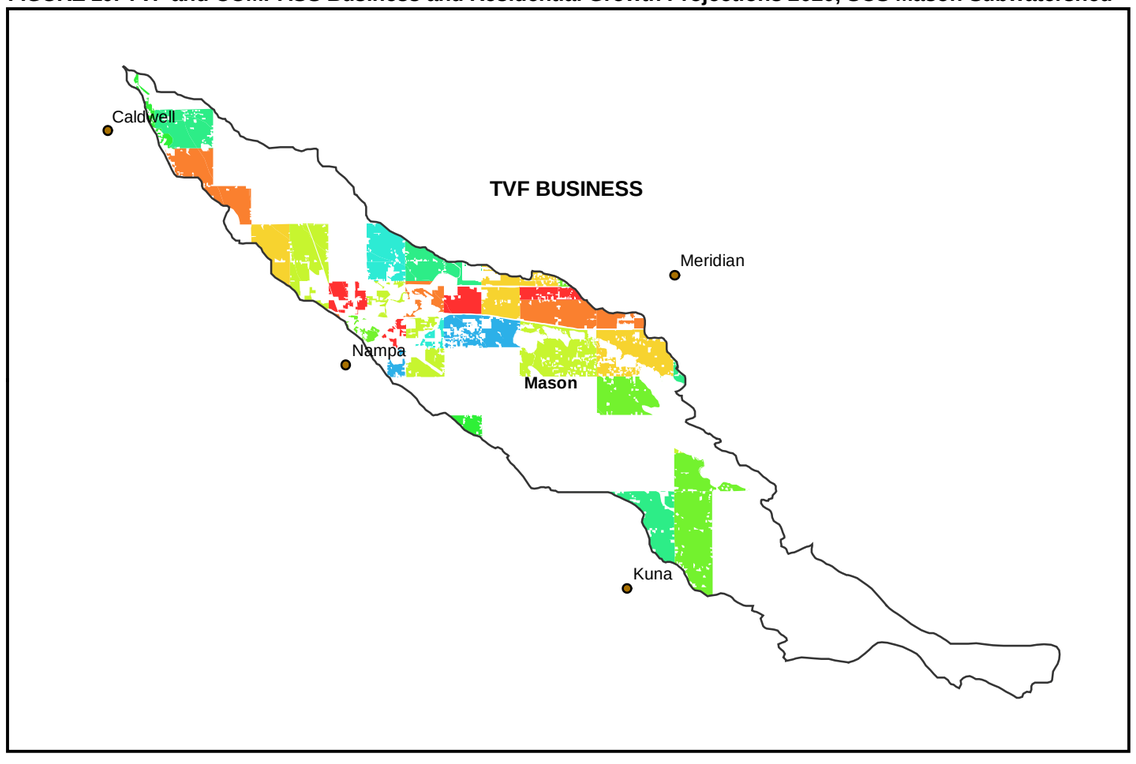
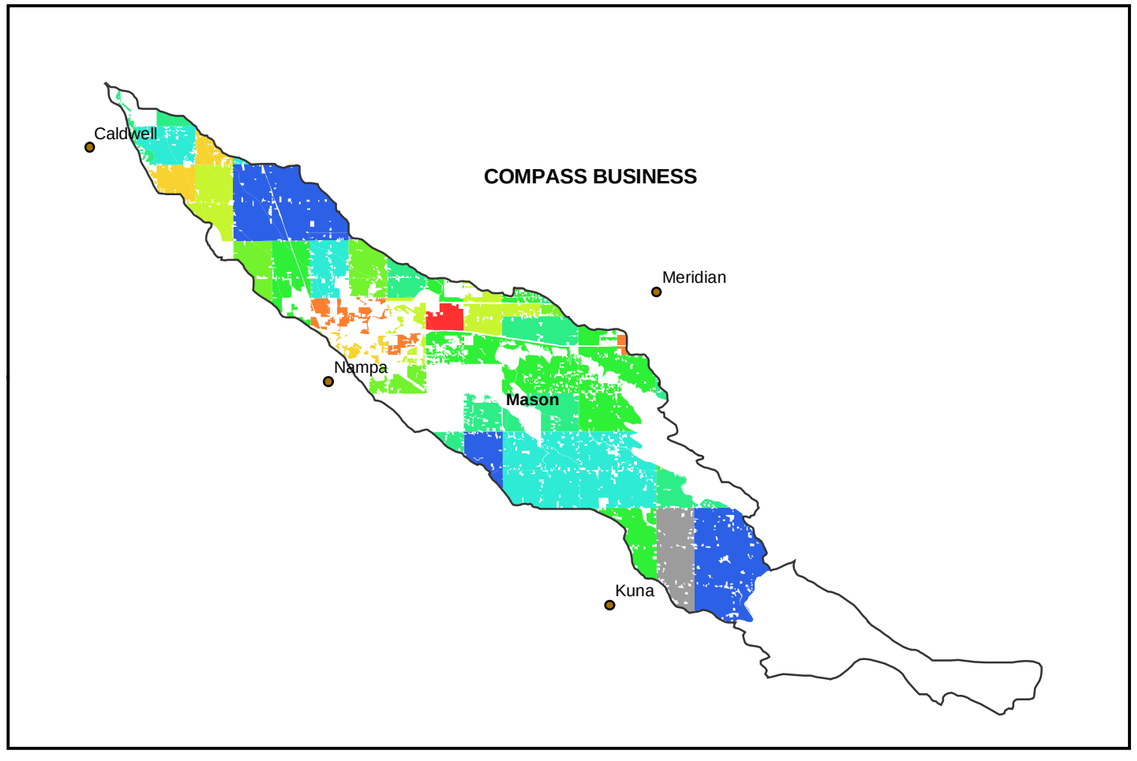
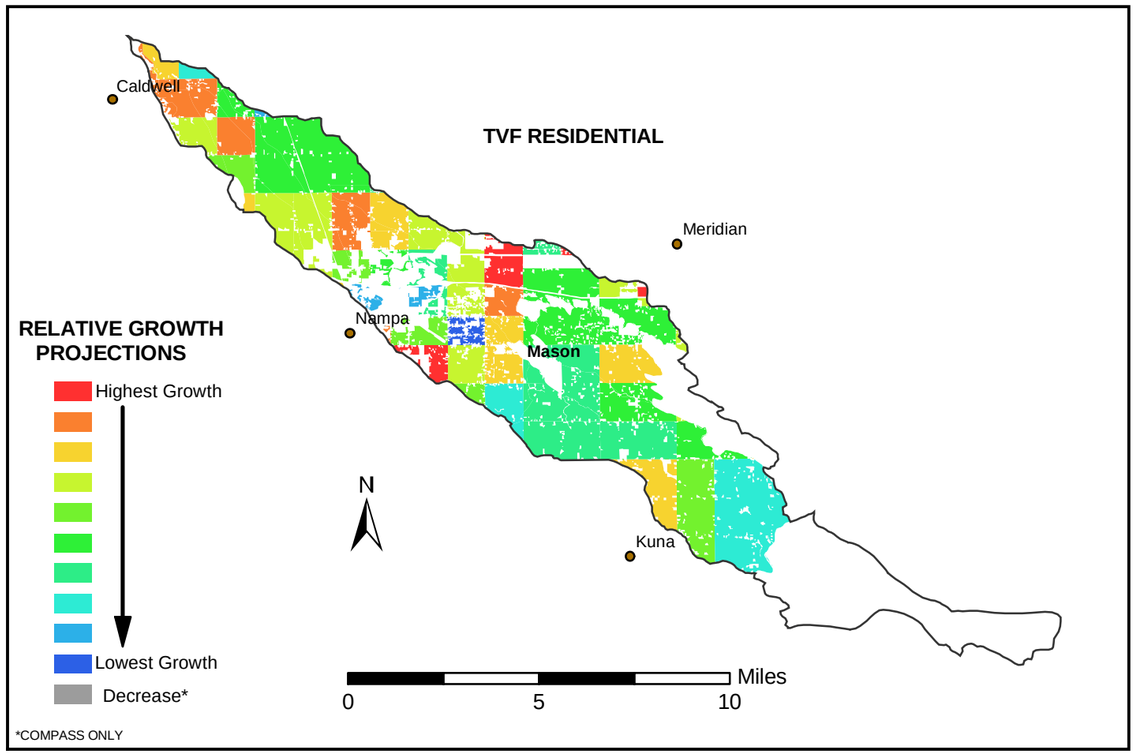


**FIGURE 10: TVF and COMPASS Business and Residential Growth Projections 2020, SCS Mason Subwatershed**



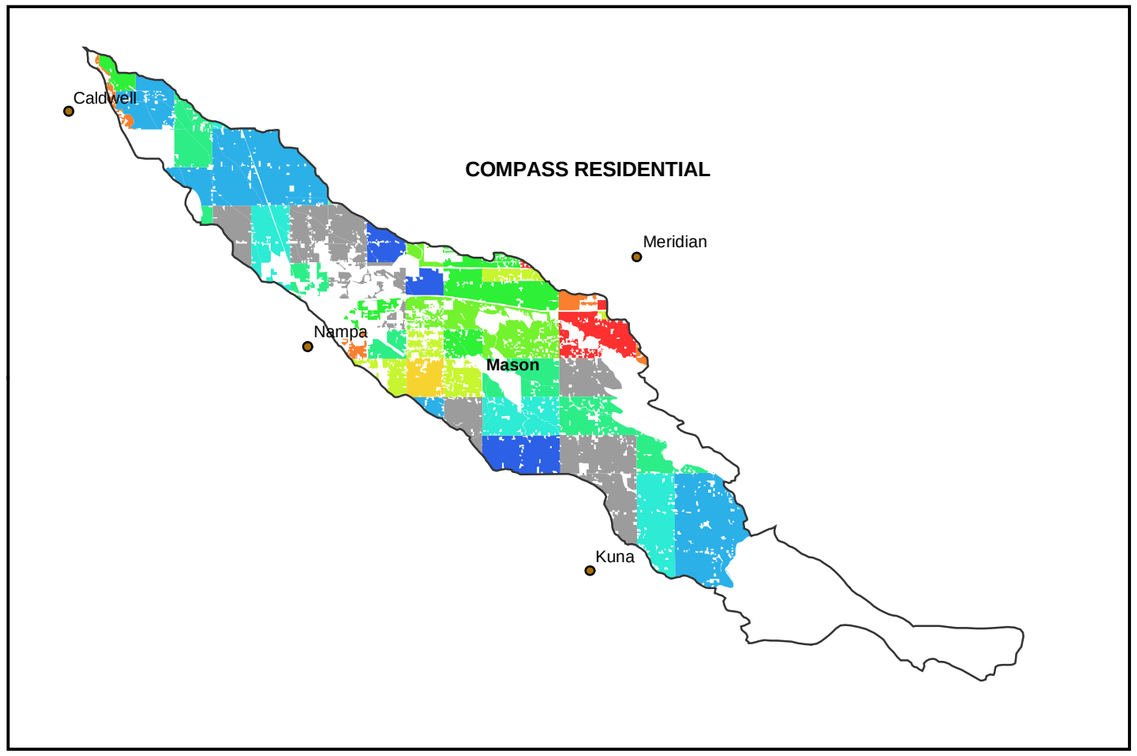
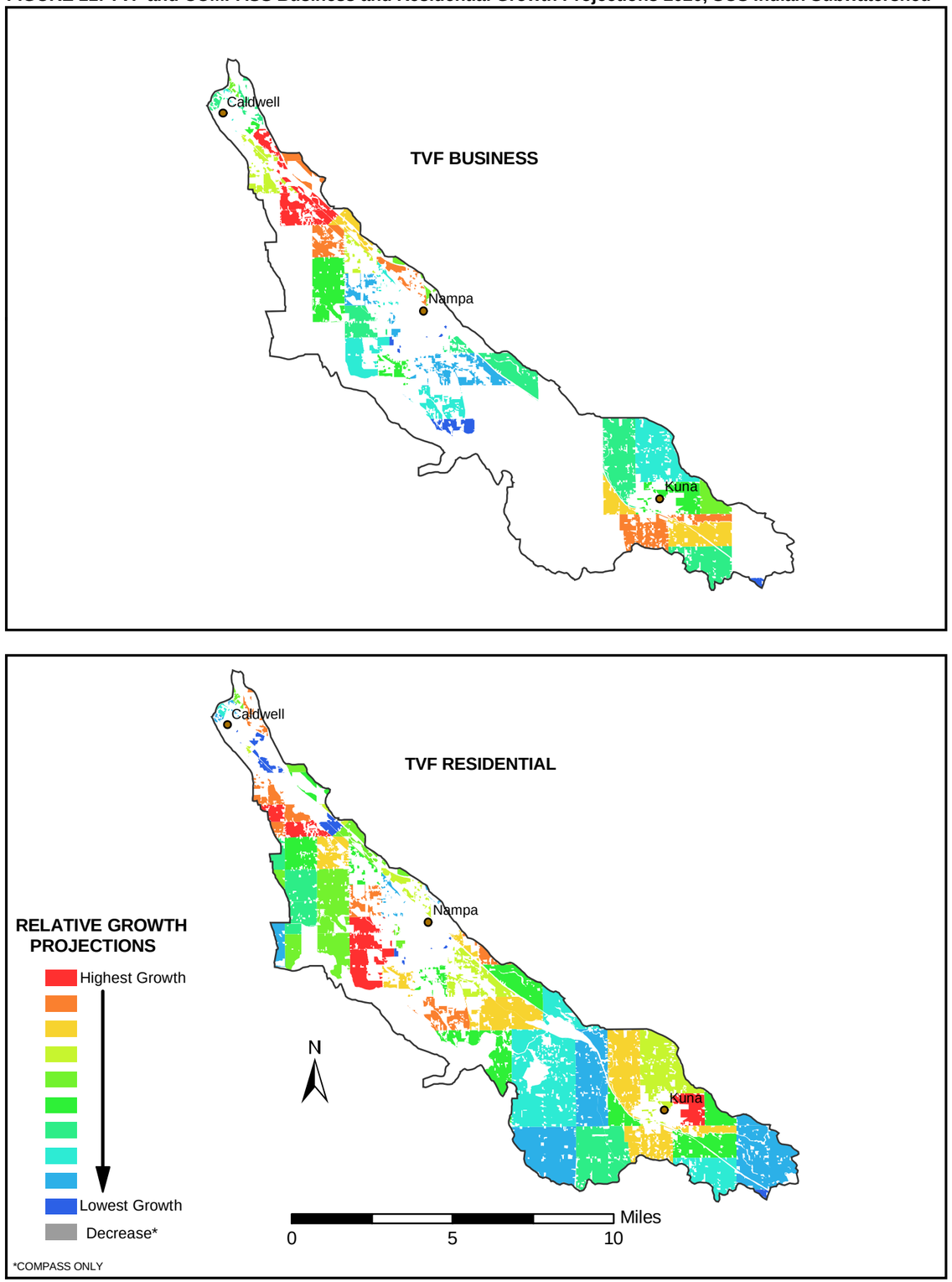
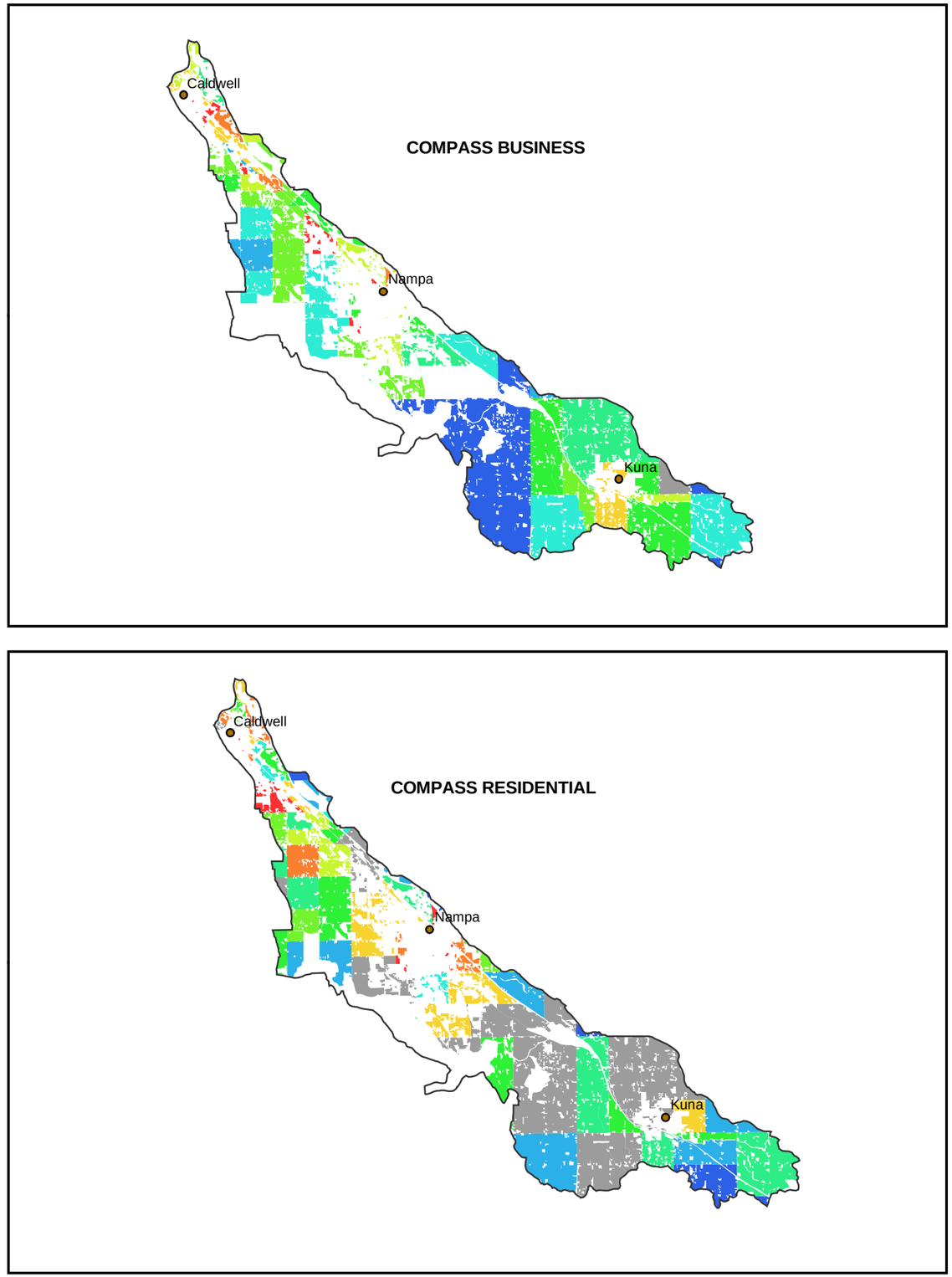



**FIGURE 11: TVF and COMPASS Business and Residential Growth Projections 2020, SCS Indian Subwatershed**



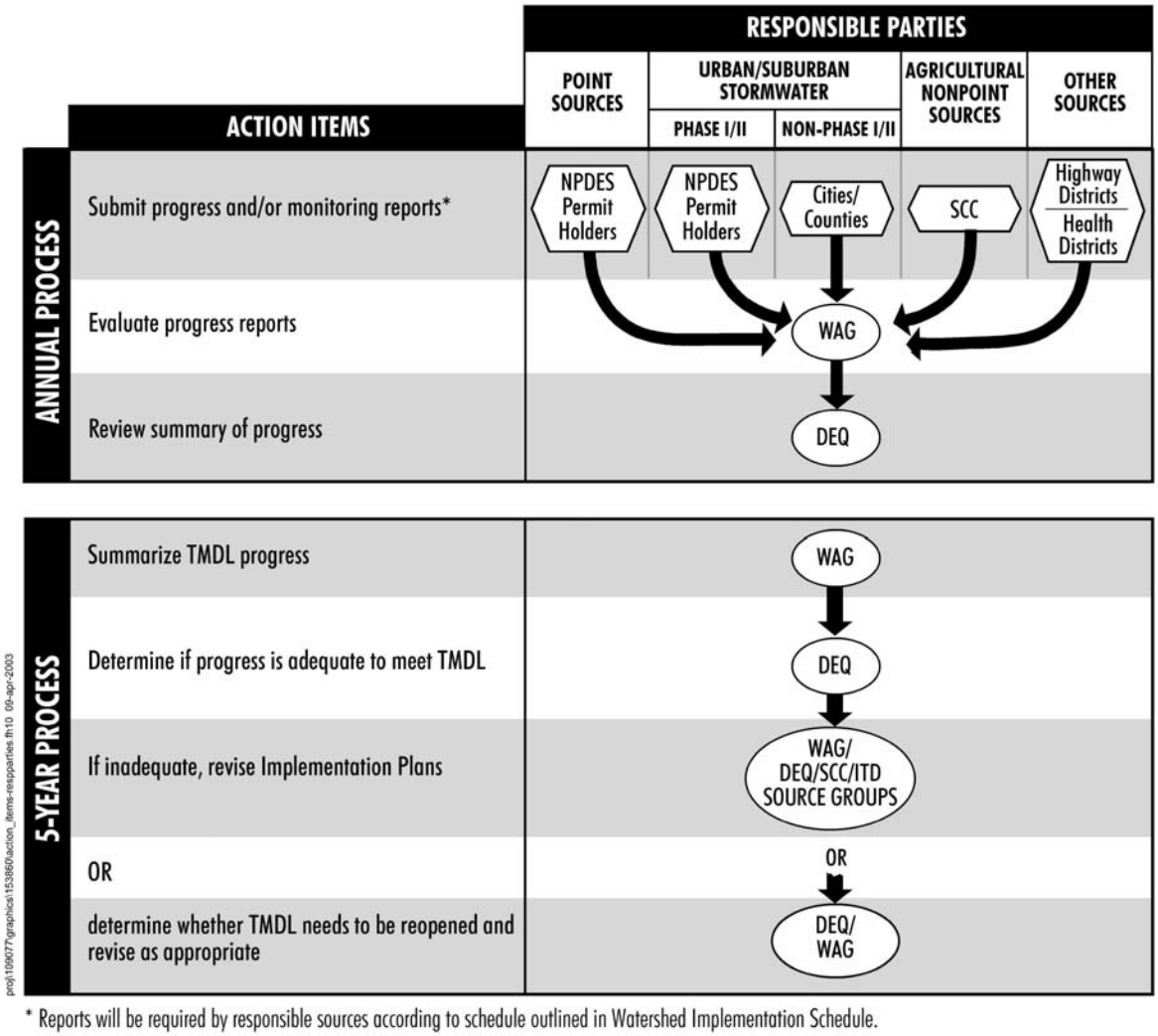



**FIGURE 12.**
Roles and Responsibilities Chart

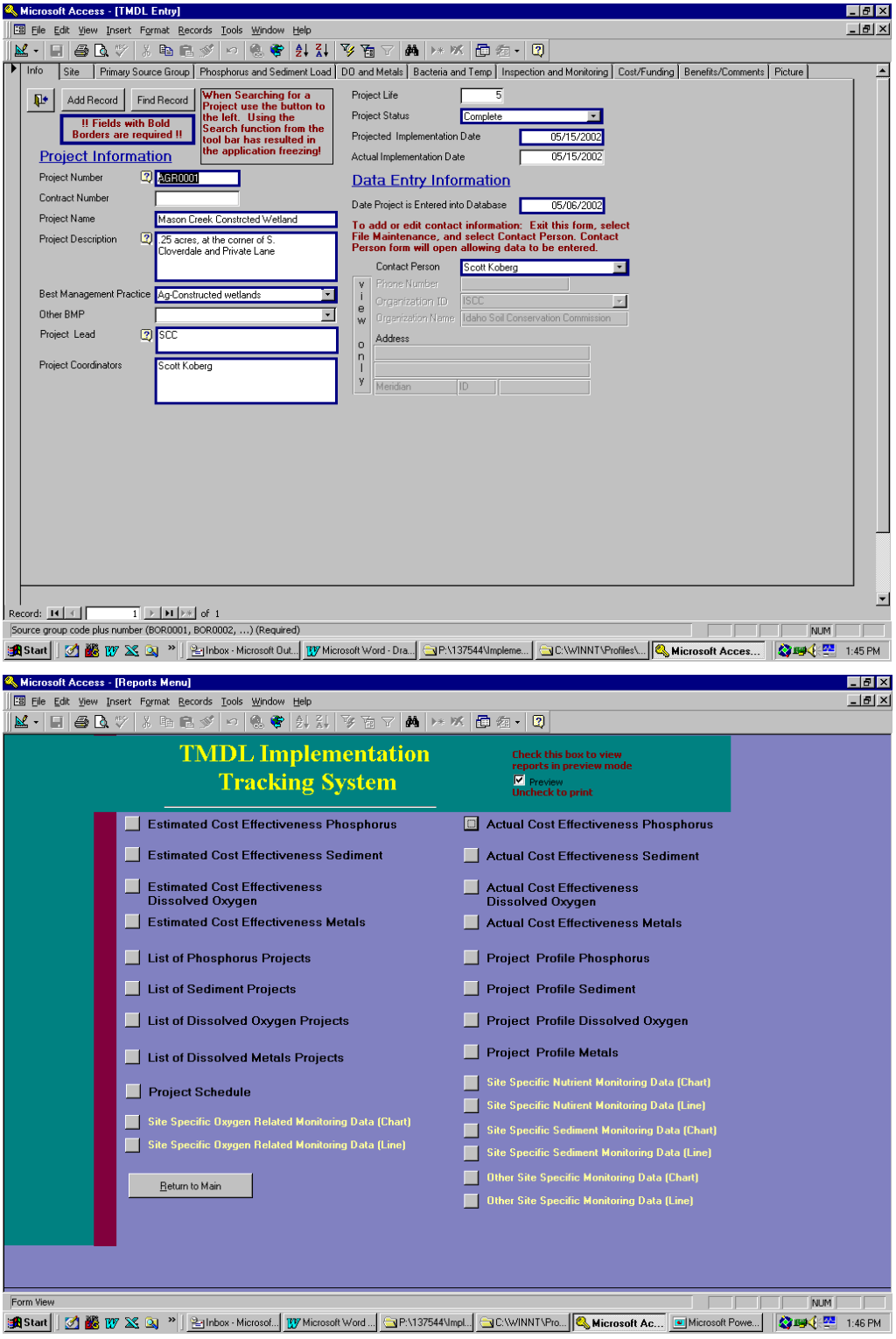



**FIGURE 13.**
Example Snapshots of DEQ Tracking Database

Appendix A

# LBRWQP Stakeholders and/or Implementation Plan Contributors

# Appendix A:
# LBRWQP Stakeholders and/or Implementation Plan Contributors

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Appendix B

# Urban/Suburban Implementation Plan

# LOWER BOISE RIVER

# Total Maximum Daily Load
# Urban/Suburban Source

# IMPLEMENTATION PLAN

**Prepared for the**
**Idaho Department of Environmental Quality**

**December 2003**

**Lower Boise River Total Maximum Daily Load**
**Urban/Suburban Implementation Plan**
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## I. Introduction

This *Total Maximum Daily Load Urban/Suburban Source Implementation Plan (Plan)* identifies implementation activities designed to reduce pollutants in discharges to the Lower Boise River and its tributaries from urban and suburban land use activities. The emphasis is on sources within municipalities and rural residential subdivisions with the potential to contribute pollutants to hard surfaces that can then be transported to receiving waters via storm water runoff.

The purpose of this source plan is to describe actions that will be taken to ensure compliance with the Lower Boise River Total Maximum Daily Load (TMDL), to provide information to the public about urban runoff mitigation activities; and to provide guidance to the stakeholders, those entities that are required to reduce pollutants in their storm water discharges. As guidance, this Plan is intended to provide an understanding of the federal requirements for storm water management, the tools available for improving storm water quality, and a process for implementing programs to achieve TMDL pollutant reduction targets.

## II. Goal and Objectives

The goal of the Plan is to address the reduction of existing pollutant loads and the prevention of future increases of sediment, bacteria, and coincidentally temperature increases and nutrient loading from urban and suburban land use activities. This Plan focuses on achievement of the sediment load allocations and bacteria load requirements established by the Lower Boise River TMDL. The completion of the lower Snake River and Brownlee Reservoir TMDLs may result in temperature reductions and phosphorus allocations in the lower Boise River watershed. Therefore activities that reduce phosphorus in runoff and control temperature, along with sediment and bacteria, are also discussed in this Plan. Under the Adaptive Management framework adopted in this watershed, potential activities that reduce and control temperature will be reviewed within the context of the final Snake River and Brownlee Reservoir TMDLs.

The implementation strategy is a tiered approach to pollutant reduction that:

1) Documents existing activities that control pollutants in storm water runoff;
2) Accounts for the pollutant reductions inherent in land use changes associated with the conversion of agricultural land to urban land uses;
3) Relies on reductions associated with the development and implementation of programs required by the federal storm water regulations; and
4) Provides for the implementation of specific projects or activities designed to achieve additional reductions in identified priority areas.

This approach is provided to ensure that the combination of activities will achieve the necessary pollutant reductions synergistically, mutually supporting and

reinforcing stakeholder activities. The following Plan objectives have been identified to achieve the goal of pollutant reduction:

- Integration of TMDL implementation activities and the federal Phase II storm water requirements
- Adaptive management through the use of best management practices (BMPs) and measurable goals with built-in milestones for determining effectiveness and making adjustments
- Partnerships to improve efficiency through shared resources and optimize effectiveness by focusing on watershed priority areas

## III. Urban and Suburban Sources

This section identifies the jurisdictions with urban and suburban sources within the Lower Boise River watershed; discusses the characteristics of storm water runoff, and identifies the reductions required by the Lower Boise TMDL for pollutants in storm water runoff.

### Jurisdictions as Stakeholders

Entities with responsibilities for the management of storm water are located in Ada and Canyon counties, and the communities of Boise, Garden City, Eagle, Meridian, Star, Kuna, Nampa, Caldwell, Middleton, Notus, and Parma. Stakeholders have been identified as entities that operate systems that receive storm water runoff from or have jurisdiction over urban and suburban land use activities that have the potential to contribute pollutants to urban runoff. Stakeholders include local governments (e.g. counties, municipalities, highway districts, drainage districts) and state government (e.g. Idaho Transportation Department, Boise State University). All jurisdictions that own, operate or maintain a storm water system, which discharges directly or indirectly into the Boise River must identify actions to reduce their discharge of pollutants.

### Storm Water Runoff Characteristics

Storm water runoff has unique characteristics that must be considered in developing a pollutant reduction strategy. Land development contributes to the problem through the creation of impervious surfaces such as city streets, driveways, parking lots, and sidewalks. Impervious areas act as a collector for pollutants from concentrated human activities. Pollutants can fall out of the sky during dryfall or they may arrive in rain or snow as wetfall. Pollutants can also be blown in from adjacent pervious areas. Pollutants land on the street where they often stay in curbs, cracks and other areas until the next rainstorm where they are washed off the surface and into the storm drain system and ultimately to receiving streams.

There are a multitude of different land use activities that have the potential to contribute pollutants to storm water runoff. Pollutants are many and can include

sediment, bacteria, and chemicals such as oil and grease, pesticides, heavy metals, and nutrients (e.g., nitrogen and phosphorus).

Another concern is the possible illicit connections to the storm drain systems. Sanitary sewer connections can result in fecal coliform bacteria entering the storm sewer system, and floor drains can contribute other non-storm water discharges.

In addition to water quality impacts, land development impacts the hydrology and geomorphology of the receiving water, and affects aquatic and riparian habitats. Development results in impervious surfaces that eliminate the natural retention provided by vegetation and soil in an undeveloped area. Increasing impervious surfaces increases the quantity of water delivered to the waterbody during storms. This results in increased runoff with more rapid peak discharges. Changes in the volume and timing of runoff can result in stream widening and erosion, decreased channel stability, embeddedness and decreased substrate quality.

An increase in impervious surface also decreases the amount of rainfall available for infiltration. During dry weather periods, urban streams tend to have less flow because groundwater recharge and stormwater infiltration has been diminished. Without infiltration, the groundwater will not be recharged and the stream will lose this potential source of water.

Along with changes in hydrology, geomorphology, and water quality associated with increased impervious cover, the habitat associated with urban streams diminishes. There are numerous impacts to the aquatic habitat as well as the riparian corridor. With increased urbanization, there is a corresponding decline of habitat quality and consequently a decline in plant and animal diversity, particularly along the streamside zone.

The effects of storm water runoff on the beneficial uses of receiving waters are difficult to isolate and characterize because of the nature of urban runoff. Storm water discharges are short-term and intermittent, not continuous. As such, traditional methods of analysis and control for water quality protection are not appropriate. For example, application of chronic water quality standards (and to some extent even acute water quality standards) to intermittent, short-term discharges is not appropriate because the existing standards are based on longer term testing to derive dose-response relationships. Understanding is complicated by a lack of sufficient data and high variability in the available monitoring data.

Likewise, the relationship between outfall discharges and the sources of pollutants is complicated by several factors. The drainage patterns in the lower Boise River watershed have been altered by irrigation practices. Water does not follow natural drainage paths in much of the lower Boise valley. Stream

alterations and man-made waterways have created new drainage areas that are significantly different from the natural subwatershed areas (DEQ, 1999).

Many existing drainage ways were built over and downstream outlets eliminated which created situations where there were no options for surface discharge of runoff. As a consequence of limited disposal options and the costs associated with developing a public storm drain system; many local governments in the Lower Boise River watershed require on-site control of post-development runoff. In many areas, it is now the responsibility of the developer to control drainage and storm water runoff on his property.

The short-term intermittent nature of runoff, the lack of connectivity of many drainage systems, and the on-site detention requirements must all be considered in evaluating storm water runoff and its impacts. Methods used to estimate runoff or pollutant loading fail to account for these factors and can result in biased conclusions.

**Lower Boise River Pollutants of Concern**

The Lower Boise River TMDL includes allocations for sediment and bacteria. The goal of the load and wasteload allocations was to create target loads for tributaries and wastewater treatment facilities that create conditions by which the targets for suspended sediment are met in the river. The load and wasteload allocations were designed such that they will maintain the 50 mg/L and 80 mg/L targets in the Boise River. The application of targets is annual, not seasonal; however, the critical period on which the TMDL was based is seasonal (February 15 through June 14) because this is the period that coincides with when the lowest mainstem flow coincides with the largest sediment inputs to the river. Monitoring should, at a minimum, occur in this time frame to determine whether load reductions during this period are being achieved. The loads were developed to ensure that, with a sufficient margin of safety, the 50 mg/L target would be met at all locations in the Boise River given seasonal 30-day minimum flows.

Using the mass balance approach, analysis showed that total suspended sediment targets were met upstream from Middleton. Thus, three contributing areas (the Riparian Area #1, Eagle Drain, and Thurman Drain) upstream from Middleton were assigned sediment loads equal to the 1995 loads used to develop the TMDL. Implementation of Phase I stormwater requirements (including the application of 12 stormwater BMPs listed in Appendix K of the TMDL) are expected to be sufficient to meet the goals of the TMDL. Likewise, implementation of Phase II requirements above Middleton are expected to be sufficient to meet the goals of the TMDL. For other unregulated non-point sources above Middleton, including those within Riparian Area #1, Eagle Drain, and Thurman Drain, implementing reasonable control activities (e.g., BMPs) to maintain current sediment loads is expected to be sufficient to meet the goals of the TMDL.

Tributary loads below Middleton must be reduced by 37 percent in order to meet the 50 and 80 mg/L targets in the river. Since 1992 had the lowest flows on record since 1928, it represented an extreme, and rare low flow condition that created stringent load reduction requirements. The reduction percent (37) was applied to median year (1995) total suspended sediment loads for each tributary to determine load allocations.

Sediment is a common pollutant in urban stormwater. Sediment can smother bottom organisms and it can clog gills of fish and aquatic insects when it is in the water column. Sources of sediment include streambank erosion, construction sites, and the wash off from paved surfaces. Sediment runoff rates from construction sites are typically 10 to 20 times greater than those of agricultural lands.

The target for bacteria in the Boise River is based upon the state criteria for primary and secondary contact recreation. The TMDL concluded that the tributaries to the lower Boise River are significant sources of bacteria loading to the river, and generally will have to reduce bacterial counts to levels close to the state bacteria criteria in order to protect contact recreation beneficial uses. The TMDL indicated that the tributaries and drains below Glenwood Bridge should be able to meet a geometric mean of 50 coliform forming units (colonies) per 100 mL (CFU/100 mL) where they enter the river. This is because downstream of Glenwood Bridge, the river exceeded the existing bacteria standards and no in-river dilution was available for other sources.

Since the TMDL was developed, *E. coli* has replaced fecal coliform as the state water quality standard (126 *E. coli*/100 ml). Thus, compliance with the lower Boise River bacteria TMDL will be evaluated using the applicable E. coli state water quality standards to maintain the intent of the TMDL (to protect human health using the applicable standard).

Nationwide, fecal coliform levels in urban stormwater runoff are typically 15 to 50 times the standard set for water contact recreation. The origins of urban bacterial loads are diverse, and may include leakage from sanitary sewers and direct loading of human fecal matter, as well as bacteria derived from dog and cat feces. High levels of bacteria may be due to leaks of human sewage from sanitary sewer leaks, leaking septic systems, or illicit discharge of sewage. Ducks and geese or other avian species also contribute to bacteria levels. Any lake or stream or adjacent area where these birds forage or swim could harbor high levels of pathogens. Similar findings also appear to be evident in the Lower Boise River system, as explained in more detail in the overall implementation Plan.

The draft Snake River – Hells Canyon TMDL (SR-HC) includes allocations for phosphorus (0.07 mg/l total phosphorus) that will require additional limitations on the discharges to the Boise River. The nonpoint source allocation and

appropriate action identified in the draft TMDL is implementation of BMPs in tributaries to reach 0.07 mg/l at inflow to the Snake River. Urban and suburban sources of phosphorus include fertilizers from lawns and golf courses, leaking septic systems, and animal waste.

The draft Snake River – Hells Canyon TMDL also addresses temperature and identifies a target for the protection of salmonid rearing/cold water aquatic life of 17.8°C (expressed in terms of a 7-day average of the maximum temperature) if and when the natural background (identified in the draft SR-HC TMDL as "site potential") is less than 17.8°C. If and when the natural background (identified in the draft SR-HC TMDL as site potential) is greater than17.8°C, the target is no more than a 0.14°C (0.25 °F) increase from anthropogenic sources.

Tributary temperature load allocations apply at the mouth of the tributary only for Idaho tributaries and are no more than a 0.14°C (0.25 °F) increase from anthropogenic sources. Because the tributaries were not assessed for temperature increase due to anthropogenic sources as part of the SR-HC TMDL, an assessment of natural and anthropogenic temperature loading influences in each of the inflowing tributaries will be necessary as part of the tributary TMDL processes.

The temperature of surface runoff during storm events increases as a result of urbanization and the accompanying increase in impervious areas. Urban development can also lead to wider channels and more surface ponds with greater exposure of stormwater to solar radiation, further increasing the runoff temperature. Due to the nature of the lower Boise River Valley climate, storm events resulting in rainfall runoff in hot summer months are infrequent. Stormwater monitoring data are largely absent during this time period, but temperature is expected to be an issue when there are storms (e.g., thermal heating from hot pavement causes warmer runoff during summer storms).

## IV. Federal Storm Water Requirements

The timing of Phase II of the federal storm water regulations and the Lower Boise River TMDL provides an opportunity for some stakeholders to create a storm water program designed to achieve the objectives of both sets of requirements. The federal storm water requirements are a phased approach to the regulation of discharges from separate storm sewer systems (MS4s) through the National Pollutant Discharge Elimination System (NPDES) permitting program. A MS4 means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) designed or used for collecting or conveying storm water (40 CFR 122.26(b)(8)).

The Phase I storm water program covers medium and large MS4s. The Phase II storm water regulation covers a certain subset of small MS4s. Entities other than

local governments may be regulated, including the Idaho Department of Transportation, highway districts that operate within regulated areas, universities, hospitals, prisons, drainage districts, irrigation districts if they meet the definition of a MS4.

The Boise are is regulated under Phase I of the storm water requirements. An NPDES Storm Water Permit was issued in November 2000 to Boise area MS4 owners and operators. Co-pemittees include Boise City, the Ada County Highway District, Drainage District 3, Garden City, Region 3 of the Idaho Transportation Department, and Boise State University. The permit obligations for these entities go beyond the requirements that must be addressed by Phase II MS4s.

**Entities Regulated Under Phase II**

A small MS4 may be designated as regulated by the Environmental Protection Agency (EPA) in three ways:

- Location within the boundaries of a Census Bureau-defined Urbanized Area (UA) based on the 2000 census
- Located outside of UA but contribute substantially to pollutant loadings of a physically interconnected, regulated MS4
- Located outside of UA with a population of at least 10,000 and population density of at least 1,000 people per square mile and meet certain designation criteria

The designation criteria that will be considered by EPA in determining which small MS4 include:

- Discharge storm water to sensitive waters
- Significant contributor of pollutants to waters of the United States
- Densely populated
- Experienced high population growth over the last 10 years
- Contiguous to an Urbanized Area
- Physically interconnected to another regulated MS4
- Storm water runoff not effectively addressed by other water quality programs

In addition, EPA considers MS4s with load allocations through an EPA-approved TMDL as significant contributors of pollutants to waters of the United States.

EPA's preliminary list of candidate communities that are within regulated Urban Areas for Phase II includes the following local governments in the Treasure Valley1:

- Portions of Ada County
- Caldwell
- Portions of Canyon County
- Eagle
- Meridian
- Middleton
- Nampa

Star, Kuna, Notus, and Parma are not identified but the list of designated entities may expand once EPA has completed their designation process. While these communities may not be required to comply with the Phase II storm water regulations, they are still required by the Lower Boise River TMDL to implement activities to reduce pollutants of concern in their discharges. The control measures identified in the Phase II rule for reducing pollutants in storm water runoff are the same activities that communities not subject to the Phase II Rule should consider in determining how to meet the Lower Boise River TMDL requirements.

Municipalities and counties are not the only entities affected by Phase II requirements. Any other public entity within an urbanized area, which operates a municipal separate storm sewer system, as defined by EPA, is also subject to these requirements. This includes drainage districts, highway districts, and state or federal facilities. The Ada County Highway District, and portions of the Notus Parma, Nampa, and Canyon Highway Districts have been included within the boundaries of regulated urbanized areas.

**Storm Water Permitting Approach**

The EPA has adopted an interim permitting approach for regulating storm water discharges (EPA, 1996). Due to the nature of storm water discharges, and the typical lack of information on which to base numeric water quality-based effluent limitations (expressed as concentration and mass), EPA uses an interim permitting approach for NPDES storm water permits.

The interim permitting approach uses best management practices (BMPs) in first-round storm water permits, and expanded or better-tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards. The Phase II storm water requirements require a MS4 operator to design a storm water management program so that it:

[1] Although Boise City and Garden City meet the size requirements for Phase II stormwater, these entities are already covered under the Phase I stormwater program.

- Reduces the discharge of pollutants to the “maximum extent practicable” (MEP);
- Protects water quality; and
- Satisfies the appropriate water quality requirements of the Clean Water Act.

MS4s covered under Phase II are not required to show numerical results to substantiate that they are improving their water quality. Instead they are allowed to rely on the use of BMPs to meet the required minimum measures, to the “maximum extent practicable”.

There is no regulatory definition of MEP in order to allow the permitting authority and regulated MS4s maximum flexibility in their interpretation of it as appropriate. Compliance with the technical standard of MEP requires the successful implementation of approved BMPs. The Phase II Final Rule considers narrative effluent limitations that require the implementation of BMPs and the achievement of measurable goals as the most appropriate form of effluent limitations to achieve the protection of water quality, rather than requiring that storm water discharges meet numeric effluent limitations.

**Measurable Goals**

Measurable goals are described in the Phase II rule as BMP design objectives or goals that quantify the progress of program implementation and the performance of BMPs. They are milestones used to track the progress and effectiveness of BMPs in reducing pollutants to the MEP. They can be used to assess compliance with both NPDES permit and TMDL requirements. Measurable goals will enable local governments, the Idaho Department of Environmental Quality (IDEQ) and EPA to gauge administrative compliance and measure water quality improvements.

There are a number of different ways to establish measurable goals based on one or more of the following general categories:

1. *Tracking implementation over time.* Where a BMP is continually implemented over the permit term, a measurable goal can be developed to track how often, or where, this BMP is implemented.

2. *Measuring progress in implementing the BMP*. Some BMPs are developed over time, and a measurable goal can be used to track this progress until BMP implementation is completed.

3. *Tracking total numbers of BMPs implemented*. Measurable goals also can be used to track BMP implementation numerically, e.g., the number of wet detention basins in place or the number of people changing their behavior due to the receipt of educational materials.

4. *Tracking program/BMP effectiveness*. Measurable goals can be developed to evaluate BMP effectiveness, for example, by evaluating a structural BMP's effectiveness at reducing pollutant loadings, or evaluating a public education campaign's effectiveness at reaching and informing the target audience to determine whether it reduces pollutants to the MEP. A measurable goal can also be a BMP design objective or a performance standard.

5. *Tracking environmental improvement*. The ultimate goal is environmental improvement, which can be a measurable goal. Achievement of environmental improvement can be assessed and documented by ascertaining whether state water quality standards are being met for the receiving waterbody or by tracking trends or improvements in water quality (chemical, physical, and biological) and other indicators, such as the hydrologic or habitat condition of the waterbody or watershed. (EPA, 2000)

Measurable goals contain descriptions of actions taken to implement each BMP, what will be achieved by each goal, and the frequency and dates for such actions to be taken. A baseline is established against which future progress at reducing pollutants to the MEP can be measured. For example, information on current water quality conditions, numbers of BMPs already implemented, and the public's current knowledge/awareness of storm water management are useful in setting this baseline.

The requirement of identifying measurable goals for each control measure is unique to Phase II. While communities regulated under Phase I were not required to devise measurable goals, they are required to assess the effectiveness of programs and activities and conduct storm water outfall monitoring to characterize storm water runoff.

## V. Implementation Strategy

This section includes a discussion of the implementation strategy, a tiered approach to pollutant reduction that accounts for:

1) Existing activities that control pollutants in storm water runoff;
2) The pollutant reductions inherent in land use changes associated with the conversion of agricultural land;
3) Pollutant reductions associated with the development and implementation of programs required by the federal storm water regulations; and
4) Specific projects or activities designed to achieve additional reductions in identified priority areas.

This approach is provided to ensure that the combination of activities will achieve the necessary pollutant reductions synergistically, mutually supporting and reinforcing stakeholder activities.

## Documenting Existing Activities

Using the mass balance approach, analysis showed that total suspended sediment targets were met upstream from Middleton. Thus, three contributing areas (the Riparian Area #1, Eagle Drain, and Thurman Drain) upstream from Middleton were assigned sediment loads equal to the 1995 loads used to develop the TMDL. Implementation of Phase I stormwater requirements (including the application of 12 stormwater BMPs listed in Appendix K of the TMDL) are expected to be sufficient to meet the goals of the TMDL. Likewise, implementation of Phase II requirements above Middleton are expected to be sufficient to meet the goals of the TMDL. For other unregulated non-point sources above Middleton, including those within Riparian Area #1, Eagle Drain, and Thurman Drain, implementing reasonable control activities (e.g., BMPs) to maintain current sediment loads is expected to be sufficient to meet the goals of the TMDL. Tributary loads below Middleton must be reduced by 37 percent in order to meet the 50 and 80 mg/L targets in the river.

The target for bacteria in the Lower Boise River is based upon the state criteria for primary and secondary contact recreation. The TMDL concluded that the tributaries to the Lower Boise River are significant sources of bacteria loading to the river, and generally will have to reduce bacterial counts to levels close to the state bacteria criteria in order to protect contact recreation beneficial uses. The TMDL indicated that the tributaries and drains below Glenwood Bridge should be able to meet a geometric mean of 50 coliform forming units (colonies) per 100 mL (CFU/100 mL) where they enter the river. This is because downstream of Glenwood Bridge, the river exceeded the existing bacteria standards and no in-river dilution was available for other sources.

Since the TMDL was developed, *E. coli* has replaced fecal coliform as the state water quality standard (126 *E. coli*/100 ml). Thus, compliance with the lower Boise River bacteria TMDL will be evaluated using the applicable E. coli state water quality standards to maintain the intent of the TMDL (to protect human health using the applicable standard).

In some cases, particularly in the case of entities already covered by a Phase I NPDES permit; the MS4 operator may already have a program or activity in place and functioning, which controls the discharge of pollutants in storm water runoff and is sufficient to meet the requirements of the TMDL. In this case, the program or activity should be identified and well documented but no additional activities may be necessary.

Boise area co-permittees were issued an NPDES Storm Water Permit in November 2000. Co-permittees include Boise City, the Ada County Highway District, Drainage District 3, Garden City, Region 3 of the Idaho Transportation Department, and Boise State University. These entities have built upon existing

programs and developed and implemented new programs and activities to address Phase I federal storm water requirements. These actions are identified in an annual report submitted to the Environmental Protection Agency and represent a significant effort to achieve pollutant reductions. A copy of the annual report in available at the Boise State University library. Summary information about the Boise City program can be accessed at the City's website.

Other communities in the lower Boise River watershed have existing requirements for on-site control of post-development runoff. Infiltration practices are typically used to meet these requirements, which limits or eliminates off-site discharges and associated impacts to receiving waters. These programs and other existing activities that address the Phase II minimum measures should be identified and well documented to demonstrate compliance with the requirements of the NPDES permit and the Lower Boise TMDL.

**Land Conversion and Associated Pollutant Load Reductions**

Land in the Treasure Valley is rapidly transitioning from agricultural uses to urban uses. Changes in land use will continue to occur throughout the implementation process and into the future. This land-use transition changes the contributing load, as well as the fate and transport complexity of sediment and other pollutants to the river.

The management of impacts from land use changes can result in achievement of the TMDL reduction goals when BMPs are applied. When agricultural activities are the existing land use, the management of development impacts may actually result in a net decrease in pollutant loading. The end result is a load reduction from agricultural land uses and a reduction credit for urban land uses that should be accounted for.

Land development under the jurisdiction of Phase II – regulated entities offers opportunities to achieve pollutant reductions when development is subject to requirements during the construction and post-construction phases that reduces or eliminates off-site storm water caused impacts that might otherwise occur. When development is permitted to occur as "business as usual" an opportunity to achieve pollutant reductions is lost and other mitigation measures may be necessary.

**Implementation Activities Associated with Federal Requirements**

The third component of the implementation strategy is based on the integration of TMDL requirements with the measures required of local governments that are currently regulated under Phase I or will be regulated under Phase II of the federal storm water regulations.

Local governments in the Treasure Valley must comply with federal requirements for storm water quality control. Boise area co-permittees have been implementing programs for several years to reduce the pollutants in storm water runoff as the result of conditions contained in an NPDES storm water permit. Phase II of the federal storm water regulations will affect public owners or operators of regulated small MS4s in parts of Canyon and Ada counties. Many entities that operate MS4s will be required to obtain storm water NPDES permits from the EPA and implement management programs intended to reduce the amount of pollutants in their storm water runoff discharges.

Stakeholders will develop storm water management programs that identify activities and schedules for implementation that address six minimum measures. The emphasis will be on program components that reflect site-specific characteristics of the municipality (e.g., population density, land use, age of communities, soil type, topography), the municipal storm sewer system, and the receiving waters. Implementation priorities are set to target the sources of specific pollution problems from certain land uses or target the problems resulting from the land use activities of a specific geographic area.

The Phase II storm water requirements require a MS4 operator to design a storm water management program so that it:

- Reduces the discharge of pollutants to the “maximum extent practicable” (MEP);
- Protects water quality; and
- Satisfies the appropriate water quality requirements of the Clean Water Act.

The main requirement of the permits will be for the MS4 operator to develop and implement six storm water management programs, or minimum measures. These measures are:

1. Public education and outreach
2. Public participation/involvement
3. Illicit discharge detection and elimination
4. Construction site storm water runoff control
5. Post-construction storm water management
6. Pollution prevention/good housekeeping for municipal operations

Each stakeholder will select appropriate BMPs after considering their situation and objectives for each minimum measure. The BMPs chosen should work toward one or more common program objectives related to storm water quality improvement and should reduce pollutants to the MEP. These objectives and subsequent program implementation activities should reflect TMDL requirements. The objectives should be based on what is known about existing pollutant sources and problems in the watershed(s) and what is required by the minimum

measure. The objective can be something that can be quantified, or it can be a goal or purpose statement.

Measurable goals to be achieved must also be identified for each of the BMPs that comprise a MS4's storm water management program. The evaluation methods chosen for each BMP should lead to a determination of the environmental benefits of each minimum measure and the overall effectiveness of the storm water management program in reducing pollutants to the MEP.

A five-year schedule for implementing various program components should be developed that includes milestones and measurable goals for the six minimum measures, with intermediate goals when appropriate. Key dates could be included for public comment and review, local authority approval, stakeholder meetings, acquiring funding, and any other institutional, funding, and legal issues that must be addressed before implementation can occur.

Stakeholders should review the programs (municipal or other) that are already in place for each minimum measure. They are encouraged to coordinate with other agencies, non-profit groups, citizen groups, etc., to identify existing initiatives that can be used as part of the storm water management program.

Appendix A includes a table which lists possible implementation approaches for the six minimum measures and criteria for selecting the appropriate program actions and activities for each stakeholder's situation. While some practices target specific pollutants, many activities reduce the range of pollutants found in storm water runoff.

Criteria Discussion

BMP selection is based upon application of the criteria that address the objective identified above and meets the regulatory requirements in the minimum measure. Selected BMPs should complement each other and work toward meeting each minimum measure. This section includes a discussion of suggested criteria for selecting BMPs.

***Targets Sediment***

Sediment reduction has been identified as a BMP criterion because of the requirements of the TMDL. Efforts to reduce discharges of suspended sediment to the storm drain system by controlling activities at the source should focus on construction and post-construction measures. Measures that maintain pre-development hydrology are also fundamental to meeting sediment reduction requirements. Developing a program to address streambank erosion could reduce in-stream sources of sediment. Maintenance activities such as street sweeping and clean out of catch basins also reduce sediment loads to the River.

### *Targets Bacteria*

Bacteria reduction has been identified as a BMP selection criterion because of the requirements of the TMDL. Source controls are the most effective way to achieve bacteria reduction. Source control seeks to reduce or eliminate sources of bacteria in urban watersheds before they come into contact with stormwater. Common source control programs focus on pet waste cleanup, proper disposal of kitty litter, septic system maintenance, discouraging resident waterfowl and general urban housekeeping.

In watersheds where untreated wastewater is a documented source of bacteria, basic repairs to the wastewater system can produce impressive local reductions in bacteria levels (Schueler, 1999). For example, several communities have measurably reduced bacteria levels by connecting homes with failing septic systems to sanitary sewer lines, rehabilitating ageing sanitary sewer lines, eliminating illicit/illegal connections, and providing pumpouts of recreational sewage.

### *Addresses Hotspots*

Stormwater hotspots are areas that produce higher concentrations of pollutants than normally found in urban runoff. Addressing hotspots has been identified as a selection criterion because greater pollutant reductions can be achieved by implementing controls at these sites. Certain areas of the urban landscape are known to be hotspots of stormwater pollution. Examples of stormwater hotspots include gas stations, parking lots, and auto recycling facilities which can contribute 5 to 10 times higher concentrations of trace metals and hydrocarbons in stormwater runoff. Parks and golf courses can be hotspots for bacteria and nutrients from fertilizer applications. These hotspots merit special management and pollution prevention activities.

### *Targets Nutrients*

Nutrient reduction has been identified as a BMP selection criterion because of the phosphorus reduction goals of the draft Snake River – Hells Canyon TMDL. Source controls that result in phosphorus reductions include components of the illicit discharge detection and elimination measure, public education activities, and certain types of structural BMPs that provide for phosphorus removal.

### *Temperature Control*

BMPs for reduction of other pollutants should include practices that can result in localized temperature improvements such as revegetation of streambanks. Other methods to control the thermal enrichment of stormwater are becoming available, which can help reduce the impacts of urbanization on receiving waters.

Construction and post-construction BMPs that preserve or mimic the predevelopment hydrologic regime at urbanized sites are among the most promising techniques for controlling temperature.

### *Life Cycle Costs*

The cost of a BMP should be weighed against its effectiveness. Consideration of costs includes both capitol costs and maintenance costs, if applicable. Maintenance costs should also be considered because proper maintenance plays a vital role in ensuring the proper operation of both structural and source controls. For example, reducing the frequency of inspections and cleanout of a structure may initially reduce program costs, but the effectiveness of the BMP can be diminished, which creates the need for additional controls and results in deterioration in water quality, which has a cost associated with it.

### *Site-Specific Suitability*

Technical factors affect the site-specific suitability of particular BMPs, especially structural controls. These factors include land use, size of drainage area, soil permeability, slopes, depth to seasonal high water table, space requirements, depth to bedrock, pollutants to be addressed, the type and condition of water and maintenance access. These factors must be considered in identifying acceptable controls for discharges from new development.

### *Public Acceptability*

The makeup and activities of the community is important for successful implementation of BMPs, which require significant community involvement to be effective. Factors to be considered include demographics, environmental and aesthetic issues, and business climate.

### *Multiple Application Advantage*

Certain types of BMPs have an advantage because they offer a multiple use advantage that single use controls do not. Land use controls are an example of a BMP with multiple applications. It has an advantage over a single use control such as a detention pond because it has the potential to result in reductions over large areas. Another examples of a multiple use BMP is an education campaign that is targeted to the general public or a specific audience.

### *Existing Programs*

Activities that can be implemented through existing programs have an advantage because of institutional acceptability and cost savings. Support is more likely to exist if the activity builds on existing capabilities or modifies existing programs or activities. Without institutional support, control measures are less likely to be

implemented which will have a significant impact on the effectiveness of urban runoff control programs. Integrating new activities with existing programs is also one of the most cost-effective ways to achieve reductions in pollutant loadings.

Phase II Minimum Measures - Addressing Existing Discharges

Pollutant load reductions from existing activities can be achieved by the implementation of programs and activities associated with four of the six minimum measures required by the Phase II requirements. These measures include public education, public involvement, illicit connection detection and elimination, and pollution prevention/good housekeeping practices for municipal operations. The following discussion of the six minimum measures was adapted from EPA guidance materials (EPA, 2000).

### *Public Education and Outreach*

The federal regulations require that a public education program be implemented to distribute educational materials to the community, or conduct equivalent outreach activities about the impacts of storm water discharges on local waterbodies and the steps that can be taken to reduce storm water pollution. Public education helps ensure success through greater support and greater compliance for the storm water program. The public education program should include initial public contact and education and milestones for involvement throughout the development and implementation phase.

Public education programs are expected to target specific audiences, including those regulated or affected by the program, such as developers, building contractors, and industrial operators, and those that can assist with program implementation (e.g. volunteers and citizens). It can also include other Phase II communities, groups or associations in the area willing to cooperate as partners.

Examples of public education and outreach activities include:

- A community-wide survey assessing homeowner storm water knowledge, attitudes, and practices, to gauge the level of knowledge in the area, and prioritize activities to meet local concerns
- Signs posted along roadways and in housing areas to identify the watershed, especially where its boundaries intersect streets and highways. This increases public awareness regarding activities occurring within the watershed and alerts emergency responders to notify the utility of any potentially harmful releases that occur within it.
- Newsletters or water bill inserts about the storm water program
- Local paper coverage of program-related meetings to keep the community informed on progress and issues or a series of short articles about storm water

- Brochures with guidelines for items such as pet waste cleanup, proper storage and disposal of household hazardous materials, lawn care and septic tank maintenance
- Community meetings, with invited state or local officials to explain why protecting storm water is important
- Alternative information sources, such as web sites, bumper stickers, refrigerator magnets, posters for bus stops and restaurant place mats
- Educational displays at home shows and community festivals
- Curriculums and activities for school-age children
- A volunteer monitoring program
- Water Awareness Week activities
- Recognizing community and volunteer efforts publicly
- A household hazardous waste collection day as an occasion for education on proper storage and use of chemicals.

Examples of measurable goals for this minimum measure are shown in Table 1.

Table 1. Public Education and Outreach Measurable Goals Example

| Target | Activity |
|---|---|
| Year 1 | 3 brochures developed and distributed in water utility bills |
| Year 2 | A web site created; school curricula developed; storm drains stenciled |
| Year 3 | 75% of public reached with storm water educational material |
| Year 4 | Survey shows 20% increase in public awareness of storm water |

***Public Involvement***

The storm water management program should include a public involvement component. Public participation will ensure broader public understanding and support, provide a broader base of expertise, and provide additional resources to the program through volunteer activities.

Generally, the public should be involved as early as possible in program development. In some cases the public involvement may simply be to receive information but it is also important to involve the public through advisory groups or public meetings when considering major policy issues in the development of the program.

At a minimum, the public participation component of the program must include compliance with applicable state and local public notice requirements, which includes public notice of new ordinances or ordinance revisions. The Open Meeting Law (Idaho Code Title 67, Chapter 23) sets forth requirements for public notification of meetings.

Examples of public involvement activities include:

- Public meetings/citizen panels to provide input concerning new policies and programs
- Volunteer water quality monitoring
- Volunteer educators/speakers who can conduct workshop, encourage public participation, and staff special events
- Storm drain stenciling by volunteers
- Community clean-ups along waterways and around storm drains
- Citizen watch group to assist in identification of polluters

Examples of measurable goals for this minimum measure are shown in Table 2.

Table 2. Public Participation Measurable Goals Example

| Target | Activity |
|---|---|
| Year 1 | Notice of public meeting in different print media and bilingual flyers; local storm water advisory group established |
| Year 2 | Final recommendations of advisory group; radio spots promoting program and participation |
| Year 3 | Three stream clean-up days held every year |
| Year 4 | Volunteer monitoring results published |

***Illicit Discharge Detection and Elimination***

Illicit discharges enter the storm water system through either direct connections (e.g. wastewater piping either mistakenly or deliberately connected to the storm drains) or indirect connections (e.g. paint or used oil dumped directly into a drain). Sources of illicit discharges include such things as sanitary wastewater, effluent from septic tanks, car wash wastewaters, improper oil disposal, radiator flushing disposal, sump pump discharges, laundry wastewaters, and improper disposal of household chemicals.

Storm water management plans must include an illicit discharge detection and elimination program which includes:

- A storm sewer system map, showing the location of all outfalls and the names and locations of receiving waters;
- An ordinance, or other regulatory mechanism which prohibits or regulates non-storm water discharges into the MS4;
- A plan to detect and address non-storm water discharges, including illegal dumping into the MS4; and
- Education of public employees, businesses, and the general public about the hazards associated with illegal discharges and the improper disposal of waste.

It is important to understand how storm water runoff is currently managed in order to target efforts efficiently. This requires an assessment of the storm water system. Maps, inventories, or other assessments of the physical infrastructure in place should be identified. If these do not exist or are incomplete, an assessment should be done. An assessment should provide an inventory of storm water inlets, pipes, ditches, and open channels; identify outfalls and where they are located; determine if someone else is discharging storm water into the system; identify major pollutant sources (industrial, commercial, residential); and identify what types of flood control or water quality practices are currently in place.

A plan should then be developed to detect and address illicit discharges, based on available resources, and the degree and character of the illicit discharges. The plan should identify steps that will be taken to locate problem areas, finding the source of the problem, removing the connection or correcting the discharge.

Education efforts and working with the discharger can be effective in resolving the problem before taking legal action. This should be part of a broader educational effort to detect and eliminate illicit discharges that should include:

- Providing training programs for public employees;
- Developing informative brochures, and guidance for specific audiences;
- Designing a program to publicize and facilitate public reporting of illicit discharges;
- Coordinating volunteers for locating, and visually inspecting, outfalls or to stencil storm drains; and
- Initiating a recycling program for commonly dumped wastes, such as motor oil.

Examples of measurable goals for this minimum measure are shown in Table 3.

Table 3. Illicit Discharge Measurable Goals Example

| Target | Activity |
|---|---|
| Year 1 | Outfall locations mapped; recycling program for household hazardous waste in place |
| Year 2 | Ordinance in place; training for public employees completed |
| Year 3 | 50% of priority areas have been screened for illicit discharges; households participating in household hazardous waste collection days |
| Year 4 | All identified illicit connections have been fixed |

### *Pollution Prevention/Good Housekeeping for Municipal Operations*

Stakeholders must develop and implement an operation and maintenance program to prevent or reduce pollutant runoff from municipal operations into the MS4, including employee training.

The following components should be considered for this measure:

- Maintenance activities, maintenance schedules, and long-term inspection procedures
- Control for reducing or eliminating the discharge of pollutants from areas such as roads and parking lots, maintenance and storage yards, and waste transfer stations
- Procedures for the proper disposal of waste removed by maintenance activities
- Ways to ensure that new flood management projects assess the impacts on water quality

Stakeholders should develop a schedule of regular maintenance of structural controls and infrastructure (e.g., removing sediment from retention ponds every five years, cleaning catch basins annually, removal of litter from channels twice a year) as part of a storm water management program. Maintenance logs can be used to track activities and develop a matrix of tasks on a timeline, such as inspection, repair, replacement, and cleanout.

When regularly scheduled maintenance is not appropriate, periodic inspections can be used to determine when maintenance is needed. If maintenance is to be based on the results of inspections or if maintenance is scheduled infrequently, an inspection schedule should be provided. Because maintenance issues are critical to successful program implementation, measurable goals for maintenance should be considered throughout the term of the permit.

Retrofitting should also be considered as an opportunity to improve existing structural controls. Retrofitting is a process that involves the modification of existing surface water runoff control structures or conveyance systems that were designed to control flooding, so they will also serve a water quality improvement function.

An evaluation of major existing public structural controls and municipally owned sites and rights-of-way should be conducted to identify where retrofits or new controls can be installed. An inventory will identify where additional reductions of pollutants can be achieved using current and potential storm water quality and quantity controls and will facilitate both long- and short-term storm water master planning.

Examples of measurable goals for this minimum measure are shown in Table 4.

Table 4. Municipal Operations Measurable Goals Example

| Target | Activity |
|---|---|
| Year 1 | Pollution prevention plan completed; employee training materials developed; procedures in place for catch basin cleaning and street sweeping |
| Year 2 | Training for appropriate employees completed; recycling program fully implemented |
| Year 3 | Pollution prevention BMPs incorporated into master plan; 30% reduction in pesticide and sand/salt use; maintenance schedule for BMPs established |
| Year 4 | 30% reduction in floatables discharged; 80% compliance with BMP maintenance schedules; controls in place in all areas of concern |

Phase II Minimum Measures - Preventing Future Discharges

Construction site discharge control and post-construction storm water management comprise the other two minimum measures required under the Phase II rule. These measures are necessary to prevent additional future loads to the Boise River and its tributaries in areas undergoing new development or redevelopment. Pollutant loads above current discharges can be prevented by implementation of activities that control runoff from new development. This includes control of discharges from building sites during construction and following construction. Additional pollutant reductions may be achieved when land conversion is from a high load situation (e g. irrigated agriculture) when additional BMPs are implemented.

Opportunities for achieving pollutant reductions can be incorporated into the site plan review and land use planning processes. Water-related codes and ordinances, such as erosion and sediment controls, storm water management, and prevention of illicit connections, can be implemented through the site planning process and verified through the review process.

Storm water management can be achieved by relying on existing land development requirements, strengthening or developing new storm water codes and ordinances, and using the site plan review process to ensure that appropriate storm water codes and ordinances are implemented. The site plan review process is typically the final stage of municipal review that occurs before development takes place.

Land use planning is an additional process that precedes (but does not replace) the site plan review process. The planning process typically involves the setting of land use goals and objectives for various parts of a municipality into a plan document or onto a plan map. Water quality can be addressed by incorporation of policies regarding storm water quality into the land use.

### *Construction Site Discharge Control*

The construction site discharge control measure is intended to control all pollutants commonly discharged from construction sites. The Phase II Rule requires entities to develop, implement, and enforce a program to reduce pollutants from construction activities that result in a land disturbance of *greater than or equal to one acre*. Generally, sediment in runoff or as fugitive dust is the main pollutant of concern. Consequently, this is an important measure for achieving the sediment load reductions required by the TMDL. In addition to sediment, construction sites can generate many other pollutants such as pesticides, oil and grease, concrete truck washout, construction chemicals, construction debris, solvents, paints, sanding dusts, and fertilizers.

Required activities include:

- An ordinance or other regulatory mechanism requiring the implementation of proper erosion and sediment controls, and controls for other wastes, on applicable construction sites;
- Procedures for site plan review that consider potential water quality impacts;
- Procedures for site inspection and enforcement of control measures;
- Sanctions to ensure compliance established in the ordinance or other regulatory mechanism; and
- Procedures for the receipt and consideration of information submitted by the public.

In addition, the federal storm water regulations require NPDES Permits, issued by EPA, for construction sites greater than five acres. A Storm Water Pollution Prevention Plan must be prepared and implemented to control storm water discharges from the construction site. Under Phase II, this requirement will extend to all construction sites greater than one acre. This requirement applies to all construction sites that meet the size threshold regardless of whether the construction occurs within the jurisdiction of a municipality regulated under Phase I or Phase II of the federal storm water requirements. This requirement is in addition to the construction site controls that are implemented by Phase I and Phase II regulated municipalities.

Construction site BMPs can be categorized as erosion control practices, which prevent or minimize erosion; sediment control practices, which attempt to capture soil released through erosion; and source controls.

Erosion control represents various practices designed to keep water from coming in contact with bare soil or controlling its velocity if it does. Preventive erosion controls include limiting disturbance to land and vegetation; scheduling; and phasing construction. Phasing construction is a practice in which clearing

operations are performed in stages to take advantage of cover that exists on the site before construction.

Temporary cover practices are used on portions of construction sites that remain unworked for months, during which time very large amounts of erosion can occur unless these areas are stabilized. Stabilization can be achieved with temporary seeding or various kinds of slope coverings, or both. Slope coverings include both mulches and commercial mats and blankets. Fugitive dust can be controlled through these practices or through the application of water or tackifiers.

Other stabilization practices include a stabilized construction entrance and permanent stabilization through vegetation establishment as soon as possible after all construction is completed in each segment of the site. The construction entrance at the most important access route is important to stabilize, since it is the last point at which tracking sediment off site can be stopped. If equipment travels extensively on unstabilized roads on the site, a tire and vehicle undercarriage wash near the entrance will be needed. Wash water will require treatment in a sediment pond or trap.

Erosion control practices Include drains for surface and subsurface water, dikes and swales placed across slopes to interrupt runoff, and roughness created on the surface to reduce velocity.

Trapping sediments once they are released requires slowing the transport velocity sufficiently for soil particles to settle (i.e., reducing the velocity below the settling velocity of the particles). The two basic types of sediment trapping techniques in use are sediment barriers and settling ponds. Sediment barriers include the commonly used filter fabric and straw bale fences as well as brush fences and barriers constructed of gravel. Both types trap sediments in the same way, by ponding water.

Source controls are used in the management of other construction site pollutants. Construction sites can create pollution problems over and above erosion and sediments through paving operations, handling and storage of various materials, spills, and waste handling. Examples of measurable goals for this minimum measure are shown in Table 5.

Table 5. Construction Site Runoff Control Measurable Goals Example

| Target | Activity |
|---|---|
| Year 1 | Ordinance or other regulatory mechanism in place; procedures for information submitted by the public in place |
| Year 2 | Procedures for site inspections implemented; educational program for construction operators in place |
| Year 3 | 75% of local construction operators trained |
| Year 4 | 90+% of sites complying with local ordinance |

### *Post Construction Storm Water Management*

Post-construction storm water management in areas undergoing new development or redevelopment is necessary to prevent additional future loads to the Boise River and its tributaries and may result in reductions when BMPs are applied. The Phase II Rule includes a requirement to develop, implement, and enforce a program to reduce pollutants in post-construction runoff to the MS4 from new development and redevelopment projects that result in the land disturbance of *greater than or equal to 1 acre* that includes:

- Strategies which include a combination of structural and/or no-structural BMPs;
- An ordinance or other regulatory mechanism requiring the implementation of post-construction runoff controls; and
- A strategy to ensure adequate long-term operation and maintenance of controls

Structural and non-structural BMPs could be used to satisfy the requirements of this measure. Structural controls include infiltration devices, detention and retention basins, vegetated swales, water quality inlets, screens and filters, channel stabilization, riparian habitat enhancement efforts, and wetland restoration projects.

Non-structural controls include planning, procedures, and site-based local controls. Runoff problems can be addressed efficiently with sound planning procedures. Master plans, comprehensive plans, and zoning ordinances can promote improved water quality by guiding the growth of a community away from sensitive areas and by restricting certain types of growth to areas that can support it without compromising water quality. Site-based local controls can include buffer strip and riparian zone preservation, minimization of disturbance and imperviousness, and maximization of open space.

Many communities already require that developers maintain post-construction runoff to pre-construction levels through the use of structural controls. A water quality component can be added to these requirements to ensure that off-site discharges have received pretreatment and that infiltration facilities are appropriately sited to prevent untreated storm water from being injected into the shallow aquifer and contaminating ground water.

Redevelopment projects also offer the opportunity to improve existing storm water management practices. Existing practices may be inadequate or performing poorly, or they may simply lack the pollutant removal capability of newer BMP designs. The least expensive and most practicable retrofit opportunities often involve the improvement of existing urban BMPs. Examples of measurable goals for this minimum measure are shown in Table 6.

Table 6. Post-Construction Measurable Goals Example

| Target | Activity |
|---|---|
| Year 1 | Strategies developed that include structural and/or nonstructural BMPs |
| Year 2 | Strategies codified by use of ordinance or other regulatory mechanism |
| Year 3 | Reduced percent of new impervious surfaces associated with new development projects |
| Year 4 | Improved clarity and reduced sedimentation of local waterbodies |

## VI. Establishing Watershed Priorities

Because the resources to achieve the TMDL reductions are limited, there is a need to prioritize activities and subwatersheds for implementation of additional BMPs to achieve pollutant reductions beyond those that result from existing activities; pollutant reductions associated with land conversion, and Phase II activities.

In this section, priority subbasins are recommended for additional pollutant control activities where it is most likely that the greatest load reductions can be achieved. This approach could be used by state agencies to establish funding priorities or by a stakeholder for setting priorities for areas within its boundaries.

The prioritization approach is qualitative and is based on a consideration of subbasin location, existing pollutant loads, and growth patterns. When evaluating specific project proposals, subbasin characteristics should also be considered because such factors as land ownership, physical characteristics, or jurisdiction may play a role in the effectiveness of efforts to reduce pollutant loads. Subbasin characteristics were not used in this exercise of identifying subbasin priorities because of the site-specific nature of this type of information.

Subbasin location refers to the location of the subwatershed within the Lower Boise River watershed (distance down valley). Water is used several times as it moves down irrigation conveyance and drainage facilities in the Boise Valley. As water is used and reused, dissolved and suspended constituents increase to levels greater than those found at diversion sites located primarily in the reach between Lucky Peak Dam and the City of Boise (Reclamation 2001). A Bureau of Reclamation study found that there is a significant correlation between distance down valley and specific water quality parameters measured in storm runoff (2001).

The relative magnitude of existing pollutant loads and load reductions must also be considered in establishing subbasin priorities. Tables 7 and 8 display information regarding loads, load allocations and load reductions for subbasins in the Lower Boise River watershed. Table 7 lists the sediment loads and load

allocation by subbasin. Those subbasins with the largest loads have been highlighted.

Table 7. Sediment Loads and Load Allocation by Subbasin

| Subbasin | 1995 Load (tons/day) | Load Allocation (tons/day) |
|---|---|---|
| Boise River @ Middleton | 4.40 | 4.40 (see Note) |
| Conway Gulch | 11.34 | 7.14 |
| Dixie Slough | 41.12 | 25.91 |
| Fifteen Mile Creek | 28.6 | 18.02 |
| Hartley Gulch | 8.43 | 5.31 |
| Indian Creek | 9.11 | 5.74 |
| Mason Creek | 34.1 | 21.48 |
| Mill Slough | 11.24 | 7.08 |
| Willow Creek | 3.62 | 2.28 |

NOTE: Using the mass balance approach, analysis showed that total suspended sediment targets were met upstream from Middleton. Thus, three contributing areas (the Riparian Area #1, Eagle Drain, and Thurman Drain) upstream from Middleton were assigned sediment loads equal to the 1995 loads used to develop the TMDL.

Table 8 displays the bacteria concentrations and percent reduction needed to meet the TMDL target. The subbasins with the highest means have been highlighted. Although the new state water quality standards for *E. coli* affect these target reductions, the subbasins with the highest percent reduction needed for fecal coliform colonies are very likely to be the same subbasins in which the highest percent reduction is necessary for *E. coli*. This will be confirmed with monitoring data that are currently being collected.

Table 8. Fecal Coliform Bacteria Concentrations and Percent Reduction

| Subbasin | Primary contact geometric mean (CFU/100 ml) | Percent Reduction needed to meet 50 CFU/100 ml |
|---|---|---|
| Boise River@ Middleton | 208 | |
| Conway Gulch | 723 | 93 |
| Dixie Slough | 2987 | 98 |
| Fifteen Mile Creek | 992 | 95 |
| Hartley Gulch | 2296 | 98 |
| Indian Creek | 770 | 94 |
| Mason Creek | 1407 | 97 |
| Mill Slough | 1282 | 96 |
| Willow Creek | 803 | 94 |

NOTE: Since the TMDL was developed, *E. coli* has replaced fecal coliform as the state water quality standard (126 *E. coli*/100 ml). Thus, compliance with the lower Boise River bacteria TMDL will be evaluated using the applicable *E. coli* state water quality standards to maintain the intent of the TMDL (to protect human health using the applicable standard).

Areas of projected growth are an important consideration in developing priorities for pollutant reduction activities primarily related to construction and post-development controls, because it is easier and most cost-effective to implement BMPs, both structural and nonstructural, before development has occurred. There is also greater potential for widespread application of development and post-development stormwater BMPs in the subbasins where future development is most likely to occur.

Information generated by the Treasure Valley Futures (TVF) Project was used to understand development trends. The TVF project looked at how transportation and land use planning interact to understand the consequences of growth as it is expected to occur over the next 20 years. The TVF project examined land use consumption trends and their relationship to household growth in order to characterize future growth pressures. The study found that new housing built between 1994 and 2000 is built at average lower densities than the existing housing stock, and that rural area and small cities are driving this rapid regional land consumption. The TVF report states that rural residential development is expected to be the main driver in the conversion of agricultural lands to residential uses over the next two decades with a little more than 5 % or 21,000 of the current agricultural acreage in the region likely utilized by 2020.

In evaluating land supply, the study found that the region's four large cities: Boise, Meridian, Nampa and Caldwell still contain considerable land supply for future growth, almost 55,000 acres. Of the existing land currently available for growth, 88% or almost 461,000 acres is in rural areas. Small cities in the Treasure Valley contribute relatively little additional land capacity, with only roughly 10,000 acres of land suitable for development among them.

Several growth scenarios concerning growth in the Treasure Valley by the year 2020 were also analyzed. They are presented in the "Treasure Valley Growth Scenario Analysis" (2002) and summarized below.

- Scenario 1 is based on the COMPASS 2020 Ada/Canyon Transportation Model, which assigns growth projection to subareas within the Valley called traffic analysis zones (TAZs).

- Scenario 2, called the TVF scenario, shows where future development would occur in the Treasure Valley by 2020 if the growth patterns from 1994 through 2000 were to continue for the next 20 years. Key factors included available land supply, the presence of existing similar development, and transportation accessibility.

- Scenario 3 is based on land use policies/objectives in each community's comprehensive plan based on allowable development densities and shows the total amount of future development that is permitted within the current public policy framework, but with no timeframe.

While the TVF study found that the total number of additional housing units is the same under both the COMPASS scenario and the TVF scenario, the increase is allocated differently among the places in the region. According to the COMPASS projection, future residential growth will be heavily concentrated in more urbanized parts of the Valley, with 82 percent of the increase in metropolitan areas. The TVF scenario shows more intensive growth in rural areas of the region, with more than twice the amount of additional housing units in rural areas than in the COMPASS scenario. Table 9 shows the difference between the TVF and COMPASS scenarios.

Table 9. TVF and COMPASS Shifts in Distribution of Regional Housing Stock, 2000-2020 (TVF Project, 2002)

| City/Area | 2000 Baseline | | 2020 TVF | | | 2020 COMPASS | | |
|---|---|---|---|---|---|---|---|---|
| | Housing Units | Percent of Total | Housing Units | Percent of Total | 2000-2020 Increase | Housing Units | Percent of Total | 2000-2020 Increase |
| Metro | 136,985 | 84.2% | 183,493 | 76.5% | 34.0% | 199.967 | 83.4% | 46.0% |
| Small Cities | 8,594 | 5.3% | 13,832 | 5.8% | 60.9% | 10,160 | 4.2% | 18.2% |
| Rural | 17,051 | 10.5% | 42,519 | 17.7% | 149.4% | 29.717 | 12.4% | 74.3% |
| Treasure Valley | 162,630 | 100.0% | 239,844 | 100.0% | 47.5% | 239,844 | 100.0% | 47.5% |

In Ada County, the metropolitan areas are Boise, Garden City, and Meridian, as are Caldwell and Nampa in Canyon County. Eagle, Kuna, Star and Middleton represent the small cities. The magnitude and spatial distribution of the anticipated future expansion is displayed in Table 10, according to the residential density classes.

Table 10. TVF Regional Housing Stock Increase by Place Type and Density, 2000-2020 (TVF Project, 2002)

| Place Type | 2000-2020 Housing Units Increase | | | |
|---|---|---|---|---|
| | Rural | Suburban | Urban | Total |
| Metro | 3,231<br>6.9% | 33,391<br>71.8% | 9,884<br>21.3% | 46,506<br>100,00% |
| Small Cities | 861<br>16.4% | 3,400<br>64.9% | 979<br>18.7% | 5,240<br>100.00% |
| Rural | 7,987<br>31.4% | 14,865<br>58.4% | 2,616<br>10.3% | 25,468<br>100.00% |
| Total | 12,079<br>15.6% | 51,656<br>66.9% | 13,479<br>17.5% | 77,214<br>100.00% |

Residential Density Assumptions: Rural - 2.46 Acres/Dwelling Unit (DU), Suburban – 0.24 Acres/DU, Urban - 0.08 Acres/DU

The majority of total housing units in the region in 2000 were built at suburban densities and this type of housing account for almost two-thirds of the region's total housing stock. The majority of residential growth is projected to continue at suburban densities.

The location of the 2020 TVF projections and the 2020 COMPASS growth projections are shown on the following maps. Subbasin boundaries have also been included on these maps.

The maps physically illustrate the TVF and COMPASS projects for 2020. For the purposes of this Plan, subbasins have been delineated on the maps and include the Boise River corridor, Conway Gulch, Dixie Slough, Dry Creek, Five Mile Creek and Ten Mile Creek, Hartley Gulch, Indian Creek, Lake Lowell, Mason Creek, Mill Slough, Sand Hollow Creek, and Willow Creek.

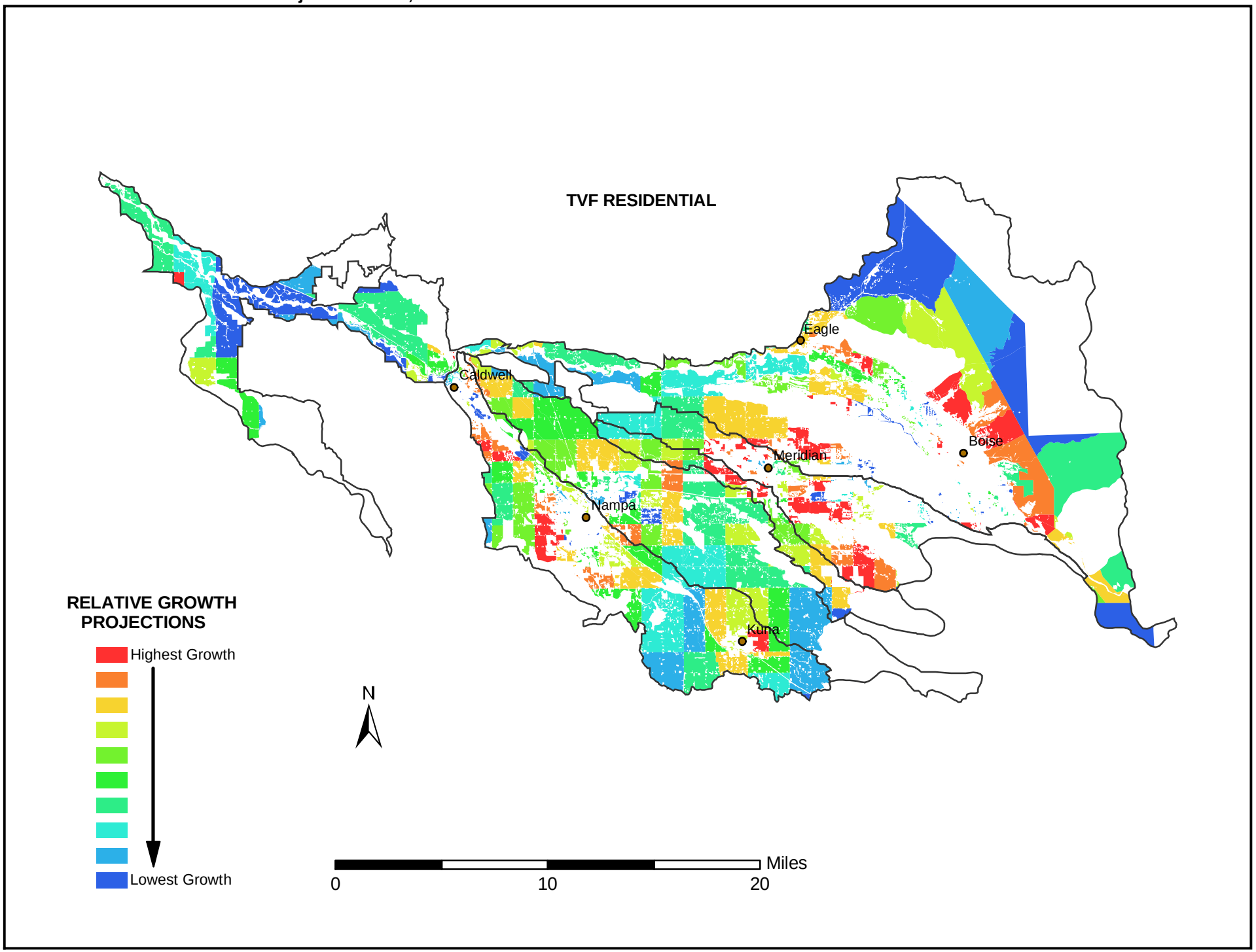
The Sand Hollow subbasin discharges directly to the Snake River and separate TMDLs will be prepared for the Lake Lowell, Upper Indian, Upper Five Mile and Upper Ten Mile subbasins. However, these subbasins have been included in order to present a holistic view of the subbasins that comprise the Lower Boise River watershed, to assist stakeholders and regulatory agencies with responsibilities in these areas in understanding the larger picture

With an understanding of the projected development pattern, local jurisdictions can target efforts related to storm water program priority areas and agricultural interests can avoid investment in agriculture BMPs in areas likely to be developed in the short term since these expenditures will have limited future payoffs.

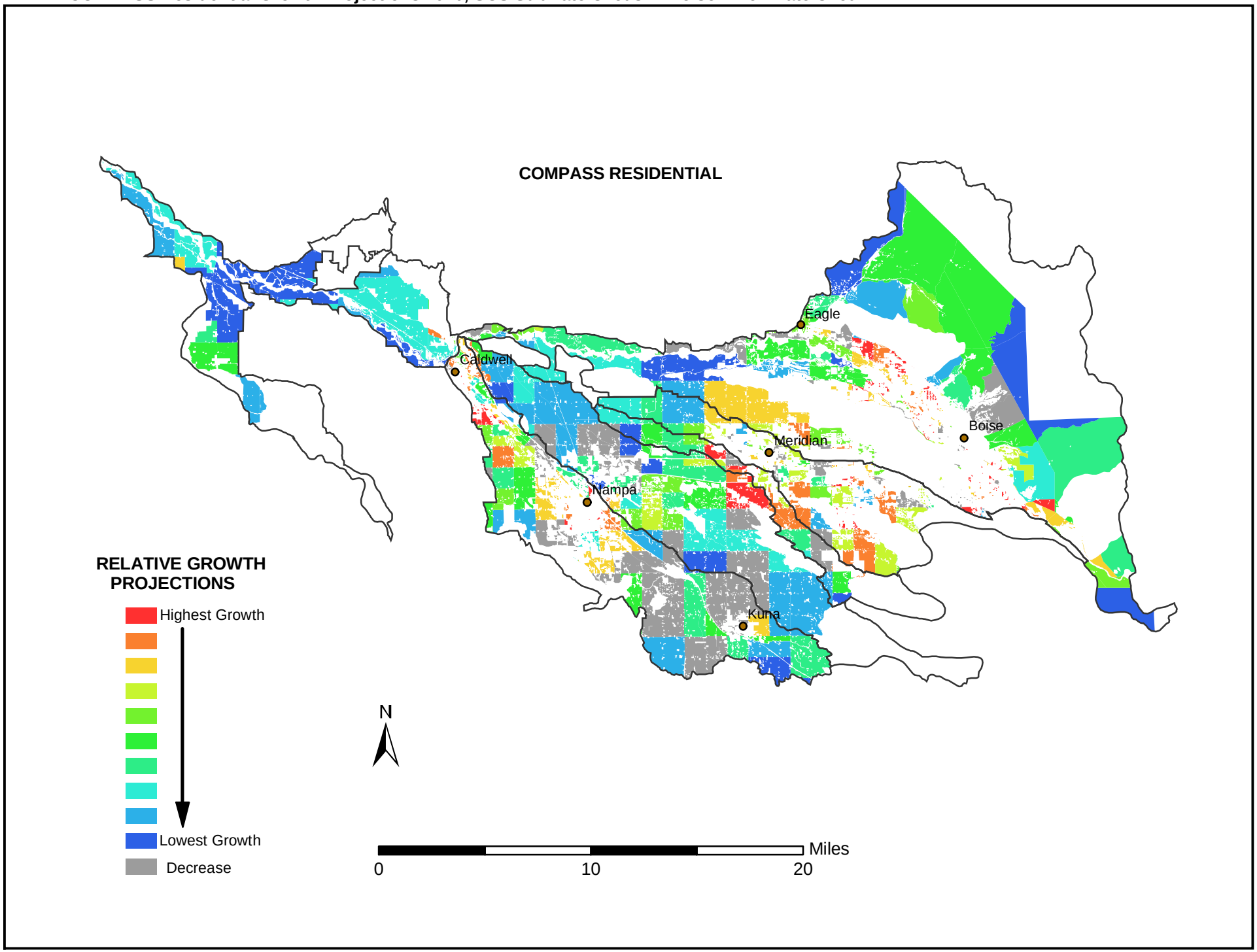
Most importantly, jurisdictions that must deal with the expected growth in the coming years have the opportunity to modify existing development policies and regulations to address stormwater runoff and associated loads and realize a net pollutant load reduction as the land use is converted from agriculture to urban/suburban. This net decrease will only occur if adequate controls are in place prior to development.

The Boise River corridor, Lower Five Mile Creek, Lower Indian Creek, Lower Ten Mile Creek and Mason Creek best meet the criteria conditions of location, loads and growth. All of these subbasins discharge into the lower portions of the Boise River, except for the upper end of the Lower Boise corridor. Mason Creek and Fifteen Mile Creek (which is formed by Five and Ten Mile Creeks) had among the largest sediment loads (1995 loads in tons/day). Mason Creek also had among the highest bacteria concentrations.

**MAP 1: TVF Residential Growth Projections 2020, SCS Subwatersheds in Boise River Watershed**



**MAP 2: COMPASS Residential Growth Projections 2020, SCS Subwatersheds in Boise River Watershed**



Although sediment loads from the Dixie Slough subbasin were higher, urban/suburban land uses are more limited and the projected growth potential is low in this area. Similarly, the highest bacteria concentrations are found in the Dixie Slough and Hartley Gulch subbasins, which also has fewer urban/suburban activities. On the other hand, the application of long-term agricultural BMPs in these areas, Dixie Slough and Hartley Gulch, would not be limited by the likelihood of development of these agricultural lands.

The Lower Boise corridor, Mason Creek and the lower portions of Five Mile, Ten Mile and Indian Creek; should be considered priority areas for the implementation of activities beyond the requirements of Phase II because they provide opportunities to achieve the largest pollutant reductions associated with land use conversion and the largest benefit for the resources invested relative to other areas.

## VII. Partnerships

The effectiveness of pollutant reductions from urban and suburban sources can be enhanced by partnerships among the stakeholders at the local and/or regional level. Partnerships are a key to effective watershed management and often result in:

- More efficient use of financial resources,
- A spirit of sharing and cooperation,
- Fairness which minimizes the potential for negative social and economic impacts, and
- More creative and acceptable ways to protect water quality

Stakeholders should consider local partnerships with other affected entities in their area. Stakeholders could share information through regular meetings and, if goals are compatible, partner to share resources or join as co-permittees. The NPDES storm water permit issued for the Boise area is based on such a partnership. Boise City, ACHD, Garden City, Boise State University, the Idaho Transportation Department, and Ada County Drainage District 3 are partners in the implementation of activities required by permit conditions. Co-permittees implement activities specific to their jurisdiction while activities that affect all permittees, such as education and enforcement are accomplished cooperatively through an intergovernmental agreement.

At the regional level, a partnership would promote regional consistency and facilitate efficient use of public resources. Stakeholders could focus on regional challenges and opportunities to improving the quality of storm water runoff. A partnership would encourage information sharing and cooperation, and could develop products and programs that would be more cost-effective done regionally than could be accomplished locally. A partnership could provide a range of options for participation, and would allow local governments to pool their

resources, to produce higher quality products, and in some cases, to do things they cannot do separately.

This association could evolve from an organization that promotes talking to each other, to one that shares information and resources, to one that does things together, and finally to an organization that does things with agencies and organizations outside of itself.

Partnerships also enable a watershed approach to permit issuance and program implementation to occur more easily. A watershed approach allows for coordinated (and hence most cost-efficient) monitoring for effluent and receiving waters.

## VIII. Plan Implementation Schedule

Plan implementation is based on a schedule related to the proposed timeframes associated with the Phase II storm water requirements. The schedule is displayed in Table 10, and is based on the assumption that TMDL compliance and reporting activities will coincide with Phase II permit requirements to facilitate the development of storm water management programs that integrate and achieve the requirements of both simultaneously. Existing activities are ongoing and are displayed as such in this table. While a consideration of pollutant load reduction associated with land use conversion is considered in the strategy of this Plan, it is not displayed as a separate implementation activity. Control activities associated with new development are part of ongoing programs and new programs required by Phase II that are included in the schedule.

Activities and milestones, identified in the Table, will occur over a 5-year time period, beginning in 2003. Load reductions required to meet TMDL requirements will be achieved over a ten-year time period with activities to meet the Phase II six minimum measures phased in over the first five years. Additional activities beyond existing programs and Phase II activities may be needed in priority subbasins.

Milestones identified in Table 10 are based on the assumption of full implementation in the first five years with mid-course corrections to programs and activities based on annual evaluations of the progress made towards the measurable goals identified in each jurisdictions storm water management plan. This approach is consistent with the adaptive management strategy presented in the overall Lower Boise River TMDL Implementation Plan.

It should be recognized that Boise area storm water NPDES permittees have been implementing programs and activities for improving storm water runoff quality for several years. The first year of their 5-year NPDES permit began November 29, 2000. Annually, and at the end of each five-year permit period, permittees evaluate programs and activities and make adjustments as needed.

## IX. Implementation Costs and Potential Sources of Funding

Funding is needed to implement a storm water management program, and to maintain the staff, equipment and materials. The U.S. EPA developed detailed cost estimates for the Phase II requirements (Table 11). Implementation of the six minimum measures was projected to represent the primary cost components.

In the final regulations, EPA estimated the cost of compliance based on a fixed cost component and a variable cost component. The fixed cost component included costs for the municipal application, record keeping, and reporting activities. On average, EPA estimated annual costs of $1,525 per municipality. Variable costs include the costs associated with annual operations for the sic minimum measures and are calculates at a rate of $8.93 annually per household (assuming 2.62 persons per household.) Thus the cost estimating equation is:

Annual = $1,525 + population/2.62*$8.93

Reese (Table 12) further refined these estimates for two hypothetical permittees. Permittee one (“Smallville”) is a community of 10,000 that is adjacent to a larger city that has obtained a Phase I permit or that can assist Smallville in many of its permit responsibilities. Permittee two (“Midtown”) is a larger community with a population of 50,000 located within an urbanizing county whose total population makes it a designated “urbanized area.”

Table 10. Phase II Permittee Plan Implementation Schedule

| Activity/Milestone | Year 1 | | Year 2[1] | | Year 3 | | Year 4 | | Year 5 | | Year 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continued implementation of existing programs | | | | | | | | | | | | |
| Stakeholders assess systems, existing authorities and programs | | | | | | | | | | | | |
| Stakeholders form local and/or regional partnerships | | | | | | | | | | | | |
| Storm water management plans prepared.<br>Plan approval by local decision makers.<br>Phase II NPDES permit application submitted (if applicable) | | | | | | | | | | | | |
| Local advisory groups established. | | | | | | | | | | | | |
| Public education developed. | | | | | | | | | | | | |
| Storm water systems mapped. | | | | | | | | | | | | |
| Storm water authorities in place. | | | | | | | | | | | | |
| Priority subbasins assessed for additional load reduction opportunities | | | | | | | | | | | | |
| Structural controls for development in place. | | | | | | | | | | | | |
| O&M plans for public facilities in place. | | | | | | | | | | | | |
| Initiate planning and implementation of additional pollutant reduction activities in subbasins. | | | | | | | | | | | | |
| Construction site controls in place. | | | | | | | | | | | | |
| Nonstructural controls for development enacted. | | | | | | | | | | | | |
| All illicit connections fixed. | | | | | | | | | | | | |
| Submittal of Annual Reports | Same date each year (determined by NPDES Permit) | | | | | | | | | | | |

[1]Year 2 is assumed to be year 1 of the Phase II NPDES permit

Table 11. Per Capita Costs for Six Minimum Measures (US EPA, 1999)

| Measure | Low End of Per Capita Costs ($ per capita) | High End of Per Capita Costs ($ per capita) |
|---|---|---|
| Public Education | $0.02 | $0.34 |
| Public Involvement | $0.19 | $0.20 |
| Illicit Discharges | $0.02 | $2.61 |
| Construction Sites | $0.04 | $1.59 |
| Post Construction | $1.09 | $1.09 |
| Municipal Operations | $0.01 | $2.00 |
| Total | $1.37 | $7.73 |

Table 12. Estimated Costs for Two Municipalities of Differing Size (Reese, 2000)

| | Annual Per-Capita Cost | |
|---|---|---|
| Minimum Control | Smallville | Midtown |
| Public Education | 0.39 | 1.24 |
| Public Involvement | 0.21 | 0.62 |
| Illicit Connections | 0.24 | 1.77 |
| Construction | 0.20 | 0.96 |
| Post Construction | 0.14 | 5.78 |
| Municipal Operations | 0.15 | 0.59 |
| Total | 1.33 | 10.96 |

There is site-specific variability in the selection of appropriate BMPs, as well as in the design constraints and pollution control effectiveness of practices. Moreover, some stakeholders may already be meeting the minimum measures, or only one or two practices may need to be added to achieve the measures. The estimates in Tables 11 and 12 represent costs to local government and do not include additional costs that will be passed on to contractors, developers and other entities that will be regulated by Phase II entities.

EPA also considered cost effectiveness, which they defined as the incremental annualized cost of a pollution control option per incremental pound of pollutant removed annually by the control option (US EPA, 1999a). Only potential reductions in TSS loadings were quantified, although EPA anticipated that reductions in oil and grease, nitrogen, phosphorus, pathogens, lead, copper, zinc, and other metals would also result. EPA compared the potential costs per pound of TSS removed from Phase II municipalities to the costs estimated for publicly owned treatment works (POTW) to remove this same pollutants. For municipalities, costs were expected to range from $0.04 to $0.18 per pound of TSS removed compared to $0.70 per pound of TSS removed for POTWs (Ibid.).

The objective of the Phase II Stormwater requirements is to control the whole array of potential pollutants in storm water discharges to protect water quality. This Plan includes activities that meet that objective, but emphasizes the pollutants of concern addressed by the Lower Boise River TMDL: sediment and bacteria. For the purpose of the TMDL, the most effective activities are those that

target sources of sediment (streambank erosion, construction sites, and the wash off from paved surfaces) and sources of bacteria (sanitary sewer leaks, leaking septic systems, illicit discharge of sewage, and contributions from pets and wild animals). In the interest of controlling new sources, new development must also be considered.

EPA developed an analysis of potential costs to the construction and land development sector from post-construction runoff control measures in municipal measures (Table 13). Although a mix of planning, site design, and structural approaches can be used for post construction runoff control, the cost analysis focused on structural controls (installation and maintenance of structural BMPs).

Table 13. Summary of Per-Site Average Total BMP Costs by Acreage and by Percent Imperviousness in 1998 dollars (US EPA, 1999a)

| Area (Acreage) | 35% Impervious (Multi-Family Residential) | 65% Impervious (Multi-Family/Commercial) | 85% Impervious (Commercial) |
|---|---|---|---|
| 1 Acre | $2,277 | $4,867 | $10,192 |
| 3 Acres | $5,172 | $12,068 | $15,260 |
| 5 Acres | $8,760 | $14,389 | $17,497 |
| 7 Acres | $15,865 | $29,248 | $68,996 |

Average per-site costs can be multiplied by the number of construction starts for each category to determine projected post-construction runoff control costs. Cost savings can be achieved through an array of other structural and non-structural options for post-construction control. These options include:

- Improved site/construction design that minimizes impervious areas or redirects runoff to grassy surfaces
- Site-based local controls, such as buffer strips and riparian zone preservation
- Other municipal regulatory approaches, such as reduced parking requirements for commercial facilities and changes to zoning and comprehensive plans.

The implementation of other sediment and bacteria control practices is more site specific making cost estimates more difficult. Costs for vegetative stabilization for shorelines and streambanks can include costs for wetland plants and riparian area vegetation, including trees and shrubs. Additional costs could be incurred depending on the level of site preparation that is required. The items of work could include (1) clearing the site of fallen trees and debris; (2) extensive site work requiring heavy construction equipment; (3) application of seed stock or sprigging of nursery-reared plants; (4) application of fertilizer (most typically for marsh creation); and (5) post project maintenance and monitoring.

Costs for structural stabilization typically include costs for survey and design and for extensive site work, including costs to gain access for trucks and front-end loaders necessary to place the stone (for revetments) or sheet pile (for bulkheads). Costs frequently vary depending on the level of wave exposure at the site and on the overall length of shoreline or streambank that is being protected in a single project.

Street and parking lot sweeping and catch basin cleaning costs have been estimated to be $65/curb mile, excluding disposal costs, and $10-$40/catch basin (Rouge Program Office, 1997). The cost of pet waste collection programs will vary depending on the intensity of the effort and the paths chosen to control pet waste. The most popular way is through an ordinance, but managers must consider the cost of enforcement, including staff and equipment requirements. The type of materials produced and the method of distribution selected determine public education program costs. Signs in parks may initially have a higher cost than printed materials, but can last for many years. Signs may also be more effective because they act as on-site reminders to dog owners to clean up in parks.

**Funding Options**

Funding is needed to maintain the staff, equipment and materials necessary to develop and implement an effective program. Some alternative funding options include:

Debt Financing: Revenue bonds or bonds that rely on ongoing sources of revenue may be used. Alternatively, a general obligation bond can be issued which are backed by the full faith and credit of your municipality.

Grants and Loans: Federal or state grant or loan funds may be available for some elements of the storm water program, depending on the BMPs selected. Grants and loans are usually applicable to specific projects and not on-going activities, such as operation and maintenance.

Users/Utility Fees: Utility services charges are rates billed to customers for providing storm water management services. The service charges may be flat rates, or variable rates based on classes of customers. Utility service charges may represent a dedicated source of funding and an ongoing method of funding some or all storm water management programs.

Special Assessment: Properties can be assessed annually to fund storm water management programs. Often, special assessments are used to fund a special district or authority that can implement

all or portions of a region's storm water management program.

General Fund: General fund monies are used for many storm water programs. If storm water programs are funded from your General Fund, the programs are at risk in each budget cycle.

Inspection Fees: Plan review and inspection fees allow the community to recover some or all of the direct cost associated with performing design reviews for pre- and post-construction BMPs.

Developer Fees: The developers construct needed facilities as a condition of development and bear associated costs.

Alternative Fees: Instead of constructing on-site facilities to meet development requirements, developers may be given the option of paying a comparable fee to be used by the local government to build regional facilities that are designed to meet the same objectives as the developer-constructed on-site mitigation.

Connection Fees: A one-time charge assessed at the time of development to recover a proportionate share of the cost of existing facilities and planned future facilities.

## X. Mechanisms for Ensuring Achievement of Phase II Plan Goal

There are three mechanisms that will be used to ensure that Phase II stakeholders reduce pollutant loads from urban and suburban sources by implementing activities identified in this plan: permitting agency oversight, built in milestones or measurable goals, and regulatory oversight by IDEQ and EPA.

NPDES storm water permit compliance depends on stakeholder responsibility, with oversight by EPA. EPA employs inspections, record reviews, and annual reports to monitor compliance with its environmental regulations although regulated entities have the primary responsibility for ensuring that they are in continuous compliance through self-audit and self-disclosure.

Regulated communities must conduct periodic evaluations and assessments of their storm water management practices, maintain records and prepare required reports. Regulated communities under Phase II must:

- Evaluate program compliance
- Evaluate the appropriateness of the identified BMPs
- Evaluate progress toward achieving measurable goals
- Keep records required for at least three (3) years
- Submit the records when requested by EPA

- Make the records and storm water management plan accessible to the public

Regulated communities must also submit annual reports to EPA that address:

- Status of permit condition compliance
- Appropriateness of identified BMPs
- Progress toward achieving measurable goals for each measure
- Results of data collected and analyzed during the reporting period
- A summary of the activities that will take place during the next reporting period
- Any changes in measurable goals

These activities will ensure that all NPDES-permitted entities are taking actions to improve storm water quality in their jurisdictions.

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## Appendix A. BMP Selection Matrix

| Best Management Practice | Targets sediment | Targets bacteria | Targets nutrients | Life cycle costs | Addresses hotspots | Site specific suitability | Public acceptance | Temperature Control | Multiple Applications | Existing Programs |
|---|---|---|---|---|---|---|---|---|---|---|
| **Public education and outreach** | | | | | | | | | | |
| Lawn and garden activities | | | X | | | | X | | X | |
| Proper disposal of household hazardous wastes | | | | X | | | X | | X | |
| Pet waste management | | X | X | | | | X | | X | |
| Trash management | X | | | | | | X | | X | X |
| Pollution prevention for business | | | | | X | | X | | | X |
| Educational programs for school age children | | | | | | | | | X | |
| Storm drain stenciling | | X | | | X | | | | X | |
| Informational materials | X | X | X | | X | | | | X | X |
| Using the media | X | X | X | | X | | | | X | X |
| **Public participation/involvement** | | | | | | | | | | |
| Community cleanups | | | | | X | X | X | | | |
| Adopt-A-Stream programs | | | | | | X | X | | | |
| Stakeholder meetings | | | | | | | X | | X | X |
| Community hotlines | | | | X | | | X | | | |
| Storm drain stenciling | | | | | X | | X | | X | |
| **Illicit discharge detection and elimination** | | | | | | | | | | |
| Identify illicit connections | | X | X | | X | | | | | |
| Repair leaking sewer lines | | X | X | | | | | | | X |

| **Best Management Practice** | **Targets sediment** | **Targets bacteria** | **Targets nutrients** | **Life cycle costs** | **Addresses hotspots** | **Site specific suitability** | **Public acceptance** | **Temperature Control** | **Multiple Applications** | **Existing Programs** |
|---|---|---|---|---|---|---|---|---|---|---|
| Hookup failing septic systems to sanitary sewer | | X | X | X | | | X | | | X |
| Prohibit illegal dumping | | X | X | | | | X | | X | X |
| Dry weather outfall screening | X | X | X | | X | | | | | |
| **Construction site storm water runoff control** | | | | | | | | | | |
| Structural BMPs | | | | | | | | | | |
| Sediment trapping and filtering BMPs | X | | | | | | | | | |
| Stabilized construction entrance and roads | X | | | | | | | | | |
| Permanent stabilization | X | | X | | | | | | | |
| Runoff controls | X | | | | | | | | | |
| Storm drain inlet protection | X | | | | | | | | | |
| Temporary cover | X | | | | | | | | | |
| Source controls | X | X | X | | | | | | | |
| Nonstructural BMPs | | | | | | | | | | |
| Site plan review procedures | X | | | | | | | | X | |
| Ordinance or other regulatory mechanism | X | | | | | | X | | X | |
| Contractor education | X | | | | | | | | X | |
| **Post-construction storm water management** | | | | | | | | | | |
| Structural BMPs | | | | | | | | | | |
| Storage practices | X | | | X | | X | | | | X |
| Infiltration practices | X | | | X | | X | | X | | X |
| Vegetative practices | X | X | X | X | | X | | X | | X |

| **Best Management Practice** | **Targets sediment** | **Targets bacteria** | **Targets nutrients** | **Life cycle costs** | **Addresses hotspots** | **Site specific suitability** | **Public acceptance** | **Temperature Control** | **Multiple applications** | **Existing Programs** |
|---|---|---|---|---|---|---|---|---|---|---|
| Nonstructural BMPs | | | | | | | | | | |
| Buffer zones | **X** | **X** | **X** | | | **X** | | | **X** | |
| BMP O&M | **X** | **X** | **X** | **X** | | | | | **X** | |
| Open space design | **X** | | | | | | | | **X** | **X** |
| Comprehensive planning/zoning | | | | | | | **X** | | **X** | |
| Integrative ordinances | | | | | | | **X** | | **X** | |
| Site-based local controls | **X** | | | | | | **X** | | **X** | |
| Low impact development techniques | **X** | **X** | **X** | | | | **X** | **X** | **X** | |
| **Pollution prevention/good housekeeping for municipal operations** | | | | | | | | | | |
| Parking lot cleaning | X | X | X | X | X | | | | X | X |
| Street sweeping | X | | | X | X | | | | X | X |
| Maintenance of gravel roads | X | | | X | | | | | X | X |
| Unpaved roads | X | | | X | | | | | X | X |
| Maintenance of roads and bridges | X | | | X | | | | | X | X |
| Storm drain system operation and maintenance | X | | X | X | X | | | | X | X |
| Vehicle maintenance practices | | | | | X | | | | | X |
| Employee training | X | | | | | | | | | X |
| Record keeping | | | | | | | | | | X |
| Materials management | | | | | | | | | X | X |
| Deicing practices | X | | X | | | | | | X | X |
| Community facility and grounds management (public buildings and facilities) | | | X | X | | | | | X | X |

| Best Management Practice | Targets sediment | Targets bacteria | Targets nutrients | Life cycle costs | Addresses hotspots | Site specific suitability | Public acceptance | Temperature Control | Multiple Applications | Existing Programs |
|---|---|---|---|---|---|---|---|---|---|---|
| Storm water system retrofitting | X | | | X | X | | | | | X |
| **Vegetation management** | | | | | | | | | | |
| Riparian area management | X | X | X | | | X | | X | | |
| Revegetation | X | X | X | | | X | | X | | |
| Streambank stabilization | X | | | | | X | | | | |
| Urban forestry | | | | | | X | X | X | X | X |

## Appendix B. Definitions

Best Management Practices (BMPs): Activities or structural improvements that help reduce the quantity and improve the quality of storm water runoff. BMPs include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

General Permit: A permit issued under the NPDES program to cover a certain class or category of storm water discharges. These permits reduce the administrative burden of permitting storm water discharges.

Illicit Connection: Any discharge to a municipal separate storm sewer that is not composed entirely of storm water and is not authorized by an NPDES permit, with some exceptions (e.g., discharges due to fire fighting activities).

Maximum Extent Practicable (MEP): A standard for water quality that applies to all MS4 operators regulated under the NPDES Storm Water Program. Since no precise definition of MEP exists, it allows for maximum flexibility on the part of MS4 operators as they develop and implement their programs.

Municipal Separate Storm Sewer System (MS4): A publicly-owned conveyance or system of conveyances that discharges to waters of the U.S. and is designed or used for collecting or conveying storm water, is not a combined sewer, and is not part of a publicly-owned treatment works (POTW).

Non-point Source (NPS) Pollutants: Pollutants from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water.

NPDES: “National Pollutant Discharge Elimination System” the name of the surface water quality program authorized by Congress as part of the 1987 Clean Water Act. This is EPA’s program to control the discharge of pollutants to waters of the United States (see 40 CFR 122.2).

Permitting Authority: The NPDES-authorized state agency or EPA regional office that administers the NPDES Storm Water Program. Pas issue permits, provide compliance assistance, and inspect and enforce the program. In Idaho, EPA Region X in out of Seattle administers the NPDES program.

Storm Water: Precipitation that accumulates in natural and/or constructed storage and storm water systems during and immediately following a storm event.

Total Maximum Daily Load (TMDL): The maximum amount of pollutants that can be released into a water body without adversely affecting the water quality.

Urbanized Area (UA): A Bureau of Census determination of a central place (or places) and the adjacent densely settled surrounding territory that together have a minimum residential population of 50,000 people and a minimum average density of 1,000 people/square mile.

## Appendix C. Identifying Applicable Regulatory Requirements

Two sets of regulatory requirements have been incorporated into this source plan: the federal storm water requirements and the Lower Boise River TMDL requirements. The following questions can assist you in determining how you are affected by these requirements.

1. Are you located within the Boise City Limits?

If yes, then you are subject to the Phase I federal storm water requirements.

2. Have you been designated by EPA as regulated under Phase II of the federal storm water requirements?

To date, entities within the following areas in the Treasure Valley have been designated by EPA:

- Portions of Ada County located with the Urbanized Area boundary
- Caldwell
- Portions of Canyon County located within the Urbanized Area boundary
- Eagle
- Meridian
- Nampa
- Middleton

According to 40 CFR 122.26(b)(8), "municipal separate storm sewer means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

i. Owned or operated by a State, city town, borough, county, parish, district, association, or other public body (created to or pursuant to State law)…including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under Section 208 of the Clean Water Act that discharges into waters of the United States.
ii. Designed or used for collecting or conveying storm water;
iii. Which is not a combined sewer; and
iv. Which is not part of a Publicly Owned Treatment Works (POTW).

3. Is storm water runoff from your system discharged into the Boise River either directing, or indirectly via a tributary to the Boise River, or another entity's system?

If yes, then you are subject to the pollutant load allocations specified in the Lower Boise River TMDL. The next step is to further evaluate your system to identify sources, pathways and control opportunities.

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## Appendix E. Resources

Storm Water Phase II Final Rule (64 FR 68722) published December 8, 1999.
http://www.epa.gov/owm/sw/phase2

Storm Water Phase II Final Rule Fact Sheet Series, January 2000
A series of 15 fact sheets breaking the final rule into separate parts
http://www.epa.gov/owm/sw/phase2

American Society of Civil Engineers. 1999. *National Stormwater Best Management Practices BMPs Database.*
http://www.asce.org/peta/tech/nsbd01.html

American Public Works Association. 2000. *Designing and Implementing an Effective Storm Water Management Program.*
http://www.apwa.net

Idaho Department of Environmental Quality. *Catalog of Stormwater BMPs for Idaho Cities and Counties.*
http://www2.state.id.us/deq/stormwater-catalog/index.asp

Region 10 Storm Water Phase II Web Site

http://yosemite.epa.gov/R10/WATER.NSF/95537302e2c56cea8825688200708c9a/d3f55362ebfaa5608825698f0059285b?OpenDocument

OTHER WEB SITES OF INTEREST

Center for Watershed Protection.
http://www.cwp.org/

Clean Water Network.
http://www.cwn.org

Local Government Environmental Assistance Network.
http://www.lgean.org/html/whatsnew.cfm?id=74

Stormwater Center
http://www.stormwatercenter.net

Internet Guide to Financing Storm Water Management:
http://stormwaterfinance.urbancenter.iupui.edu/home.htm

Preliminary Data Summary of Urban Stormwater Best Management Practices
http://www.epa.gov/OST/stormwater/

EPA's new "Local Links" page
www.epa.gov/npdes (click on "Links")

National Resource Defense Council:
Storm Water Strategies Report
http://www.nrdc.org/water/pollution/storm/stoinx.asp

Steps to Clean Up Pollution
http://www.nrdc.org/water/pollution/gsteps.asp

StormWater News: A good source of technical information on storm water.
Large library of technical information
http://www.stormwater-resources.com

Texas Nonpoint Source Book
http://www.txnpsbook.org

California Model Urban Runoff Program: A how-to guide for developing urban runoff programs for small municipalities
http://www.swrcb.ca.gov/stormwtr/index.html

Wayne County, Rouge River (Michigan) National Wet Weather Demonstration Project: downloadable report on illicit connections, example Ordinance, and other technical topics
http://www.wcdoe.org/rougeriver/stormwater/index.html

Erosion Control Magazine
http://www.erosioncontrol.com

Stormwater Magazine
http://www.StormH2o.com

Grading and Excavation Contractor Magazine
http://www.gradingandexcavating.com

Wisconsin's statewide stormwater ordinances
http://www.dnr.state.wi.us/org/water/wm/nps/admrules.html

San Mateo Countywide Stormwater Pollution Prevention Program
http://stoppp.tripod.com/

Marin County CA Storm Water Pollution Prevention Program
http://mcstoppp.org/

Longview, WA's Storm Water Utility
http://www.ci.longview.wa.us/utilities/Storm_Water.pdf

Pierce County WA Storm Water Pollution Prevention Manual:
http://www.co.pierce.wa.us/services/home/environ/water/swm/sppman/index.htm

City of Seattle, Public Utilities Surface Water Management Program
http://www.ci.seattle.wa.us/util/surfacewater/

Appendix C

# Implementation Plan for Agriculture

# Lower Boise River TMDL Implementation Plan for Agriculture

**Idaho Soil Conservation Commission**
**&**
**Idaho Association of Soil Conservation Districts**

November, 2003



# Lower Boise River TMDL

# Implementation Plan for Agriculture

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## *Executive Summary*

**Watershed:** Lower Boise River Watershed (HUC #17050114) 839,835 acres

**Implementation Plan Total Scope:** 508,798 total acres drain to the Boise River and potentially impact river water quality (*does not include Upper Fivemile, Upper Tenmile, Upper Indian, Sand Hollow or Lake Lowell subwatersheds)

**Agricultural Plan Scope:** 163,270 of the 508,798 acres are in agricultural production and are addressed by this Implementation Plan for Agriculture

**Location:** Boise River between Lucky Peak Dam and Snake River, covering parts of Ada, Boise, Canyon, and Gem counties

**Priority Watershed:** High

**Cooperating Agricultural Agencies:** Ada Soil & Water Conservation District (Ada SWCD)
Canyon Soil Conservation District (Canyon SCD)
USDA-Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)
Idaho Association of Soil Conservation Districts (IASCD)
Idaho State Department of Agriculture (ISDA)
University of Idaho Extension Service (U of I)

**Agricultural Land Use**

| Agricultural Land Use | Acres | Percent of Implementation Plan Area (508,798 acres) |
|---|---|---|
| Surface Irrigated Cropland and Orchards | 115,798 | 22.8 |
| Surface Irrigated Pasture | 20,212 | 4. 0 |
| Non-Irrigated Pasture | 2,495 | 0.5 |
| Sprinkler Irrigated Cropland and Pasture | 23,084 | 4.5 |
| Feedlots & Dairies | 1,681 | 0.3 |

**Major Agricultural Products:** Alfalfa and hay seed, dry beans, sugar beets, winter and spring wheat, barley, seed corn, sweet corn, field (silage) corn, barley, potatoes, commercial onions, onion seed, hops, wine grapes, beef, and dairy products

**Agricultural Implementation Plan:** Land treatment through application of a combination of improved irrigation systems, and management practices. Proposed Best Management Practices (BMPs) include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) applications, irrigation water management, pest management, nutrient management, conservation tillage, livestock grazing management, and drain vegetation management.

## *Introduction*

The Idaho Soil Conservation Commission (SCC) and the Idaho Association of Soil Conservation Districts have prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The TMDL established instream targets for total suspended solids (TSS) and bacteria, and set goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve these instream targets. The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species, and the purpose of the bacteria target is to protect human health.

The TSS target concentrations are 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL set a sediment reduction goal of 37% at twelve tributaries to the river. The bacteria targets require a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). The TMDL set targets to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, while also setting bacteria reduction goals for the tributaries ranging from 92% to 98%.

The TMDL did not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 "SR-HC TMDL") will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL called for no net increase (NNI) of current total phosphorus (TP) loads to the Lower Boise River.

This implementation plan addresses nonpoint, agriculture sources of sediment, phosphorus, and bacteria within the Lower Boise River watershed. Detailed summaries and implementation plans for each tributary subwatershed within the Lower Boise River watershed are located in the appendices. Within this plan the following elements pertaining to agriculture are identified: pollutant sources, critical acres contributing pollutants to the Boise River, priority areas for treatment, and Best Management Practices (BMPs) that, when applied on agricultural land, will have the greatest effect on water quality.

In terms of TSS and TP, surface irrigated croplands are the most critical and highest priority agricultural lands requiring treatment. For bacteria (E. coli), irrigated pasture, dairy operations, feedlots, and riparian areas are the most critical and highest priority agricultural lands requiring treatment. For all pollutants, Irrigation Water Management (IWM) is an essential BMP --- reducing or eliminating wastewater runoff from agricultural lands greatly decreases the potential for pollutant delivery to receiving water bodies.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2. It is recommended that agricultural landowners within the Lower Boise River watershed contact the Ada Soil & Water Conservation District (Ada SWCD), the Canyon Soil Conservation District (Canyon SCD), the Natural Resources Conservation Service (NRCS), or the Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific farm fields, but rather provides a watershed approach for addressing water quality problems attributed to runoff from agricultural lands.

Several efforts to gather additional nutrient, sediment, bacteria, temperature and other relevant data are either underway, have been planned, or are the subject of ongoing discussions between the Environmental Protection Agency (EPA), Idaho Department of Environmental Quality (DEQ), the Watershed Advisory Group (WAG), and various stakeholders. The information developed through these efforts can be used to revise the targets and load allocations established by the TMDL, as well as adjust appropriate implementation plans and control measures where necessary.

## ***Goal***

The goal of the Clean Water Act and Idaho's water quality laws is that water quality standards shall be met or that all feasible steps will be taken towards achieving the highest quality water attainable. The purpose of this Implementation Plan is to assist agricultural landowners in identifying and implementing BMPS that, in conjunction with the efforts of other stakeholders in the Lower Boise River watershed, will accomplish the following objectives.

## ***Objectives***

- Restore the chemical, physical, and biological integrity of the Lower Boise River
- Achieve the total suspended sediment target in the Lower Boise River of 50 mg/l for no more than 60 days, and 80 mg/l for no more than 14 days
- Achieve the bacteria target in the Lower Boise River for fecal coliform colonies (not to exceed 800/100 ml at any time for secondary contact recreation, and not to exceed 500/100 ml at any time for primary contact recreation)
- Maintain current NNI target for total phosphorus loading to the Lower Boise River until a phosphorus target is established at the mouth of the Boise River through the Lower Snake-Hells Canyon TMDL process
- Reduce soil losses on treated cropland to the soil loss tolerance level "T" for the crop rotation
- Improve salmonid spawning habitat within the applicable reaches of the Lower Boise River
- Preserve and enhance agricultural lands within the Lower Boise River watershed
- Educate agricultural landowners and operators in the Lower Boise River watershed regarding the TMDL process and water quality

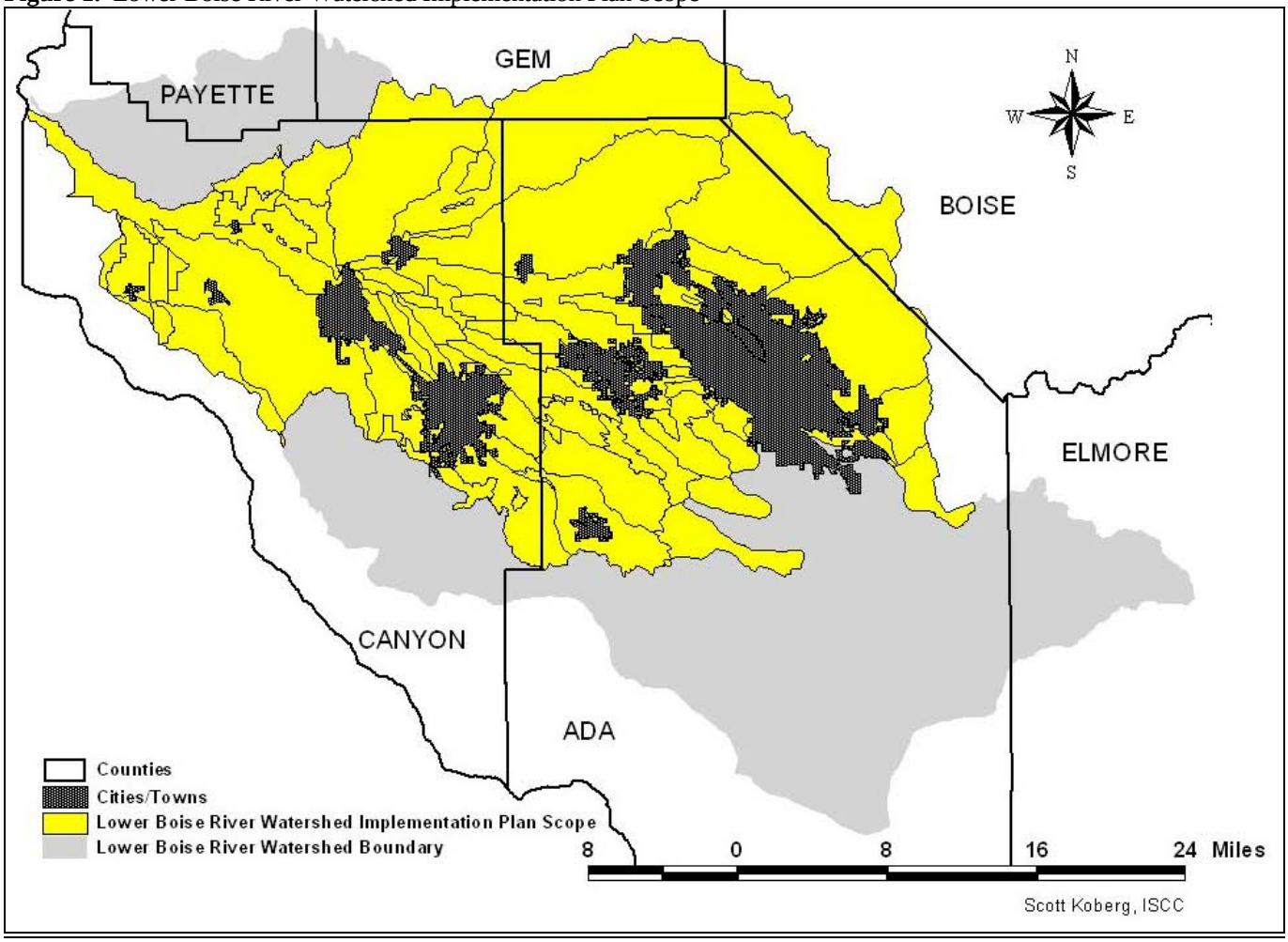
## ***Subbasin Assessment***

The Lower Boise River Subbasin Assessment can be reviewed in its entirety as it was approved by the Environmental Protection Agency (EPA) along with the "Technical Appendices" as the official *Lower Boise River TMDL Subbasin Assessment* (IDEQ, 1999). The following provides a summary of the assessment as well as additional information pertaining to the agricultural community within the Lower Boise River watershed.

### General Description (HUC 17050114*)*

This section provides a detailed summary of soils, climate, surface hydrography, ground water hydrology, land ownership and land use, and demographics and economics in the Lower Boise River watershed.

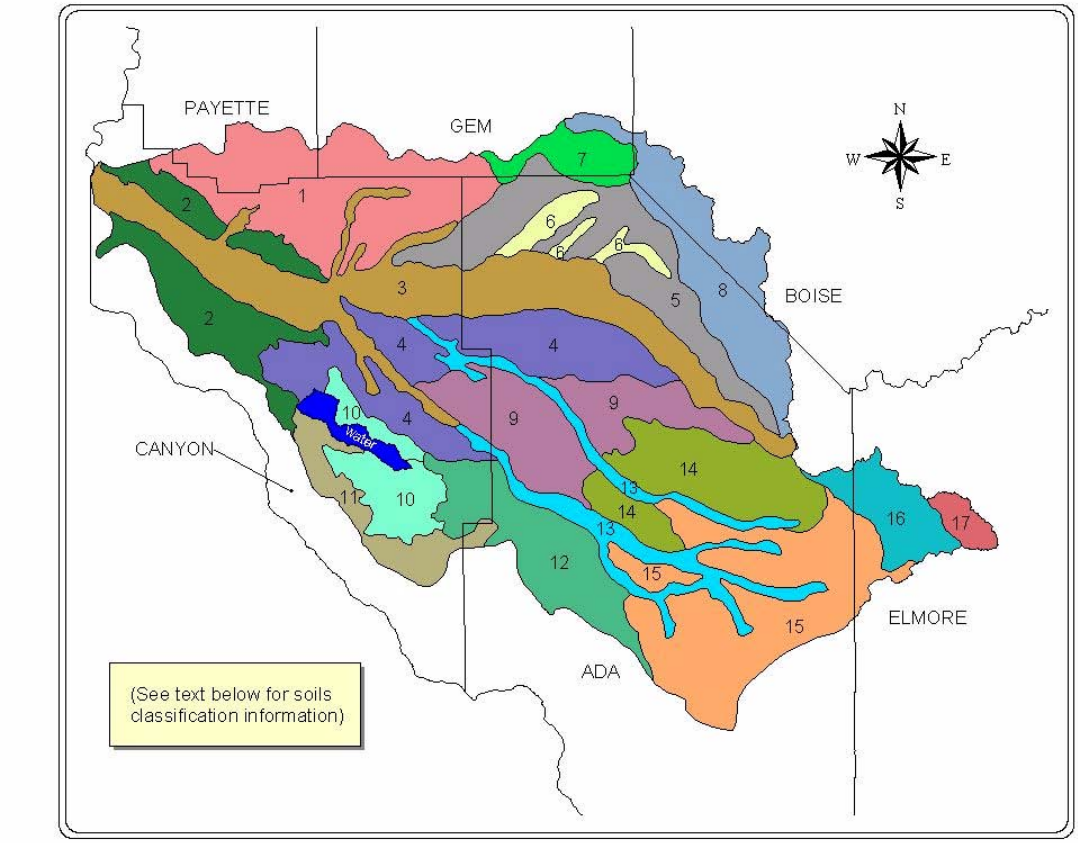
**Figure 1.** Lower Boise River Watershed Implementation Plan Scope



## Soils

Figure 2 provides a generalized overview of the soils in the Lower Boise River watershed. The soil names used are the most predominant series within each delineated boundary, although many other soil series may also exist. Since this soils map does not display specific soils for specific sites within the watershed, it is not suitable for planning or management on specific farms or fields. In order to determine soils information regarding specific fields or properties within the watershed, refer to the soil surveys published by USDA-NRCS for Ada, Canyon, Elmore, Gem, Payette, and Boise counties.

**Figure 2.** General Soil Associations




(Noe, 2000, Collett, 1980, and Priest &others, 1972)

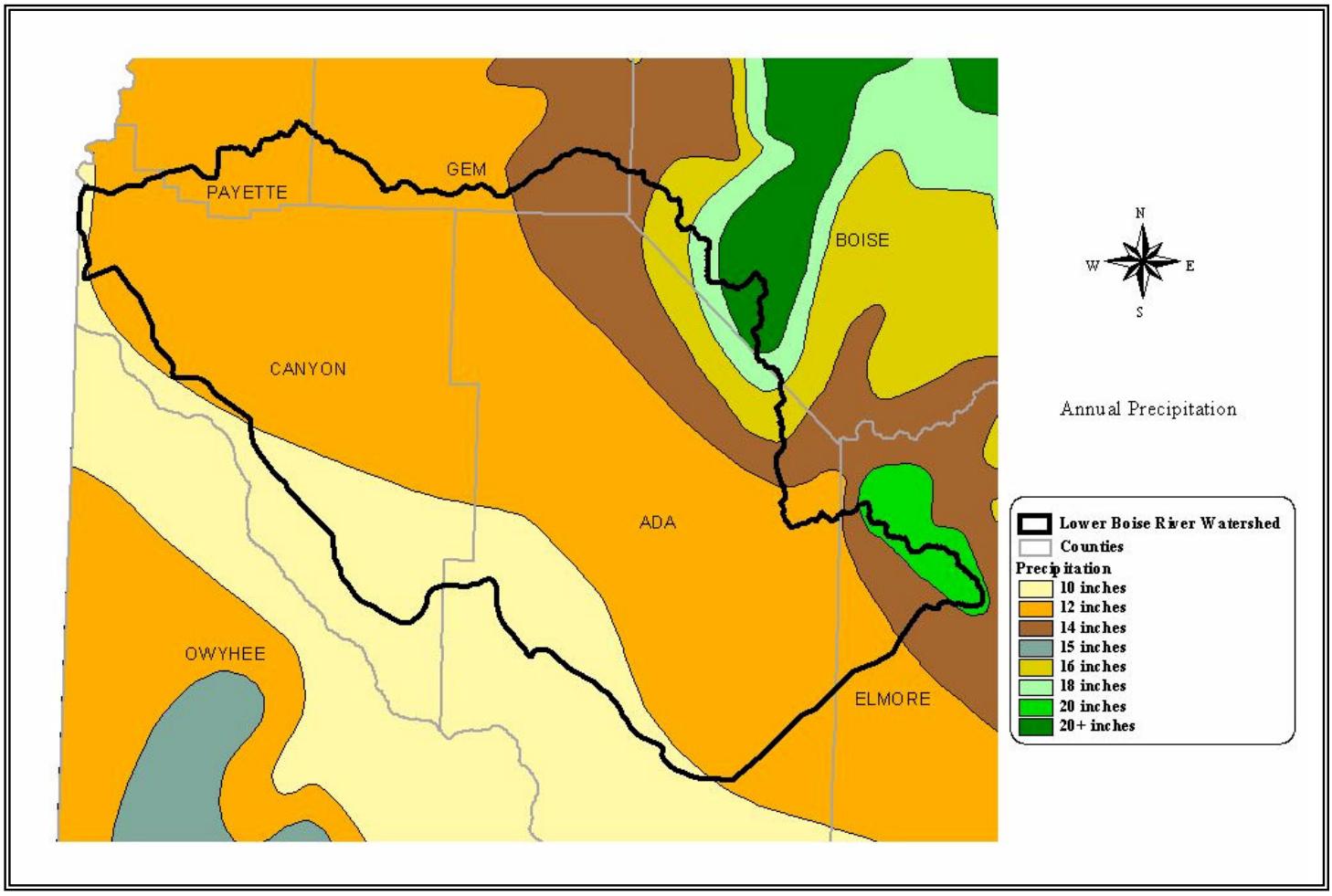
The following are the 17 predominant soil associations within the Lower Boise River watershed:

1. *Elijah-Lankbush-Chilcott-Lanktree:* Well drained soils on higher nearly level to rolling dissected alluvial fan terraces
2. *Greenleaf-Nyssaton-Owyhee:* Well drained silt loam soils on lacustrine terraces
3. *Moulton-Bram-Baldock-Falk:* Moderately well and poorly drained soils on floodplains and low river terraces
4. *Power-Purdam:* Well drained silt loams on nearly level to moderately sloping alluvial fan terraces
5. *Lankbush-Brent-Tindahay:* Well and somewhat excessively drained soils on sloping to steep foothills
6. *Cashmere-Tindahay:* Somewhat excessively drained soils in drainageways and on low alluvial fans
7. *Haw-Payette-Van Dusen:* Well to somewhat excessively drained soils on dissected sandy alluvial fans
8. *Searles-Ladd-Ola:* Well drained soils on moderately sloping to steep granitic mountains
9. *Colthorp-Elijah-Purdam:* Well drained soils with duripans on intermediate alluvial fan terraces
10. *Minidoka-Marshing-Vickery:* Well drained silt loams with duripans on higher alluvial fan terraces
11. *Scism-Bahem-Turbyfill-Trevino:* Well drained soils on higher alluvial terraces and basalt plains
12. *Power-Purdam-Potratz:* Well drained silt loam soils formed in alluvium on basalt plains
13. *Power-Aeric Haplaquepts:* Poorly drained soils in drainageways and well drained soils on adjacent fan terraces
14. *Tenmile-Chilcott-Kunaton:* Well drained soils on basalt plains and dissected alluvial fan terraces
15. *Chilcott-Kunaton-Chardoton:* Well drained soils with strong duripans on basalt plains and dissected fan terraces
16. *Lankbush-Chilcott-Lanktree:* Well drained soils on nearly level to strongly sloping dissected alluvial fan terraces
17. *Elkcreek-Gaib-Immiant:* Well drained soils on sloping basalt foothills

## Climate

The annual precipitation in the Lower Boise River watershed varies from 10-12 inches per year throughout most of the watershed to 24-30 inches per year near the upper reaches of the watershed in the Boise National Forest. Summers are warm and dry with an average temperature of 71.0 °F. Prevailing winds blow from the northwest during warmer months and from the southeast the rest of the year. Generally, rainfall is not adequate for crop production from early June through late September. Frost-free season ranges from 140 to 165 days and subzero temperatures occur about 3 days a year, normally in January. The average winter temperature is 33.0 °F. During most winters, frost is likely to penetrate only a few inches (USDA-NASS, 2000, Collett, 1980, and Priest & others, 1972).

**Figure 3.** Precipitation



## Surface Hydrology

In a watershed that consists primarily of surface irrigated cropland, pasture, and urban land, artificial features complicate the watershed boundary determination. Modifications in the surface hydrology occur regularly due to irrigation system modifications and urban development. In fact, the actual headwaters of the Lower Boise River begin at the base of Lucky Peak Dam and river flows are adjusted based on the capacity of Lucky Peak Reservoir just above the dam. In addition, there are 13 irrigation districts and several canal companies within the watershed that divert water from the Boise River into irrigation canals for agricultural use. Laterals, canals, and drains commonly exist in the watershed and often interrupt natural flow (Ferguson, 1999). In many cases, pre-existing ephemeral and intermittent channels have been modified for water delivery or drainage for croplands and pastures. Some agricultural wells also supply surface water for use within the watershed, and in most cases any excess water is then delivered to a surface drainage system that returns to the Boise River.

**Figure 4.** Irrigation Districts within the Lower Boise River Watershed

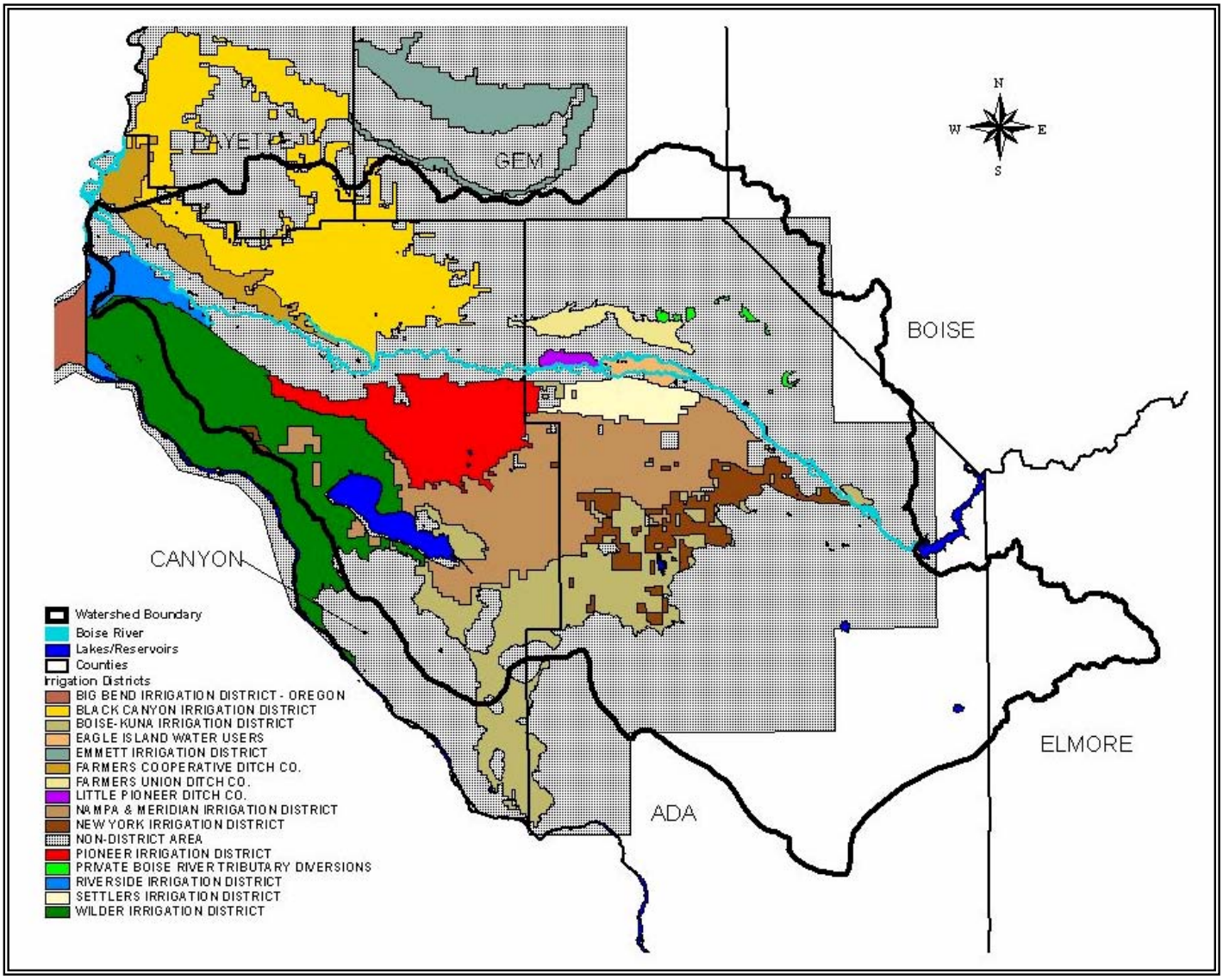
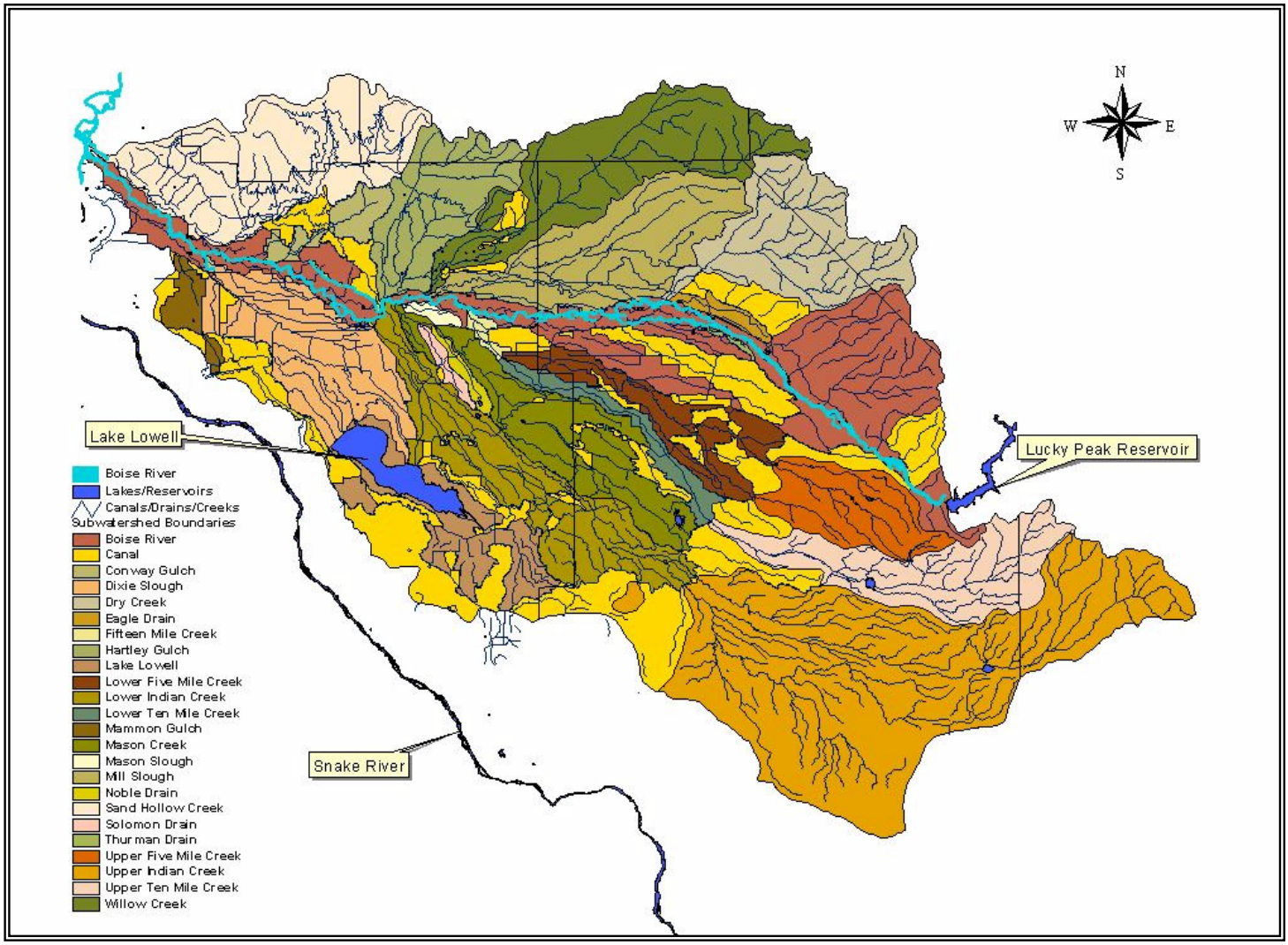


**Figure 5.** Surface Hydrology of Lower Boise River Watershed



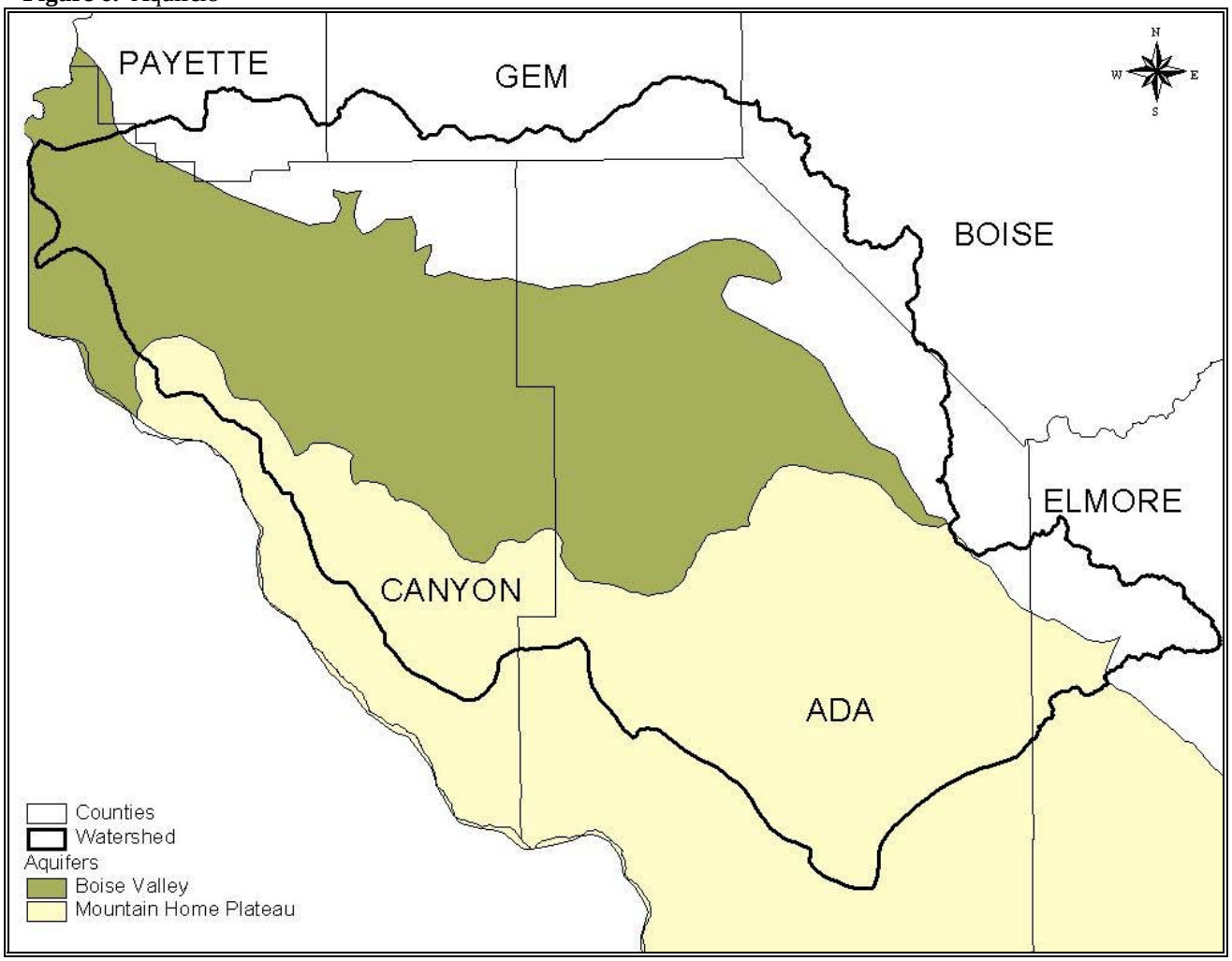

In Figure 5, the complicated hydrology of the watershed is evident in the yellow "islands" of land that represent canals. These isolated subwatersheds are a direct result of the significant modifications that have occurred within the Lower Boise River watershed to accommodate irrigated agriculture and suburban development. The land contained within the "islands" is generally irrigated from one canal, and then drains into a separate canal that delivers the water to another location. This type of water re-use is very common within the watershed.

## Ground Water Hydrology

Prior to irrigation development during the 1900's, the large shallow aquifer under the Boise Valley did not exist. This aquifer (< 200 feet) is recharged annually by surface irrigation and earthen canals that recharge the artificial and natural drains throughout the year. Without the irrigation delivery system, most shallow wells in the Boise Valley would not exist.

Deep wells also provide some irrigation water to the watershed. Most ground water in the Boise River Watershed is used for domestic supply and is of concern for excessive nitrates and pesticides. Most wells range in depth from 200 to 600 feet. In addition to the shallow aquifer under the Boise Valley, a deeper aquifer also exists under the southern portion of the Lower Boise River Watershed that extends east into the valley towards Mountain Home (Figure 6).

**Figure 6.** Aquifers



## Land Ownership and Land Use

Ada and Canyon Counties display completely different patterns of land ownership. Ada County consists of 45.1% federally managed land (much of which exists in the rangeland and sagebrush areas south of the Lower Boise River watershed boundary), and 46.9% private land. In contrast, Canyon County consists of only 7.9% federally managed land and 90.9% private land. Ada County, however, consists of approximately 300,000 more total acres than Canyon County. Land ownership for the entire Lower Boise River Watershed is displayed in Figure 7.

**Figure 7.** Land Ownership

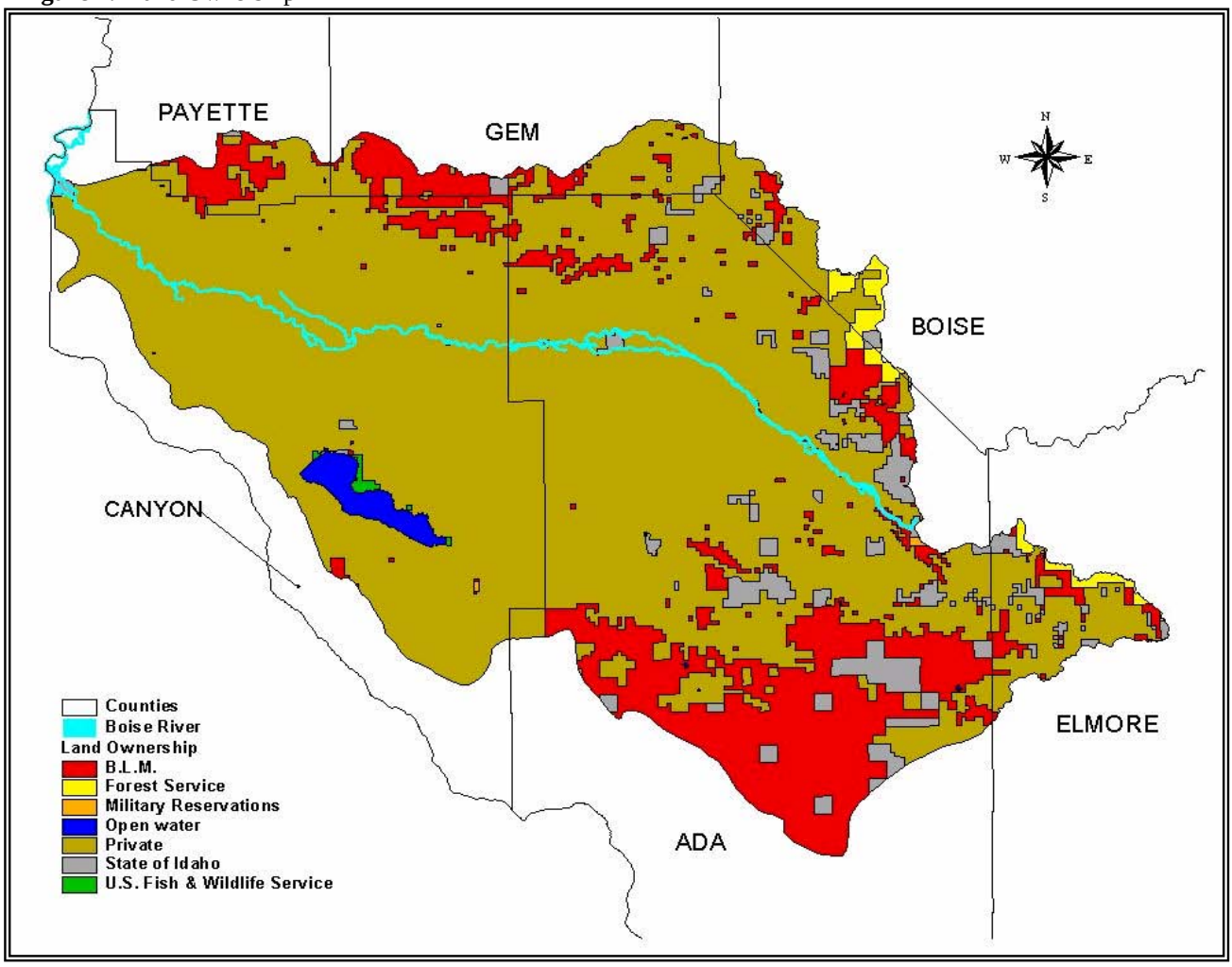



**Table 1.** 1997 Land Use

| County | Land Use | Acres | % of County |
|---|---|---|---|
| **Ada** | Urban Land | 30,100 | 4.5% |
| | Agriculture | 172,500 | 25.6% |
| | Rangeland | 464,800 | 69.0% |
| | Water | 3,900 | 0.6% |
| | Other | 2,000 | 0.3% |
| **Canyon** | Urban Land | 11,200 | 3.0% |
| | Agriculture | 322,800 | 84.3% |
| | Rangeland | 29,400 | 7.7% |
| | Water | 7,800 | 2.0% |
| | Other | 11,500 | 3.0% |

(USDA-NASS, 2000)

## Demographics and Economics

The landscape of the Lower Boise River watershed is changing every year as prime agricultural lands are rapidly being subdivided for housing and converted to urban and suburban areas. The data included in this section regarding watershed demographics and economics refers to statistics for both Ada and Canyon counties. Although portions of both counties extend beyond the watershed boundary, the majority of the data refers to the Lower Boise River watershed.

**Density Class Definitions:**

| Density Class | Net Density |
|---|---|
| Agriculture | 1 DU/10+ Acres |
| Rural Residential | 1 DU/1-10 Acres |
| Low Suburban | 2-4 DU/Acre |
| High Suburban | 5-7 DU/Acre |
| Urban | 8+ DU/Acre |

# **Table 2.** Development Patterns

**Number of Housing Units by Density Class for 1994 and 2000:**

| Jurisdiction | Agriculture | | | | Rural Residential | | | | Low Suburban | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1994 | 2000 | 94-'00 Change | | 1994 | 2000 | 94-'00 Change | | 1994 | 2000 | 94-'00 Change | |
| | | | Units | Percent | | | Units | Percent | | | Units | Percent |
| Boise | 134 | 193 | 59 | 44.0% | 4,028 | 4,516 | 488 | 12.1% | 15,453 | 17,556 | 2,103 | 13.6% |
| Eagle | 102 | 132 | 30 | 29.4% | 1,190 | 1,703 | 513 | 43.1% | 900 | 1,549 | 649 | 72.1% |
| Garden City | 5 | 6 | 1 | 20.0% | 217 | 263 | 46 | 21.2% | 829 | 969 | 140 | 16.9% |
| Kuna | 27 | 40 | 13 | 48.1% | 141 | 273 | 132 | 93.6% | 241 | 434 | 193 | 80.1% |
| Meridian | 223 | 277 | 54 | 24.2% | 1,815 | 2,042 | 227 | 12.5% | 1,440 | 2,957 | 1,517 | 105.3% |
| Unincorporated | 568 | 842 | 274 | 48.2% | 1,610 | 2,373 | 763 | 47.4% | 124 | 287 | 163 | 131.5% |
| **Ada County Subtotal** | **1,059** | **1,490** | **431** | **40.7%** | **9,001** | **11,170** | **2,169** | **24.1%** | **18,987** | **23,752** | **4,765** | **25.1%** |
| Caldwell | 57 | 86 | 29 | 50.9% | 583 | 779 | 196 | 33.6% | 1,680 | 1,862 | 182 | 10.8% |
| Greenleaf | 4 | 5 | 1 | 25.0% | 39 | 69 | 30 | 76.9% | 172 | 187 | 15 | 8.7% |
| Melba | 25 | 32 | 7 | 28.0% | 43 | 48 | 5 | 11.6% | 51 | 55 | 4 | 7.8% |
| Middleton | 12 | 25 | 13 | 108.3% | 95 | 136 | 41 | 43.2% | 126 | 175 | 49 | 38.9% |
| Nampa | 104 | 139 | 35 | 33.7% | 1,684 | 1,943 | 259 | 15.4% | 2,039 | 2,781 | 742 | 36.4% |
| Notus | 2 | 6 | 4 | 200.0% | 24 | 31 | 7 | 29.2% | 57 | 60 | 3 | 5.3% |
| Parma | 17 | 25 | 8 | 47.1% | 46 | 62 | 16 | 34.8% | 83 | 84 | 1 | 1.2% |
| Wilder | 7 | 10 | 3 | 42.9% | 16 | 19 | 3 | 18.8% | 47 | 49 | 2 | 4.3% |
| Unincorporated | 1,535 | 2,105 | 570 | 37.1% | 3,702 | 5,004 | 1,302 | 35.2% | 1,471 | 1,747 | 276 | 18.8% |
| **Canyon County Subtotal** | **1,763** | **2,433** | **670** | **38.0%** | **6,232** | **8,091** | **1,859** | **29.8%** | **5,726** | **7,000** | **1,274** | **22.2%** |
| **Treasure Valley Total** | **2,822** | **3,923** | **1,101** | **39.0%** | **15,233** | **19,261** | **4,028** | **26.4%** | **24,713** | **30,752** | **6,039** | **24.4%** |

| Jurisdiction | High Suburban | | | | Urban | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1994 | 2000 | 94-'00 Change | | 1994 | 2000 | 94-'00 Change | | 1994 | 2000 | 94-'00 Change | |
| | | | Units | Percent | | | Units | Percent | | | Units | Percent |
| Boise | 32,773 | 37,723 | 4,950 | 15.1% | 21,178 | 23,217 | 2,039 | 9.6% | 73,566 | 83,205 | 9,639 | 13.1% |
| Eagle | 827 | 1,397 | 570 | 68.9% | 231 | 307 | 76 | 32.9% | 3,250 | 5,088 | 1,838 | 56.6% |
| Garden City | 13 | 1,342 | 135 | 11.2% | 1,155 | 1,453 | 298 | 25.8% | 3,413 | 4,033 | 620 | 18.2% |
| Kuna | 300 | 1,455 | 1,155 | 385.0% | 139 | 244 | 105 | 75.5% | 848 | 2,446 | 1,598 | 188.4% |
| Meridian | 4,008 | 7,772 | 3,764 | 93.9% | 1,385 | 1,514 | 129 | 9.3% | 8,871 | 14,562 | 5,691 | 64.2% |
| Unincorporated | 77 | 427 | 350 | 454.5% | 62 | 64 | 2 | 3.2% | 2,441 | 3,993 | 1,552 | 63.6% |
| **Ada County Subtotal** | **39,192** | **50,116** | **10,924** | **27.9%** | **24,150** | **26,799** | **2,649** | **11.0%** | **92,389** | **113,327** | **20,938** | **22.7%** |
| Caldwell | 3,334 | 3,993 | 659 | 19.8% | 2,674 | 3,091 | 417 | 15.6% | 8,328 | 9,811 | 1,483 | 17.8% |
| Greenleaf | 18 | 18 | 0 | 0.0% | 114 | 115 | 1 | 0.9% | 347 | 394 | 47 | 13.5% |
| Melba | 94 | 110 | 16 | 17.0% | 23 | 23 | 0 | 0.0% | 236 | 268 | 32 | 13.6% |
| Middleton | 421 | 656 | 235 | 55.8% | 152 | 170 | 18 | 11.8% | 806 | 1,162 | 356 | 44.2% |
| Nampa | 8,533 | 12,235 | 3,702 | 43.4% | 4,876 | 5,436 | 560 | 11.5% | 17,236 | 22,534 | 5,298 | 30.7% |
| Notus | 48 | 49 | 1 | 2.1% | 21 | 21 | 0 | 0.0% | 152 | 167 | 15 | 9.9% |
| Parma | 389 | 389 | 0 | 0.0% | 241 | 243 | 2 | 0.8% | 776 | 803 | 27 | 3.5% |
| Wilder | 200 | 200 | 0 | 0.0% | 34 | 34 | 0 | 0.0% | 304 | 312 | 8 | 2.6% |
| Unincorporated | 128 | 138 | 10 | 7.8% | 567 | 802 | 235 | 41.4% | 7,403 | 9,796 | 2,393 | 32.3% |
| **Canyon County Subtotal** | **13,165** | **17,788** | **4,623** | **35.1%** | **8,702** | **9,935** | **1,233** | **14.2%** | **35,588** | **45,247** | **9,659** | **27.1%** |
| **Treasure Valley Total** | **52,357** | **67,904** | **15,547** | **29.7%** | **32,852** | **36,734** | **3,882** | **11.8%** | **127,977** | **158,574** | **30,597** | **23.9%** |

(Ada and Canyon County Assessors, 2000)

**Table 3.** 1997 Agricultural Data for Ada and Canyon Counties

| Inventory: Farms & Cropland | Ada County | Canyon County |
|---|---|---|
| Total # of Farms | 1,221 | 1,898 |
| Total Acres of Farms | 231,188 | 354,919 |
| Average Farm Size (acres) | 189 | 187 |
| Total Acres in Crops | 89,540 | 235,077 |
| # of Irrigated Acres | 78,112 | 221,051 |
| **Farms by Size (Acres)** | | |
| Under 10 | 368 | 391 |
| 10 to 49 | 495 | 679 |
| 50 to 179 | 214 | 420 |
| 180 to 499 | 74 | 265 |
| 500 to 999 | 35 | 98 |
| 1,000 and over | 35 | 45 |

(Idaho Department of Commerce, 1998)

**Table 4.** 1999 & *2000 Estimated Income from Agricultural Commodities in Ada County

| Product | Production | Unit | Estimated Sales |
|---|---|---|---|
| Alfalfa Hay | 123,100 | tons | $ 10,094,200 |
| *Alfalfa Seed | 2,184,630 | lbs | $ 24,030,983 |
| Barley | 286,000 | bu. | $ 715,000 |
| Corn (grain) | 405,000 | bu. | $ 911,250 |
| Corn (silage) | 182,000 | tons | $ 1,081,080 |
| Dry Beans | 49,200 | cwt | $ 805,404 |
| *Onions | 249,300 | cwt | $ 1,296,360 |
| *Peppermint | 132,025 | lbs | $ 1,707,083 |
| Potatoes | 213,000 | cwt | $ 1,043,700 |
| *Spearmint | 31,360 | lbs | $ 408,196 |
| Sugar Beets | 123,000 | tons | $ 4,059,000 |
| *Sweet Corn (produce) | 545 | tons | $ 41,693 |
| *Sweet Corn (seed) | 755,980 | lbs | $ 453,588 |
| Wheat | 1,159,000 | bu. | $ 3,303,150 |
| Cattle | | | $ 25,852,000 |
| Dairy/Dairy Products | | | $ 13,000,000 |
| **Total Sales** | | | **$ 88,802,687** |

(USDA-NASS, 2000 & FSA, 2001)

**Table 5.** 1999 Estimated Income from Agricultural Commodities in Canyon County

| Product | Production | Unit | Estimated Sales |
|---|---|---|---|
| Alfalfa Hay | 265,800 | tons | $ 21,795,600 |
| Alfalfa Seed | 15,540,000 | lbs | $ 21,758,000 |
| Barley | 783,000 | bu. | $ 1,957,500 |
| Corn (grain) | 2,400,000 | bu. | $ 5,400,000 |
| Corn (silage) | 332,000 | tons | $ 1,972,080 |
| Dry Beans | 307,100 | cwt | $ 5,027,227 |
| Onions | 2,800,000 | cwt | $ 5,600,000 |
| Peppermint | 1,494,000 | lbs | $ 15,537,000 |
| Potatoes | 3,549,000 | cwt | $ 17,390,100 |
| Spearmint | 171,000 | lbs | $ 1,710,000 |
| Sugar Beets | 423,000 | tons | $ 13,959,000 |
| Sweet Corn (produce) | 13,875 | tons | $ 1,140,525 |
| Sweet Corn (seed) | 16,200,000 | lbs | $ 7,290,000 |
| Wheat | 4,150,000 | bu. | $ 11,827,500 |
| Cattle | | | $ 51,000,000 |
| Dairy/Dairy Products | | | $ 53,000,000 |
| **Total Sales** | | | **$ 236,364,532** |

(USDA-NASS, 2000 & U of I Extension Service, 2000)

## *Water Quality Status & TMDL Objectives*

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. The designated uses for the Lower Boise River are identified in Table 6.

**Table 6.** Lower Boise River Beneficial Uses

| Segment | Designated Uses |
|---|---|
| **Boise River, Lucky Peak Dam to River Mile 50 (Veteran's Parkway)** | Domestic Water Supply<br>Agricultural Water Supply<br>Cold Water Biota<br>Salmonid Spawning<br>Primary Contact Recreation<br>Secondary Contact Recreation |
| **Boise River, River Mile 50 (Veteran's Parkway) to Caldwell** | Agricultural Water Supply<br>Cold Water Biota<br>Salmonid Spawning<br>Primary Contact Recreation |
| **Boise River, Caldwell to Mouth** | Agricultural Water Supply<br>Cold Water Biota<br>Primary Contact Recreation<br>Secondary Contact Recreation |

(IDEQ 1999)

- Secondary contact recreation is an existing use in the Boise River in the segment from just upstream of Glenwood Bridge (river mile 50) to Caldwell (river mile 20).*
- Data collected by USGS in December 1996 and August 1997 suggest that salmonid spawning is an existing use for the Boise River from Caldwell to the mouth.*
- The presence of warm and cool water species such as large mouth bass, small mouth bass, and catfish in the Boise River from Caldwell to the mouth indicate that warm water biota is also an existing use within this reach.*
- The Boise River from Lucky Peak to just above Glenwood Bridge (river mile 50) is also designated as a Special Resource Water. Designation as a Special Resource Water affords this segment additional protection from pollutants discharged by point sources.*

(*all bulleted items taken directly from section 2.2 of the *Lower Boise River TMDL Subbasin Assessment*)

**Table 7.** Summary of 1996 Section 303(d) listed stream segments of the Lower Boise River.

| Name | Boundaries | Pollutants 1996 303(d) list | Recommended for Delisting in 1998 |
|---|---|---|---|
| **Boise River** | Lucky Peak Dam to Barber Diversion | Flow Alteration | |
| **Boise River** | Barber Diversion to Star | Sediment, DO, Oil & Grease | DO, Oil & Grease |
| **Boise River** | Star to Notus | Nutrients, Sediment, DO, Temperature, Bacteria | DO |
| **Boise River** | Notus to Snake River | Nutrients, Sediment, DO, Temperature, Bacteria | DO |

The effects of pollutants on surface waters are extremely complex and difficult to quantify. Pollutants such as sediment, phosphorus, and bacteria are typically delivered to a water body, where they immediately become a part of the complex physical, biological, and chemical cycle. Excessive amounts of a pollutant may reduce the quality of the water and eventually threaten the beneficial uses of that water.

### Causes and Sources of Pollution

Agricultural related pollution is being caused by soil erosion and irrigation return flows that transport sediment, bacteria, and nutrients from agricultural lands to the Boise River. Many of the pollutants contributing to the water quality problems in the Lower Boise River originate from agricultural sources. The predominant agricultural contributors of pollutants to the Lower Boise River are surface irrigated cropland, surface irrigated pasture, riparian pasture, and confined animal feeding operations.

## ***Sediment***

- The principal source of sediment from agricultural land uses is erosion of soils from surface irrigation.
- Storm events great enough to cause erosion and runoff are sources of sediment from all land uses where exposed soils are present.
- Riparian grazing exists along many drains and canals. Livestock that have complete access to the water throughout pastures increase soil compaction along the banks and limit vegetative growth for bank stability. This can increase erosion along drain and canal banks.

The following is a slightly modified excerpt from section 2.2 of the *Lower Boise River TMDL Subbasin Assessment*. The content remains the same, although certain sentences have been modified for clarity and verb tense:

> From 1994 through 1997, when USGS sampled the four main river stations, suspended sediment concentrations in the lower Boise River occasionally exceeded 50 mg/l at Glenwood Bridge (4 out of 29 measurements) and Middleton (1 out of 22 measurements), and more frequently at Parma (10 out of 26 measurements). The highest concentrations were generally observed during spring runoff, although 245 mg/l of suspended sediment was measured at Parma on July 19, 1995 and concentrations exceeding 50 mg/l have been observed in every month from February to August. Mason Creek, Conway Gulch, and Fifteenmile Creek have the highest sediment concentrations during the high flow and irrigation flow periods. In terms of total sediment load, however, Dixie Drain, Mason Creek, and Fifteenmile Creek are the largest contributors of sediment to the Boise River.

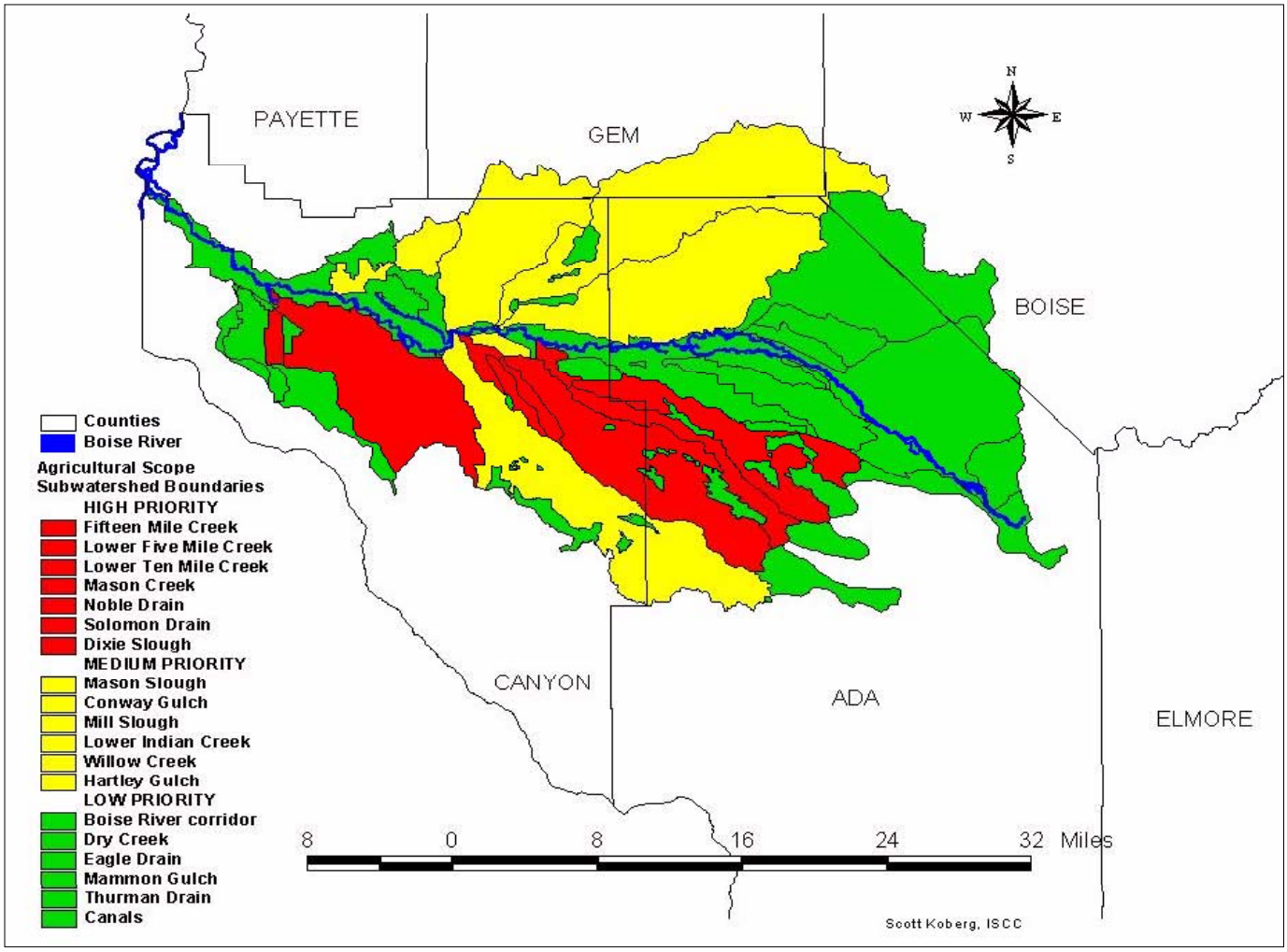
### Sediment Priority Areas

The tributaries with loads at less than 5% of total river load are considered of little contribution. The Lower Boise River riparian corridor was not specifically given a sediment load allocation in the *Lower Boise River TMDL Subbasin Assessment*. These adjacent land areas generally fall within the 5% load category because of the land use type, and any agricultural activities occurring in these areas generally do not yield substantial sediment loads. Pollutant sources with small, yet still significant loads fall within the range of 5 to 25% of the total river load, while large contributors are those which contribute greater than 25% of the total river load. Large contributors (Fifteenmile Creek, Mason Creek, and Dixie Slough) are considered high priority for treatment regardless of the land uses identified as the primary TSS source. Due to the large proportion of agricultural acreage in each of these three high priority subwatersheds, implementation efforts for TSS reductions should initially be focused here. Sediment treatment priorities for all major tributary subwatersheds are presented in Table 8.

**Table 8.** Sediment Priorities for Agricultural BMP Implementation

| High Priority | Medium Priority | Low Priority |
|---|---|---|
| Fifteenmile Creek *(includes Lower Fivemile and Tenmile Creeks)* | Mason Slough | Boise Riparian Corridor |
| Mason Creek *(includes Noble and Solomon Drains)* | Conway Gulch | Dry Creek |
| Dixie Slough | Mill Slough | Eagle Drain |
| | Lower Indian Creek | Mammon Gulch |
| | Willow Creek | Thurman Drain |
| | E. & W. Hartley Gulch | |

**Figure 8.** Sediment Prioritization for Agricultural BMP Implementation




## Sediment Load Allocations

Sediment load allocations for all the major tributaries are currently set at a 37% reduction of total suspended solids (TSS) (water column suspended sediment). Table 9 provides a summary of the load reductions for each of the major tributaries on the river. It reflects the criteria for sediment concentrations in the river of 50 mg/l TSS for no more than 60 days, and 80 mg/l TSS for no more than 14 days. This sediment goal does not include bedload reductions. The critical period for the criteria to be met is during low flow periods in the river; however, the reductions are to be met at all times. Critical flow condition has been set to be February 15 to June 14. A mass balance analysis for river flows during 1992 (a low flow year), yielded a 37% TSS required reduction for all major tributaries in order to meet the 50 and 80 mg/l TSS goal. It is important to note that these TSS goals are only intended to reduce or place a cap on water column suspended sediment, and do not reflect any potential contribution from bedload sediment. There has been no data collected to quantify bedload sediment that may be entering the river, and then become re-suspended and later sampled as TSS.

Erosion of sediment within the main stem of the Lower Boise River has not been calculated. The majority of the in-stream erosion appears to occur where banks are exposed to high water in the spring and where irrigation canal diversions are maintained. Water quality samples show that TSS concentrations are low in the river above the mouth of Fifteenmile Creek, but bedload sediment in this section may be significant. Severe bank erosion occurred near the City of Notus during the high spring runoff period in 1997, and nearly caused the Union Pacific railroad tracks to fall into the river.

**Table 9.** 1995 TSS loads and allocations for the Lower Boise River and tributaries

| Tributary | 1995 Loads | % of Total River Load | TSS Load Goals | % of Total Goal |
|---|---|---|---|---|
| Eagle Drain | 1.6 | 1% | 1.6 | 1% |
| Thurman Drain | 0.3 | 0% | 0.3 | 0% |
| Boise River, Middleton | | | 1.9 | |
| Fifteenmile | 28.6 | 18% | 18.0 | 12% |
| Star Feeder | 2.8 | 2% | 1.7 | 1% |
| Long Feeder | 0.6 | 0% | 0.3 | 0% |
| Watts Drain | 0.5 | 0% | 0.3 | 0% |
| Mill Slough | 11.2 | 7% | 7.1 | 5% |
| Willow | 3.6 | 2% | 2.3 | 1% |
| Mason Slough | 1.9 | 1% | 1.2 | 1% |
| Mason Drain | 34.1 | 22% | 21.5 | 14% |
| E. & W. Hartley Gulch | 8.4 | 5% | 5.3 | 3% |
| Indian | 9.1 | 6% | 5.7 | 4% |
| Conway Gulch | 11.3 | 7% | 7.1 | 5% |
| Dixie Slough | 41.1 | 26% | 25.9 | 17% |
| Boise River, Parma | | | 96.5 | |
| ***Total*** | **155.2** | | **98.5** | |

(IDEQ, 1999)

## Agricultural Sediment Sources

Soil erosion can occur where water forces exceed soil-bonding forces. The potential for erosion increases where soils have been disturbed by excavation or tillage, and where disturbed or undisturbed soils are exposed to increased water velocities during spring runoff, storm events, or inadequately managed irrigation. The extent to which soil erosion results in discharges of sediment to the Boise River depends on several factors that affect sediment transport, such as water velocities and volumes, distance from the point of erosion to the river, and barriers between the point of erosion and the river. Agricultural BMPs are designed to reduce soil erosion or intercept irrigation return flows to prevent or reduce sediment transport to receiving waterbodies. Implementation of BMPs is prioritized to locations and land uses with the highest known or potential sediment transport to the Lower Boise River.

### *Surface Erosion*

Significant soil movement can occur under surface irrigation practices, where water has been diverted, applied, and allowed to run off a field for reuse or as waste. The most erosive irrigation land use occurs on surface irrigated cropland fields with soil slopes ranging from 1 to 7 percent and planted to low residue row crops such as sugar beets, commercial onions, dry beans, and field corn. Fields with high residue crops such as winter wheat and alfalfa display much less soil erosion and hold soils in place even when shear forces would be greater than soil bonds.

### *Bank Erosion*

River bank erosion is most significant in the spring runoff period during flood control and during storm events, and may be enhanced by soil-disturbing activities in and adjacent to the river. The amount of soil loss has not been calculated but is still evident and part of the load at the mouth of the river and influences TSS samples throughout the river. Riverbank erosion may be better evaluated through bedload sampling. Soils deposited on the river bottom from upstream bank erosion or tributary loads are susceptible to further transport during higher flows.

There is a limited potential for bank erosion in irrigation delivery ditches and drains that could result in sediment transport to the Boise River. Most of the canals, laterals and drains in the Boise Valley have existed since the late 1800s or early 1900s. The durability and longevity of these facilities demonstrate that ditch bank erosion is not a significant occurrence. The soil structure of the irrigation ditches and drains in the Valley has evolved to resist water velocities and seepage forces. Water velocities in drains are generally too slow to cause erosion. Irrigation and drainage organizations actively protect and maintain the structural integrity of these facilities by controlling water flows and through maintenance.

Many drains were constructed to decrease ground water levels below crop root zones, so that the majority of the water they carry is from subterranean flows that carry no sediment. Surface return flows, storm water, and other discharges are the major source of sediment in drains. Most drains are cleaned far less frequently than delivery ditches (for many larger drains once every several years) to remove sediment and other material s that can, by accumulating and compacting over time, inhibit the movement of water from adjacent lands into the drains. It is possible for some of the sediment that is disturbed from the bed and banks of a drain during cleaning and not removed from the drain to be transported to the river within a few days after cleaning, before the sediment settles and is re-deposited on the bed and banks of the drain.

## Sediment Best Management Practices (BMPs) for Agriculture

Conservation and soil erosion mitigation practices are typically referred to as Best Management Practices (BMPs). BMPs for agriculture are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural land uses (ISCC, 1991). The following sediment BMPs (Table 10) are available for use by landowners within the Boise River TMDL Agricultural Implementation area. The table does not include all of the available BMPs for sediment.

**Table 10.** Sediment Best Management Practices for Agriculture

| Sediment BMPs | Sediment &/or Erosion Control Effectiveness | Installation Costs | Maintenance Costs |
|---|---|---|---|
| Sediment Basin | High | Low | Moderate |
| Underground Outlet | High | High | Low |
| Buried Pipeline | High | High | Low |
| Surge Irrigation System | High | High | Moderate |
| Sprinkler Irrigation System | High | High | Moderate |
| Drip Irrigation System | High | High | Moderate |
| Pipeline | High | High | Low |
| Polyacrylamide (PAM) | Moderate | Moderate | Moderate |
| Straw Mulching | Moderate | Moderate | Moderate |
| Irrigation Water Management | Moderate | Low | Low |
| Filter Strips | Moderate | Low | Low |
| Conservation Tillage | Moderate | Low | Low |
| Conservation Cropping Sequence | Moderate | Low | Low |

(These sediment BMPs, as well as others, are discussed in the Appendix 1 under Best Management Practices of Southwest Idaho and in APAP, 1991.)

The most important BMP for addressing water quality concerns is Irrigation Water Management (IWM). Controlling irrigation water effectively is the key to reducing soil erosion, sedimentation, nutrient, and pesticide losses. However, without advanced irrigation systems, such as surge, sprinkler, or drip irrigation, water management is often difficult, time consuming, and labor intensive. Reducing soil losses under conventional surface irrigation systems requires a commitment from the farm operator to use proper Irrigation Water Management techniques at all times.

# ***Bacteria***

Sources of bacteria from agricultural lands uses include:

1. Dairies
2. Feedlots
3. Pastureland

Riparian grazing exists along many drains and canals. Livestock that have unimpeded access to the water throughout pastures increase the chance of depositing fecal matter into or near the water.

As per the Lower Boise River TMDL Subbasin Assessment, secondary and primary contact recreational uses are impaired by bacteria at several locations within the Lower Boise River. The Lower Boise River Watershed Advisory Group conducted a bacteria testing program to determine the sources of bacteria within the watershed. The study includes DNA fingerprinting of the samples to determine the species of origin to help watershed stakeholders determine bacteria sources that have the most significant impact on the river. The methods and results of the DNA testing project are discussed at pages 18-22 of the overall Lower Boise River TMDL Implementation Plan.

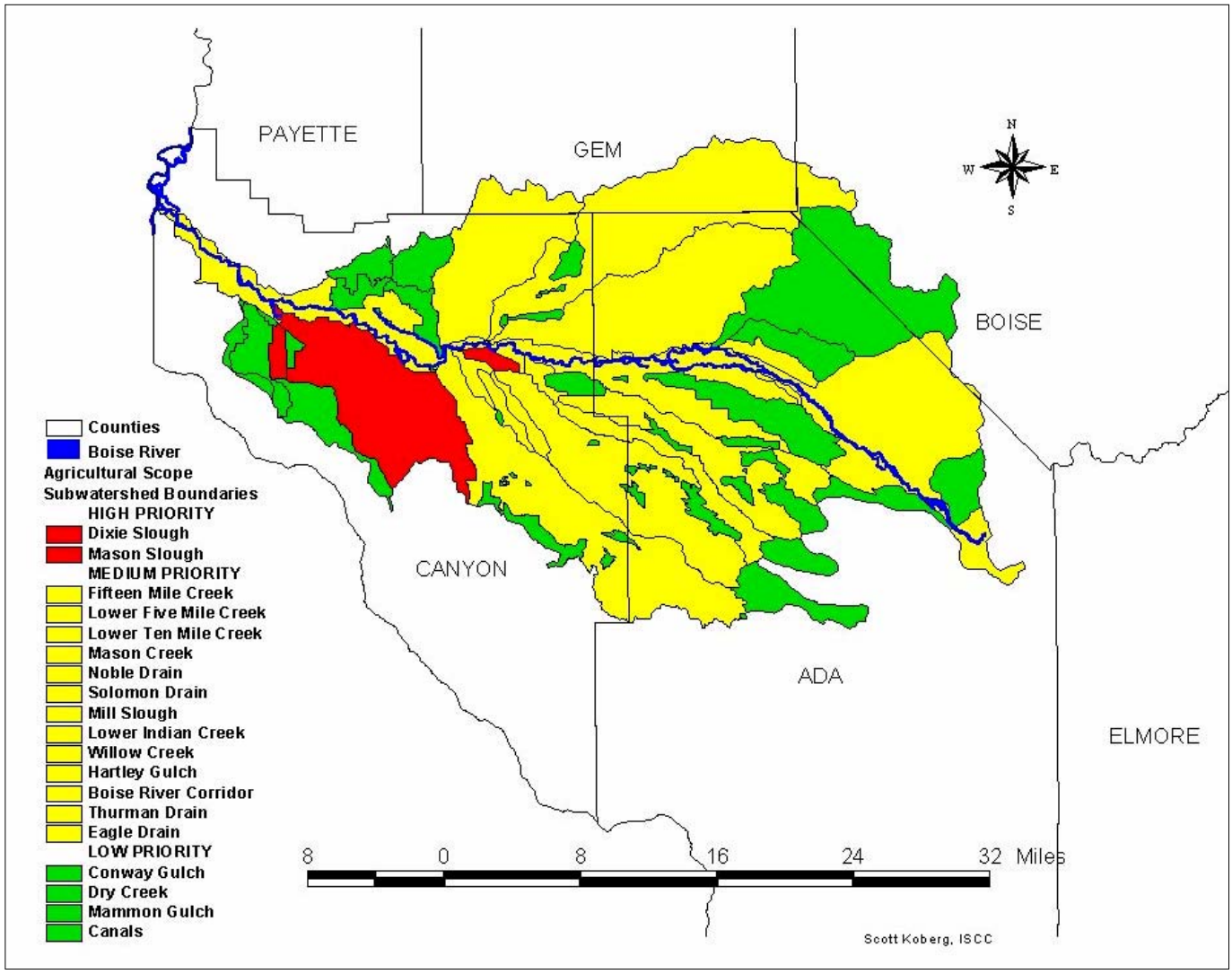
## Bacteria Priority Areas

Bacteria treatment priorities for all major tributary subwatersheds to the Lower Boise River are presented in Table 11. The prioritization of tributaries for bacteria is based on the monitoring data and information presented in the *Lower Boise River Subbasin Assessment*.

**Table11.** Bacteria Priorities for Agricultural BMP Implementation

| High Priority | Medium Priority | Low Priority |
|---|---|---|
| Dixie Slough | Mason Creek *(includes Noble and Solomon Drains)* | Dry Creek |
| Mason Slough | Mill Slough | Conway Gulch |
| | Lower Indian Creek | Mammon Gulch |
| | Willow Creek | |
| | E. & W. Hartley Gulch | |
| | Fifteenmile Creek *(includes Lower Fivemile and Tenmile Creeks)* | |
| | Boise River Riparian Corridor | |
| | Mammon Gulch | |
| | Eagle Drain | |

**Figure 9.** Bacteria Prioritization for Agricultural BMP Implementation




## Bacteria Load Allocations

The Lower Boise River and tributary bacteria load reductions are based on monitoring data for fecal coliform concentrations and flows at the river locations and mouths of the major tributaries entering the river. These coliform concentrations were then compared to current, state coliform standards and load reductions were calculated. Table 12 summarizes the load reductions and targets for the tributaries.

The highest priority areas for bacteria source reduction treatment are lands that have the highest concentration of domestic or wildlife species. Livestock operations that allow direct animal access to a water body or have a high potential for direct runoff into a water body have the greatest impact on bacteria related water quality concerns from agricultural land.

**Table 12.** Percent Reductions to Meet Current Instream State Standard Bacterial Goals

| Tributary | Primary Geo-mean CFU/100ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| Eagle drain | 604 | 50 | 92% | 579 | 200 | 65% |
| Thurman drain | 758 | 50 | 93% | 512 | 200 | 61% |
| Fifteenmile creek | 992 | 50 | 95% | 612 | 200 | 67% |
| Willow creek | 803 | 50 | 94% | 528 | 200 | 62% |
| Mill slough | 1282 | 50 | 96% | 556 | 200 | 64% |
| Mason slough | 3507 | 50 | 99% | 1422 | 200 | 86% |
| Mason drain | 1407 | 50 | 97% | 515 | 200 | 61% |
| East & West Hartley | 2296 | 50 | 98% | 565 | 200 | 65% |
| Indian creek | 770 | 50 | 94% | 384 | 200 | 48% |
| Conway gulch | 723 | 50 | 93% | 177 | 200 | 0% |
| Dixie slough | 2987 | 50 | 98% | 1156 | 200 | 83% |

(IDEQ, 1999)

## Agricultural Bacteria Sources

There is very little potential for bacterial losses from cropland that is not receiving land applications of animal waste. Irrigation Water Management (IWM) is one of the most critical BMPs for reducing pollutant losses from agricultural land.

Dairies and feedlots are under State regulations or strict recommendations to eliminate runoff for up to a 25 year, 24 hour storm event as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to lands, existing NRCS standards are being applied to dairy operations to ensure manure applications are balanced to match crop uptake. Maximum bacteria losses are not quantified in the NRCS state standards, but it is strongly recommended that runoff with potential bacterial contamination be contained on facilities and croplands.

Riparian grazing exists along many drains and streams that enter the Boise River. Many livestock have unrestricted access to drain waters throughout the pasture, allowing for excrement deposition into the water, soil compaction along the banks, and limited vegetative growth for bank stability and filtration.

## Bacteria Best Management Practices (BMPs) for Agriculture

Agricultural conservation and bacteria control practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent bacteria from entering waterbodies from agricultural land uses (ISCC, 1991). The following bacteria BMPs (Table 13) are available for use by landowners within the Boise River TMDL Agricultural Implementation area. The table does not include all of the available BMPs for bacteria.

**Table 13.** Bacteria Best Management Practices for Agriculture

| Bacteria BMPs | Bacteria Control Effectiveness | Installation Costs | Maintenance Costs |
|---|---|---|---|
| Livestock Exclusion | High | Moderate | Low |
| Nutrient Management | High | Moderate | Low |
| Dike | High | High | Low |
| Waste Management System | High | High | Moderate |
| Waste Storage Pond | High | High | Low |
| Filter Strips | Moderate | Low | Low |
| Wetland Development & Restoration | Moderate | High | Moderate |
| Pasture and Hayland Management | Moderate | Moderate | Moderate |
| Irrigation Water Management | Moderate | Low | Low |
| Livestock Watering Facility | Moderate | Low | Low |
| Prescribed Grazing | Moderate | Low | Low |
| Fencing | Low | Moderate | Low |

## *Nutrients*

Sources of nutrients from agricultural lands uses include:

1. surface irrigated croplands
2. surface irrigated pasture
3. dairies and feedlots
4. shallow groundwater leachate

Nutrients that enter the river from shallow ground water are likely derived from canal and irrigation leaching and may be "flushing" natural and land use related nutrients though to the drainages. Storm events great enough to cause erosion and runoff are sources for nutrients that are attached to soil particles (i.e. particulate phosphorus).

### Phosphorus

Although the original Lower Boise River Subbasin Assessment and TMDL called for a no net increase (NNI) in instream nutrient concentrations and nutrient discharges, DEQ subsequently completed a more detailed subbasin assessment for nutrients in 2001 that determined nutrients are not impairing beneficial uses in the Lower Boise River. The NNI objective remains in effect in anticipation that EPA will approve the Snake River-Hells Canyon TMDL, which proposes to assign a phosphorus allocation to the mouth of Boise River. It is expected that the Lower Boise Watershed Advisory Group and DEQ will then evaluate load reductions that may be necessary to meet the phosphorus allocation.

Highest concentrations of dissolved phosphate have been measured during low flow periods and concentrations increase downstream from Lucky Peak. Generally, ortho-phosphate concentrations are 75% to 80% of total phosphorus concentrations in the Boise River.

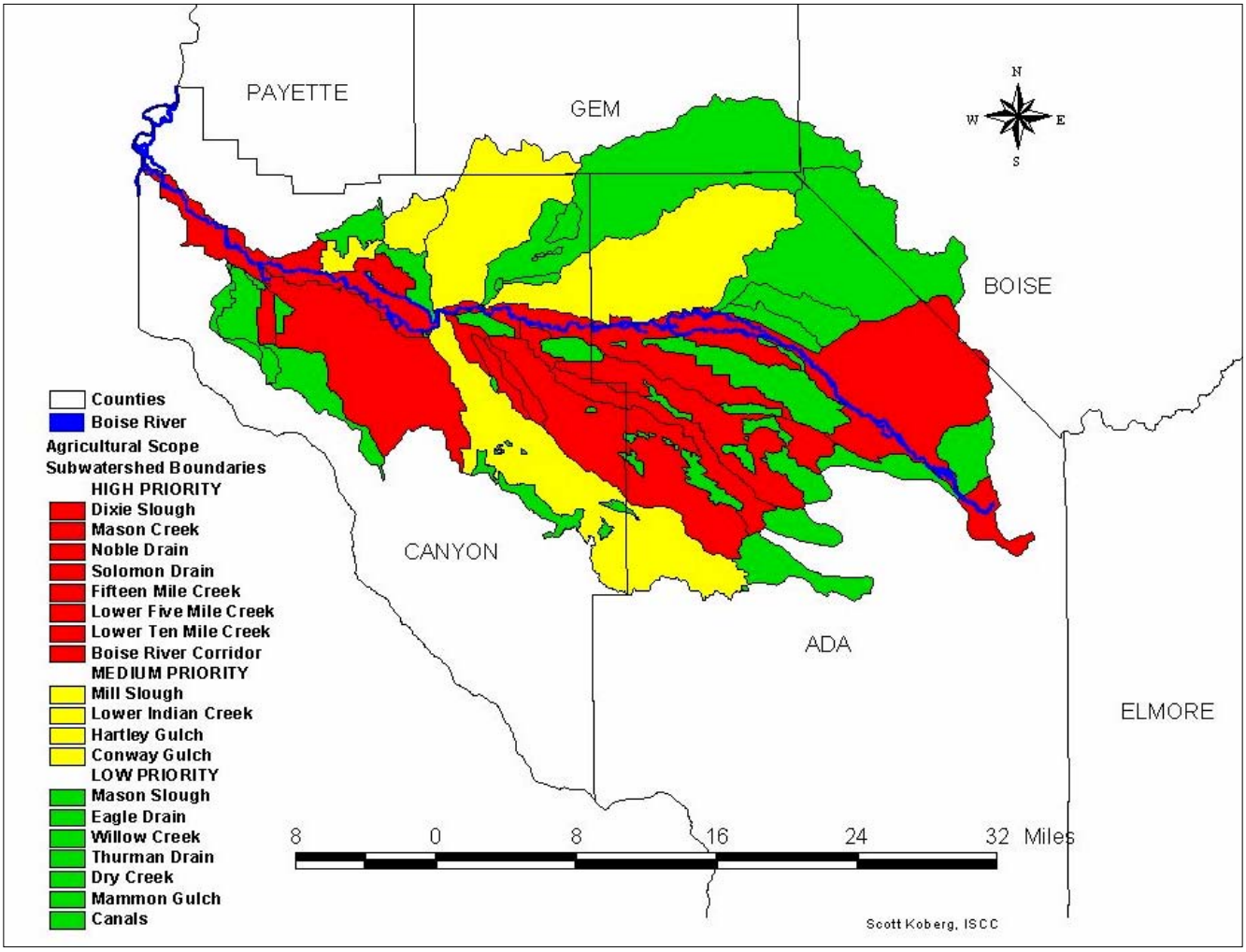
### Phosphorus Priority Areas

Phosphorus treatment priorities for all major tributary subwatersheds to the Lower Boise River are presented in Table 14. The prioritization of tributaries for phosphorus is based on the monitoring data and information presented in the *Lower Boise River Subbasin Assessment*.

**Table14.** Phosphorus Priorities for Agricultural BMP Implementation

| High Priority | Medium Priority | Low Priority |
|---|---|---|
| Dixie Slough | Mill Slough | Mason Slough |
| Mason Creek *(includes Noble and Solomon Drains)* | Lower Indian Creek | Eagle Drain |
| Fifteenmile Creek *(includes Lower Fivemile and Tenmile Creeks)* | E. & W. Hartley Gulch | Willow Creek |
| Boise River Riparian Corridor | Conway Gulch | Thurman Drain |
| | | Dry Creek |
| | | Mammon Gulch |

**Figure 10.** Phosphorus Prioritization for Agricultural BMP Implementation




## Phosphorus Load Allocations

**Table 15.** Proposed No Net Increase (NNI) Phosphorus Loads by Tributary

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| Eagle Drain | 30 | 5566 |
| Thurman Drain | 19 | 3563 |
| Fifteenmile Creek | 241 | 44411 |
| Mill Slough | 197 | 36277 |
| Willow Creek | 30 | 5438 |
| Mason Slough | 59 | 10863 |
| Mason Creek | 340 | 62539 |
| East and West Hartley Gulch | 136 | 25009 |
| Indian Creek | 164 | 30219 |
| Conway Gulch | 101 | 18648 |
| Dixie Drain | 444 | 81672 |

(IDEQ, 1999)

## Agricultural Phosphorus Sources

### *Surface Irrigated Cropland*

The application of fertilizers, crop supplements, and animal waste to surface irrigated cropland creates the potential for phosphorus losses offsite via sediment transport and deep percolation. In many cases, phosphorus is usually attached to soil particles and referred to as particulate phosphorus. With particulate phosphorus, any BMP installed to decrease erosion will also decrease the potential for particulate phosphorus to be delivered offsite. With dissolved phosphorus, the transport mechanism is either surface runoff or deep percolation. The most effective BMPs for treating potential phosphorus losses from surface irrigated cropland are Irrigation Water Management (IWM) and Nutrient Management. Soil testing and adjusting fertilizer applications based on crop needs and recommended rates are both components of Nutrient Management that decreases the potential for excessive phosphors applications and runoff potential.

### *Animal Related Phosphorus Sources*

Riparian razing exists along many drains and canals. Livestock that have unrestricted access to drain water throughout pastures limit vegetative growth that can decrease bank stability and increase bank erosion and sediment delivery. Deposition of animal excrement directly in or near the water, while generally associated with bacteria, can also increase the amount of phosphorus that enters a canal or drain and contributes loads to the Boise River.

Dairies and feedlots are under regulations or strict recommendations to eliminate deep percolation from manure application areas. The existing Nutrient Management standard developed by ISDA and the Dairy Bureau was developed to ensure that manure and fertilizer applications are balanced to match crop uptake. As of March 2001, all dairies in the state must have an ISDA approved Nutrient Management Plan for their operation.

## Phosphorus Best Management Practices (BMPs) for Agriculture

Agricultural conservation and phosphorus control practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent phosphorus from entering waterbodies from agricultural land uses (ISCC, 1991). The following phosphorus BMPs (Table 16) are available for use by landowners within the Boise River TMDL Agricultural Implementation area. The table does not include all of the available BMPs for phosphorus.

**Table 16.** Phosphorus Best Management Practices for Agriculture

| Phosphorus BMPs | Phosphorus Control Effectiveness | Installation Costs | Maintenance Costs |
|---|---|---|---|
| Livestock Exclusion | High | Moderate | Low |
| Nutrient Management | High | Moderate | Low |
| Dike | High | High | Low |
| Waste Management System | High | High | Moderate |
| Waste Storage Pond | High | High | Low |
| Filter Strips | Moderate | Low | Low |
| Wetland Development & Restoration | Moderate | High | Moderate |
| Diversion | Moderate | Moderate | Moderate |
| Irrigation Water Management | Moderate | Low | Low |
| Fencing | Low | Moderate | Low |

## Land Classification & Implementation Priorities

Of the 163,270 acres addressed by this Implementation Plan for Agriculture, there are currently 115,798 acres of surface irrigated cropland (including orchards and vineyards), 20,212 acres of surface irrigated pasture, 2,495 acres of non-irrigated pasture, 23,084 acres of sprinkler irrigated cropland and 1,681acres of feedlots and dairies (CAFOs/AFOs) (Griswold and Koberg, 2001). The subwatershed implementation plans divide land areas into "treatment units" according to these five agricultural uses.

In order to allocate available resources most effectively, implementation efforts should be focused on the highest priority tributary subwatersheds. For sediment, Dixie Slough, Fifteenmile Creek, and Mason Creek are the highest priority tributary subwatersheds due to their historically high levels of TSS loading to the Boise River.

Within the tributary subwatersheds, BMP implementation is prioritized to address land uses that have the greatest potential for erosion and pollutant transport to the Boise River. The subwatershed implementation plans identify surface irrigated croplands as "critical acreage" because they have the greatest potential for erosion. These critical acres are further prioritized by their proximities to tributaries and their potential for sediment transport according to a tiered method. Critical acres closest to the mouths of the tributaries or adjacent to the tributaries are considered highest priority for treatment due to their increased potential to directly impact surface water quality. It is difficult to determine pollutant delivery potential in a watershed with extremely modified surface hydrology systems. In the Lower Boise River watershed, one farmer's return flow often becomes another farmer's irrigation water. The accuracy in determining exactly where particular pollutants originate is greatly compromised as distance from the water body of concern increases. Accordingly, the following is a general rule that applies to the prioritization of critical acres within each tributary subwatershed priority area:

**Tier 1:** Fields directly adjacent to either the tributary of concern or a drain to the tributary of concern; or fields having a direct and substantial influence on the tributary of concern

**Tier 2:** Fields in the subwatershed with an indirect, yet substantial influence on the tributary of concern

**Tier 3:** Fields upland in the subwatershed that indirectly influence the tributary of concern

(Information regarding the tiers for treatment identified specifically for each tributary subwatershed can be found in appendices 3 through 12).

Feedlots and dairies (CAFOs/AFOs) have varying effects on water quality in the Lower Boise River. These lands are not prioritized by tiers in this plan because facility monitoring is administered by the Idaho State Department of Agriculture (ISDA). All dairy facilities in the state of Idaho currently have a Certified Nutrient Management Plan (CNMP) on file with ISDA as per Idaho state law, and feedlot facilities must also meet the CNMP requirement by July 1, 2005. Although a CNMP is required for each facility, implementation of the various components of each CNMP is ongoing. As a result, CAFOs and AFOs in this implementation plan are identified as critical acreage for treatment.

Sprinkler irrigated cropland is not prioritized for treatment because the potential for erosion and pollutant transport to the Boise River is typically not significant enough to warrant treatment with additional BMPs.

Lands in pasture are generally low in priority for sediment treatment because the fields are not typically disturbed by excavation or tillage. Surface irrigated pastures that are a potential source of bacteria or phosphorus may warrant a higher priority for treatment as determined on a site-specific basis. Generally, non-irrigated pastures do not warrant a high priority because they are an unlikely source of sediment, bacteria, or phosphorus transport to the Boise River.

## Nonpoint Source Pollution Control Efforts

There are many existing state and federal water quality programs and activities existing in the Lower Boise River watershed to address pollutant loads from nonpoint sources. Most agricultural programs are voluntary; however, there are some regulatory state and federal rules that restrict pollutant losses from nonpoint and point sources. Table 17 provides a summary of the regulatory authority and administrating agencies for various programs.

**Table 17.** State of Idaho's Regulatory Authority for Nonpoint Pollution Sources.

| Authority | IDAPA Citation | Responsible Agency |
|---|---|---|
| **Idaho Forest Practice Rules** | 16.01.02.350.03(a) | Idaho Department of Lands |
| **Rules Governing Solid Waste Management** | 16.01.02.350.03(b) | Idaho Department of Health and Welfare |
| **Rules Governing Subsurface and Individual Sewage Disposal Systems** | 16.01.02.350.03(c) | Idaho Department of Health and Welfare |
| **Rules and Standards for Stream-channel Alteration** | 16.01.02.350.03(d) | Idaho Department of Water Resources |
| **Rules Governing Exploration and Surface Mining Operations in Idaho** | 16.01.02.350.03(f) | Idaho Department of Lands |
| **Rules Governing Placer and Dredge Mining in Idaho** | 16.01.02.350.03(g) | Idaho Department of Lands |
| **Rules Governing Dairy Waste** | 16.01.02.350.03(h) or IDAPA .02.04.14 | Idaho Department of Agriculture |
| **Rules Governing Animal Feeding Operations** | Unknown at this time | Idaho Department of Agriculture |

## Feasible Control Strategies

Establishing long-term, scientifically supported water quality objectives and interim goals based on feasible and attainable control strategies is consistent with the goal of the Clean Water Act. Idaho's water quality laws also state that water quality standards shall be met or that all feasible steps will be taken towards achieving the highest quality water attainable. Rule 54 of Idaho's Water Quality Standards directs IDEQ in "[c]onsultation with appropriate basin and watershed advisory groups, designated agencies and landowners to determine the feasibility of, and assurance that required or cost-effective interim pollution control strategies can be effectively applied to the sources of pollution to achieve full support status within a reasonable period of time."

Feasible pollution control strategies are those that can reasonably be implemented by stakeholders to improve water quality within the physical, operational, economic and other constraints which affect their individual enterprises and their communities. Control strategies that will hamper existing or future social and economic activity and growth are neither reasonable nor feasible. Attainable water quality goals should reflect control strategies that are feasible on a watershed basis.

## Reasonable Assurance

- The Lower Boise River TMDL will rely substantially on nonpoint source reductions to achieve desired water quality goals. If appropriate load reductions are not achieved from nonpoint sources through existing regulatory and voluntary programs, then reductions must come from point sources (IDEQ, 1999).
- Regulatory authority can be found in the water quality standards (IDAPA 16.01.02.350.01 through 16.01.02.350.03).
- IDAPA 16.01.02.054.07 refers to the Idaho Pollution Abatement Plan (Ag Plan) (ISCC, 1991) which provides direction to the agricultural community for approved Best Management Practices.
- If a voluntary approach does not succeed in abating the pollutant problem, the state may seek injunctive relief for those situations that may be determined to be an imminent and substantial danger to public health or environment (IDAPA 16.01.02.350.02(a)).

## Agencies and Organizations

Many different agencies and organizations exist that can assist the agricultural community with conservation plan development and implementation in the Lower Boise River watershed. Table 18 represents a partial list of groups and agencies available for assistance.

**Table 18.** Agencies and Organizations

| State Government | Organizations/Associations | Federal Government |
|---|---|---|
| Ada Soil & Water Conservation District | Lower Boise River WAG | Natural Resources Conservation Service |
| Canyon Soil Conservation District | Idaho Association of Soil Conservation Districts | Farm Services Agency |
| Idaho Soil Conservation Commission | Idaho Cattle Association | Rural Development |
| Idaho Department of Environment Quality | Idaho Dairyman's Association | Bureau of Reclamation |
| Idaho Department of Agriculture | Idaho Water Users Association | Bureau of Land Management |
| University of Idaho Research Stations | | |
| University of Idaho Extension Offices | | |
| Idaho Fish and Game | | |

## Conservation Planning on Agricultural Lands

The Soil and Soil & Water Conservation Districts interact with the agricultural community through newsletters, personal contacts, and by input through other organizations. Experience in the watershed has demonstrated that landowners are more likely to install BMPs when cost-share assistance is available. To initiate conservation planning through specific watershed projects Conservation Districts, NRCS, and ISCC develop an extensive landowner, operator, and field database to determine potential participants and areas for treatment. Letters are sent to each landowner describing the project and available programs and request that they contact the Conservation District if they intend to participate. Landowners who respond to the letter are then contacted to discuss the resource concerns and issues that exist on their land. If the landowner is interested in installing BMPs and working towards farm goals, conservation planning begins.

Conservation plans are developed by producers on a voluntary basis with technical assistance provided by NRCS, ISCC, Conservation Districts, or other local organizations. Step-by-step resource inventories, evaluations, and recommendations are conducted with the landowner throughout the planning process.

Conservation planning consists of an inventory of land use activities, natural resource condition, farm management characteristics, off-site environmental impacts, and landowner needs and future goals. Evaluations are completed to determine where resource problems are occurring, and to begin the formulation of alternative treatment practices. These treatment alternatives are generated in cooperation between the landowner and the technical agency to select the best conservation practices for the land use and the landowner. Treatment alternatives are evaluated by the landowner in terms of costs, net returns, practicality, and longevity. Alternatives that are too costly or do not show any return on farm inputs are likely not adopted. Low cost alternatives that fit into the immediate farm management plan are more likely to be selected by the landowner.

## Factors Affecting BMP Implementation

Several factors, including the following, affect BMP Implementation for Irrigated Agriculture:

### *Financial*

The primary constraint on BMP implementation is limited availability of funding for BMP implementation. Low commodity prices result in very limited margins (revenues after farm operating and family living expenses) available to commit to BMP implementation. Although cost-sharing opportunities are often available to farmers through local, state, and federal entities, the cost-sharing rates are often not adequate enough to ensure widespread funding for BMP implementation. Changes in commodity prices, operating expenses, and Federal and State funding priorities may further constrain the availability of funds for water quality projects.

Many non-structural BMPs described in the subwatershed implementation plans involve annual treatment expenses (such as application of PAM). Structural BMPs, such as sprinkler systems, require substantial initial capital expenditures to purchase and install equipment and construct structures. Both non-structural and structural BMPs require annual operation and maintenance in order to function properly. The cost estimates in the subwatershed implementation plans do not include operation and maintenance or replacement costs.

Under the Clean Water Act Idaho law, implementation of control strategies to reduce discharges from irrigated lands is voluntary. It is not reasonable to expect farmers to commit financial resources to BMP implementation if those resources are essential to continue operations or to support their families.

***Crop Requirements***

Onions and seed crops are more appropriately produced using furrow irrigation than with sprinkler irrigation. Onions and seed crops are adversely affected by overhead sprinkler irrigation. The comparative climatic advantage for onion and seed crop production in the Treasure Valley is directly associated with the absence of rainfall, which promotes high quality. If onions receive regular rainfall or sprinkler irrigation, they become inoculated with fungal and bacterial diseases. These diseases can cause both losses before harvest, and tend to make the crop decompose during storage. Subsurface drip irrigation, however, is an appropriate method for irrigating onions, but requires significant start-up and annual operating expenses to remain effective.

***Hydrologic***

Many irrigation systems utilize, and may rely entirely, upon return flows from upstream or upgradient irrigation. Recharge from delivery and use of irrigation water replenishes the shallow aquifer in the Boise Valley. The majority of water flows in the Boise River below Star are generated by return flows. For these reasons, eliminating or significantly reducing return flows will significantly impact water use, recharge, and the hydrologic balance in the Lower Boise River watershed.

***Value of Land in the Treasure Valley***

As a result of the rapidly increasing Treasure Valley population, much of the acreage currently in agricultural production is increasing in value for urban and suburban development. Land that would previously have sold for $3,000/acre for farming is now being sold for up to $30,000/acre for housing. Consequently, many farmers who own and farm land within the watershed have decided not to invest in additional farm improvements (i.e. BMPs for water quality), and are instead awaiting offers from developers.

## BMP Maintenance within Cost-Share Programs

After BMPs have been installed, proper maintenance and operation is checked by the ISCC or NRCS during annual status reviews conducted throughout the life of the contract. When conservation plans are not under contract agreements, such as when landowners install BMPs without cost-share assistance they are not obligated by contract to maintain BMPs. The state of Idaho has adopted the voluntary approach to agricultural BMP implementation.

# *TMDL Implementation Monitoring*

## Plan for Agricultural BMP Effectiveness Monitoring

BMP effectiveness studies on erosion and sedimentation have been conducted extensively by the Agricultural Research Service (ARS) and University of Idaho Extension service. Site specific BMP effectiveness monitoring and field evaluations of progress within the Lower Boise River watershed will be conducted by IASCD and ISDA field staff. Any BMPs installed through a water quality and conservation program will be annually inspected to ensure the BMPs are properly maintained by the landowner/operator throughout the length of the contract. BMP effectiveness monitoring typically consists of a visual inspection and operator record keeping.

## Plan for Water Quality Monitoring

ISDA is currently taking water quality samples in the Fivemile, Tenmile, Fifteenmile, Mason, Indian, and Dixie subwatersheds. Data is available from April 1998, through April 2000. Most samples have been taken bimonthly through the irrigation season (April - October) and monthly through the rest of the year (winter). Data collected thus far includes DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids), pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli. This monitoring may continue beyond April of 2000 if funding is provided.

The U.S. Geological Survey (USGS) has monitored the major tributaries to the river at their mouths since 1993 and will continue at the mouths of each of the 303(d) listed tributaries as long as funding will allow. Sampling frequency is now upgraded to bimonthly starting in April of 1999, then sampled monthly through the winter period. In addition, USGS and ISDA will both conduct monitoring projects as needed within tributaries to the Lower Boise River during the implementation of specific water quality project in the subwatersheds. This type of monitoring will allow for trend analysis of water quality in the tributaries before, during, and after implementation of each water quality project.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will provide trend analysis of water quality, and gauge progress toward meeting the TMDL load reductions on a subwatershed basis. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

# *Costs and Time Frame for Agricultural BMP Implementation*

Overall costs to reduce sediment, bacteria, and phosphorus transport from agricultural lands to the Boise River are difficult to estimate due to a variety of factors, including the variability in crops and existing irrigation methods.

The subwatershed implementation plans describe three alternative levels of treatment based on implementation cost (high, moderate, and low) for each treatment unit in which BMPs will be implemented (surface-irrigated cropland, surface-irrigated pasture, non-irrigated pasture, and CAFO/AFO). The per-acre cost of each alternative and the cost of applying each alternative to all lands within each treatment unit are calculated. With this information, overall implementation costs associated with various treatment scenarios can be forecasted. Please refer to appendices 3 through 12 for a summary of the costs for each of the tributary subwatersheds.

Available funding is the primary factor in determining the amount of time required to implement BMPs on the lands addressed by this Implementation Plan. Currently there is approximately $354,000 of cost-share funding available annually for BMP implementation in Ada and Canyon Counties. Current Canyon County funding consists of $110,112 annually ($550,062 over five years) for the Dixie WQPA and $66,843 annually ($334,213 for five years) for the countywide EQIP. Current Ada County funding consists of $57,969 annually ($289,845 over five years) for the Fifteenmile WQPA, $82,800 annually ($414,000 over five years) for the countywide EQIP, and $36,720 annually ($183,600 over five years) for a Fifteenmile 319 project. With 50% cost share from landowners, provided through their time, labor, materials, and financial contributions, an equivalent total of $708,000 is currently available annually for BMP installation within Ada and Canyon Counties. As previously discussed, installation does not include annual operation and maintenance, or replacement costs.

**Table 19.** BMP Implementation Costs and Time Frames by Treatment Unit for All Subwatersheds

| Treatment Unit | Acres/Units | Per Acre/Unit Cost | Total Cost | Acres/Units @ $708,000/year | Time Frame @ $708,000/year |
|---|---|---|---|---|---|
| Surface irrigated cropland: Tier 1 | 27,519 | $500 | $13,759,500 | 1416 | 19.4 years |
| Surface irrigated cropland: Tier 2 | 21,943 | $500 | $10,971,500 | 1416 | 15.5 years |
| Surface irrigated cropland: Tier 3 | 66,336 | $500 | $33,168,000 | 1416 | 46.8 years |
| *Tiers 1-3 Total* | *115,798* | *$500* | *$57,899,000* | *1416* | *81.8 years* |
| Surface Irrigated Pasture | 20,212 | $350 | $7,074,200 | 2,023 | 10 years |
| CAFO/AFO | 228 units | $35,000 | $7,980,000 | 20 | 11.3 years |
| ***Total*** | **138,505 acres 228 units** | | **$72,943,200** | | **103.1 years** |

It is unlikely that every acre within the 163,270 total acres addressed in this plan will require BMP implementation in order to achieve TMDL objectives. In fact, many of the farmers within the watershed are already using various BMPs on an annual basis. In addition, many of these agricultural lands will be converted to other uses as a result of urban development. If, for example, it is only necessary to apply moderate level treatment to Tier 1 surface irrigated cropland, surface irrigated pasture, and CAFO/AFO units to achieve the TMDL objectives, the agriculture implementation cost will be significantly lower ($28,813,700 instead of $73,701,700). Additionally, a more effective strategy may be to target the highest priority subwatersheds for BMP implementation based on current pollutant loading to the river (Table 20).

**Table 20.** BMP Implementation Costs and Time Frames by Treatment Unit for Sediment High Priority Subwatersheds (Dixie, Mason, and Fifteenmile)

| Treatment Unit | Acres/Units | Per Acre/Unit Cost | Total Cost | Acres/Units per year @ $708,000 | Time Frame @ $708,000 annual |
|---|---|---|---|---|---|
| Surface irrigated cropland: Tier 1 | 9,974 | $500 | $4,987,000 | 1416 | 7 years |
| Surface irrigated cropland: Tier 2 | 9,227 | $500 | $4,613,500 | 1416 | 6.5 years |
| Surface irrigated cropland: Tier 3 | 28,852 | $500 | $14,426,000 | 1416 | 20.4 years |
| *Tiers 1-3 Total* | *48,053* | *$500* | *$24,026,500* | *1416* | *34 years* |
| Surface Irrigated Pasture | 7,309 | $350 | $2,558,150 | 2,023 | 3.6 years |
| CAFO/AFO | 118 units | $35,000 | $4,130,000 | 20 | 5.8 years |
| ***Total*** | **104,656 acres 118 units** | | **$30,714,650** | | **43.4 years** |

## Sources of Funding for Agricultural BMP Implementation

The above projections assume that the current levels of funding for BMP implementation in Ada and Canyon Counties continue, and that funding doubles at least every 20 years to pay for replacement of equipment. Substantial increases in federal and state funding for BMP installation will be necessary to compress these projected time frames.

There are various sources of funding for BMP installation on subwatershed scale and smaller areas. Currently, state and federal sources comprise the majority of funds used in the Lower Boise River watershed. Through USDA, IDEQ, EPA, and ISCC programs there are funding sources available for installation of BMPs throughout priority watersheds to meet water quality objectives. A summary of funding sources available in the watershed is located in Appendix 2.

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## ***Appendices***

**APPENDIX 1.** Best Management Practices of Southwest Idaho

**APPENDIX 2.** Agriculture Cost Share Programs Available in the Lower Boise Watershed

**APPENDIX 3**. Mason Creek Subwatershed Agricultural TMDL Implementation Plan

**APPENDIX 4.** Fifteenmile Creek (Fivemile & Tenmile) Subwatershed Agricultural TMDL Implementation Plan

**APPENDIX 5.** Indian Creek Subwatershed Agricultural TMDL Implementation Plan

**APPENDIX 6.** Dixie Subwatershed Agricultural TMDL Implementation Plan

**APPENDIX 7.** Mason Slough Subwatershed Agricultural TMDL Implementation Plan

**APPENDIX 8.** Willow Creek Subwatershed Agricultural TMDL Implementation Plan

**APPENDIX 9.** Mill Slough Subwatershed Agricultural TMDL Implementation Plan

**APPENDIX 10.** Hartley Gulch Subwatershed Agricultural TMDL Implementation Plan

**APPENDIX 11.** Conway Gulch Subwatershed Agricultural TMDL Implementation Plan

**APPENDIX 12.** Boise River Riparian & Small Drainage (Thurman, Eagle, Dry, and Mammon) Agricultural TMDL Implementation Plan

# APPENDIX 1.

# Agricultural Best Management Practices of Southwest Idaho

## BMP Application

***Private Agricultural Land***

A BMP is a conservation practice designed for application on a specific site to address a specific nonpoint source (NPS) pollutant or resource concern. BMPs are based on site-specific data gathered and analyzed by a trained and experienced conservationist or resource specialist. Site data typically includes information regarding soils, slope, climate, topography, crop rotation, equipment availability, water quality, water quantity, and current resource condition. The conservationist or resource specialist uses all of the site data, in addition to his or her experience and professional judgement, the landowner's objectives, and the desired water quality goals to select the component practices that will address the resource concerns for that site. The conservationist or specialist will present the landowner with a number of alternative BMPs that will not only meet the water quality goals, but will also meet the landowner's needs and capabilities.

***Public Land***

On public lands the BMP implementation process is a bit more complicated. It typically involves an environmental evaluation, a public land use plan, interdisciplinary teams of resource specialists, and much more public involvement. BMP implementation is generally accomplished through contract with or direct involvement from one of the management agencies (i.e. U.S. Forest Service or Bureau of Land Management).

## Developing BMPs

***Typical agricultural land use categories for BMP application include:***

- Irrigated Cropland
- Non-irrigated Cropland
- Grazing Land
- Animal Waste Management
- Riparian/Wetland

A BMP usually requires the use of several component practices to meet water quality goals. A combination of BMPs may be necessary to meet water quality goals on a particular land management unit. Certain component practices are considered extremely important to ensure BMP effectiveness. For instance, Irrigation Water Management is an essential part of an Irrigated Cropland BMP. It is recommended that a BMP developed for application on irrigated or non-irrigated cropland includes Nutrient Management and Pest Management component practices. In addition, a Waste Management System should be a component of an Animal Waste Management BMP.

## Component practices commonly selected for each of the five land use categories

***Irrigated Cropland BMPs***

- Chiseling and Subsoiling
- Conservation Cropping Sequence
- Conservation Tillage
- Contour Farming
- Cover and Green Manure Crop
- Critical Area Planting
- Diversion
- Filter Strip
- Grade Stabilization Structure
- Grasses and Legumes in Rotation
- Irrigation Land Leveling
- Irrigation Pit or Regulating Reservoir
- Irrigation Storage Reservoir
- Irrigation System
- Irrigation Water Conveyance
- Irrigation Water Management
- Land Smoothing
- Nutrient Management
- Pest Management
- Reservoir Tillage
- Sediment Basin
- Stripcropping
- Structure for Water Control
- Subsurface Drain
- Unerground Outlet
- Water and Sediment Control Basin
- Well

***Non-irrigated Cropland BMPs***

- Buffer Strips
- Chiseling and Subsoiling
- Conservation Cropping Sequence
- Conservation Tillage
- Contour Farming
- Cover and Green Manure Crop
- Critical Area Planting
- Diversion
- Filter Strip
- Grade Stabilization Structure
- Grassed Waterway
- Grasses and Legumes in Rotation
- Nutrient Management
- Pest Management
- Sediment Basin
- Subsurface Drain
- Terrace
- Underground Outlet
- Water and Sediment Control Basin

***Grazing Land BMPs***

- Brush Management
- Critical Area Planting
- Deferred Grazing
- Fencing
- Grade Stabilization Structure
- Livestock Exclusion
- Nutrient Management
- Pasture and Hayland Management
- Pasture and Hayland Planting
- Pest Management
- Pipeline
- Planned Grazing System
- Pond
- Proper Grazing Use
- Proper Woodland Grazing
- Range Seeding
- Spring Development
- Stock Trails and Walkways
- Trough or Tank
- Well

***Animal Waste Management BMPs***

- Critical Area Planting
- Dike
- Diversion
- Grade Stabilization Structure
- Heavy Use Area Protection
- Irrigation System
- Irrigation Water Conveyance
- Irrigation Water Management
- Pond
- Pond Sealing or Lining
- Pumping Plant for Water Control
- Waste Management System
- Waste Storage Pond
- Waste Storage Structure
- Waste Treatment Lagoon
- Waste Utilization

***Riparian/Wetland BMPs***

- Channel Vegetation
- Critical Area Planting
- Deferred Grazing
- Ephemeral Watercourse Planting
- Fencing
- Filter Strip
- Fish Stream Improvement
- Grade Stabilization Structure
- Heavy Use Area Protection
- Livestock Exclusion
- Pipeline
- Planned Grazing System
- Pond
- Proper Grazing Use
- Spring Development
- Stock Trails and Walkways
- Streambank and Shoreline Protection
- Stream Channel Stabilization
- Structure for Water Control
- Wetland Development and Restoration

# APPENDIX 2.

# Agriculture Cost Share Programs Available in the Lower Boise River Watershed

## Sources of Funding for Agricultural BMP Implementation

There are several sources of funding for BMP installation, yet very few for individual landowners. Currently, state and federal sources provide the majority of the funding for BMP implementation on private agricultural land within the Lower Boise River Watershed. Some landowners themselves, however, also provide a significant source of funding through the voluntary implementation of BMPs using their own time and money. Through USDA-NRCS, EPA, and Idaho Soil Conservation Commission (ISCC) programs, funding is available to install BMPs on a larger scale within priority watersheds in order to help meet water quality objectives. The available sources of funding for all forms of agricultural BMP implementation are listed below. It is recommended that individual landowners or stakeholders contact the designated agencies for more information on particular programs.

- Resource Conservation and Rangeland Development Program Grants and/or Loans (RCRDP). State program Finances projects for improving rangeland and riparian areas.

  Contact: Idaho Soil Conservation Commission
  PO Box 790
  Boise, ID 83701-0790
  208-332-8650 phone

- Idaho Water Resource Board Financial Programs. State program
  The program assists local governments, water and homeowner associations, nonprofit water companies, canal companies, and irrigation districts with funding for water system infrastructure projects.

  Contact: Idaho Water Resource Board
  1301 N. Orchard St.
  Boise, ID 83706
  208-327-5432 phone

- Water Quality Program for Agriculture (WQPA). State program
  The program is available to Conservation Districts in Idaho. The Districts develop grant applications for addressing non-point source agricultural pollution from high priority watersheds.

  Contacts: Idaho Soil Conservation Commission
  PO Box 790
  Boise, ID 83701-0790
  208-332-8650 phone

  Ada Soil and Water Conservation District
  132 SW 5th Ave.
  Meridian, ID 83642
  208-888-1890 phone

  Canyon Soil Conservation District
  2208 E. Chicago, Suite A
  Caldwell, ID 83605
  208-454-8684 ext. 126 phone

- 319 Non-Point Source Pollution Control Program. State program
  EPA grants administered through the State. Funds are used to prevent nonpoint source pollution.

  Contact: Idaho Department of Environmental Quality
  Watershed Management Bureau
  1410 N. Hilton
  Boise, ID 83706-9208
  208-373-0502 phone

- Habitat Improvement Program (HIP). State program
  Improves waterfowl and upland bird habitat with emphasis on nesting habitat, wetland improvements, shelter, and food.

  Contact: Idaho Department of Fish and Game
  600 S. Walnut
  Boise, ID 83712
  208-334-3700 phone

- Conservation Reserve Program (CRP). Federal program
  Program designed to reduce soil erosion by encouraging landowners to convert highly erodible cropland to permanent vegetative cover.

  Contacts: Natural Resources Conservation Service, Ada County
  132 SW 5th Ave.
  Meridian, ID 83642
  208-888-1890 phone

  Natural Resources Conservation Service, Canyon County
  2208 E. Chicago, Suite A
  Caldwell, ID 83605
  208-454-8684 ext. 126 phone

- Environmental Quality Incentives Program (EQIP). Federal program
  Provide assistance and funding to eligible landowners to address resource concerns on agricultural land.

  Contacts: Natural Resources Conservation Service, Ada County
  132 SW 5th Ave.
  Meridian, ID 83642
  208-888-1890 phone

  Natural Resources Conservation Service, Canyon County
  2208 E. Chicago, Suite A
  Caldwell, ID 83605
  208-454-8684 ext. 126 phone

- Wetland Reserve Program (WRP). Federal program
  Program to restore and protect wetlands on private land. A voluntary opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal agricultural land.

  Contacts: Natural Resources Conservation Service, Ada County
  132 SW 5th Ave.
  Meridian, ID 83642
  208-888-1890 phone

  Natural Resources Conservation Service, Canyon County
  2208 E. Chicago, Suite A
  Caldwell, ID 83605
  208-454-8684 ext. 126 phone

- Wildlife Habitat Incentives Program (WHIP). Federal program
  Program to provide landowners with financial incentives to develop and improve wildlife habitat on private lands.

  Contacts: Natural Resources Conservation Service, Ada County
  132 SW 5th Ave.
  Meridian, ID 83642
  208-888-1890 phone

  Natural Resources Conservation Service, Canyon County
  2208 E. Chicago, Suite A
  Caldwell, ID 83605
  208-454-8684 ext. 126 phone

- Partners for Wildlife (Partners). Federal program
  Program to restore and enhance fish and wildlife habitat on private lands through partnerships.

  Contact: USDI Fish and Wildlife Service
  1387 S. Vinnell Way
  Boise, ID 83709
  208-378-5243 phone

- 8100-Range Improvement Fund. Federal program
  Funds may be used for improving rangeland management conditions, and the implementation of BMPs. The money must be used to benefit management of public lands.

  Contact: Bureau of Land Management
  1387 S. Vinnell Way
  Boise, ID 83709
  208-373-4000 phone

- Challenge-Cost Share Funds. Federal program
  Appropriated fund that are made available for projects that must directly benefit fish and wildlife on BLM administered lands.

  Contact: Bureau of Land Management
  1387 S. Vinnell Way
  Boise, ID 83709
  208-373-4000 phone

- MARSH Projects. Ducks Unlimited program
  Ducks Unlimited is committed to wetland habitat development in Idaho. Projects are funded on a cost-share basis with cooperators.

  Contact: Ducks Unlimited Inc.
  One Waterfowl Way
  Memphis, TN 38120
  901-758-3825 phone

- Pheasants Forever (PF). Pheasants Forever program
  Funding provided to establish or maintain wildlife habitat. Must restore or enhance upland game bird habitat.

  Contact: Dave Lockwood
  Boise, ID
  208-378-4371 phone

***After Water Quality BMPs have been installed and certified by qualified personnel, landowners can apply for Idaho State Tax Credit***

- Idaho Riparian Tax Credit (RTC). State program
  Established to enhance water quality and habitat for endangered species. Landowners could receive a one year tax credit for helping the state meet the requirements of the Clean Water Act.

  Contact: Idaho Soil Conservation Commission
  PO Box 790
  Boise, ID 83701-0790
  208-332-8650 phone

# APPENDIX 3.

# Mason Creek Subwatershed Agricultural TMDL Implementation Plan

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# 1.0 Executive Summary

**Subwatershed:** Mason Creek Subwatershed
Total Scope: 49,075 acres
Agricultural Scope: 23,493 acres
Agricultural Critical Acres Scope: 20,955 acres

**Location:** South side of the Boise River, located between Caldwell and Nampa in Canyon and Ada Counties

**Priority Subwatershed:** High

**Cooperating Agricultural Agencies:** Canyon Soil Conservation District (CSCD)
Ada Soil and Water Conservation District (ASWCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

**Agricultural Land Uses:**

Mason Creek Agricultural Land Uses

| Landuse | Acres | Percent of Mason Creek Subwatershed |
|---|---|---|
| Sprinkler Irrigated Cropland, and Pasture | 2381 | 5% |
| Surface Irrigated Cropland | 19,449 | 40% |
| Surface Irrigated Pasture | 1,195 | 2% |
| Non-Irrigated Pasture | 157 | .3% |
| CAFO/AFO | 311 | .6% |
| | | |
| **TOTAL** | **23,493** | **48%** |

**Major Agricultural Products:** Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops, vegetables, livestock, and dairy products.

**TMDL Objectives:** The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouth of the Mason Creek .The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98%.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 "SR-HC TMDL") will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

**Implementation Plan:** This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Mason Creek Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the five different agricultural land use types (Treatment Units) within the Mason Creek Subwatershed. Estimated costs to install BMPs on lands identified for treatment are: Alternative 1 - $19,696,950; Alternative 2 - $12,662,750; and Alternative 3 - $6,961,000. These cost estimates do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

# 2.0 Introduction

The Mason Creek Subwatershed encompasses 49,075 acres. Mason Creek (as it is commonly referred to) originates near the New York canal in Ada County and flows northwest, west toward the Lower Boise River. Parts of Caldwell, Nampa, and Meridian are located within the Mason Creek Subwatershed boundary.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from Mason Creek. Within this plan the following elements are identified: pollutant problems within Mason Creek, sources of those pollutants, critical acres contributing pollutants to the drain, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on water quality.

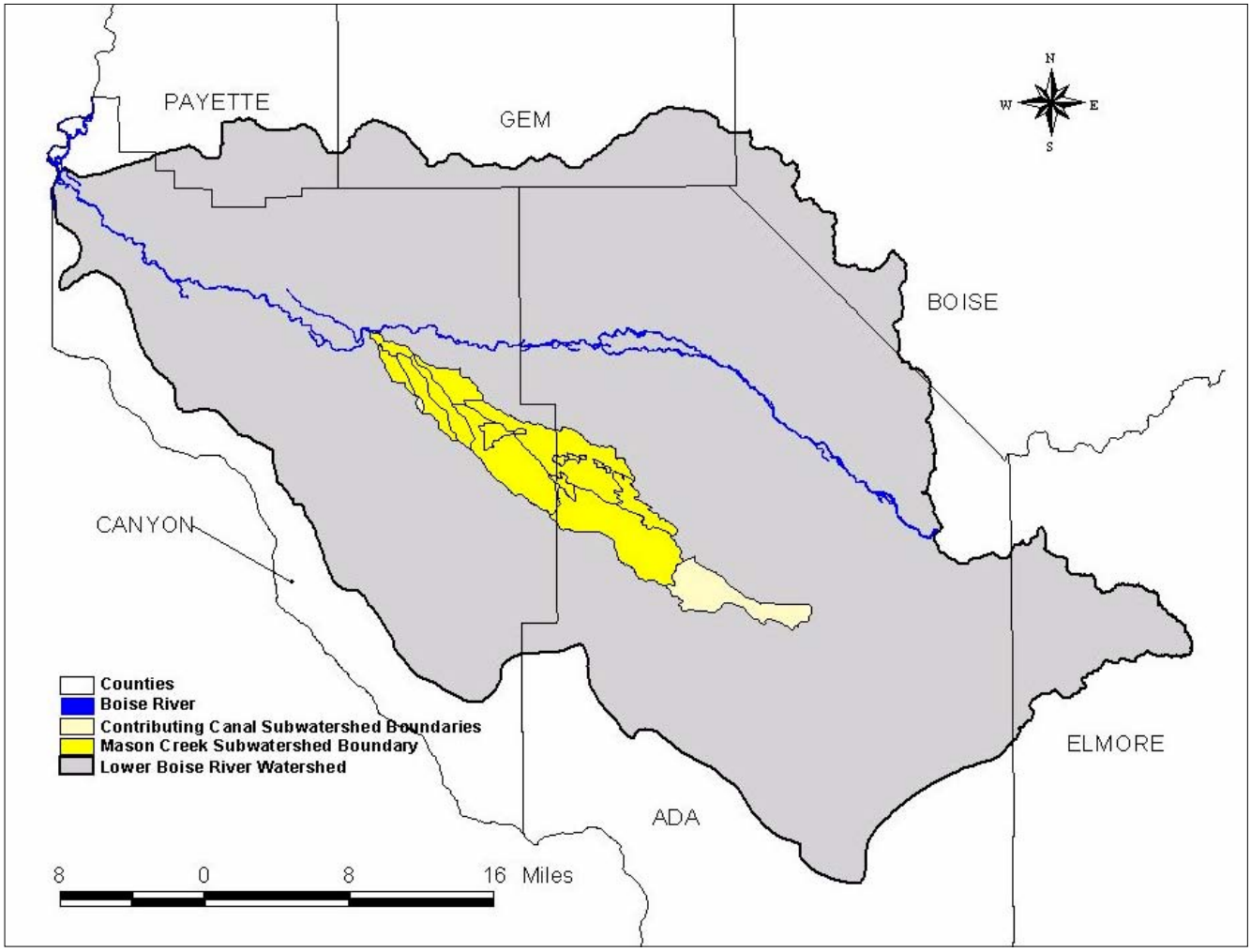
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Mason Creek Subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements at the mouth of Mason Creek. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Mason Creek Subwatershed contact the Canyon Soil Conservation District (Canyon SCD), Ada Soil and Water Conservation District (ASWCD), the Natural Resources Conservation Service (NRCS), or the Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency as well as irrigation scheduling and soil moisture monitoring methods.**

**Figure 1. Mason Creek Subwatershed Location**




## 3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Mason Creek Subwatershed.

### 3.1 Soils

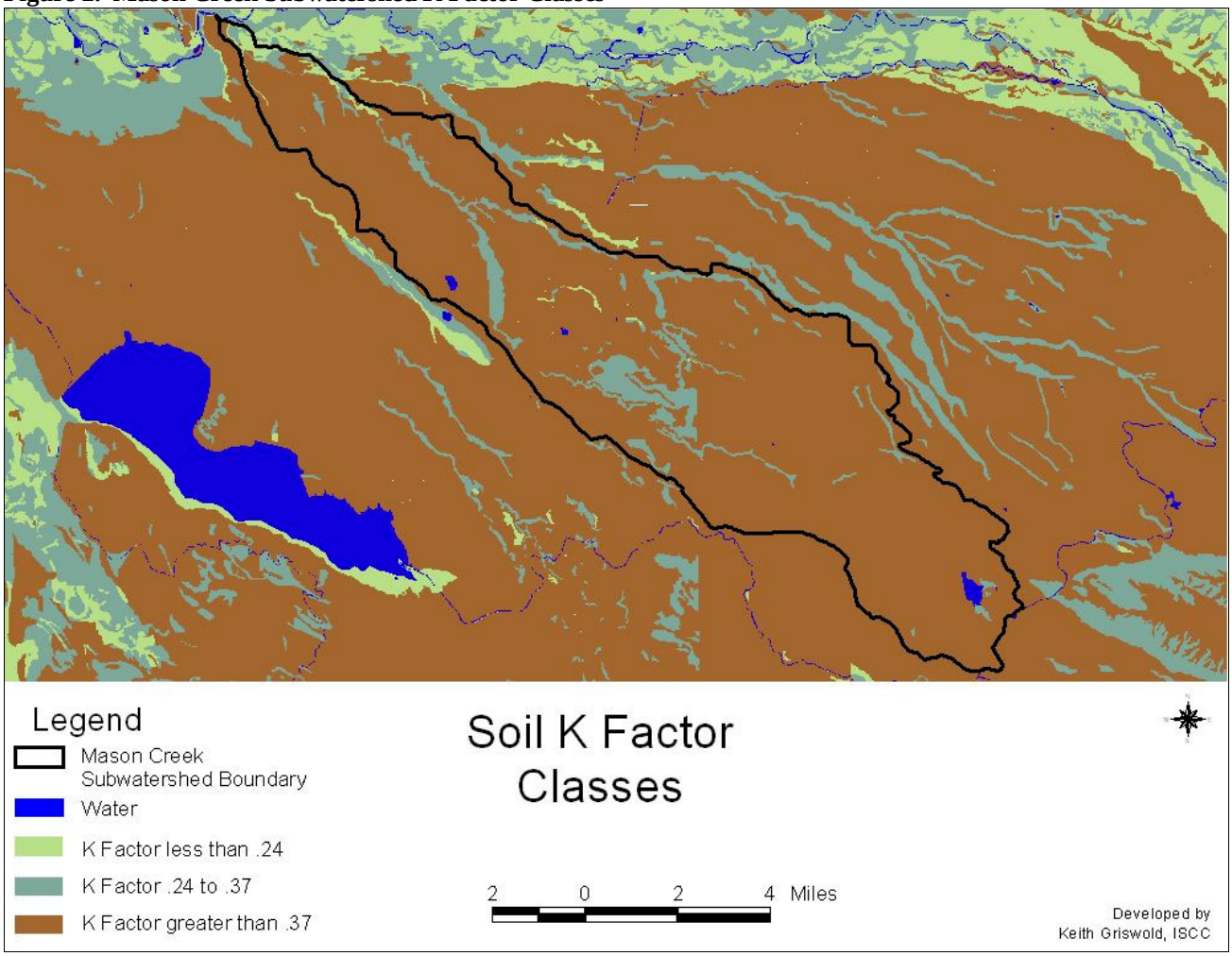
There are three major soil associations within Mason Creek Subwatershed (U. S. Department of the Agriculture, 1972).

- *Power-Purdam:* Well drained silt loams on nearly level to moderately sloping alluvial fan terraces
- *Colthorp-Elijah-Purdam:* Well drained soils with duripans on intermediate alluvial fan terraces
- *Tenmile-Chilcott-Kunaton:* Well drained soils on basalt plains and dissected alluvial fan terraces

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility.

Figure 2. Shows the "K-Factor" of the soils within Mason Creek. "K-Factor" rating explains the erodibility of a soil. The higher the number, the greater the erosion potential.

**Figure 2. Mason Creek Subwatershed K Factor Classes**



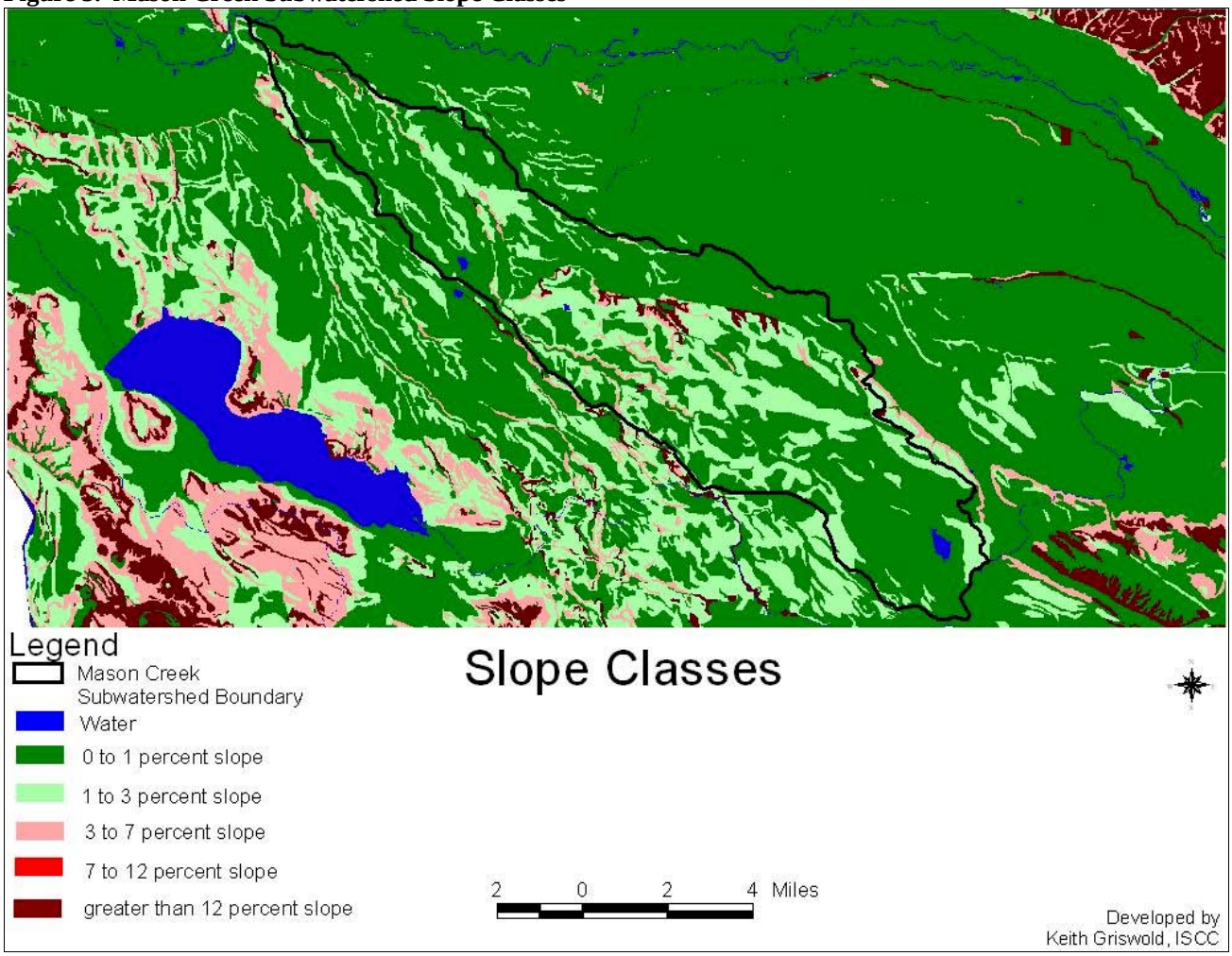

## 3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature in July for Caldwell, Idaho is 92 degrees Fahrenheit, while the average daily minimum temperature in January is 20 degrees Fahrenheit. Temperatures as low as -46 degrees Fahrenheit and as warm as 112 degrees Fahrenheit have been recorded.

Long term average annual precipitation for Caldwell is 10.48 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley. Extended periods of no rain can occur frequently during the growing season.

The average consecutive frost-free period (above 32 degrees) is 143 days, based on the Caldwell long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 125 days for this area. The average last frost (32 degrees) in the spring is around May 6 and the average first frost (32 degrees) in the fall is around September 27 (U. S. Department of the Agriculture, 1972).

**Figure 3. Mason Creek Subwatershed Slope Classes**




## 3.3 Surface Hydrology

The Mason Creek Subwatershed ranges in elevation from approximately 2,780 feet at the headwaters to 2,360 feet at the Boise River.

Pre-existing ephemeral channels have been modified over time by channelization and bank stabilization prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There are currently 13 major canals or laterals that supply water to cropland in Mason Creek Subwatershed and 4 major drains that receive tailwater from the croplands and pastures or drain ground water (Table 1). Agricultural wells supply some water to the upper portions of the subwatershed.

Phyllis Canal was one of the earliest canals constructed in Mason Creek Subwatershed. It was completed in 1891with its diversion just across the Boise River from the town of Eagle, in Ada County. The Phyllis canal flows a total length of 35 miles to Dixie Drain Subwatershed through Mason Creek Subwatershed.

**Figure 4. Surface Hydrology**

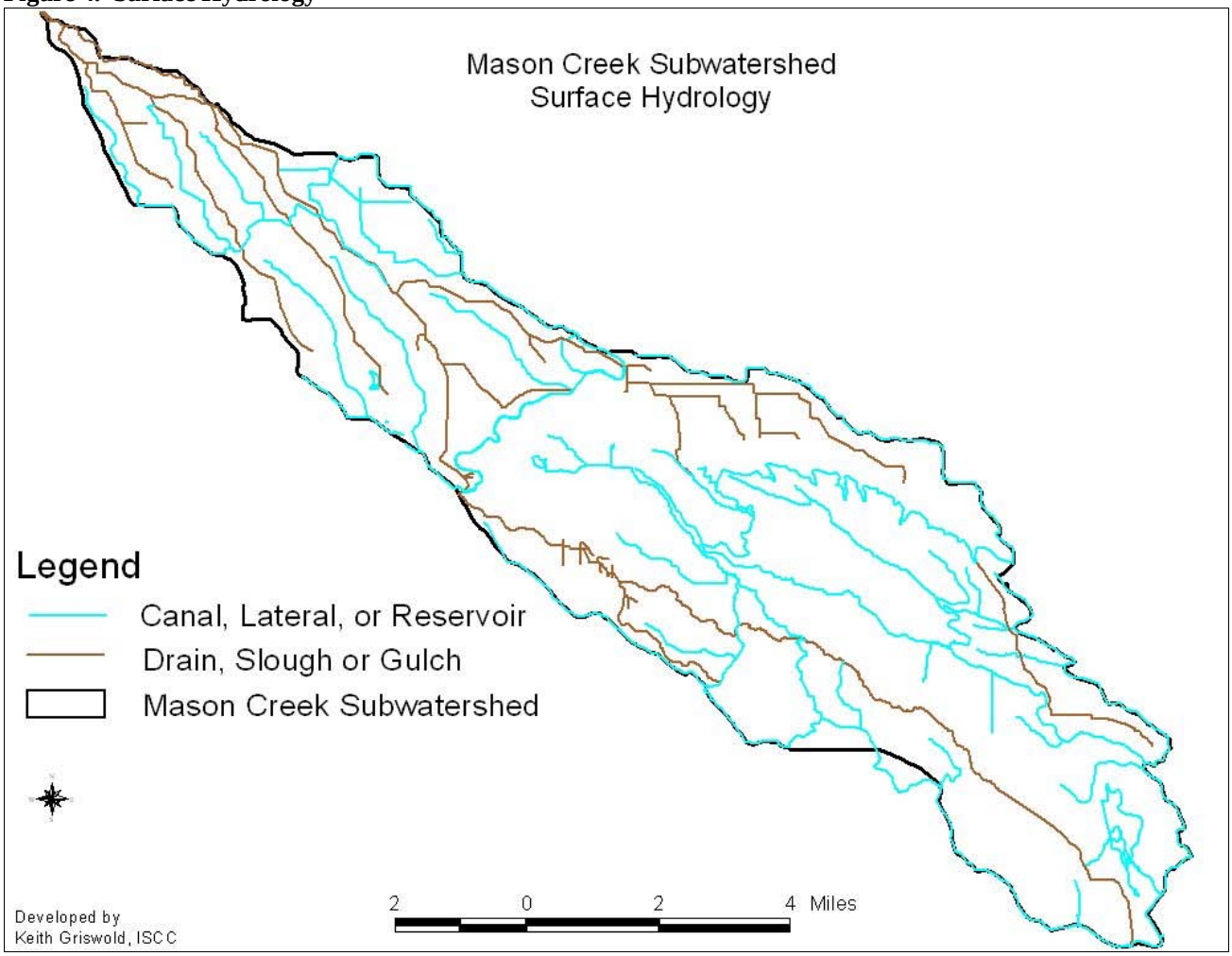
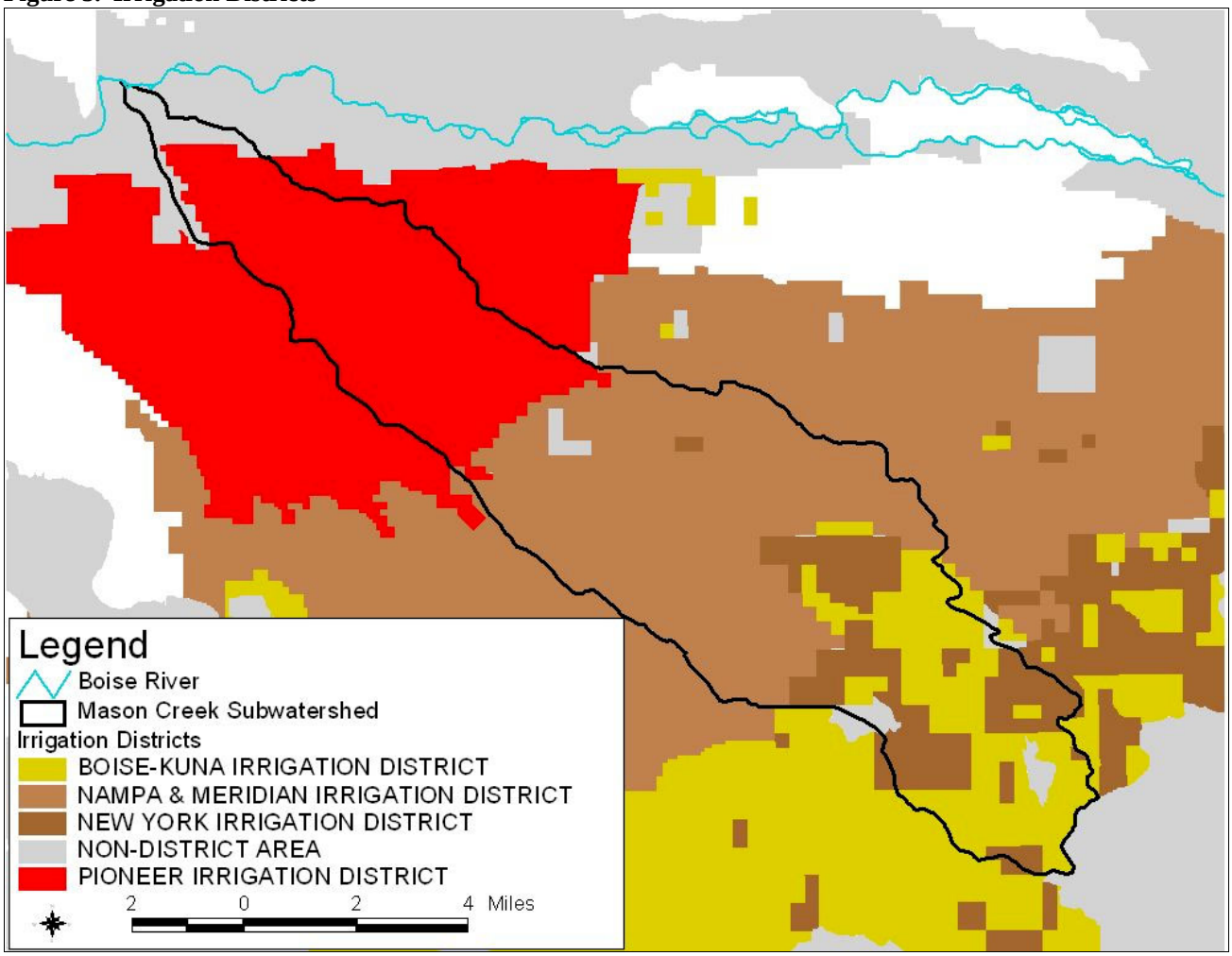



**Table 1. Surface Waterbodies in Mason Creek Subwatershed**

| Canal, Lateral or Reservoir | Drain, Slough or Gulch |
|---|---|
| Canyon Hill Lateral | "A" Drain |
| Miller Lateral | Noble Drain |
| Middle Lateral | Solomon Drain |
| East Lateral | Mason Creek |
| Phyllis Canal | Purdum Gulch |
| Calkins Lateral | |
| Ridenbaugh Canal | |
| Rawson Canal | |
| Farr Lateral | |
| Mason Creek Feeder | |
| Kuna Canal | |
| New York Canal | |
| Hubbard Reservoir | |

**Figure 5. Irrigation Districts**




## 3.4 Ground Water Hydrology

A large, shallow, aquifer (< 200 feet) is recharged annually by seepage from surface irrigation and conveyance of water through earthen canals. A deep aquifer exists under Mason Creek Subwatershed. The Boise Valley deep aquifer underlies the subwatershed.

## 3.5 Demographics and Economics

Demographic and Economic section is for all of Canyon County.

- Population of Canyon County increased from 90,076 in 1990 to 116,675 in 1997.
- Population of Ada County increased from 205,775 in 1990 to 267,168 in 1997.
- Agricultural lands around Nampa, Caldwell and Meridian are increasingly being developed for residential housing and subdivisions.
- Types of irrigated crops include, but are not limited to: seed corn, alfalfa and clover for seed and hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops and vegetables.

**Table 2. 2001 Agricultural Data for Mason Creek Subwatershed**

| Inventory: Farms & Cropland | Mason Creek Subwatershed |
|---|---|
| Total # of Farms | 450 |
| Total Acres of Farms | 23,493 |
| Average Farm Size (acres) | 52.2 |
| Total Acres in Crops | 23,182 |

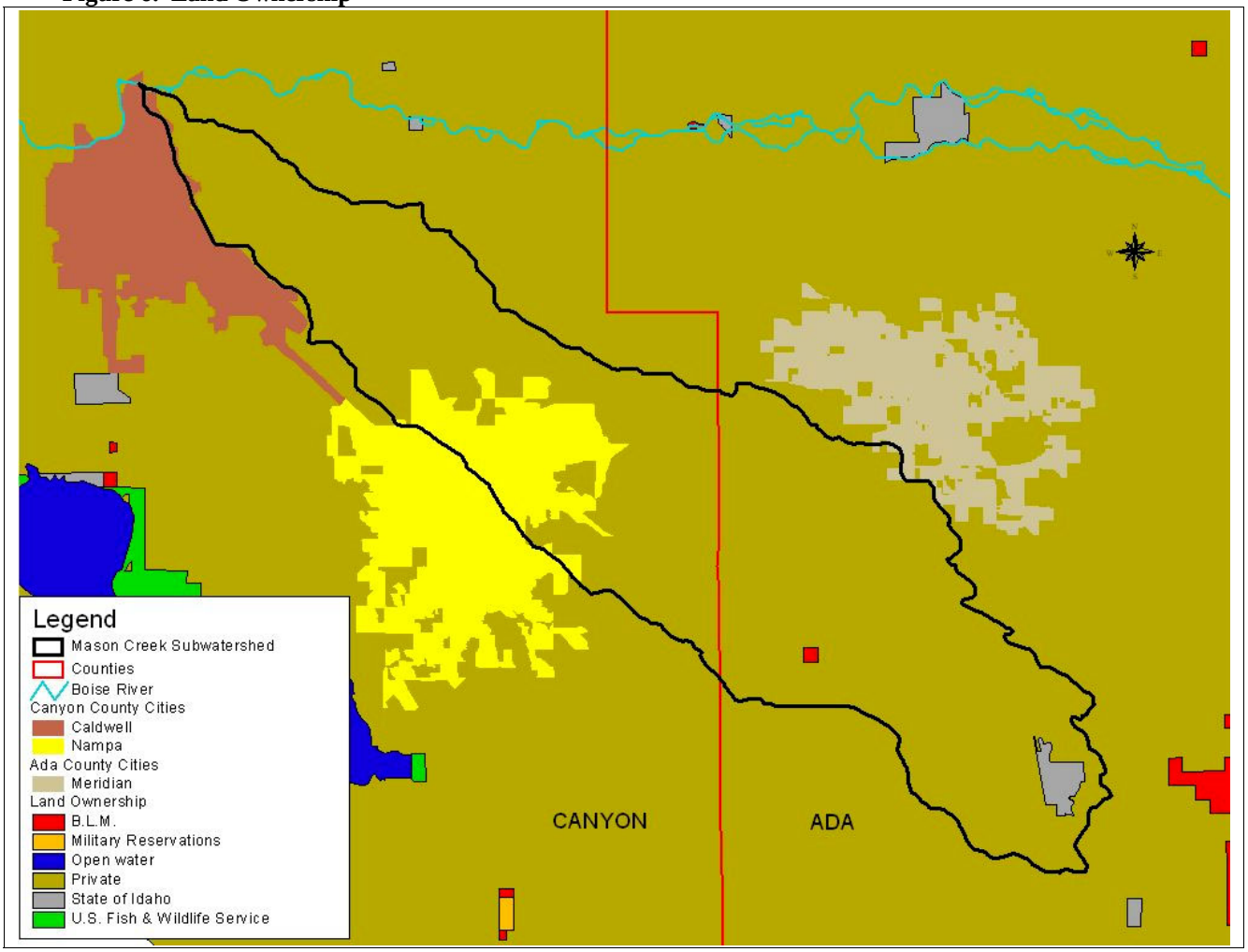
(Griswold, 2001) "Farm"--- A tract of land according to Farm Service Agency delineation, a minimum 20 acres.

## 3.6 Land Ownership and Land Use

The items listed below are highlights of the Land Ownership and Land Use section in the Lower Boise River Implementation Plan.

- Mason Creek Subwatershed is 95% privately owned (Figure 6).
- Irrigated crops are the largest agricultural use

**Figure 6. Land Ownership**



# 4.0 Treatment Units

This section presents information on the individual agricultural land uses within the watershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for solving the identified problems.

The descriptions in this section are intended to provide a general overview of the TUs.

- Treatment Unit #1 – Sprinkler Irrigated Cropland, and Pasture 2,381 acres

  This unit occurs most at the upper end of the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality because of high irrigation efficiencies resulting in insignificant amount of runoff.

- Treatment Unit #2 – Surface Irrigated Cropland, 19,449 acres

  Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- Treatment Unit #3 – Surface Irrigated Pasture 1,195 acres

  Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures enters the Lower Boise River via Mason Creek.

- Treatment Unit #4 – Non-Irrigated Pasture 157 acres

  Non-Irrigated pasture is located throughout the watershed. Typical vegetative growth is Cattail, Russian olive, Reed Canary Grass, and invasive plant species. Bank erosion and direct bacterial impacts occur when livestock enter the creeks for water and shade.

- Treatment Unit #5-- CAFO/AFO 311 acres (72 units)

  Feedlots are small and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. See Table 5. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

**Table 3. Acres of TUs within Mason Creek Subwatershed.**

| Treatment Units | Acres |
|---|---|
| Treatment Unit 1 | 2,381 |
| Treatment Unit 2 | 19,449 |
| Treatment Unit 3 | 1,195 |
| Treatment Unit 4 | 157 |
| Treatment Unit 5 | 311 |
| | |
| TOTAL | 23,493 |

(Griswold, 2001)

**Figure 7. Treatment Units**

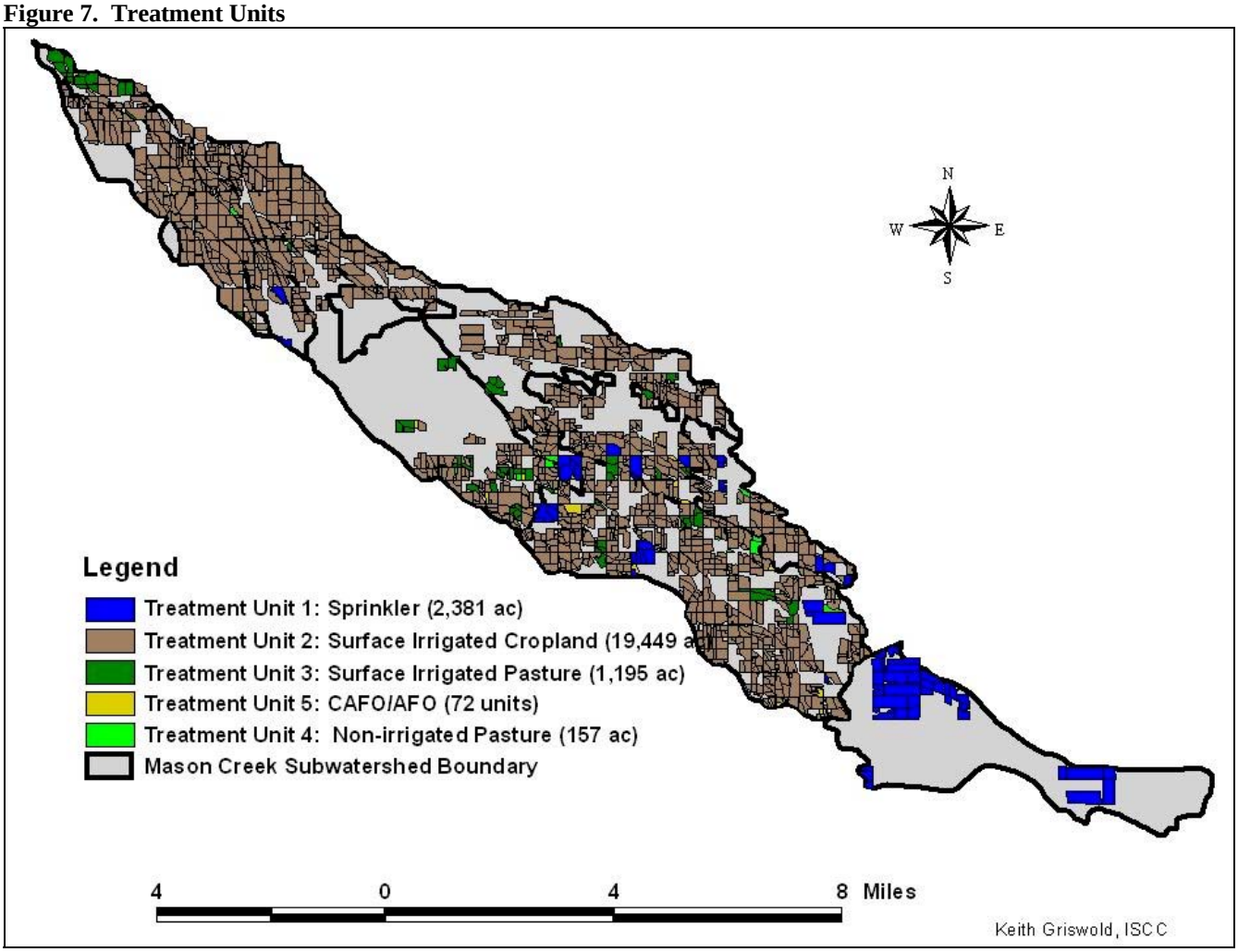
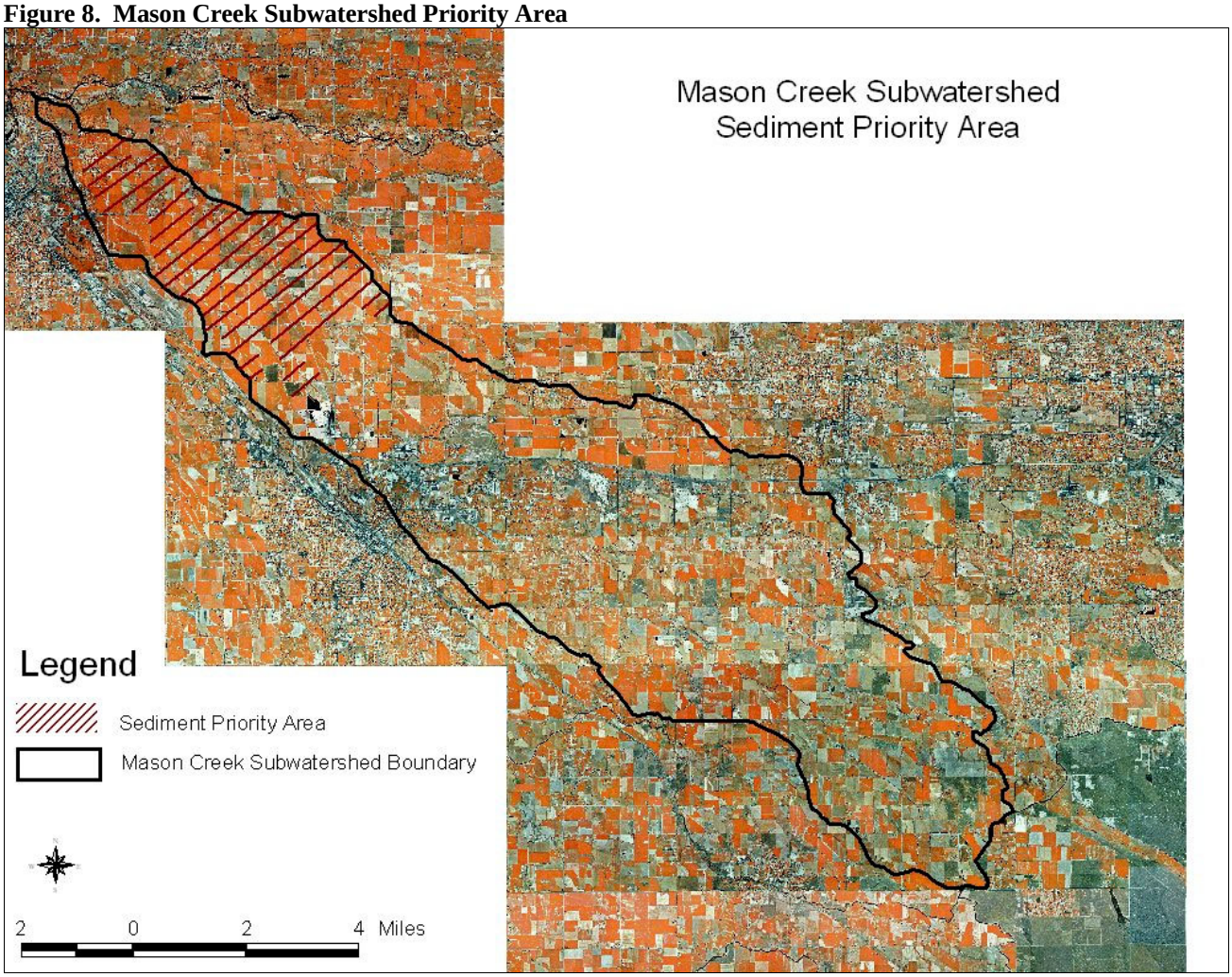


**Figure 8. Mason Creek Subwatershed Priority Area**




## 5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, including Mason Creek.

The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards change. After the TMDL targets and load reductions were established for sediment and bacteria, additional, more frequent sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been performed. This new information and water quality standards change indicate that revision of the TMDL sediment and bacteria targets is appropriate, and will continue to be evaluated with additional data as it is collected.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" in nutrients policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion.
- Lack of adequate vegetation adjacent to waterways necessary for removing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria.

## 5.1 Recreational Uses – Bacteria Objectives

The TMDL establishes a 98% bacteria reduction objective for the Mason Creek to meet Idaho's fecal coliform criteria for protection of recreational uses (Table 4).

**Table 4. Reductions Required to Meet Bacteria Load Allocation**

| Name | Primary Geo-Mean CFU/100 ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-Mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| **Mason Creek** | **1407** | **50** | **97%** | **515** | **200** | **61%** |

(portion of Table 22 from, page 71 Lower Boise River TMDL Subbasin Assessment)

Two developments affect this reduction objective and agricultural BMP implemention required to meet it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, DNA analysis of bacteria samples from various locations in the Lower Boise River watershed show that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, raccoon) that are beyond human control prevent attainment of the TMDL's bacteria targets and load reductions. It is likely that inputs of bacteria from cows can be reduced by simply limiting their access to the Boise River and tributary water sources.

**Table 5. Description of Confined Animal Feeding Operations in Mason Creek Subwatershed**

| Type of Confined Animal Feeding Operation (CAFO) | Number of CAFO's in Mason Creek Subwatershed |
|---|---|
| Dairy Cattle | 22 |
| Beef Cattle | 31 |
| Replacement Dairy Cattle | 5 |
| Horse | 11 |
| Sheep/Goats | 1 |
| Buffalo/Elk | 2 |
| **Total** | **72** |

(Griswold, 2001)

## 5.2 Aquatic Life Uses – Sediment Objectives

The approach is to seek voluntary implementation of best management practices (BMPs) on agricultural lands to reduce Total Suspended Sediment loading rate by 37%.

**Table 6. 1995 TSS loads and allocations for Mason Creek**

| Tributary | 1995 Loads | % of Total River Load | TSS Load Goals | % of Total Goal |
|---|---|---|---|---|
| Mason Creek | 34.1 | 22% | 21.5 | 14% |

(IDEQ, 1998)

## 5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

**Table 7. Proposed No Net Increase (NNI) Phosphorous Load**

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| **Mason Creek** | **340** | **62539** |

(IDEQ, 1998)

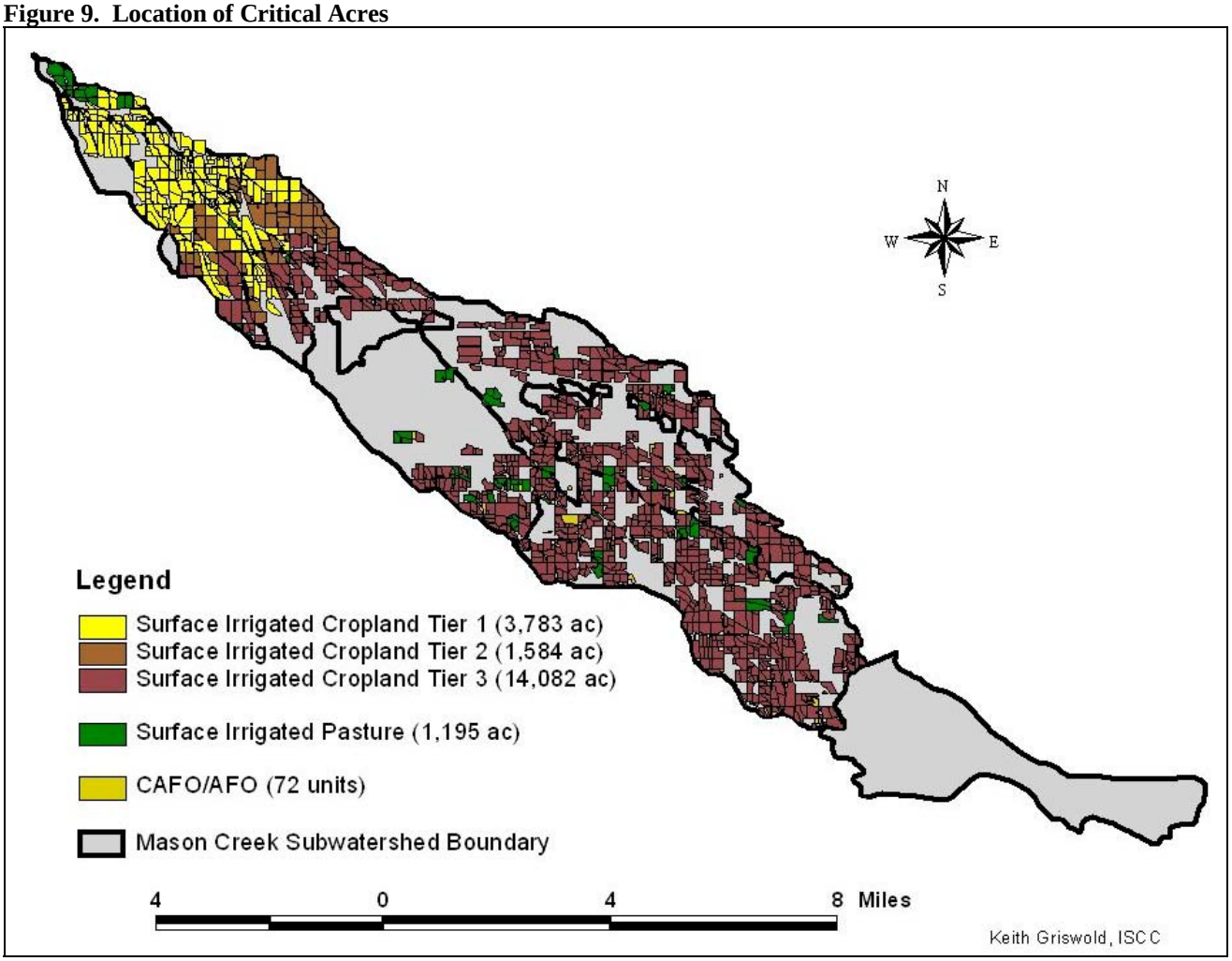
# 6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Mason Creek. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Mason Creek, which affects the Lower Boise River.

Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural lands that drain directly into Mason Creek will be a Tier 1, high priority for treatment because these lands have the most immediate impact on Lower Boise River water quality. Drainage water from Tier 2 lands is reused once on Tier 1 lands before discharging to the Mason Creek, and are given a medium priority for treatment. Tier 1 & 2 acres are the Critical Acres within Treatment Unit 2. Drainage water from Tier 3 lands is reused multiple times on Tier 1 and Tier 2 lands before discharging to the Mason Creek, and are given a low priority for treatment.

**Figure 9. Location of Critical Acres**



**Critical Acres within each Treatment Unit:**

| | |
|---|---|
| Treatment Unit 1 | No critical acres within this unit. |
| Treatment Unit 2 | 3,783 acres of Tier 1 surface irrigated cropland<br>1,584 acres of Tier 2 surface irrigated cropland<br>14,082 acres of Tier 3 surface irrigated cropland |
| Treatment Unit 3 | 1,195 acres of surface irrigated pasture |
| Treatment Unit 4 | No critical acres within this unit |
| Treatment Unit 5 | 72 units of CAFO/AFO |

# 7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited, to the following:

**Table 8. Treatment Unit 2---Surface Irrigated Cropland**

| | |
|---|---|
| Agro-Tillage | Conservation Cropping Sequence |
| Conservation Tillage | Cover and Green Manure Crop |
| Filter Strips | Grassed Waterway |
| Surge Irrigation System | Sprinkler Irrigation System |
| Tailwater Recovery System | Irrigation Water Management Systems |
| Straw Mulching | Nutrient Management |
| Pest Management | Sediment Basin |
| Underground Outlet | Chiseling and Subsoiling |
| Waste Utilization | Channel Vegetation |
| Drip Irrigation System | PAM |
| Irrigation Water Conveyance | |

**Table 9. Treatment Unit 3---Surface Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Waste Utilization |
| Spring water development | Waste Storage System |
| Irrigation systems | Nutrient Management |
| Pasture and Hayland Planting | Planned Grazing System |
| Livestock Watering Facility | Pasture and Hayland Management |

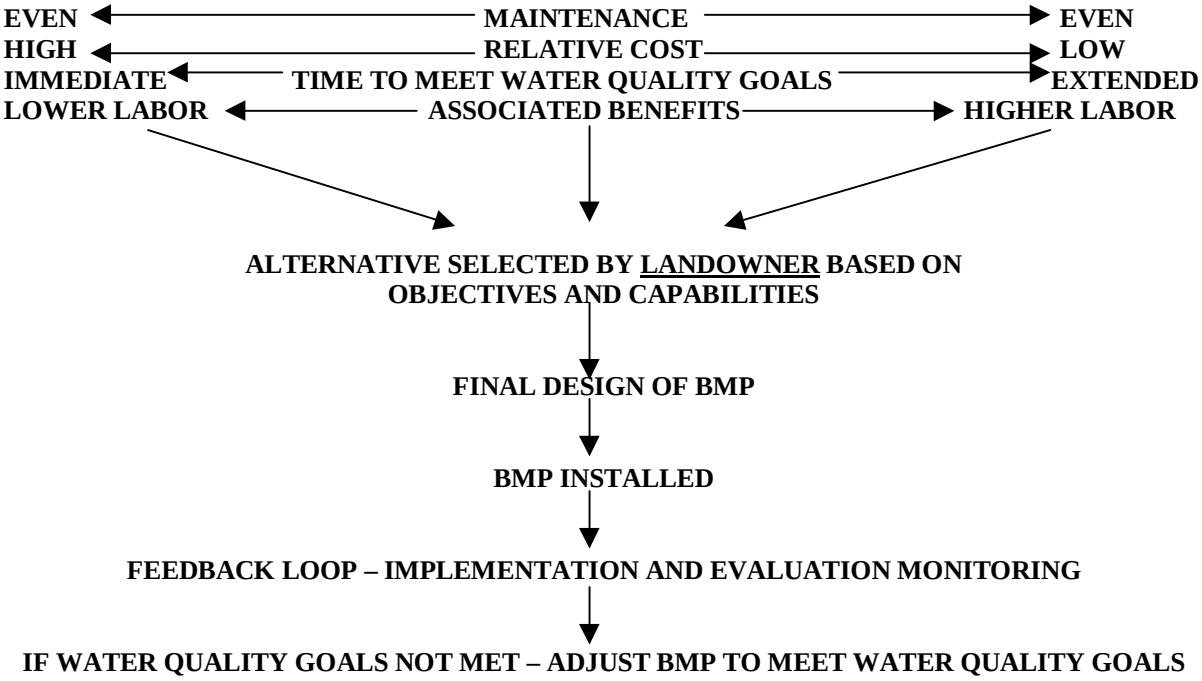
**Table 10. Treatment Unit 5---CAFO/AFO**

| | |
|---|---|
| Waste Management System | Heavy use area protection |
| Filter strips | Livestock Watering Facility |
| Nutrient Management | Fencing |

## 7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($800/ acre) | SITE SPECIFIC BMP Alternative #2 ($500/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Irrigation Water Mgt. | Irrigation Water Mgt. | Irrigation Water Mgt. |
| Sprinkler Irrigation System | Land Leveling | Concrete Ditch |
| Nutrient Mgt. | Surface Irrigation System | Filter Strip |
| Conservation Crop Rotation | Gated Pipe | PAM |
| | Tail Water Recovery System | Sediment Basin |
| | Nutrient Mgt. | Nutrient Mgt. |
| | Conservation Crop Rotation | Conservation Crop Rotation |
| | Conservation Tillage | Conservation Tillage |




(APAP, 1991)

## 7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($450/ acre) | SITE SPECIFIC BMP Alternative #2 ($350/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Livestock Watering Facility |
| Heavy Use Area Protection | Livestock Watering Facility | Irrigation Water Mgt. |
| Livestock Watering Facility | Irrigation Water Mgt. | Field Border Irrigation System |
| Irrigation Water Mgt. | Field Border Irrigation System | |
| Field Border Irrigation System | | |
| Gated Pipe | | |

## 7.3 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($50,000/ each) | SITE SPECIFIC BMP Alternative #2 ($35,000/ each) | SITE SPECIFIC BMP Alternative #3 ($25,000/ each) |
|---|---|---|
| Nutrient Mgt. | Waste Mgt. System | Waste Mgt. System |
| Heavy Use Area Protection | Nutrient Mgt. | Nutrient Mgt. |
| Livestock Watering Facility | Livestock Watering Facility | Filter strip |
| Filter strips | Filter strips | Heavy Use Area Protection |
| Waste Mgt. System | Heavy Use Area Protection | |
| Dike | | |

## 7.4 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

## 7.5 Feedback Loop

The feedback loop a process to evaluation and refinement of BMPs. The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved, the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards. (APAP, 1991)

# 8.0 Program of Implementation

Canyon Soil Conservation District and Ada Soil and Water Conservation District have selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. Significant contribution by agricultural land users in the Mason Creek Subwatershed toward achieving the TMDL's objectives of protecting aquatic life and recreational uses of the Lower Boise River by reducing the discharge of sediments and bacteria from the Mason Creek to the Snake River.

## 8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC), Ada SWCD and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. NRCS and ISCC will assist Ada SWCD and Canyon SCD with certification of installed BMPs, filing payment applications, completion of annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

**Table 11. Estimated BMP Cost Summary for Treatment Unit 2, Tier 1 (Surface Irrigated Cropland—3,783 acres).**

| ALTERNATIVE | ACRES | TOTAL COSTS |
|---|---|---|
| Alternative 1 $800/AC | 3783 | $ 3,026,400 |
| Alternative 2 $500/AC | 3783 | $ 1,891,500 |
| Alternative 3 $250/AC | 3783 | $ 945,750 |

**Table 12. Estimated BMP Cost Summary for Treatment Unit 2, Tier 2 (Surface Irrigated Cropland—1,584 acres).**

| ALTERNATIVE | ACRES | TOTAL COSTS |
|---|---|---|
| Alternative 1 $800/AC | 1584 | $ 1,267,200 |
| Alternative 2 $500/AC | 1584 | $ 792,000 |
| Alternative 3 $250/AC | 1584 | $ 396,000 |

**Table 13. Estimated BMP Cost Summary for Treatment Unit 2, Tier 3 (Surface Irrigated Cropland—14,082 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 14,082 | $ 11,265,600 |
| Alternative 2 | $500/AC | 14,082 | $ 7,041,000 |
| Alternative 3 | $250/AC | 14,082 | $ 3,520,500 |

**Table 14. Estimated BMP Cost Summary for Treatment Unit 3 (Surface Irrigated Pasture 1,195 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $450/AC | 1195 | $ 537,750 |
| Alternative 2 | $350/AC | 1195 | $ 418,250 |
| Alternative 3 | $250/AC | 1195 | $ 298,750 |

**Table 15. Estimated BMP Cost Summary for Treatment Unit 5 (CAFO/AFO 72 Units).**

| ALTERNATIVE | | UNITS | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $50,000/each | 72 | $ 3,600,000 |
| Alternative 2 | $35,000/each | 72 | $ 2,520,000 |
| Alternative 3 | $25,000/each | 72 | $ 1,800,000 |

Canyon SCD applied for Environmental Quality Incentives Program (EQIP) funding in 1999 for Mason Creek Subwatershed administered by the Natural Resources Conservation Service. The project will treat 3,600 acres of agricultural land throughout Mason Creek watershed. The project will run from 1999 through 2004.

## 8.2 Operation, Maintenance, and Replacement

Participants will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Technical assistance for BMPs will be provided by NRCS and ISCC.

Inspections of installed BMPs will be made on an annual basis by Ada SWCD, Canyon SCD, NRCS, ISCC, and the participant during the life of the contract. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant. By accomplishing this objective, it is intended that the BMPs will become a part of the participant's farming operation and will continue to be operated and maintained after the contract expires.

## 8.3 Water Quality Monitoring

The ISDA is collected water quality samples in Mason Creek Subwatershed for the year 1998. Most samples were collected on a bimonthly basis throughout the irrigation season (April - October) and on a monthly basis throughout the rest of the year (winter). Data parameters measured thus far have included DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids) pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli. U.S. Geological Survey (USGS) has been monitoring the major tributaries to the river at their mouths since 1993 and will continue until April 2000. Sampling frequency has been upgraded to bimonthly for the subwatershed starting in April of 1999, then sampled monthly through the winter period.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

# 9.0 References

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Lower Boise River TMDL, 1998. *Subbasin Assessment, Total Maximum Daily Loads*

Idaho Department of Health & Welfare Division of Environmental Quality and Idaho Department of Lands Soil Conservation Commission 1991. *Idaho Agricultural Pollution Abatement Plan (APAP).*

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# APPENDIX 4.

# Fifteenmile Creek (Fivemile & Tenmile) Subwatershed

# Agricultural TMDL Implementation Plan

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# 1.0 Executive Summary

**Subwatershed:** Fifteenmile Creek Subwatershed
Total Scope: 45,250 acres (includes contributing canal acreage)
Agricultural Scope: 12,391 acres
Agricultural Critical Acres Scope: 11,959 acres

**Location:** South side of the Boise River, located southwest of Boise, within the city of Meridian, and north of Nampa in both Ada and Canyon counties

**Elevation:** 2,780 feet at the New York Canal to 2,420 feet at the Boise River.

**Priority Subwatershed:** High

**Cooperating Agricultural Agencies:** Ada Soil & Water Conservation District (ASWCD)
Canyon Soil Conservation District (CSCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

**Agricultural Land Uses:**

| Landuse | Acres | Percent of Fifteenmile Creek Subwatershed |
|---|---|---|
| Surface Irrigated Cropland | 10,674 | 24% |
| Surface Irrigated Pasture | 1285 | 3% |
| Sprinkler Irrigated Cropland and Pasture | 432 | 1% |
| CAFO/AFO | N/A | N/A |
| | | |
| **TOTAL** | **12,391** | **28%** |

**Major Agricultural Products:** Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, specialty seed crops, vegetables, livestock, and dairy products.

**TMDL Objectives:** The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouth of the Fifteenmile Creek. The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98% for primary contact recreation.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 "SR-HC TMDL") will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

**Implementation Plan:** This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Fifteenmile Creek Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the four different agricultural land use types (Treatment Units) within the Fifteenmile Creek Subwatershed. Estimated costs to install BMPs on lands identified for treatment are: Alternative 1 - $9,867,450; Alternative 2 - $6,311,750; and Alternative 3 - $3,364,750. These cost estimates do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

# 2.0 Introduction

The Fifteenmile Creek Subwatershed encompasses 45,250 acres. It includes the lower portions of both Fivemile and Tenmile Creek from the New York Canal to their confluence at Fifteenmile Creek in addition to various portions of contributing canal subwatersheds. Both creeks flow in a northwesterly direction from the New York Canal in Ada County toward the Boise River before combining to form Fifteenmile Creek in Canyon County. Fifteenmile Creek continues for about 4 miles before its confluence with the Boise River near the city of Middleton. Portions of Boise, as well as the majority of the city of Meridian are located within the Fifteenmile Creek Subwatershed boundary.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from Fifteenmile Creek. Within this plan the following elements are identified: pollutant problems within Fifteenmile Creek Subwatershed, sources of those pollutants, critical acres contributing pollutants to the subwatershed, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on improving water quality.

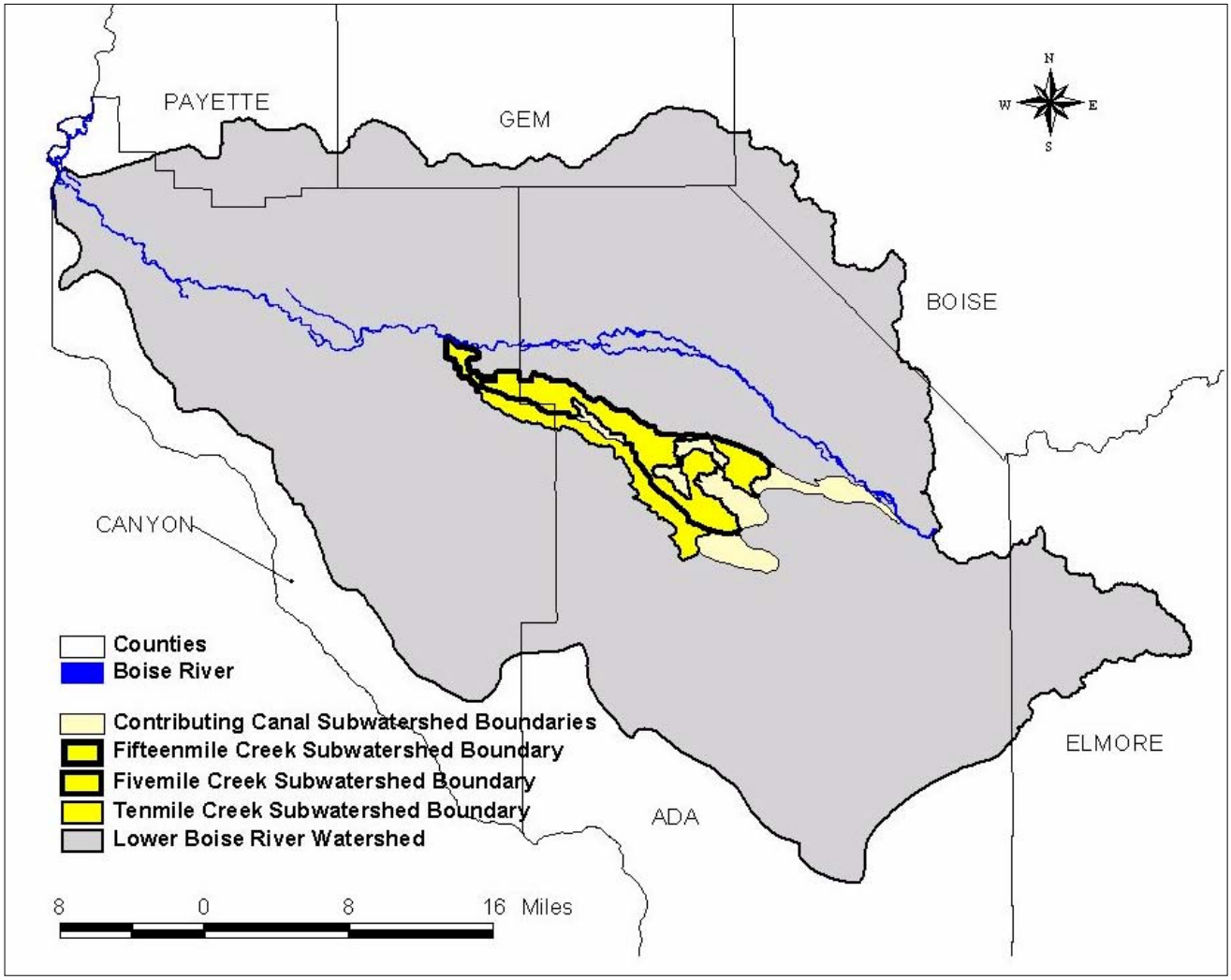
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Fifteenmile Creek Subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements at the mouth of Fifteenmile Creek. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Fifteenmile Creek Subwatershed contact the Ada Soil & Water Conservation District (Ada SWCD), Canyon Soil Conservation District (Canyon SCD), Natural Resources Conservation Service (NRCS), or Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency, as well as irrigation scheduling and soil moisture monitoring methods.**

**Figure 1. Fifteenmile Creek Subwatershed Location**




## 3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Fifteenmile Creek Subwatershed.

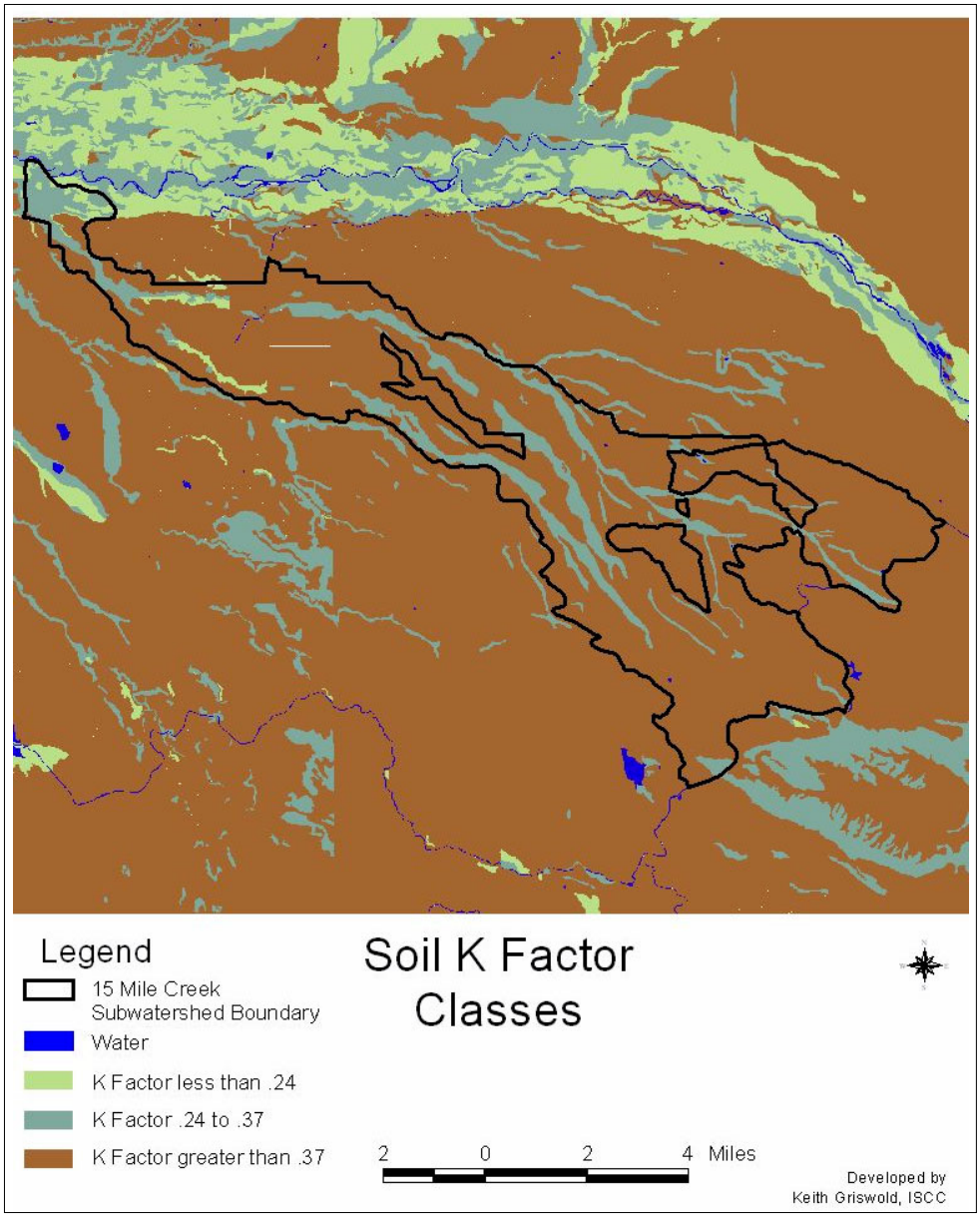
### 3.1 Soils

There are four major soil associations within Fifteenmile Creek Subwatershed (U. S. Department of the Agriculture, 1972).

- *Power-Purdam:* Well drained silt loams on nearly level to moderately sloping alluvial fan terraces
- *Colthorp-Elijah-Purdam:* Well drained soils with duripans on intermediate alluvial fan terraces
- *Power-Aeric Haplaquepts:* Poorly drained soils in drainageways and well drained soils on adjacent fan terraces
- *Tenmile-Chilcott-Kunaton:* Well drained soils on basalt plains and dissected alluvial fan terraces

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility. Soil "K Factor" classes are used to determine a soils erodibility potential. The higher the K-Factor rating, the greater the potential for erosion (Figure 2). In addition to K-Factor classes, soil slope classes provide another indication of erosion potential. As with K-Factor classes, the greater the percentage of slope, the greater the potential for erosion (Figure 3).

**Figure 2. Fifteenmile Creek Subwatershed K Factor Classes**



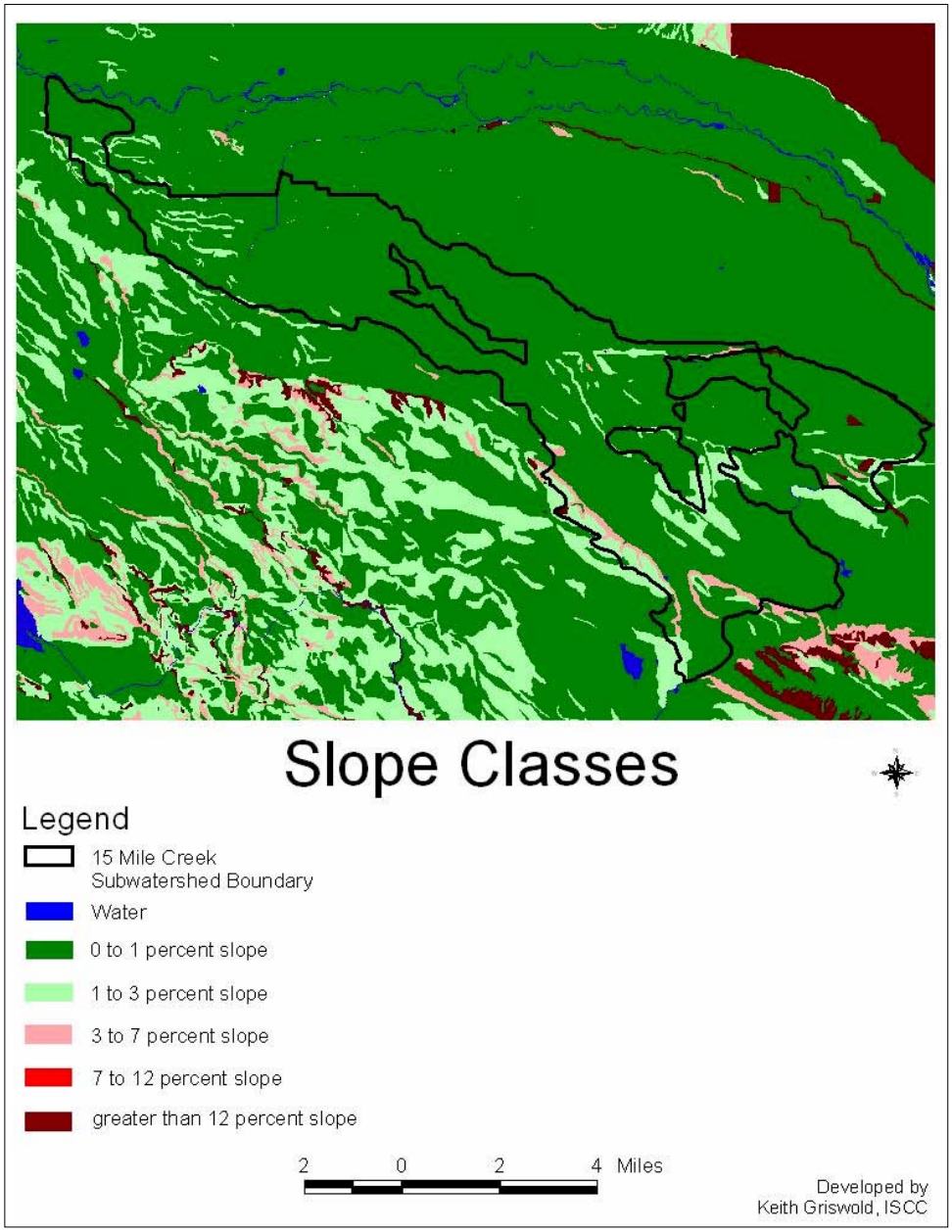

## 3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature during the summer in Boise, Idaho is 83.9° Fahrenheit, while the average daily minimum temperature during the winter is 25.9° Fahrenheit. Temperatures as low as –23.0° Fahrenheit and as warm as 111.0° Fahrenheit have been recorded (Climate Data Center, 2000).

Long term average annual precipitation for Boise is 11.9 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley, and extended periods without precipitation occur annually during the summer months.

The average consecutive frost-free period (above 32 ° F) is 152 days, based on the Boise Airport long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 135 days for this area. The average last frost (32 ° F) in the spring is around May 8 and the average first frost in the fall is around October 8 (U. S. Department of the Agriculture, 1977).

**Figure 3. Fifteenmile Creek Subwatershed Slope Classes**




## 3.3 Surface Hydrology

Pre-existing ephemeral channels have been modified over time by channelization and bank stabilization prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There are currently four major canals (New York, Ridenbaugh, Phyllis, and Caldwell Highline) that supply water to cropland in Fifteenmile Creek Subwatershed and three major drains (Fivemile, Tenmile, and Fifteenmile) that receive tailwater from the croplands and pastures or drain ground water.

Reuse of agricultural tailwater is common in the subwatershed. Although Fivemile Creek begins at the New York Canal, at its confluence with the Ridenbaugh Canal all of the water from Fivemile Creek during irrigation season is diverted into the canal for reuse, essentially forming an additional artificial headwaters of the creek (ISCC photo inventory, 2000). The reuse component along with in stream water quality data has led the local Conservation Districts and the Soil Conservation Commission to identify critical acres for treatment that fall primarily downstream from the city of Meridian.

**Figure 4. Surface Hydrology**

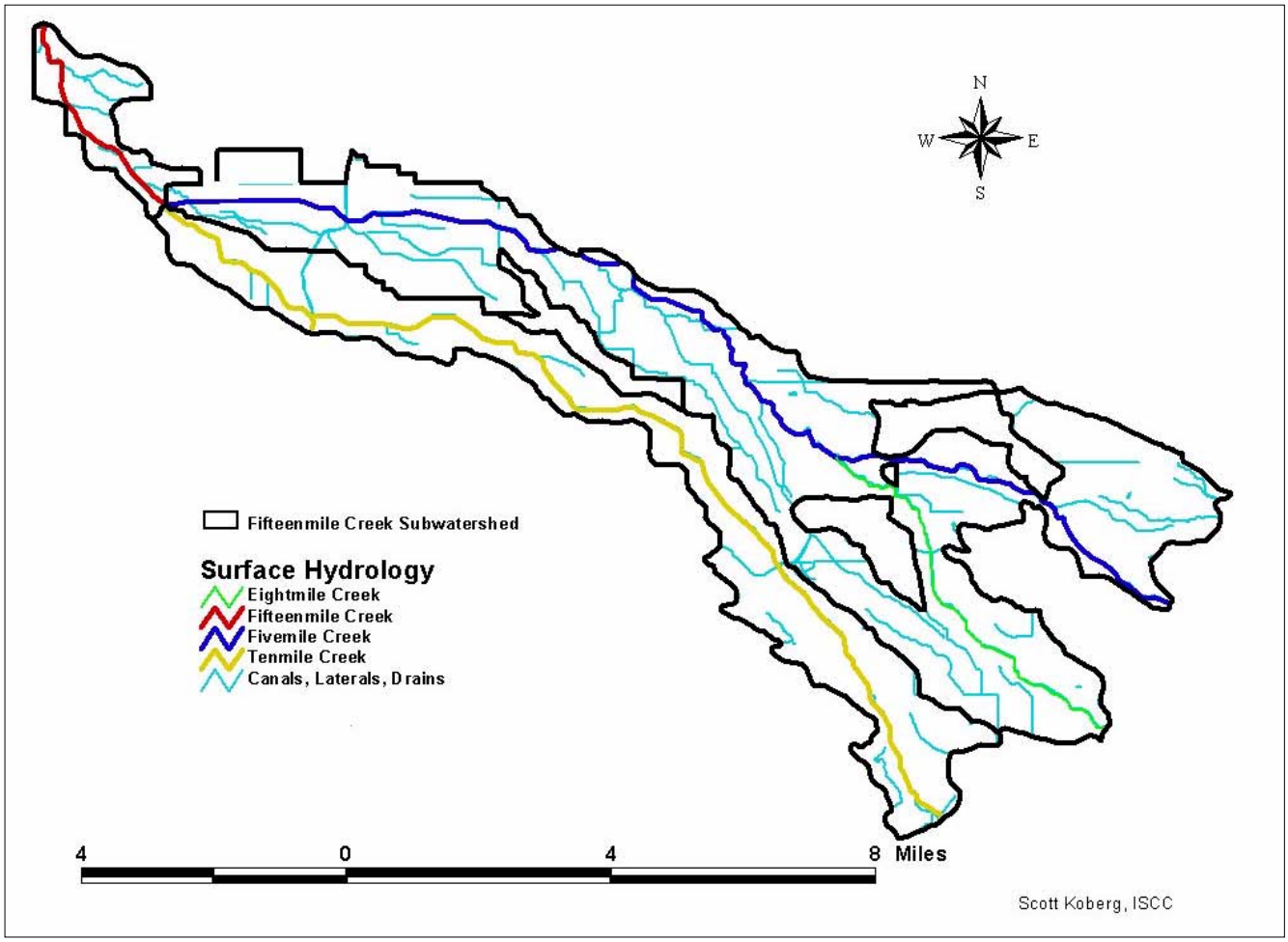
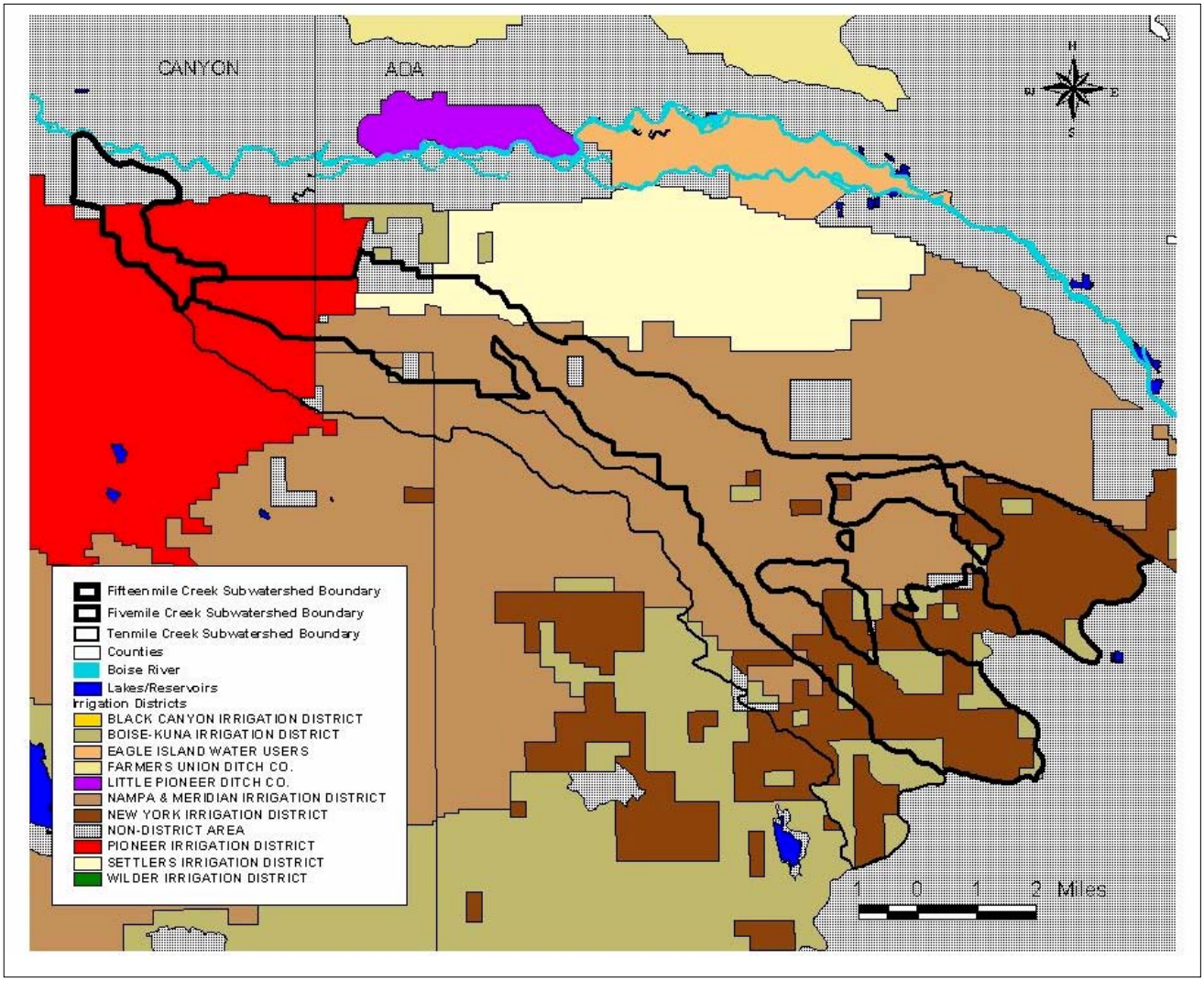


**Figure 5. Irrigation Districts**




## 3.4 Ground Water Hydrology

Prior to irrigation development during the 1900's, the large shallow aquifer under the Boise Valley did not exist. This aquifer (< 200 feet) is recharged annually by surface irrigation and earthen canals that recharge the artificial and natural drains throughout the year. Fifteenmile Creek Subwatershed sits atop the shallow Boise Valley aquifer and contributes to its recharge through surface irrigation and seepage.

## 3.5 Demographics and Economics

The Lower Boise River Watershed has experienced accelerated growth within the last 10 years. Ada and Canyon counties in particular experienced growth rates well above the state and national averages during the period from 1990 to2000. Ada County with a year 2000 population of 300,904 and Canyon County with a year 2000 population of 131,441 have increased at rates of 46.2% and 45.9% respectively (U.S. Census Bureau, 2001). These increases are huge when compared to the national average of 13.1% and Idaho state average of 28.5% during the same period.

The Fifteenmile Creek Subwatershed has been impacted significantly by the rapid growth in the Treasure Valley. The upper portion of the subwatershed (upstream from Meridian), particularly the Fivemile Creek drainage, has experienced widespread conversion of agricultural lands to urban and suburban land use as the city of Boise expands to the southwest and subdivisions continue to develop on the urban/rural fringe. While the Tenmile Creek drainage

has been impacted to a lesser extent, there are a number of subdivisions that have led to agricultural conversion in the upper reaches. The city of Meridian has left its footprint in the central portion of the Fifteenmile Creek Subwatershed with a population of 38,446 that continues to expand with urban, industrial, and residential development.

Downstream from the city of Meridian, the subwatershed remains largely agricultural in use as it crosses over from Ada into Canyon County. Unlike the upper portion of the subwatershed which consists mainly of alfalfa, clover, spring wheat, winter wheat, and pasture, the lower portion consists largely of lower residue crops such as seed corn, beans, sugar beets, sweet corn, field corn, onions, potatoes, specialty seed crops and vegetables. High residue crops such as spring wheat, winter wheat, alfalfa, clover, and pasture are also present downstream from Meridian.

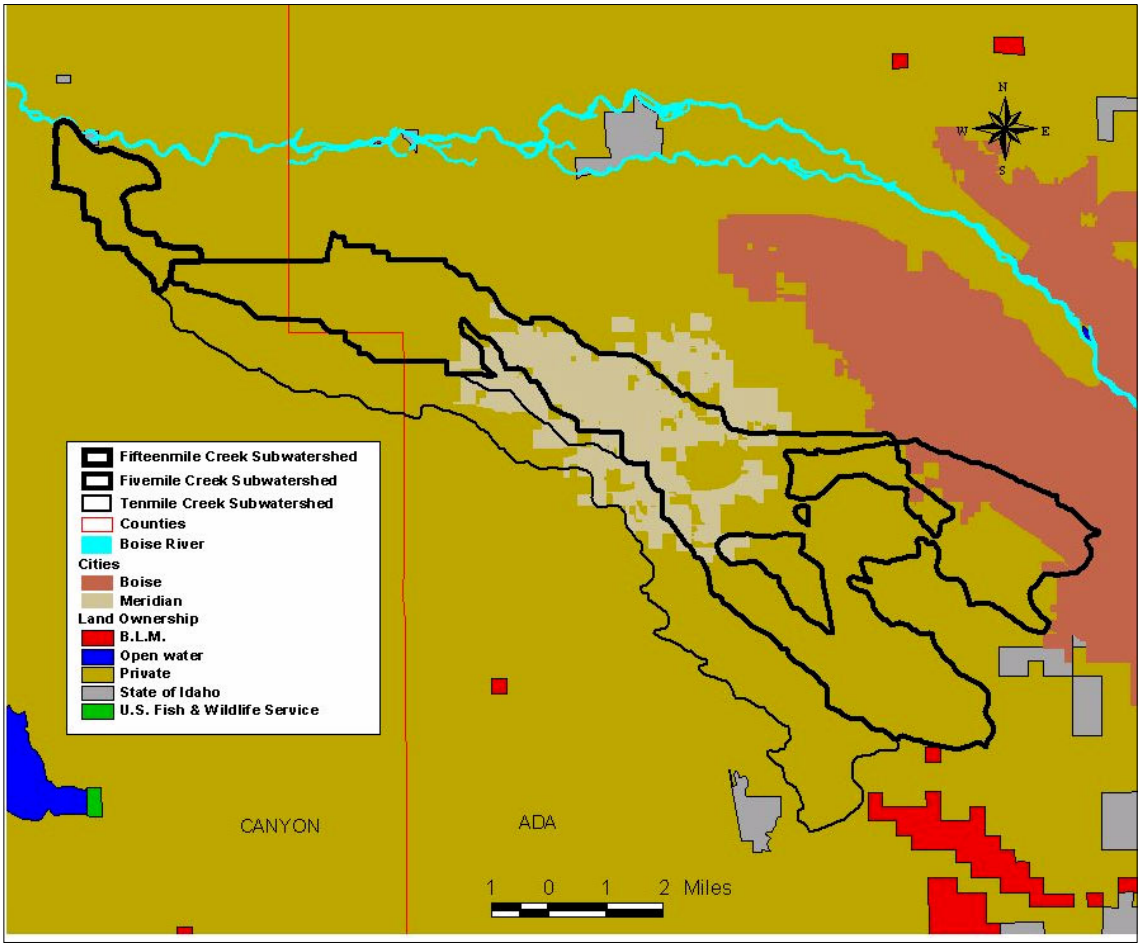
**Table 1. 2001 Agricultural Data for Fifteenmile Creek Subwatershed**

| Inventory: Farms & Cropland | Fifteenmile Creek Subwatershed |
|---|---|
| Total # of Farms (FSA Tracts) | 302 |
| Total Acres of Farms | 12,391 |
| Average Farm Size (acres) | 41.0 |
| Total Acres in Cropland | 11,106 |

## 3.6 Land Ownership and Land Use

Other than the lands that are incorporated into the cities of Boise and Meridian, Fifteenmile Creek Subwatershed is 100% privately owned (Figure 6). Irrigated cropland is the largest agricultural use within the subwatershed, while irrigated pasture is a distant second.

**Figure 6. Land Ownership**



# 4.0 Treatment Units

This section presents information on the individual agricultural land uses within the Fifteenmile Creek Subwatershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for addressing the identified problems.

- **Treatment Unit #1 – Surface Irrigated Cropland: 10,674 acres**

  Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- **Treatment Unit #2 – Surface Irrigated Pasture: 1,285 acres**

  Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures has the potential to enter the Lower Boise River via Fifteenmile Creek.

- **Treatment Unit #3 – Sprinkler Irrigated Cropland and Pasture: 432 acres**

  This unit is located throughout the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality due to high irrigation efficiencies resulting in little or no runoff.

- **Treatment Unit #4 – CAFO/AFO: 15 units**

  Feedlots are small in land area and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. See Table 5. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

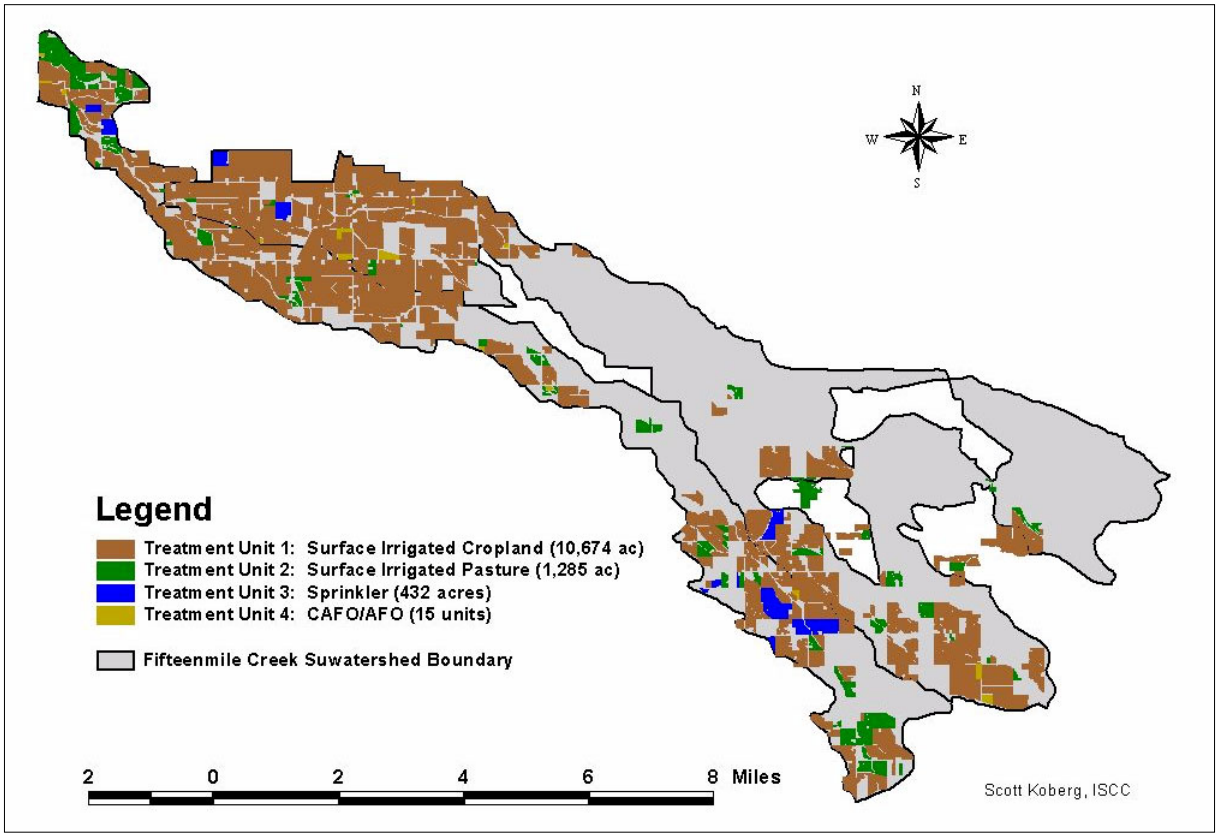
  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

**Table 2. Acres of TUs within Fifteenmile Creek Subwatershed.**

| Treatment Units | Acres |
|---|---|
| Treatment Unit 1 | 10,674 |
| Treatment Unit 2 | 1,285 |
| Treatment Unit 3 | 432 |
| Treatment Unit 4 | N/A |
| | |
| **TOTAL** | **12,391** |

(Koberg, 2001)

**Figure 7. Treatment Units**




# 5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, including Fifteenmile Creek.

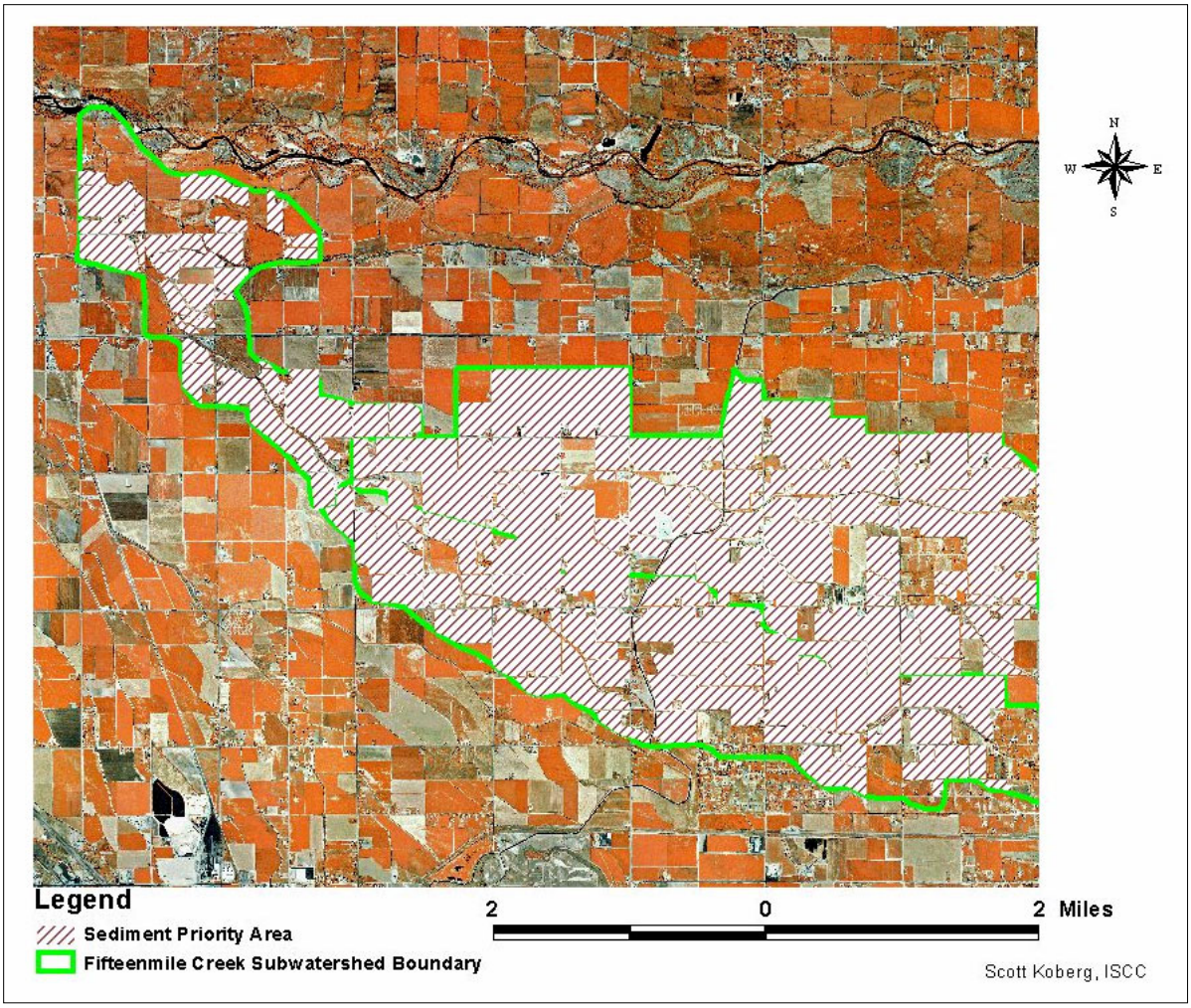
The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards adapt to reflect new developments. After the TMDL targets and load reductions were established for sediment and bacteria, additional sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been conducted. This new information and data collection indicate that the Lower Boise River may be closer to achieving its TMDL targets than originally assumed in the Subbassin Assessment.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" nutrient policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion
- Irrigation tailwater delivery to receiving water bodies
- Lack of adequate vegetation adjacent to waterways necessary for reducing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria.

**Figure 8. Fifteenmile Creek Subwatershed Priority Area**




## 5.1 Recreational Uses – Bacteria Objectives

The Lower Boise River TMDL established a 95% bacteria reduction target for primary contact recreation and a 67% reduction target for secondary contact recreation in Fifteenmile Creek to meet Idaho's fecal coliform criteria (Table 3).

**Table 3. Reductions Required to Meet Bacteria Load Allocation**

| Name | Primary Geo-Mean CFU/100 ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-Mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| **Fifteenmile Creek** | **992** | **50** | **95%** | **612** | **200** | **67%** |

(IDEQ, 1998)

Two developments affect this reduction objective and the agricultural BMP implementation that would be required to achieve it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, preliminary DNA results of bacteria samples from various locations in the Lower Boise River watershed indicate that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, and raccoon) beyond human control contribute largely to the current bacteria loads in the river. The current TMDL targets for bacteria may be unattainable as a result of these natural sources of fecal coliform and E. coli. It is likely that sources of bacteria from cows and other agricultural livestock can be reduced by implementing BMPs that limit their access to the Boise River and its tributaries while providing alternative watering sources.

**Table 4. Description of Confined Animal Feeding Operations in Fifteenmile Creek Subwatershed**

| Type of Confined Animal Feeding Operation (CAFO) | Number of CAFO's in Fifteenmile Creek Subwatershed |
|---|---|
| Dairy Cattle | 8 |
| Beef Cattle | 5 |
| Goat | 1 |
| Sheep | 1 |
| **Total** | **15** |

(Koberg, 2001)

## 5.2 Aquatic Life Uses – Sediment Objectives

The approach selected by the local and state agencies responsible for addressing resource concerns on agricultural lands is to seek voluntary implementation of best management practices (BMPs) on agricultural lands with state and federal cost-share incentive programs to reduce Total Suspended Sediment loading rate by 37%.

**Table 5. 1995 TSS loads and allocations for Fifteenmile Creek**

| Tributary | 1995 Loads (Tons/day) | % of 1995 Total Watershed Load | TSS Load Allocation (Tons/day) |
|---|---|---|---|
| Fifteenmile Creek | 28.6 | 18% | 18.02 |

(IDEQ, 1998)

## 5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

**Table 6. Proposed No Net Increase (NNI) Phosphorous Load**

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| **Fifteenmile Creek** | **241** | **44,411** |

(IDEQ, 1998)

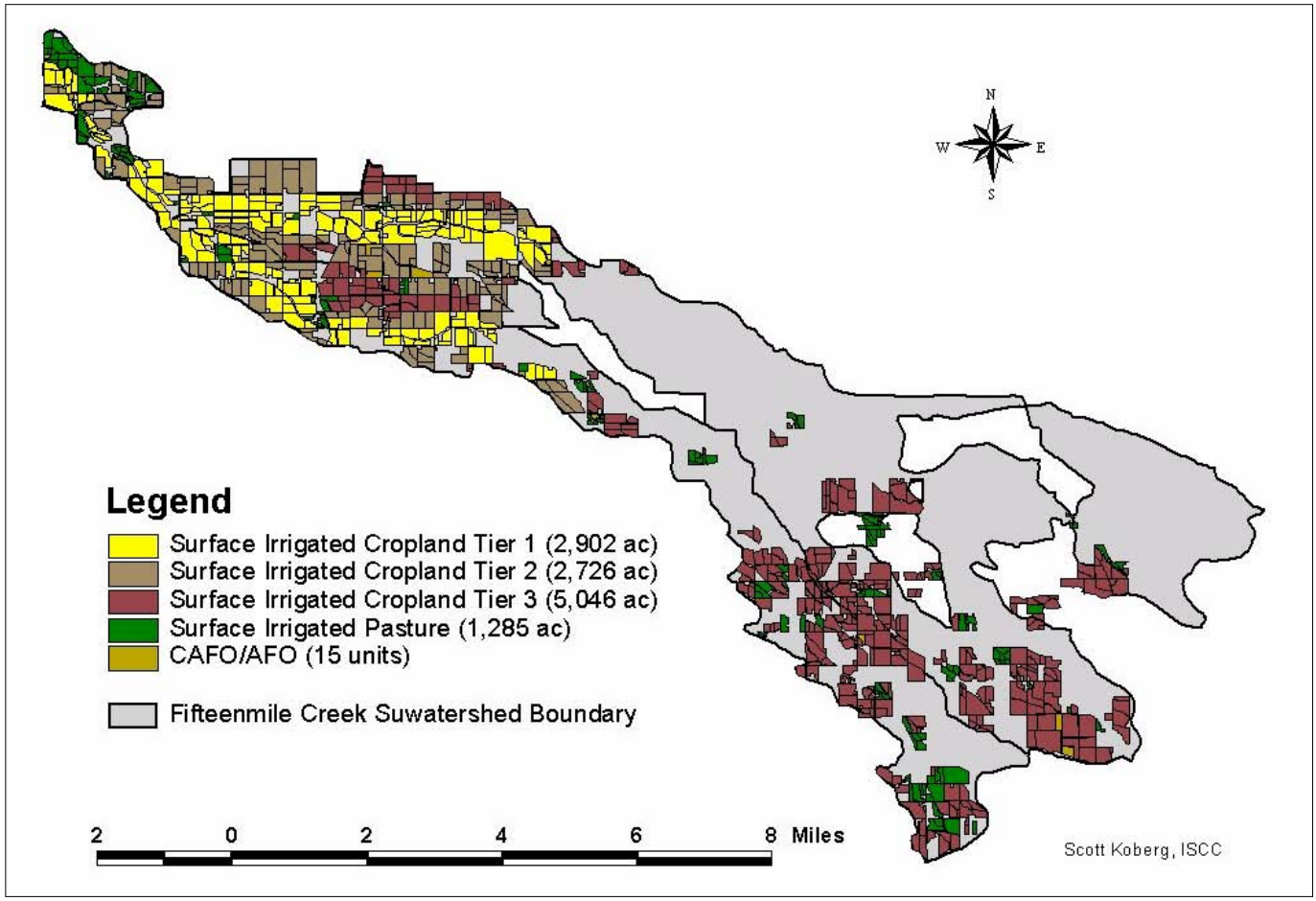
# 6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Fifteenmile Creek. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Fifteenmile Creek, which affects the Lower Boise River.

Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural land that drains directly into Fivemile, Tenmile, or Fifteenmile Creeks, and is downstream from the city of Meridian is included in Tier 1. Tier 1 lands have the most immediate impact on Lower Boise River water quality due to their proximity to the surface water tributaries. Unlike Tier 1 lands, Tier 2 lands are not directly adjacent to the tributaries of concern, and the wastewater from Tier 2 acreage has the potential to be reused by Tier 1 acreage before entering Fivemile, Tenmile, or Fifteenmile Creek. Tier 3 acreage is located either in the upper portion of the subwatershed (upstream from Meridian), or in the uplands where wastewater has the potential to be used multiple times by Tier 2 and Tier 1 acreage before entering the receiving waterbodies. In terms of BMP implementation Tier 1 is high priority, Tier 2 is medium priority, and Tier 3 is low priority (Figure 9).

**Figure 9. Location of Critical Acres**




**Critical Acres within each Treatment Unit:**

| | |
|---|---|
| Treatment Unit 1 | 2,902 acres of Tier 1 surface irrigated cropland<br>2,726 acres of Tier 2 surface irrigated cropland<br>5,046 acres of Tier 3 surface irrigated cropland |
| Treatment Unit 2 | 1,285 acres of surface irrigated pasture |
| Treatment Unit 3 | There are no critical acres within this treatment unit (Sprinkler) |
| Treatment Unit 4 | 15 units of CAFO/AFO |

# 7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited, to the following:

**Table 7. Treatment Unit 1: Surface Irrigated Cropland**

| | |
|---|---|
| Agro-Tillage | Conservation Cropping Sequence |
| Conservation Tillage | Cover and Green Manure Crop |
| Filter Strips | Grassed Waterway |
| Surge Irrigation System | Sprinkler Irrigation System |
| Tailwater Recovery System | Irrigation Water Management Systems |
| Straw Mulching | Nutrient Management |
| Pest Management | Sediment Basin |
| Underground Outlet | Chiseling and Subsoiling |
| Waste Utilization | Channel Vegetation |
| Drip Irrigation System | PAM |
| Irrigation Water Conveyance | |

**Table 8. Treatment Unit 2: Surface Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Waste Utilization |
| Spring water development | Waste Storage System |
| Irrigation systems | Nutrient Management |
| Pasture and Hayland Planting | Planned Grazing System |
| Livestock Watering Facility | Pasture and Hayland Management |

**Table 9. Treatment Unit 4: CAFO/AFO**

| | |
|---|---|
| Waste Management System | Heavy use area protection |
| Filter strips | Livestock Watering Facility |
| Nutrient Management | Fencing |

## 7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($800/ acre) | SITE SPECIFIC BMP Alternative #2 ($500/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Irrigation Water Mgt. | Irrigation Water Mgt. | Irrigation Water Mgt. |
| Sprinkler Irrigation System | Land Leveling | Concrete Ditch |
| Nutrient Mgt. | Surface Irrigation System | Filter Strip |
| Conservation Crop Rotation | Gated Pipe | PAM |
| | Tail Water Recovery System | Sediment Basin |
| | Nutrient Mgt. | Nutrient Mgt. |
| | Conservation Crop Rotation | Conservation Crop Rotation |
| | Conservation Tillage | Conservation Tillage |

## 7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($450/ acre) | SITE SPECIFIC BMP Alternative #2 ($350/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Livestock Watering Facility |
| Heavy Use Area Protection | Livestock Watering Facility | Irrigation Water Mgt. |
| Livestock Watering Facility | Irrigation Water Mgt. | Field Border Irrigation System |
| Irrigation Water Mgt. | Field Border Irrigation System | |
| Field Border Irrigation System | | |
| Gated Pipe | | |

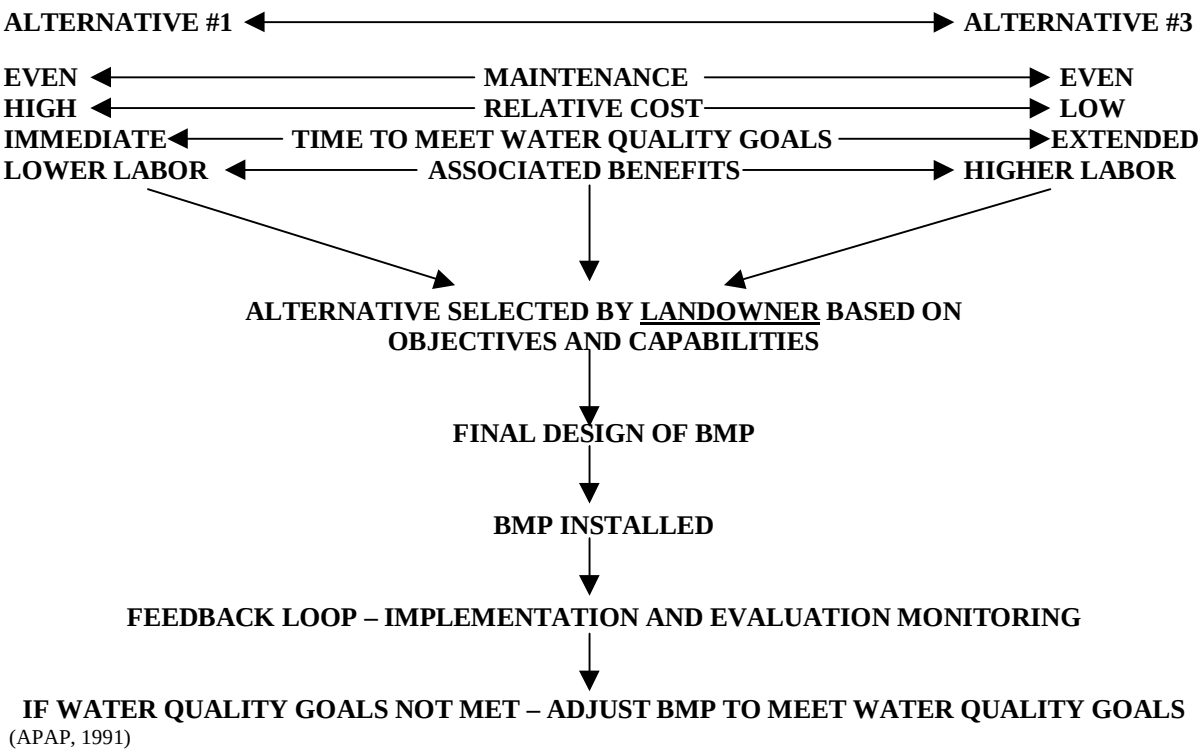
## 7.3 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($50,000/ each) | SITE SPECIFIC BMP Alternative #2 ($35,000/ each) | SITE SPECIFIC BMP Alternative #3 ($25,000/ each) |
|---|---|---|
| Nutrient Mgt. | Waste Mgt. System | Waste Mgt. System |
| Heavy Use Area Protection | Nutrient Mgt. | Nutrient Mgt. |
| Livestock Watering Facility | Livestock Watering Facility | Filter strip |
| Filter strips | Filter strips | Heavy Use Area Protection |
| Waste Mgt. System | Heavy Use Area Protection | |
| Dike | | |

## 7.4 Graphic Comparison of BMP Selection and Implementation Process

The site specific BMP Alternative is chosen based on a variety of factors, but typically reflect the landowner's objectives in conjunction with the resource concerns identified by the assisting agency. The following flow chart provides a graphic representation of selection process and some comparisons between Alternative #1(high cost), Alternative #2 (moderate cost), and Alternative #3 (low cost) for the various treatment units. The chart applies to each of the three treatment units identified in sections 7.1 through 7.3.



(APAP, 1991)

## 7.5 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

## 7.6 Feedback Loop

The feedback loop is a process used to evaluate and refine installed BMPs. Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards (APAP, 1991). The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

# 8.0 Program of Implementation

The Ada Soil & Water Conservation District along with the Canyon Soil Conservation District has selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. There are currently 2 sources of funding available for cost-share assistance within the Fifteenmile Creek subwatershed priority area. The current sources of funding include the State Water Quality Program for Agriculture (WQPA) administered by the Idaho Soil Conservation Commission and a 319 Grant secured by the Ada SWCD in conjunction with the Idaho OnePlan TMDL Implementation Project. The implementation of BMPs and distribution of incentive payments has been focused within the subwatershed boundary downstream from Black Cat Road. Idaho State Department of Agriculture data collected over a two year period at upstream sites in the subwatershed indicate that the majority of pollutant loading to the Fifteenmile system originates from this area.

## 8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC), Ada SWCD, and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. Where cost-share incentives are contracted through a state or federal program, NRCS and ISCC will assist Ada and Canyon Conservation Districts with certification of installed BMPs, filing payment applications, completing annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

**Table 10. Estimated BMP Cost Summary for Treatment Unit 1, Tier 1 (Surface Irrigated Cropland: 2,902 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 2902 | $ 2,321,600 |
| Alternative 2 | $500/AC | 2902 | $ 1,451,000 |
| Alternative 3 | $250/AC | 2902 | $ 725,500 |

**Table 11. Estimated BMP Cost Summary for Treatment Unit 1, Tier 2 (Surface Irrigated Cropland: 2,726 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 2726 | $ 2,180,800 |
| Alternative 2 | $500/AC | 2726 | $ 1,363,000 |
| Alternative 3 | $250/AC | 2726 | $ 681,500 |

**Table 12. Estimated BMP Cost Summary for Treatment Unit 1, Tier 3 (Surface Irrigated Cropland: 5,046 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 5046 | $ 4,036,800 |
| Alternative 2 | $500/AC | 5046 | $ 2,523,000 |
| Alternative 3 | $250/AC | 5046 | $ 1,261,500 |

**Table 13. Estimated BMP Cost Summary for Treatment Unit 2 (Surface Irrigated Pasture: 1,285 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $450/AC | 1285 | $ 578,250 |
| Alternative 2 | $350/AC | 1285 | $ 449,750 |
| Alternative 3 | $250/AC | 1285 | $ 321,250 |

**Table 14. Estimated BMP Cost Summary for Treatment Unit 4 (CAFO/AFO 15 Units)**

| ALTERNATIVE | | UNITS | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $50,000/each | 15 | $ 750,000 |
| Alternative 2 | $35,000/each | 15 | $ 525,000 |
| Alternative 3 | $25,000/each | 15 | $ 375,000 |

## 8.2 Operation, Maintenance, and Replacement

Participants who install BMPs in conjunction with a state or federal cost-share incentive program will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Landowners are encouraged to maintain installed BMPs after the contract expires. Participants who install BMPs on their own or without the benefit of a cost-share incentive program are not under contract to maintain the BMPs. If the BMPs are installed in response to a conservation plan completed with them by the assisting agencies, landowners are encouraged to maintain the BMPs and incorporate them into their annual operations. It is not required, however, unless they are under contract.

Inspections of BMPs installed in conjunction with a cost-share incentive program will be made on an annual basis by Ada SWCD and Canyon SCD, NRCS, ISCC, and the participant. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant.

## 8.3 Water Quality Monitoring

The Idaho State Department of Agriculture (ISDA) collected water quality samples in the Fifteenmile Creek Subwatershed during the 1998 and 1999 irrigation seasons. IDEQ has done extensive monitoring and conducted BURP evaluations on Fivemile and Tenmile Creeks in order to develop the 2001 Fivemile and Tenmile Creek Subbasin Assessment. Monitoring at the mouth of Fifteenmile Creek has been conducted by U.S. Geological Survey (USGS) since well before the TMDL was established (1993), and during the past 2 years USGS has conducted a monitoring program within the subwatershed at the same sites monitored by ISDA in 1998 and 1999. Most samples collected by the various agencies occur on a bimonthly basis throughout the irrigation season (April - October) and on a monthly basis throughout the rest of the year (winter). Data parameters measured thus far have included DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids) pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

# 9.0 References

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# APPENDIX 5.

# Indian Creek Subwatershed

# Agricultural TMDL Implementation Plan

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# 1.0 Executive Summary

**Subwatershed:** Indian Creek Subwatershed
Total Scope: 48,135 acres (includes contributing canal acreage)
Agricultural Scope: 21,317 acres
Agricultural Critical Acres Scope: 20,281 acres

**Location:** South side of the Boise River, located within the cities of Kuna, Nampa, and Caldwell, and north of Lake Lowell in both Ada and Canyon counties

**Elevation:** 2,780 feet at the New York Canal to 2,360 feet at the Boise River.

**Priority Subwatershed:** High

**Cooperating Agricultural Agencies:** Canyon Soil Conservation District (CSCD)
Ada Soil & Water Conservation District (ASWCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

**Agricultural Land Uses:**

| Landuse | Acres | Percent of Indian Creek Subwatershed |
|---|---|---|
| Surface Irrigated Cropland | 18,959 | 39% |
| Surface Irrigated Pasture | 1322 | 3% |
| Sprinkler Irrigated Cropland and Pasture | 1036 | 2% |
| CAFO/AFO | N/A | N/A |
| | | |
| **TOTAL** | **21,317** | **44%** |

**Major Agricultural Products:** Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, specialty seed crops, vegetables, livestock, and dairy products.

**TMDL Objectives:** The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouth of the Indian Creek. The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98% for primary contact recreation.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 "SR-HC TMDL") will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

**Implementation Plan:** This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Indian Creek Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the four different agricultural land use types (Treatment Units) within the Indian Creek Subwatershed. Estimated costs to install BMPs on lands identified for treatment are: Alternative 1 - $16,562,100; Alternative 2 - $10,502,200; and Alternative 3 - $5,470,250. These cost estimates do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

# 2.0 Introduction

The Indian Creek Subwatershed encompasses 48,135 acres. It includes the lower portions of Indian Creek and various contributing canal subwatersheds in addition to a large agricultural drain that accepts the flow of various other agricultural drains before entering Indian Creek. This large agricultural drain is called Wilson Drain and begins just north of the upper dam at Lake Lowell. Wilson Drain flows north from its headwaters before joining Indian Creek in the city of Caldwell. Indian Creek flows in a northwesterly direction from the Mora Canal, shares a channel with the New York Canal for a stretch through the city of Kuna, then continues through Nampa and Caldwell before reaching the Boise River about 2.5 miles downstream from its confluence with Wilson Drain.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from Indian Creek. Within this plan the following elements are identified: pollutant problems within Indian Creek Subwatershed, sources of those pollutants, critical acres contributing pollutants to the subwatershed, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on improving water quality.

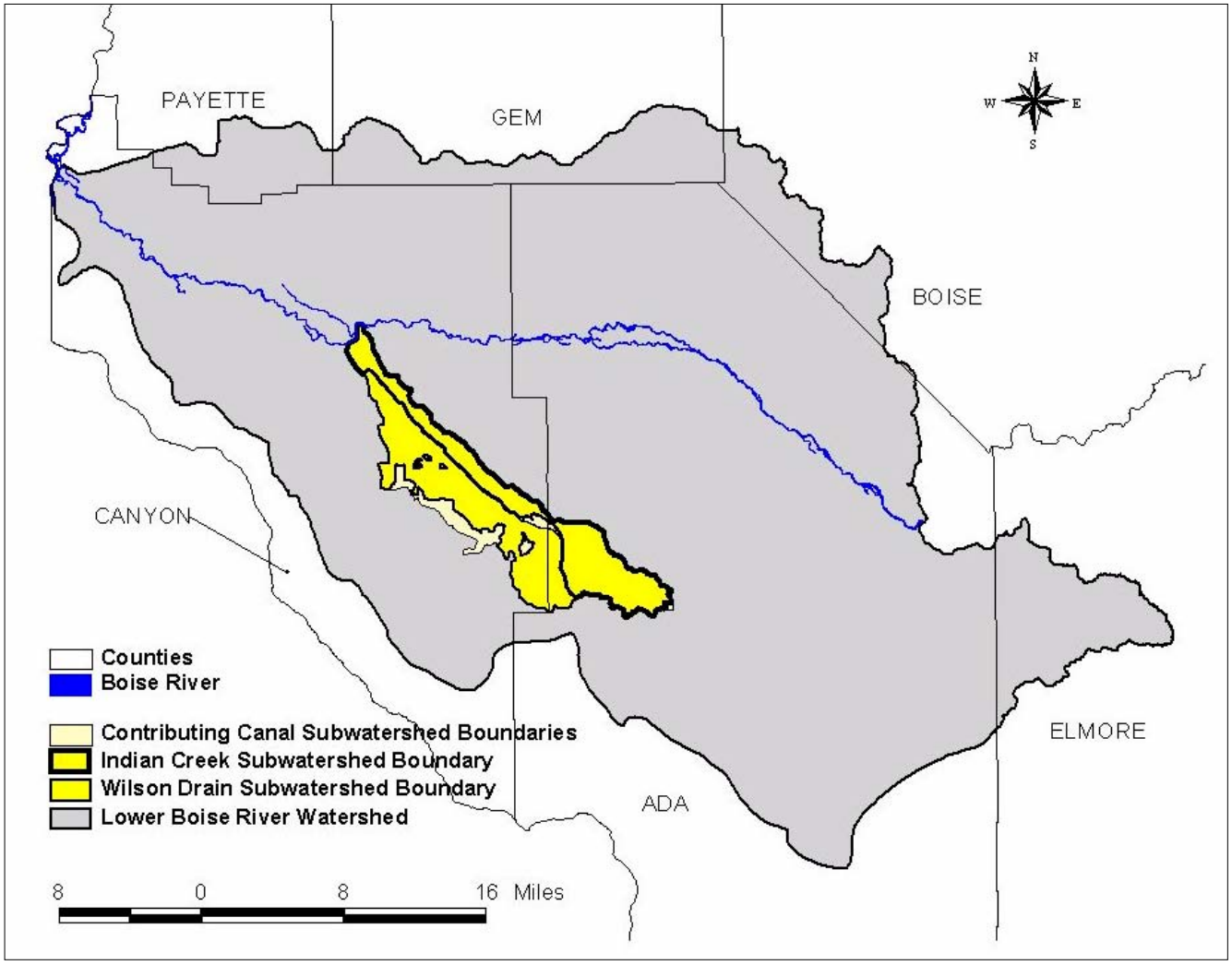
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Indian Creek Subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements at the mouth of Indian Creek. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Indian Creek Subwatershed contact the Ada Soil & Water Conservation District (Ada SWCD), Canyon Soil Conservation District (Canyon SCD), Natural Resources Conservation Service (NRCS), or Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency, as well as irrigation scheduling and soil moisture monitoring methods.**

**Figure 1. Indian Creek Subwatershed Location**




## 3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Indian Creek Subwatershed.

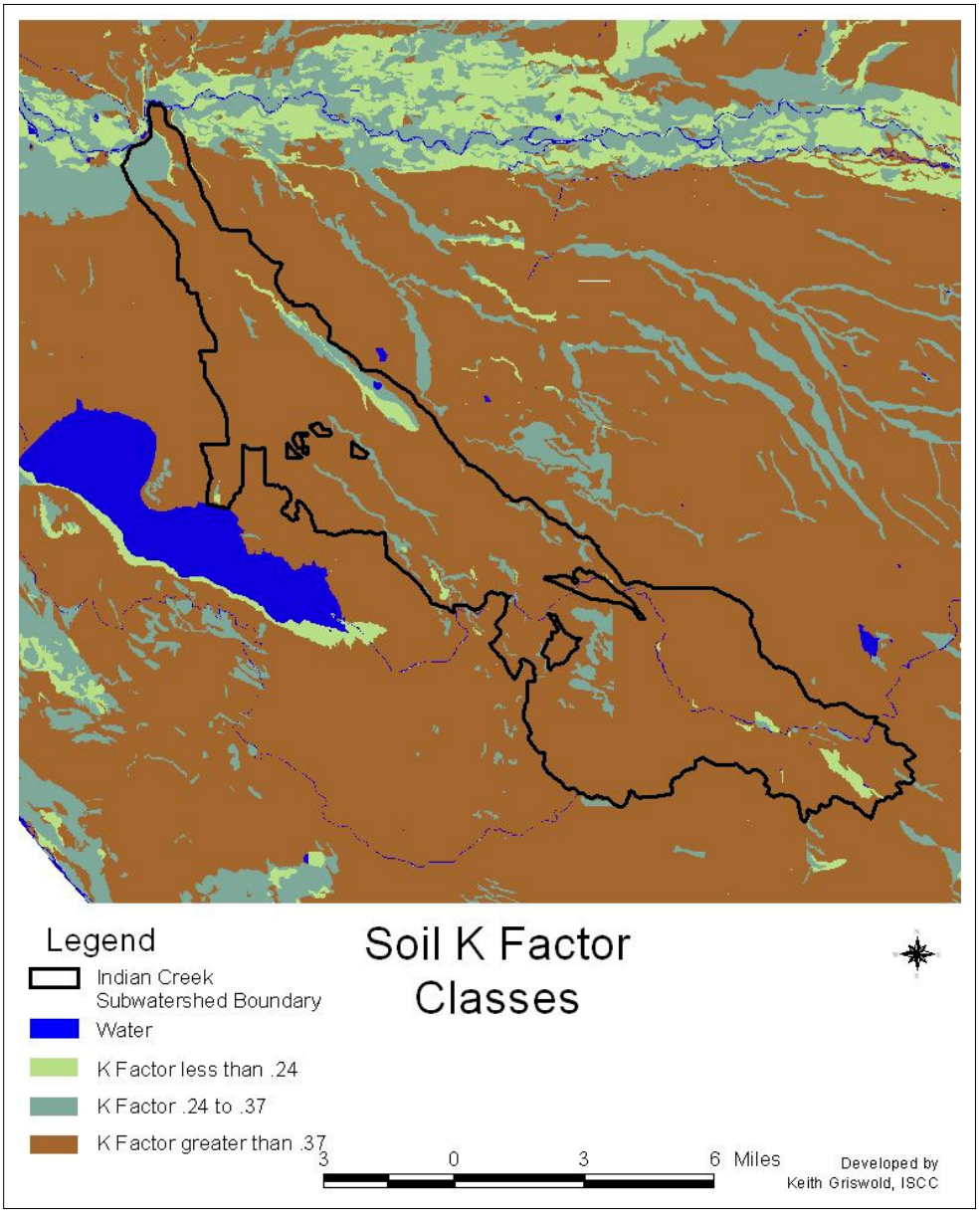
### 3.1 Soils

There are five major soil associations within Indian Creek Subwatershed (U. S. Department of the Agriculture, 1972).

- *Moulton-Bram-Baldock-Falk:* Moderately well and poorly drained soils on floodplains and low river terraces
- *Power-Purdam:* Well drained silt loams on nearly level to moderately sloping alluvial fan terraces
- *Colthorp-Elijah-Purdam:* Well drained soils with duripans on intermediate alluvial fan terraces
- *Minidoka-Marshing-Vickery:* Well drained silt loams with duripans on higher alluvial fan terraces
- *Power-Purdam-Potratz:* Well drained silt loam soils formed in alluvium on basalt plains

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility. Soil "K Factor" classes are used to determine a soils erodibility potential. The higher the K-Factor rating, the greater the potential for erosion (Figure 2). In addition to K-Factor classes, soil slope classes provide another indication of erosion potential. As with K-Factor classes, the greater the percentage of slope, the greater the potential for erosion (Figure 3).

**Figure 2. Indian Creek Subwatershed K Factor Classes**



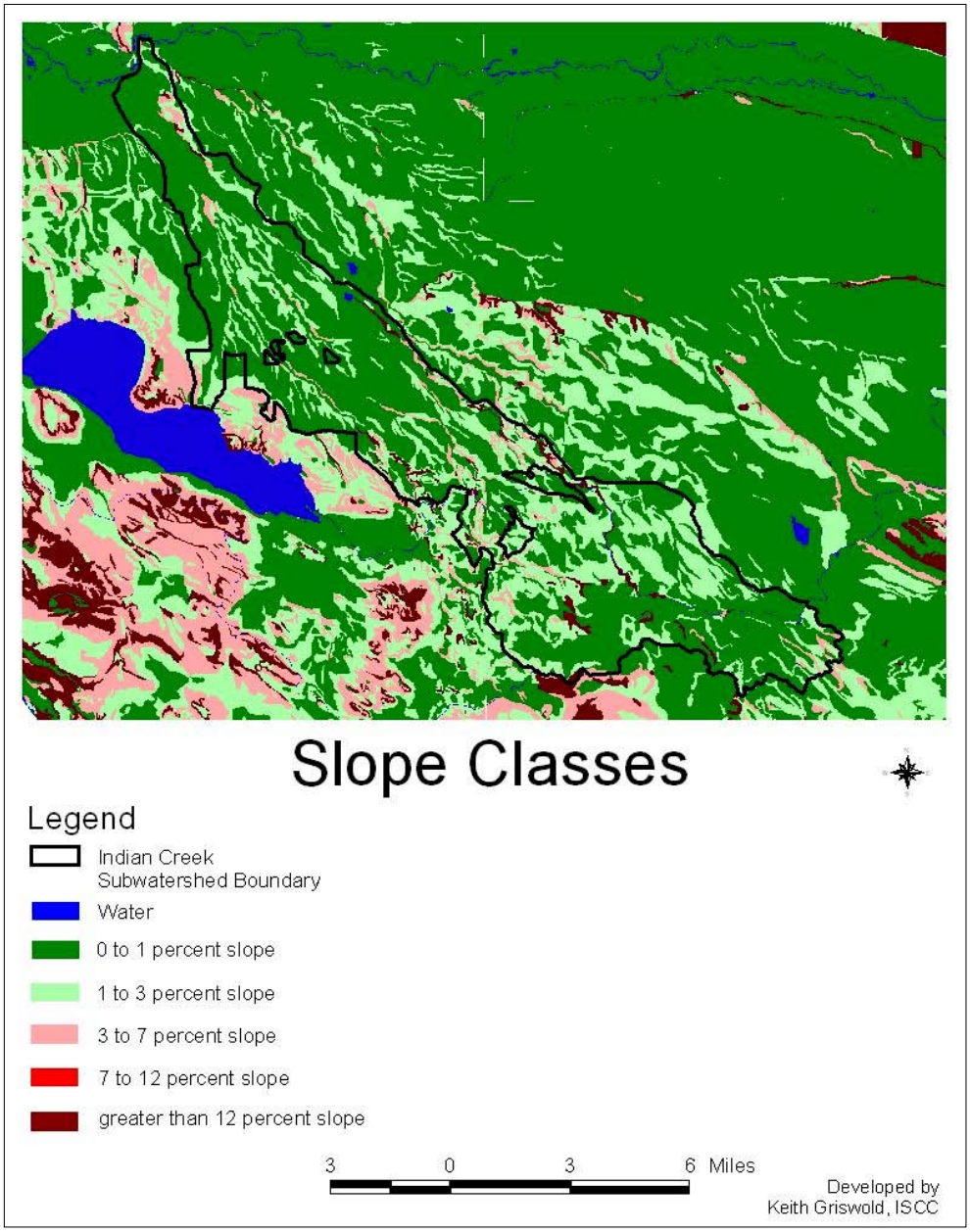

## 3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature during the summer in Boise, Idaho is 83.9°Fahrenheit, while the average daily minimum temperature during the winter is 25.9°Fahrenheit. Temperatures as low as –23.0°Fahrenheit and as warm as 111.0°Fahrenheit have been recorded (Climate Data Center, 2000).

Long term average annual precipitation for Boise is 11.9 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley, and extended periods without precipitation occur annually during the summer months.

The average consecutive frost-free period (above 32 degrees) is 152 days, based on the Boise Airport long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 135 days for this area. The average last frost (32 degrees) in the spring is around May 8 and the average first frost (32 degrees) in the fall is around October 8 (U. S. Department of the Agriculture, 1977).

**Figure 3. Indian Creek Subwatershed Slope Classes**




## 3.3 Surface Hydrology

Pre-existing ephemeral channels have been modified over time by channelization and bank stabilization prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There are currently six major canals (Mora, New York, Ridenbaugh, Phyllis, Caldwell Lowline, and Notus) that supply water to cropland in Indian Creek Subwatershed and two major drains (Indian Creek and Wilson Drain) that receive tailwater from the croplands and pastures or drain ground water.

Reuse of agricultural tailwater is common in the subwatershed. Although Indian Creek begins at the Mora Canal, at its confluence with the New York Canal, the creek and the canal actually share a channel. All of the water from Indian Creek during irrigation season has the potential to be diverted into the canal for reuse, essentially forming an additional artificial headwaters of the creek (ISCC photo inventory, 2000). The reuse component along with in stream water quality data has led the local Conservation Districts and the Soil Conservation Commission to identify critical acres for treatment that fall primarily downstream from the confluence with New York Canal, with much of the acreage falling within the Wilson Drain area.

**Figure 4. Surface Hydrology**

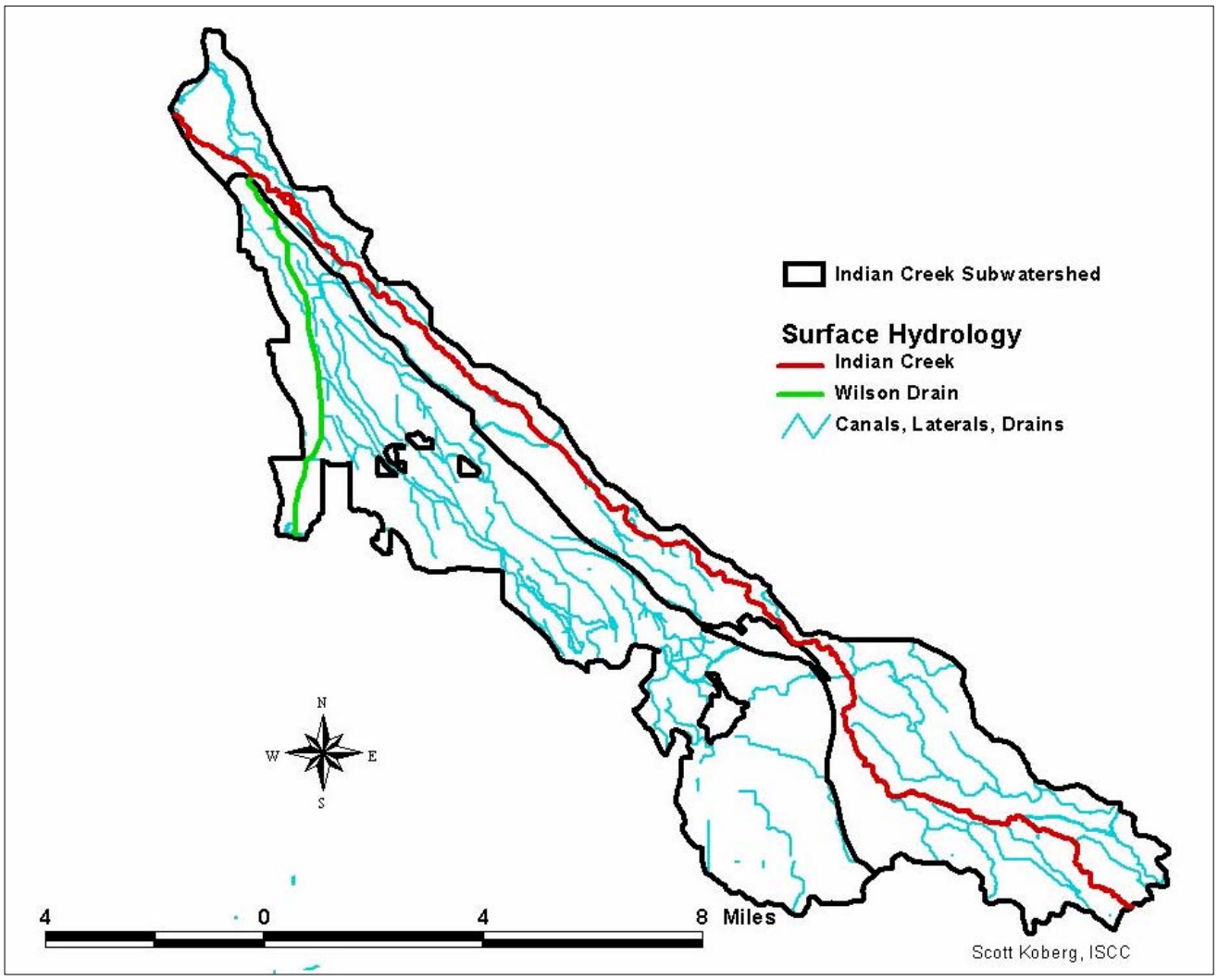
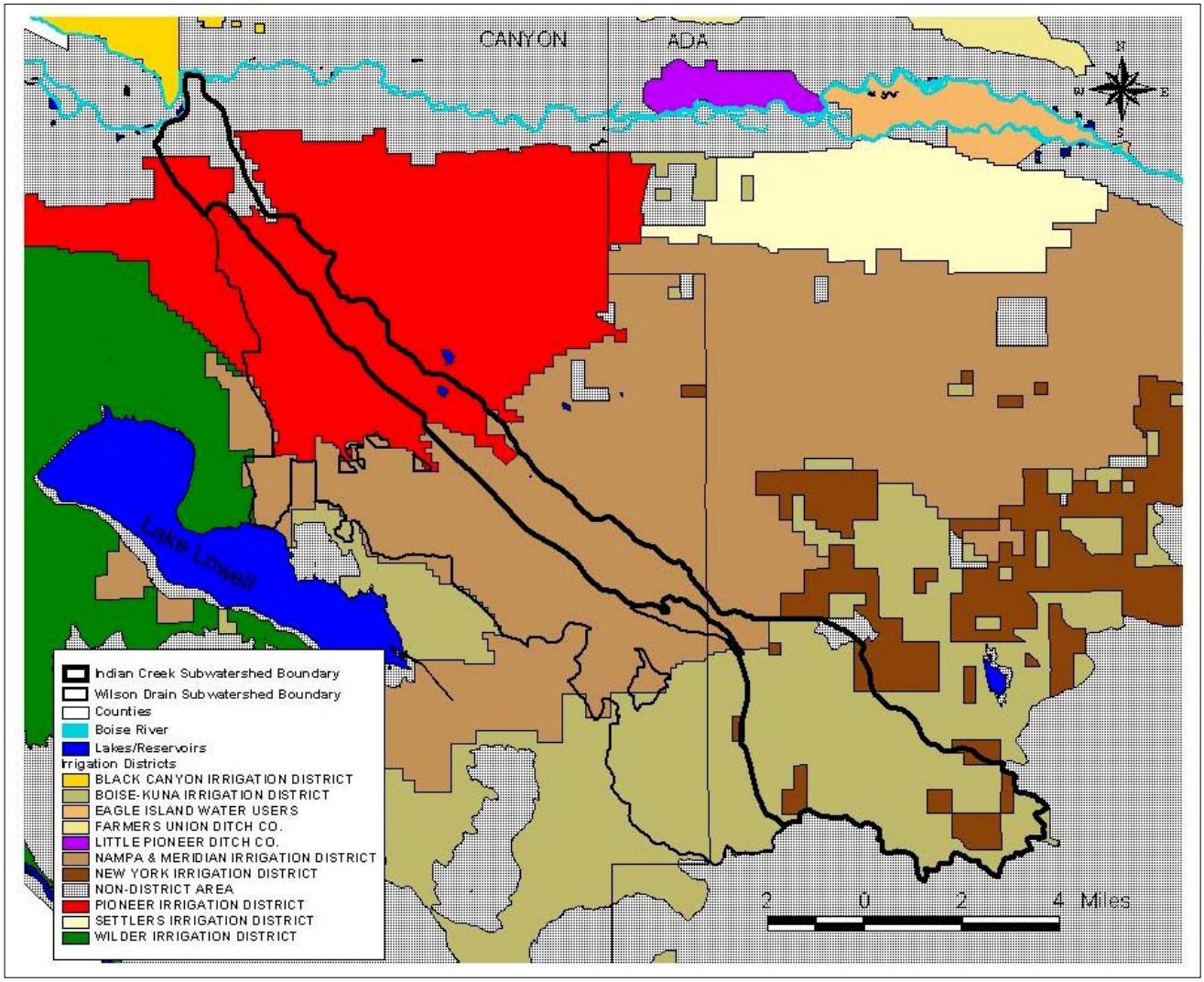


**Figure 5. Irrigation Districts**




## 3.4 Ground Water Hydrology

Prior to irrigation development during the 1900's, the large shallow aquifer under the Boise Valley did not exist. This aquifer (< 200 feet) is recharged annually by surface irrigation and earthen canals that recharge the artificial and natural drains throughout the year. Indian Creek Subwatershed sits atop the shallow Boise Valley aquifer and contributes to its recharge through surface irrigation and seepage.

## 3.5 Demographics and Economics

The Lower Boise River Watershed has experienced accelerated growth within the last 10 years. Ada and Canyon counties in particular experienced growth rates well above the state and national averages during the period from 1990 to2000. Ada County with a year 2000 population of 300,904 and Canyon County with a year 2000 population of 131,441 have increased at rates of 46.2% and 45.9% respectively (U.S. Census Bureau, 2001). These increases are huge when compared to the national average of 13.1% and Idaho state average of 28.5% during the same period.

The Indian Creek Subwatershed has been impacted significantly by the rapid growth in the Treasure Valley. The upper portion of the subwatershed has experienced rapid conversion of agricultural lands to urban and suburban land use as the city of Kuna (population 5,382) expands in every direction. The central and lower portions of the subwatershed has been impacted to a greater extent as agricultural lands are continually converted to urban,

industrial, and residential developments near the cities of Nampa and Caldwell. Much of the growth in Nampa (population 51,867) and Caldwell (population 25,967) is occurring to the south and west of Nampa and to the south of Caldwell towards Lake Lowell, mostly within the Indian Creek Subwatershed.

Unlike the upper portion of the subwatershed (upstream from Nampa) which consists mainly of alfalfa, clover, spring wheat, winter wheat, and pasture, the lower portion consists largely of lower residue crops such as seed corn, beans, sugar beets, sweet corn, field corn, onions, potatoes, specialty seed crops and vegetables. High residue crops such as spring wheat, winter wheat, alfalfa, clover, and pasture are also present in the lower portion (downstream from Nampa).

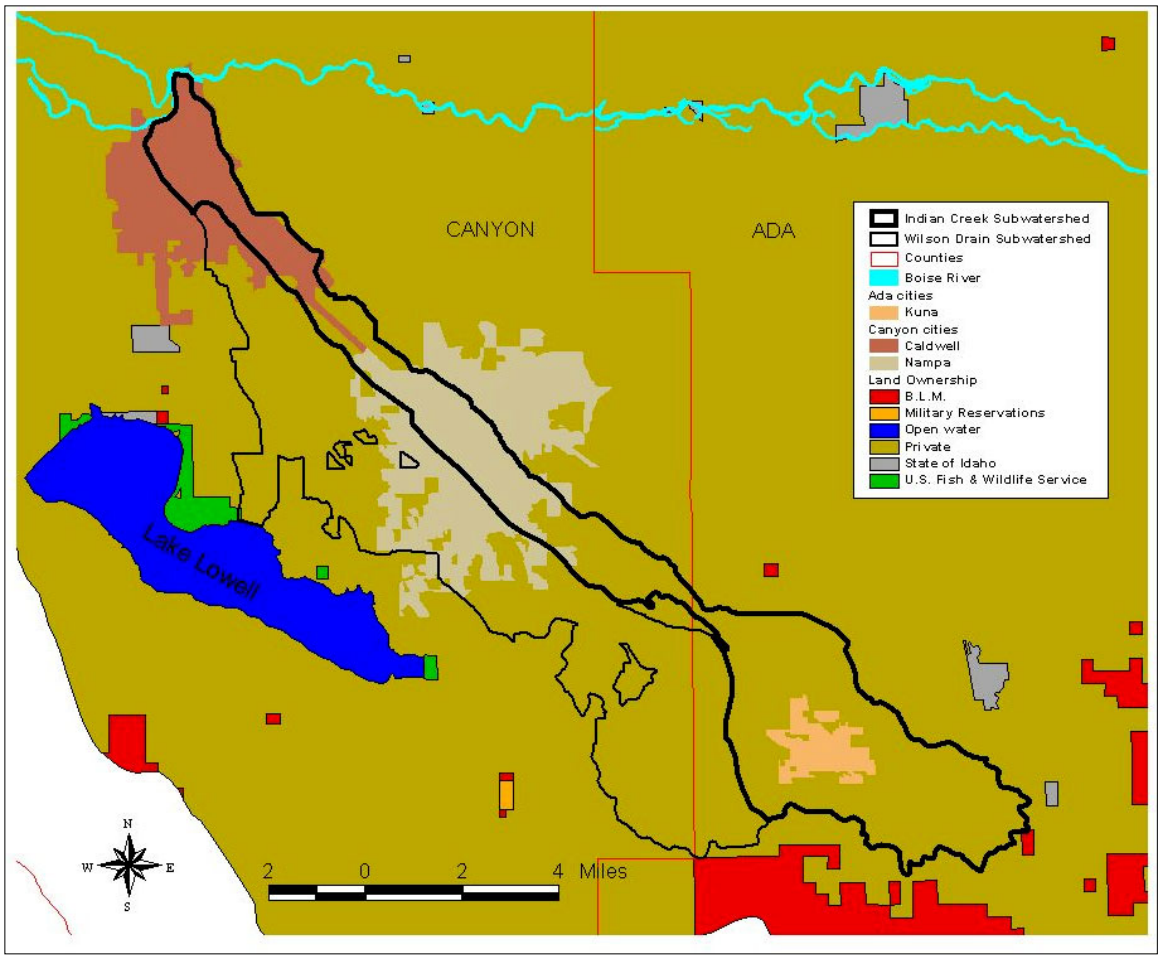
**Table 1. 2001 Agricultural Data for Indian Creek Subwatershed**

| Inventory: Farms & Cropland | Indian Creek Subwatershed |
|---|---|
| Total # of Farms (FSA Tracts) | 598 |
| Total Acres of Farms | 21,317 |
| Average Farm Size (acres) | 35.6 |
| Total Acres in Cropland | 19,995 |

## 3.6 Land Ownership and Land Use

Other than the lands that are incorporated into the cities of Kuna, Nampa, and Caldwell, Indian Creek Subwatershed is 100% privately owned (Figure 6). Irrigated cropland is the largest agricultural use within the subwatershed, while irrigated pasture is a distant second, followed closely by sprinkler irrigated cropland and pasture.

**Figure 6. Land Ownership**



# 4.0 Treatment Units

This section presents information on the individual agricultural land uses within the Indian Creek Subwatershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for addressing the identified problems.

- **Treatment Unit #1 – Surface Irrigated Cropland: 18,959 acres**

  Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- **Treatment Unit #2 – Surface Irrigated Pasture: 1,322 acres**

  Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures has the potential to enter the Lower Boise River via Indian Creek.

- **Treatment Unit #3 – Sprinkler Irrigated Cropland and Pasture: 1,036 acres**

  This unit is located throughout the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality due to high irrigation efficiencies resulting in little or no runoff.

- **Treatment Unit #4 – CAFO/AFO: 16 units**

  Feedlots are small in land area and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. See Table 5. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

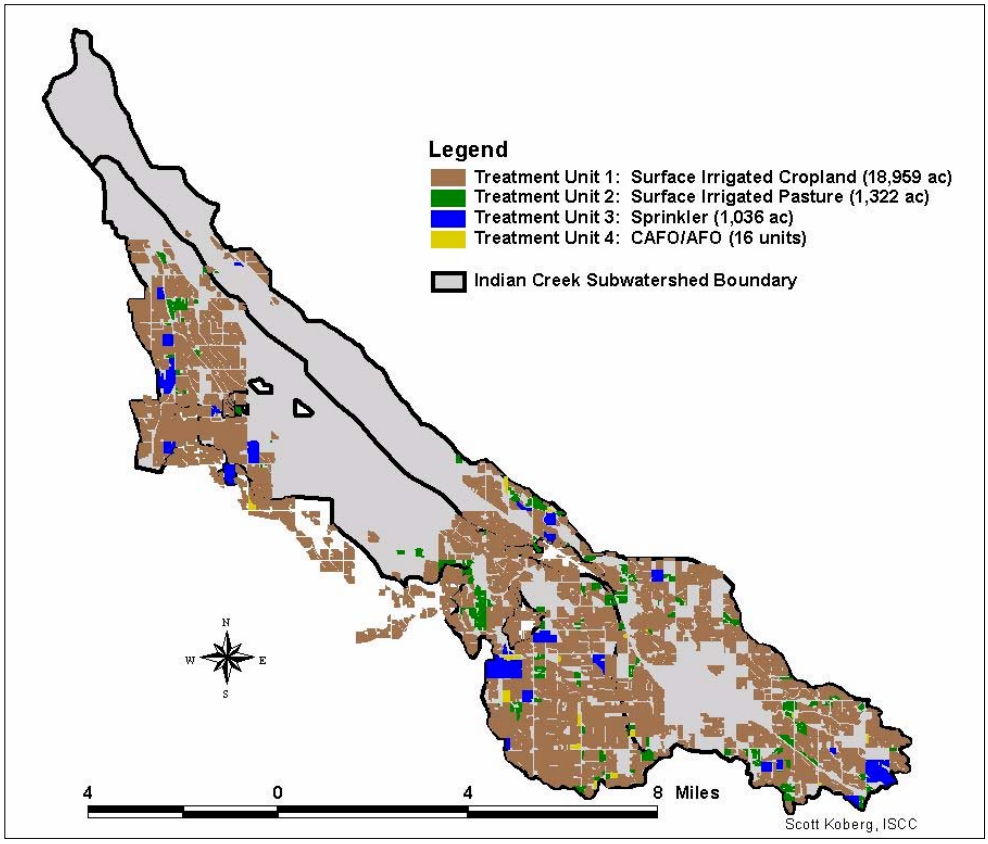
  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

**Table 2. Acres of TUs within Indian Creek Subwatershed.**

| Treatment Units | Acres |
|---|---|
| Treatment Unit 1 | 18,959 |
| Treatment Unit 2 | 1,322 |
| Treatment Unit 3 | 1,036 |
| Treatment Unit 4 | N/A |
| | |
| **TOTAL** | **21,317** |

(Koberg, 2001)

**Figure 7. Treatment Units**




## 5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, including Indian Creek.

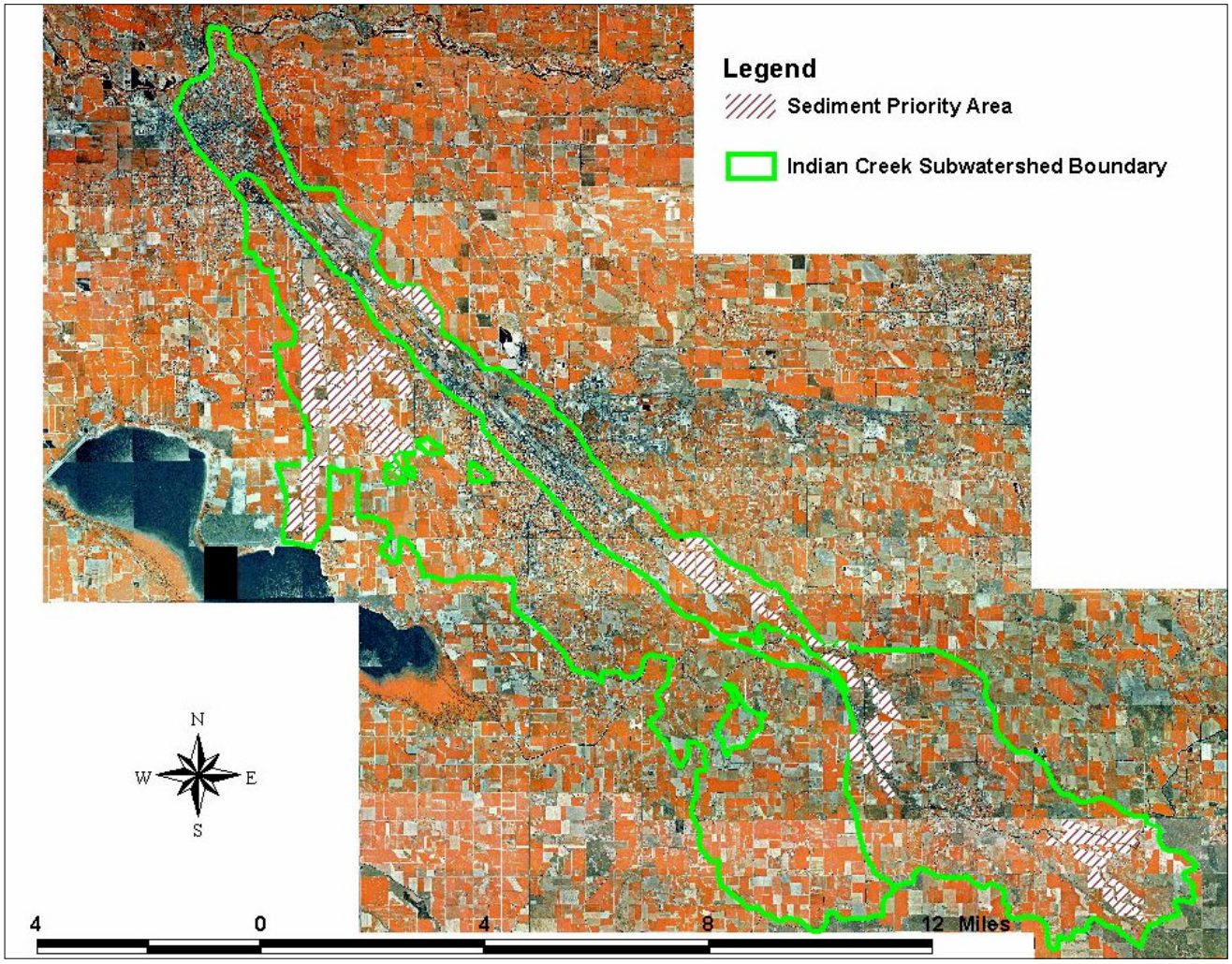
The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards adapt to reflect new developments. After the TMDL targets and load reductions were established for sediment and bacteria, additional sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been conducted. This new information and data collection indicate that the Lower Boise River may be closer to achieving its TMDL targets than originally assumed in the Subbasin Assessment.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" nutrient policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion
- Irrigation tailwater delivery to receiving water bodies
- Lack of adequate vegetation adjacent to waterways necessary for reducing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria.

**Figure 8. Indian Creek Subwatershed Priority Area**




## 5.1 Recreational Uses – Bacteria Objectives

The Lower Boise River TMDL established a 94% bacteria reduction target for primary contact recreation and a 48% reduction target for secondary contact recreation in Indian Creek to meet Idaho's fecal coliform criteria (Table 3).

**Table 3. Reductions Required to Meet Bacteria Load Allocation**

| Name | Primary Geo-Mean CFU/100 ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-Mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| **Indian Creek** | **770** | **50** | **94%** | **384** | **200** | **48%** |

(IDEQ, 1998)

Two developments affect this reduction objective and the agricultural BMP implementation that would be required to achieve it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, preliminary DNA results of bacteria samples from various locations in the Lower Boise River watershed indicate that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, and raccoon) beyond human control contribute largely to the current bacteria loads in the river. The current TMDL targets for bacteria may be unattainable as a result of these natural sources of fecal coliform and E. coli. It is likely that sources of bacteria from cows and other agricultural livestock can be reduced by implementing BMPs that limit their access to the Boise River and its tributaries while providing alternative watering sources.

**Table 4. Description of Confined Animal Feeding Operations in Indian Creek Subwatershed**

| Type of Confined Animal Feeding Operation (CAFO) | Number of CAFO's in Indian Creek Subwatershed |
|---|---|
| Dairy Cattle | 11 |
| Beef Cattle | 5 |
| **Total** | **16** |

(Koberg, 2001)

## 5.2 Aquatic Life Uses – Sediment Objectives

The approach selected by the local and state agencies responsible for addressing resource concerns on agricultural lands is to seek voluntary implementation of best management practices (BMPs) on agricultural lands with state and federal cost-share incentive programs to reduce Total Suspended Sediment loading rate by 37%.

**Table 5. 1995 TSS loads and allocations for Indian Creek**

| Tributary | 1995 Loads (Tons/day) | % of 1995 Total Watershed Load | TSS Load Allocation (Tons/day) |
|---|---|---|---|
| Indian Creek | 9.11 | 6% | 5.74 |

(IDEQ, 1998)

## 5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

**Table 6. Proposed No Net Increase (NNI) Phosphorous Load**

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| **Indian Creek** | **164** | **30,219** |

(IDEQ, 1998)

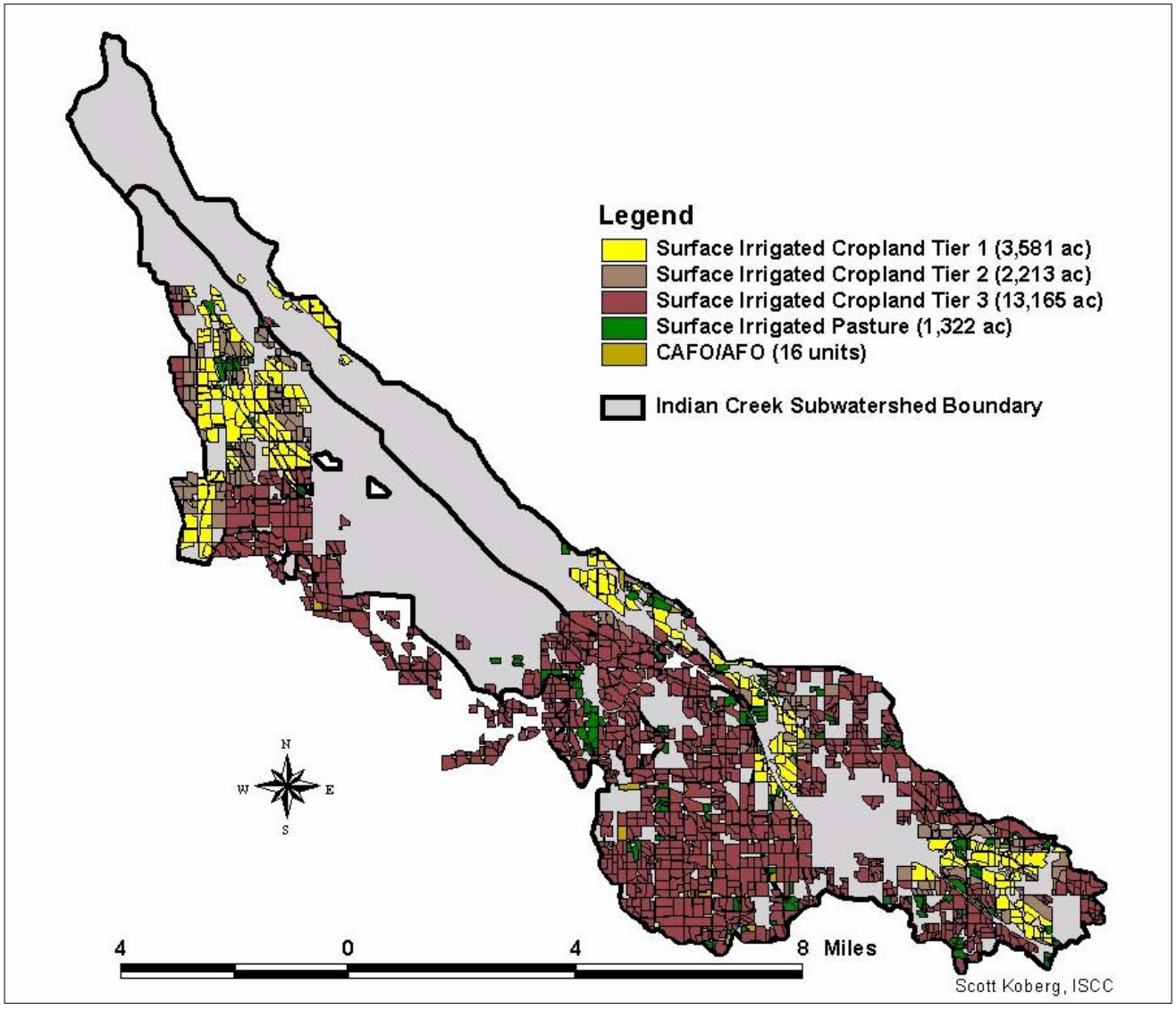
# 6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Indian Creek. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Indian Creek, which affects the Lower Boise River.

Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural land that drains directly into Indian Creek, Wilson Drain, or any of the sub-drains to Wilson and is downstream from the city of Nampa is included in Tier 1 along with any land that drains directly into Indian Creek in the upper portion. Tier 1 lands have the most immediate impact on Lower Boise River water quality due to their proximity to the surface water tributaries. Unlike Tier 1 lands, Tier 2 lands are not directly adjacent to the tributaries of concern, and the wastewater from Tier 2 acreage has the potential to be reused by Tier 1 acreage before entering Indian Creek or Wilson Drain. Tier 3 acreage is located either in the upper portion of the subwatershed (upstream from Nampa), or in the uplands where wastewater has the potential to be used multiple times by Tier 2 and Tier 1 acreage before entering the receiving waterbodies. In terms of BMP implementation Tier 1 is high priority, Tier 2 is medium priority, and Tier 3 is low priority (Figure 9).

**Figure 9. Location of Critical Acres**




**Critical Acres within each Treatment Unit:**

| | |
|---|---|
| Treatment Unit 1 | 3,581 acres of Tier 1 surface irrigated cropland<br>2,213 acres of Tier 2 surface irrigated cropland<br>13,165 acres of Tier 3 surface irrigated cropland |
| Treatment Unit 2 | 1,322 acres of surface irrigated pasture |
| Treatment Unit 3 | There are no critical acres within this treatment unit (Sprinkler) |
| Treatment Unit 4 | 16 units of CAFO/AFO |

# 7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited, to the following:

**Table 7. Treatment Unit 1: Surface Irrigated Cropland**

| | |
|---|---|
| Agro-Tillage | Conservation Cropping Sequence |
| Conservation Tillage | Cover and Green Manure Crop |
| Filter Strips | Grassed Waterway |
| Surge Irrigation System | Sprinkler Irrigation System |
| Tailwater Recovery System | Irrigation Water Management Systems |
| Straw Mulching | Nutrient Management |
| Pest Management | Sediment Basin |
| Underground Outlet | Chiseling and Subsoiling |
| Waste Utilization | Channel Vegetation |
| Drip Irrigation System | PAM |
| Irrigation Water Conveyance | |

**Table 8. Treatment Unit 2: Surface Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Waste Utilization |
| Spring water development | Waste Storage System |
| Irrigation systems | Nutrient Management |
| Pasture and Hayland Planting | Planned Grazing System |
| Livestock Watering Facility | Pasture and Hayland Management |

**Table 9. Treatment Unit 4: CAFO/AFO**

| | |
|---|---|
| Waste Management System | Heavy use area protection |
| Filter strips | Livestock Watering Facility |
| Nutrient Management | Fencing |

## 7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($800/ acre) | SITE SPECIFIC BMP Alternative #2 ($500/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Irrigation Water Mgt. | Irrigation Water Mgt. | Irrigation Water Mgt. |
| Sprinkler Irrigation System | Land Leveling | Concrete Ditch |
| Nutrient Mgt. | Surface Irrigation System | Filter Strip |
| Conservation Crop Rotation | Gated Pipe | PAM |
| | Tail Water Recovery System | Sediment Basin |
| | Nutrient Mgt. | Nutrient Mgt. |
| | Conservation Crop Rotation | Conservation Crop Rotation |
| | Conservation Tillage | Conservation Tillage |

## 7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($450/ acre) | SITE SPECIFIC BMP Alternative #2 ($350/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Livestock Watering Facility |
| Heavy Use Area Protection | Livestock Watering Facility | Irrigation Water Mgt. |
| Livestock Watering Facility | Irrigation Water Mgt. | Field Border Irrigation System |
| Irrigation Water Mgt. | Field Border Irrigation System | |
| Field Border Irrigation System | | |
| Gated Pipe | | |

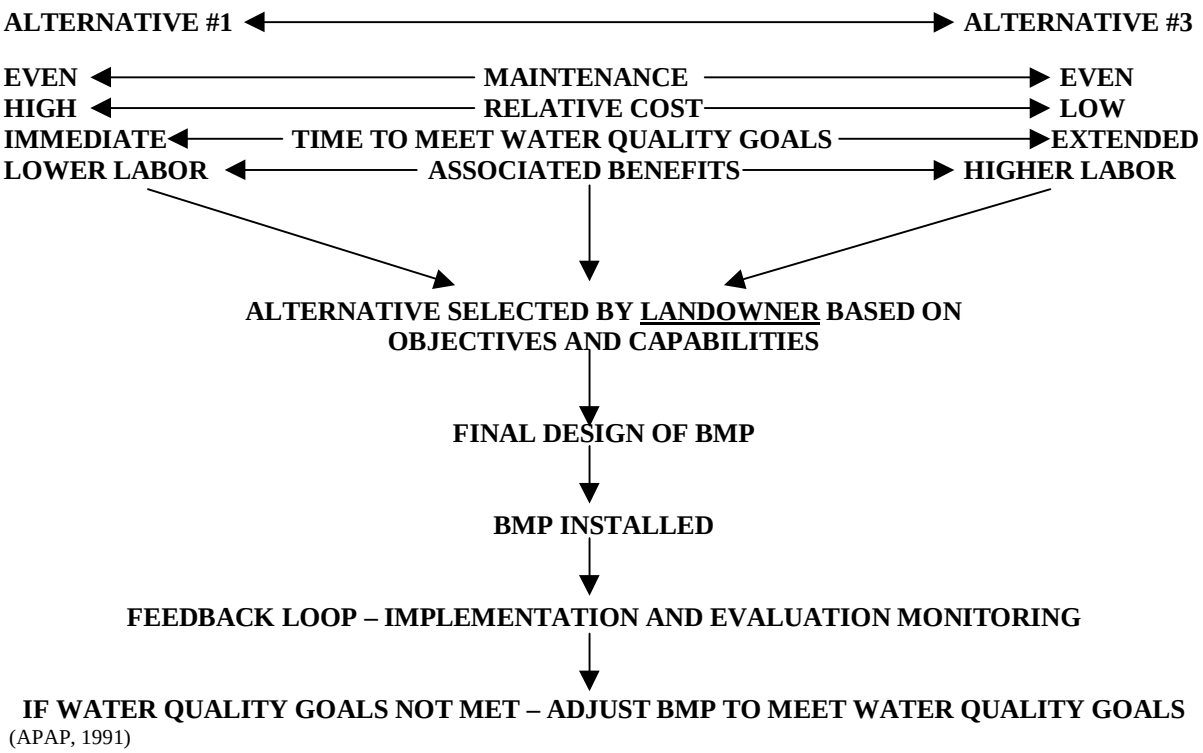
## 7.3 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($50,000/ each) | SITE SPECIFIC BMP Alternative #2 ($35,000/ each) | SITE SPECIFIC BMP Alternative #3 ($25,000/ each) |
|---|---|---|
| Nutrient Mgt. | Waste Mgt. System | Waste Mgt. System |
| Heavy Use Area Protection | Nutrient Mgt. | Nutrient Mgt. |
| Livestock Watering Facility | Livestock Watering Facility | Filter strip |
| Filter strips | Filter strips | Heavy Use Area Protection |
| Waste Mgt. System | Heavy Use Area Protection | |
| Dike | | |

## 7.4 Graphic Comparison of BMP Selection and Implementation Process

The site specific BMP Alternative is chosen based on a variety of factors, but typically reflect the landowner's objectives in conjunction with the resource concerns identified by the assisting agency. The following flow chart provides a graphic representation of selection process and some comparisons between Alternative #1(high cost), Alternative #2 (moderate cost), and Alternative #3 (low cost) for the various treatment units. The chart applies to each of the three treatment units identified in sections 7.1 through 7.3.



(APAP, 1991)

## 7.5 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

## 7.6 Feedback Loop

The feedback loop is a process used to evaluate and refine installed BMPs. Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards (APAP, 1991). The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

# 8.0 Program of Implementation

The Canyon Soil Conservation District along with the Ada Soil & Water Conservation District has selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. There are currently no sources of funding available for cost-share assistance specifically within the Indian Creek subwatershed priority area. While there are a handful of federal and state site-specific programs available to interested participants on a farm by farm basis, Indian Creek has yet to be selected as a priority area with its own specific project area. Should funding become available for use specifically in the Indian Creek Subwatershed, the implementation of BMPs and distribution of incentive payments will likely be focused within the subwatershed boundary downstream from Nampa and in the Wilson Drain area where the majority of Tier 1 acreage is located. Idaho State Department of Agriculture data collected over a two year period at upstream sites in the subwatershed indicate that the majority of pollutant loading to the Indian Creek system originates from this area.

## 8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC), Ada SWCD, and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. Where cost-share incentives are contracted through a state or federal program, NRCS and ISCC will assist Ada and Canyon Conservation Districts with certification of installed BMPs, filing payment applications, completing annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

**Table 10. Estimated BMP Cost Summary for Treatment Unit 1, Tier 1 (Surface Irrigated Cropland: 3,581 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 3581 | $ 2,864,800 |
| Alternative 2 | $500/AC | 3581 | $ 1,790,500 |
| Alternative 3 | $250/AC | 3581 | $ 895,250 |

**Table 11. Estimated BMP Cost Summary for Treatment Unit 1, Tier 2 (Surface Irrigated Cropland: 2,213 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 2213 | $ 1,770,400 |
| Alternative 2 | $500/AC | 2213 | $ 1,106,500 |
| Alternative 3 | $250/AC | 2213 | $ 553,250 |

**Table 12. Estimated BMP Cost Summary for Treatment Unit 1, Tier 3 (Surface Irrigated Cropland: 13,165 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 13,165 | $ 10,532,000 |
| Alternative 2 | $500/AC | 13,165 | $ 6,582,500 |
| Alternative 3 | $250/AC | 13,165 | $ 3,291,250 |

**Table 13. Estimated BMP Cost Summary for Treatment Unit 2 (Surface Irrigated Pasture: 1,322 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $450/AC | 1322 | $ 594,900 |
| Alternative 2 | $350/AC | 1322 | $ 462,700 |
| Alternative 3 | $250/AC | 1322 | $ 330,500 |

**Table 14. Estimated BMP Cost Summary for Treatment Unit 4 (CAFO/AFO 16 Units)**

| ALTERNATIVE | | UNITS | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $50,000/each | 16 | $ 800,000 |
| Alternative 2 | $35,000/each | 16 | $ 560,000 |
| Alternative 3 | $25,000/each | 16 | $ 400,000 |

## 8.2 Operation, Maintenance, and Replacement

Participants who install BMPs in conjunction with a state or federal cost-share incentive program will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Landowners are encouraged to maintain installed BMPs after the contract expires. Participants who install BMPs on their own or without the benefit of a cost-share incentive program are not under contract to maintain the BMPs. If the BMPs are installed in response to a conservation plan completed with them by the assisting agencies, landowners are encouraged to maintain the BMPs and incorporate them into their annual operations. It is not required, however, unless they are under contract.

Inspections of BMPs installed in conjunction with a cost-share incentive program will be made on an annual basis by Ada SWCD and Canyon SCD, NRCS, ISCC, and the participant. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant.

## 8.3 Water Quality Monitoring

The Idaho State Department of Agriculture (ISDA) collected water quality samples in the Indian Creek Subwatershed, including at the mouth of Wilson Drain, during the 1998 and 1999 irrigation seasons. IDEQ has done extensive monitoring and conducted BURP evaluations on Indian Creek in order to develop the 2001 Indian Creek Subbasin Assessment. Monitoring at the mouth of Indian Creek has been conducted by U.S. Geological Survey (USGS) since well before the TMDL was established (1994), and during the past 2 years USGS has continued to conduct a monitoring program at the mouth. Most samples collected by the various agencies occur on a bimonthly basis throughout the irrigation season (April - October) and on a monthly basis throughout the rest of the year (winter). Data parameters measured thus far have included DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids) pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

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# APPENDIX 6.

# Dixie Subwatershed Agricultural TMDL Implementation Plan

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# 1.0 Executive Summary

**Subwatershed:** Dixie Drain Subwatershed
Total Scope: 39,639 acres
Agricultural Scope: 28,263 acres
Agricultural Critical Acres Scope: 23,487 acres

**Location:** South side of the Boise River, located in between the cities of Wilder and Caldwell in Canyon County

**Priority Subwatershed:** High

**Cooperating Agricultural Agencies:** Canyon Soil Conservation District (CSCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

**Agricultural Land Uses:**

Dixie Agricultural Land Uses

| Landuse | Acres | Percent of Dixie Subwatershed |
|---|---|---|
| Sprinkler Irrigated Cropland, Pasture, Orchard and Vineyard | 3,692 | 9% |
| Surface Irrigated Cropland & Orchard | 17,930 | 45% |
| Surface Irrigated Pasture | 4,829 | 12% |
| Non-Irrigated Pasture | 1,084 | 3% |
| CAFO/AFO | 728 | 2% |
| **TOTAL** | **28,263** | **71%** |

**Major Agricultural Products:** Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops, vegetables, livestock, and dairy products.

**TMDL Objectives:** The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouth of the Dixie Drain .The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98%.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 "SR-HC TMDL") will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

**Implementation Plan:** This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Dixie Drain Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, Polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the five different agricultural land use types (Treatment Units) within the Dixie Subwatershed. Estimated costs to install BMPs on lands identified for treatment are Alternative 1 -$18,067,050; Alternative 2 - $11,740,150; and Alternative 3 - $6,464,750. These cost estimates doe not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

# 2.0 Introduction

The Dixie Subwatershed encompasses 39,639 acres located within the Lower Boise River Watershed. Dixie Drain (as it is commonly referred to) originates at the base of Lake Lowell, an agricultural reservoir. It flows northwest toward the Boise River. There are two cities within the Dixie subwatershed boundary. The largest city is Caldwell, with a population of 30,000. One third of Caldwell lies within Dixie subwatershed. The other town within Dixie is Greenleaf with a population of about 700 people. Greenleaf lies entirely within Dixie subwatershed.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from Dixie. Within this plan the following elements are identified: pollutant problems within Dixie, sources of those pollutants, critical acres contributing pollutants to the drain, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on water quality.

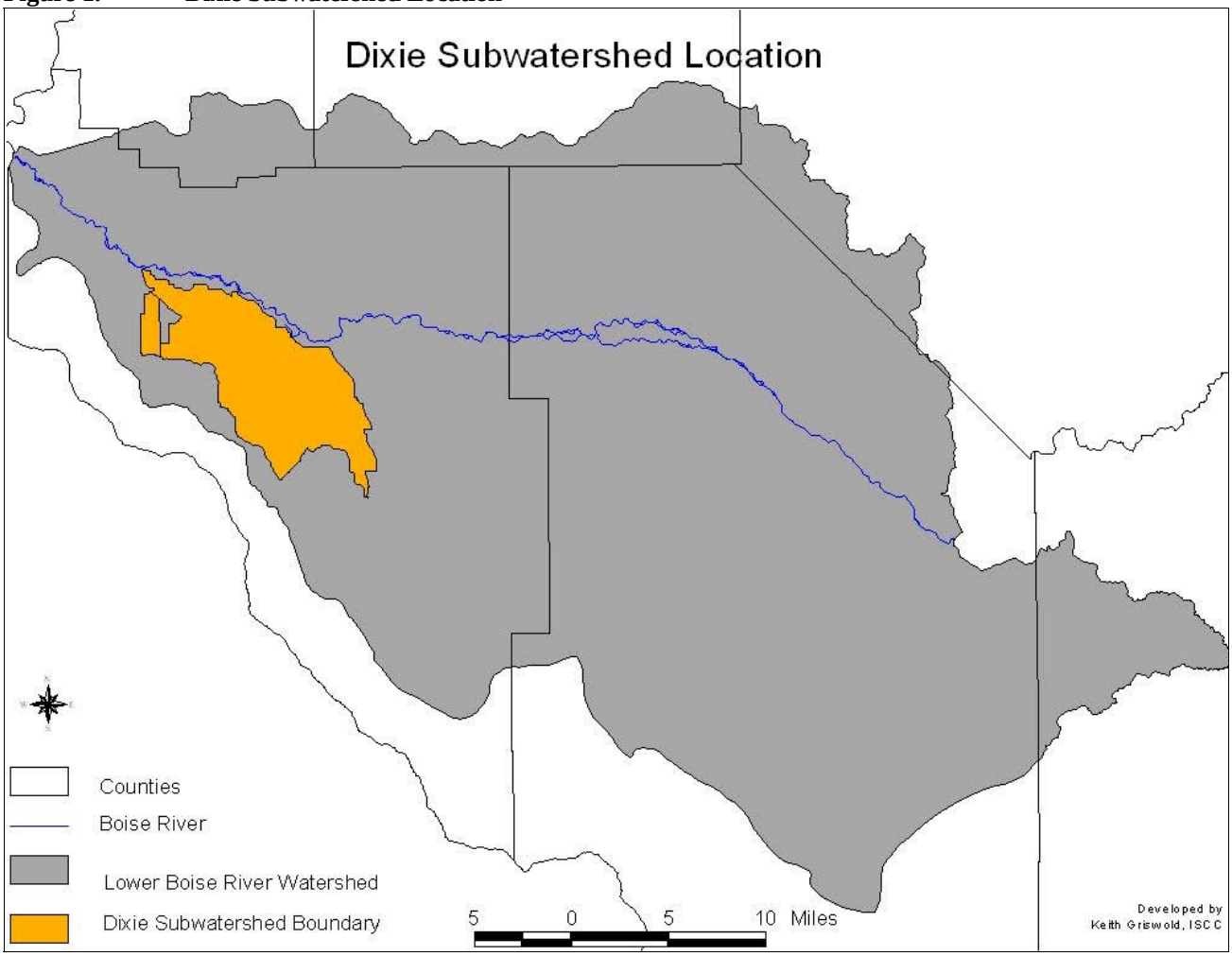
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Dixie subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements at the mouth of Dixie. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Dixie Subwatershed contact the Canyon Soil Conservation District (Canyon SCD), the Natural Resources Conservation Service (NRCS), or the Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency as well as irrigation scheduling and soil moisture monitoring methods.**

**Figure 1. Dixie Subwatershed Location**




## 3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Dixie Subwatershed.

### 3.1 Soils

There are three major soil associations within Dixie subwatershed (U. S. Department of the Agriculture, 1972).

- Moulton-Bram-Baldock association: Somewhat poorly drained and moderately well drained fine sandy loams to silt loams on lowlands. Most soils in this association are underlain by gravel and sand at a depth of less than 4 feet.
- Power-Purdam association: Well drained silt loams and loams on high river terraces. They are underlain by sandy, loamy or gravelly material at a depth of 2 to 6 feet. The Purdam soils have a hardpan below the subsoil.
- Greenleaf-Nyssaton-Garbutt association: Well drained silt loams on lake terraces and alluvial fans. The soils in this association formed in alluvium or deep lacustrine deposits of silt loam-to-loam material.

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility.

## 3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature in July for Caldwell, Idaho is 92 degrees Fahrenheit, while the average daily minimum temperature in January is 20 degrees Fahrenheit. Temperatures as low as -46 degrees Fahrenheit and as warm as 112 degrees Fahrenheit have been recorded.

Long term average annual precipitation for Caldwell is 10.48 inches and for Deer Flat Refuge on Lake Lowell is 9.17 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley. Extended periods of no rain can occur frequently during the growing season.

The average consecutive frost-free period (above 32 degrees) is 143 days, based on the Caldwell long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 125 days for this area. The average last frost (32 degrees) in the spring is around May 6 and the average first frost (32 degrees) in the fall is around September 27 (U. S. Department of the Agriculture, 1972).

## 3.3 Surface Hydrology

The Dixie Subwatershed ranges in elevation from approximately 2,500 feet at the base of Lake Lowell to 2,250 feet at the Boise River.

Pre-existing ephemeral channels have been modified over time by channelization, bank stabilization, and the development of the existed in the watershed prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There are currently 11 major canals that supply water to cropland in Dixie Subwatershed and 11 major drains that receive tailwater from the croplands and pastures or drain ground water (Table 2). Agricultural wells supply water to the upper portions of the subwatershed.

Phyllis Canal was one of the earliest canals constructed in Dixie Subwatershed. It was completed in 1891with its diversion just across the Boise River from the town of Eagle, in Ada County. The Phyllis canal flows a total length of 35 miles to Dixie Subwatershed before converging with the Renshaw Canal just south of Greenleaf. Lake Lowell was authorized March 27, 1905 and funded through the 1902 Reclamation Act for agricultural water supply (Bureau of Reclamation 1996). Lake Lowell construction finished in 1909. Three canals flow from Lake Lowell to supply water to Dixie Subwatershed.

**Table 1. Surface Waterbodies in Dixie Subwatershed**

| Canal or Lateral | Drain, Slough or Gulch |
|---|---|
| Eureka Canal | North Drain |
| Phyllis Canal | South Drain |
| Deer Flat North Canal | Dixie Slough |
| Deer Flat Low Line Canal | West End Drain |
| Renshaw Canal | Dixie Drain |
| Burris Lateral | Lower Embankment Drain |
| Forest Canal | Benson Drain |
| Caldwell canal | Guess Drain |
| Drew Canal | Benson Gulch |
| Soper Canal | Dickens Drain |
| Golden Gate Canal | Pipe Gulch |

**Figure 2. Surface Hydrology**

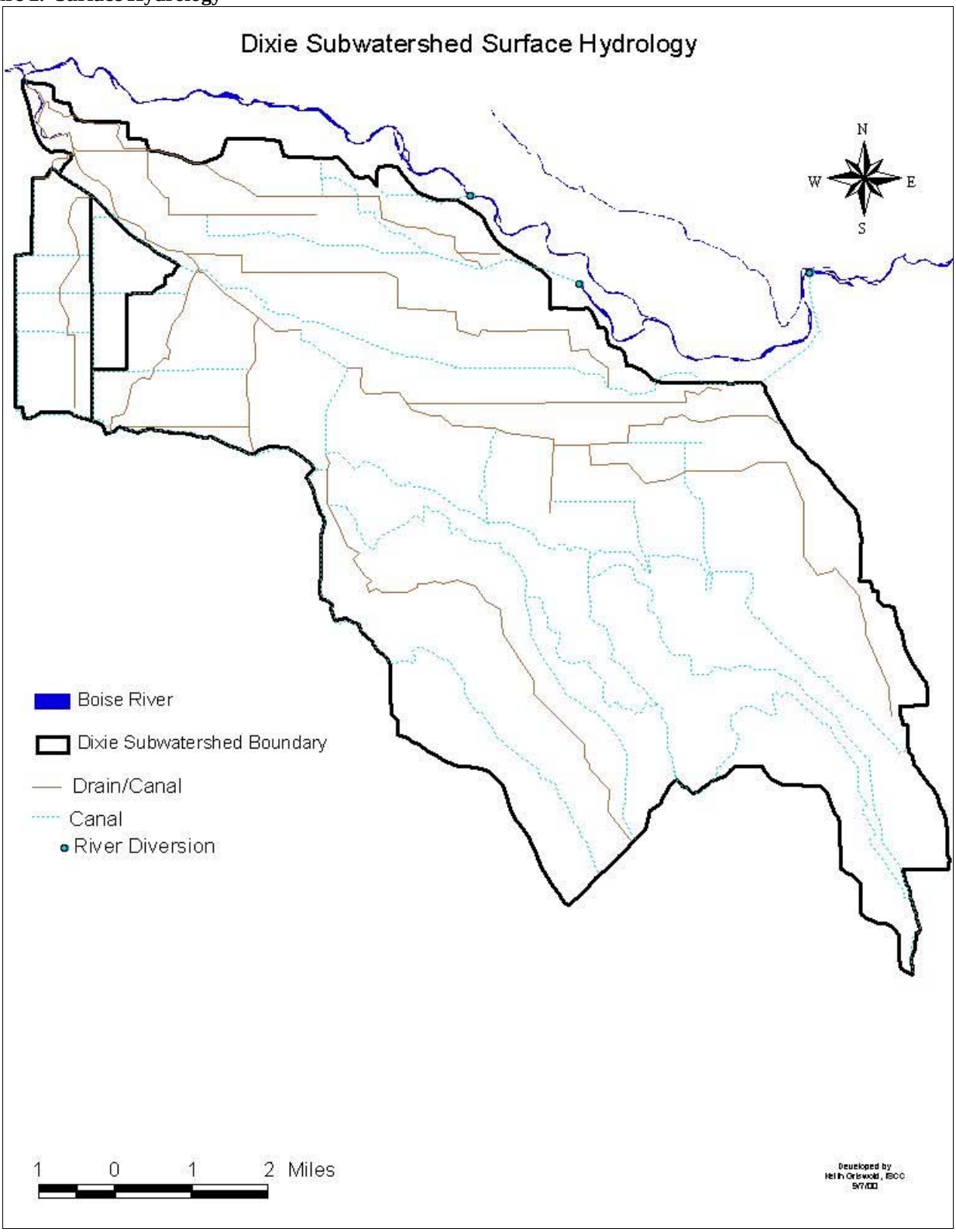
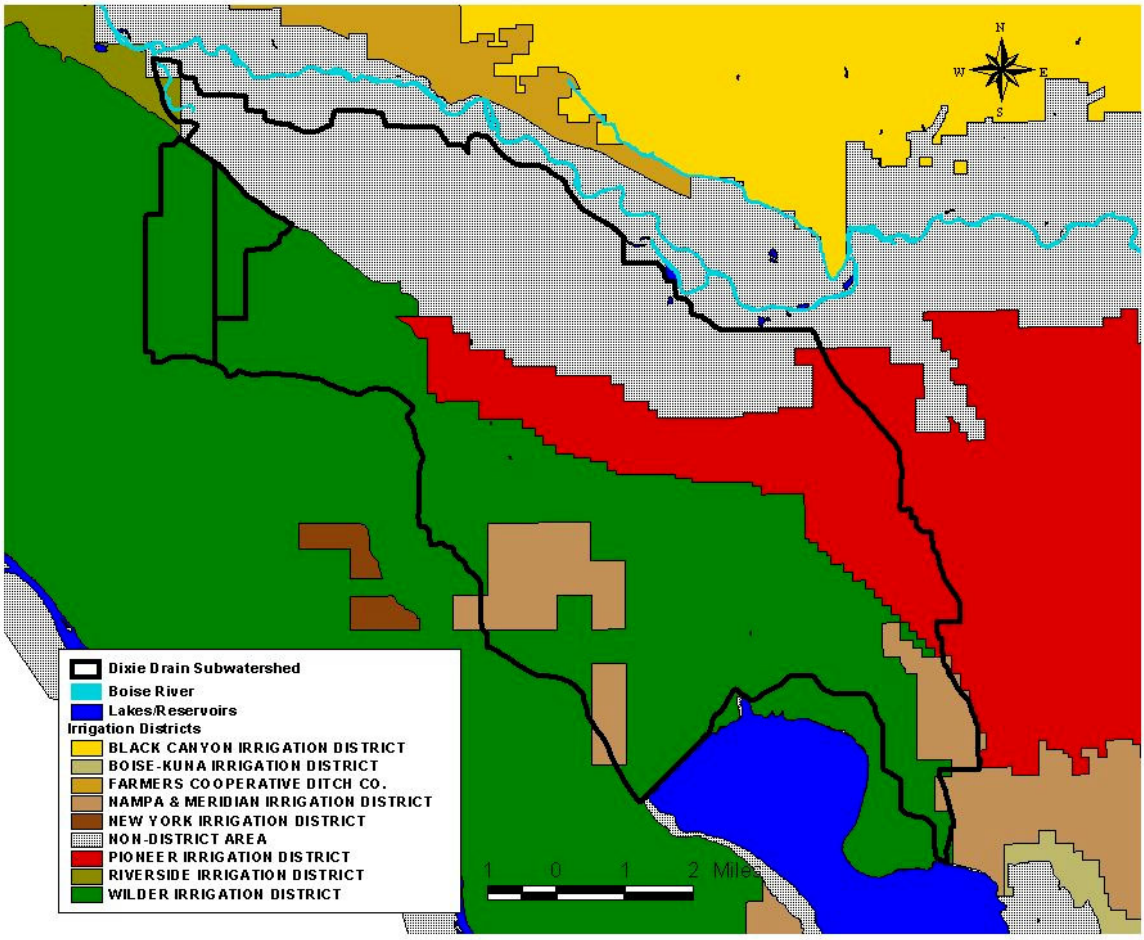


**Figure 3. Irrigation Districts**




## 3.4 Ground Water Hydrology

A large, shallow, aquifer (< 200 feet) is recharged annually by seepage from surface irrigation and conveyance of water through earthen canals.

Two deep aquifers exist under Dixie Subwatershed. The Boise Valley deep aquifer underlies most of the subwatershed, while the Mountain Home Plateau deep aquifer exists only under a small portion near the southwestern boundary.

## 3.5 Demographics and Economics

Demographic and Economic section is for all of Canyon County.

- Canyon County population increased over 14% from 1990 to 1996.
- Population of Canyon County increased from 90,076 in 1990 to 116,675 in 1997.
- Agricultural lands around Caldwell are being developed for residential housing and subdivisions are increasingly being constructed south of Caldwell toward Lake Lowell and to the west past Farmway Rd.
- Types of irrigated crops include, but are not limited to: seed corn, alfalfa and clover for seed and hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops and vegetables.

**Table 2. 1997 Agricultural Data for Dixie Subwatershed**

| Inventory: Farms & Cropland | Dixie Subwatershed |
|---|---|
| Total # of Farms | 466 |
| Total Acres of Farms | 28,263 |
| Average Farm Size (acres) | 60.7 |
| Total Acres in Crops | 27,535 |

(Griswold, 2000)

## 3.6 Land Ownership and Land Use

The items listed below are highlights of the Land Ownership and Land Use section in the Lower Boise River Implementation Plan.

- Dixie Subwatershed is 98% privately owned (Figure 7).
- Irrigated crops and pasture are the largest agricultural use. Orchards and vineyards are located in the upper portion of the subwatershed.

**Figure 4. Dixie Subwatershed K Factor Classes**

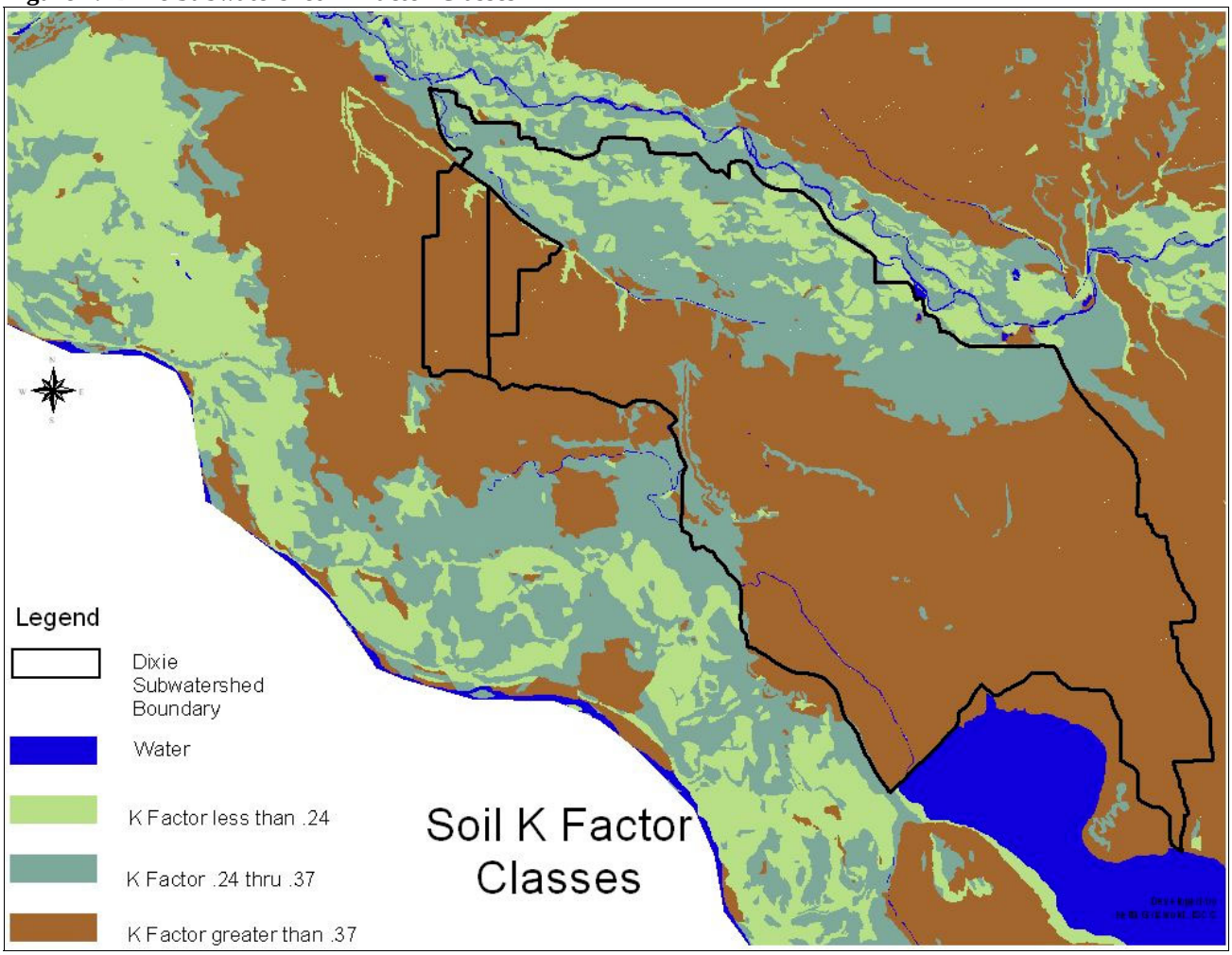


**Figure 5. Dixie Subwatershed Slope Classes**

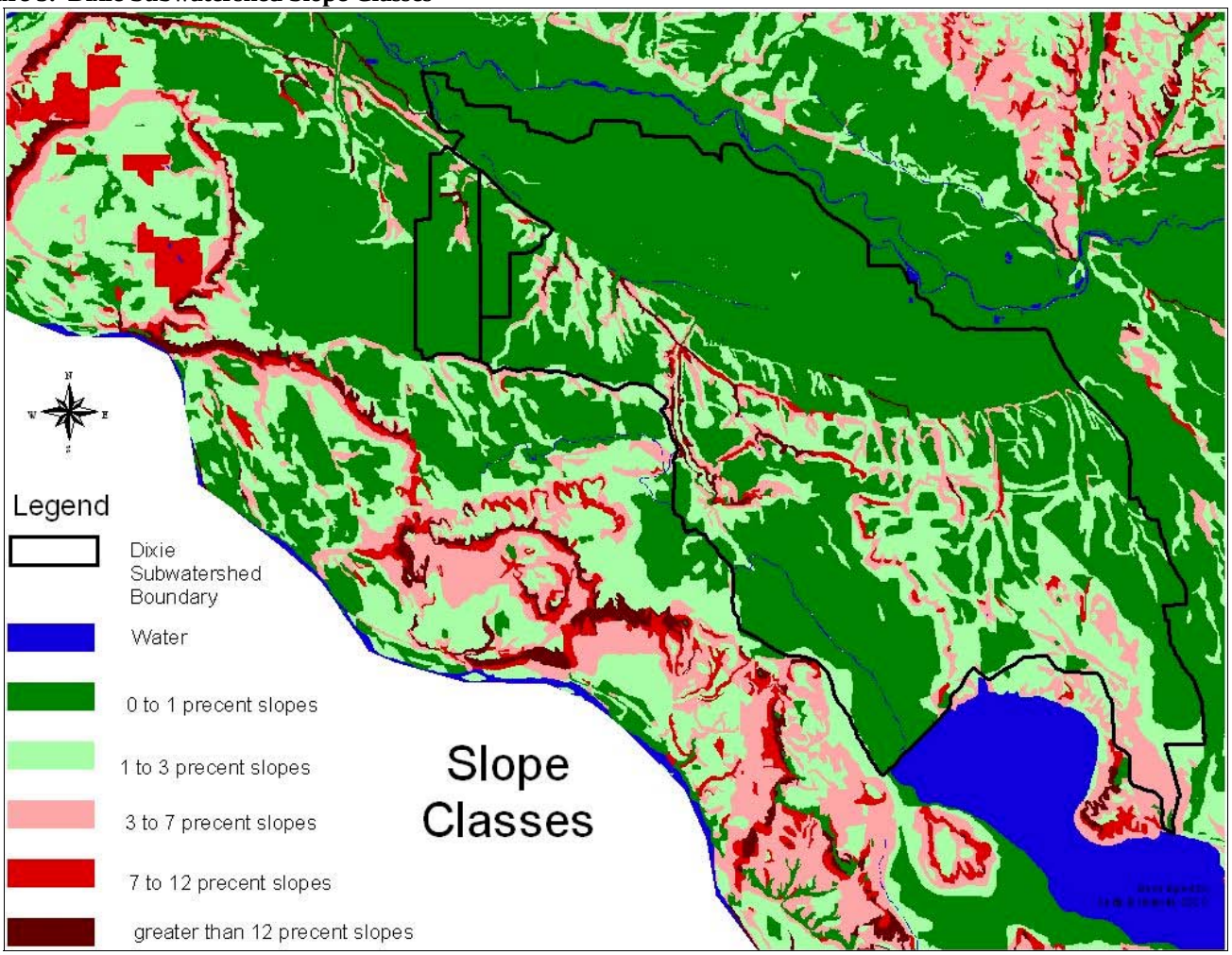
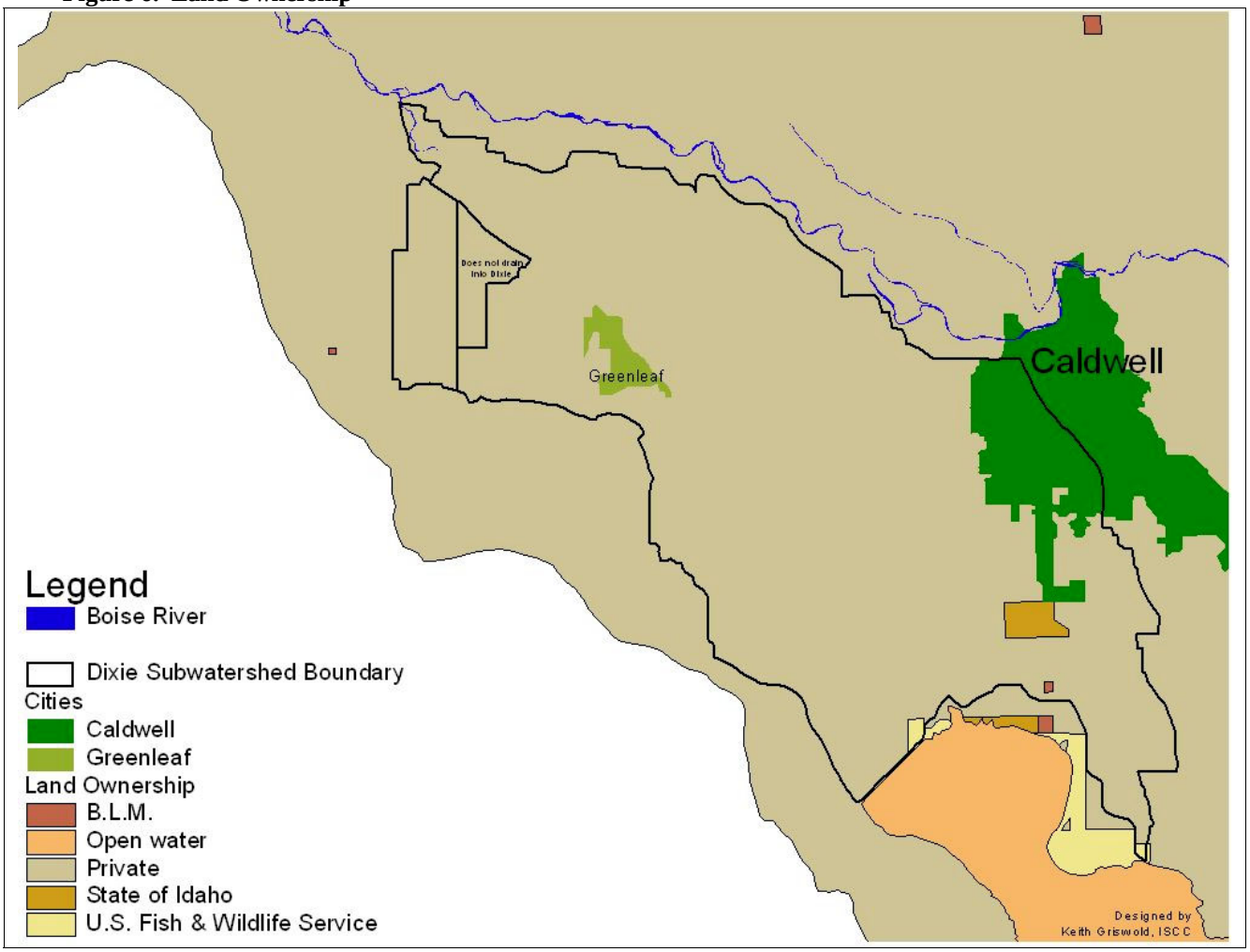


**Figure 6. Land Ownership**



# 4.0 Treatment Units

This section presents information on the individual agricultural land uses within the watershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 9). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for solving the identified problems.

The descriptions in this section are intended to provide a general overview of the TUs.

- Treatment Unit #1 – Sprinkler Irrigated Cropland, Pasture, Orchard and Vineyard, 3,692 acres

  This unit occurs throughout the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality because of the insignificant amount of runoff resulting from high irrigation efficiencies.

- Treatment Unit #2 – Surface Irrigated Cropland & Orchard, 17,930 acres

  This unit occurs mostly south of Riverside Canal. Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- Treatment Unit #3 – Surface Irrigated Pasture 4,829 acres

  This unit occurs mostly north of Riverside Canal. Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures enters the Lower Boise River via Dixie Drain.

- Treatment Unit #4 – Non-Irrigated Pasture 1,084 acres

  Riparian areas are associated mainly with Dixie Drain, Pipe Gulch, Dixie Gulch, Guess Gulch, West End Drain, and Christian Gulch. Typical vegetative growth is Cattail, Russian olive, Reed Canary Grass, and invasive plant species. Bank erosion and direct bacterial impacts occur when livestock enter the creeks for water and shade.

- Treatment Unit #5-- CAFO/AFO 728 acres

  Feedlots are small and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. See Table 6. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

**Table 3. Acres of TUs within Dixie Subwatershed.**

| Treatment Units | Acres |
|---|---|
| Treatment Unit 1 | 3,692 |
| Treatment Unit 2 | 17,930 |
| Treatment Unit 3 | 4,829 |
| Treatment Unit 4 | 1,084 |
| Treatment Unit 5 | 728 |
| TOTAL | 28,263 |

(Griswold, 2000)

**Figure 7. Treatment Units**

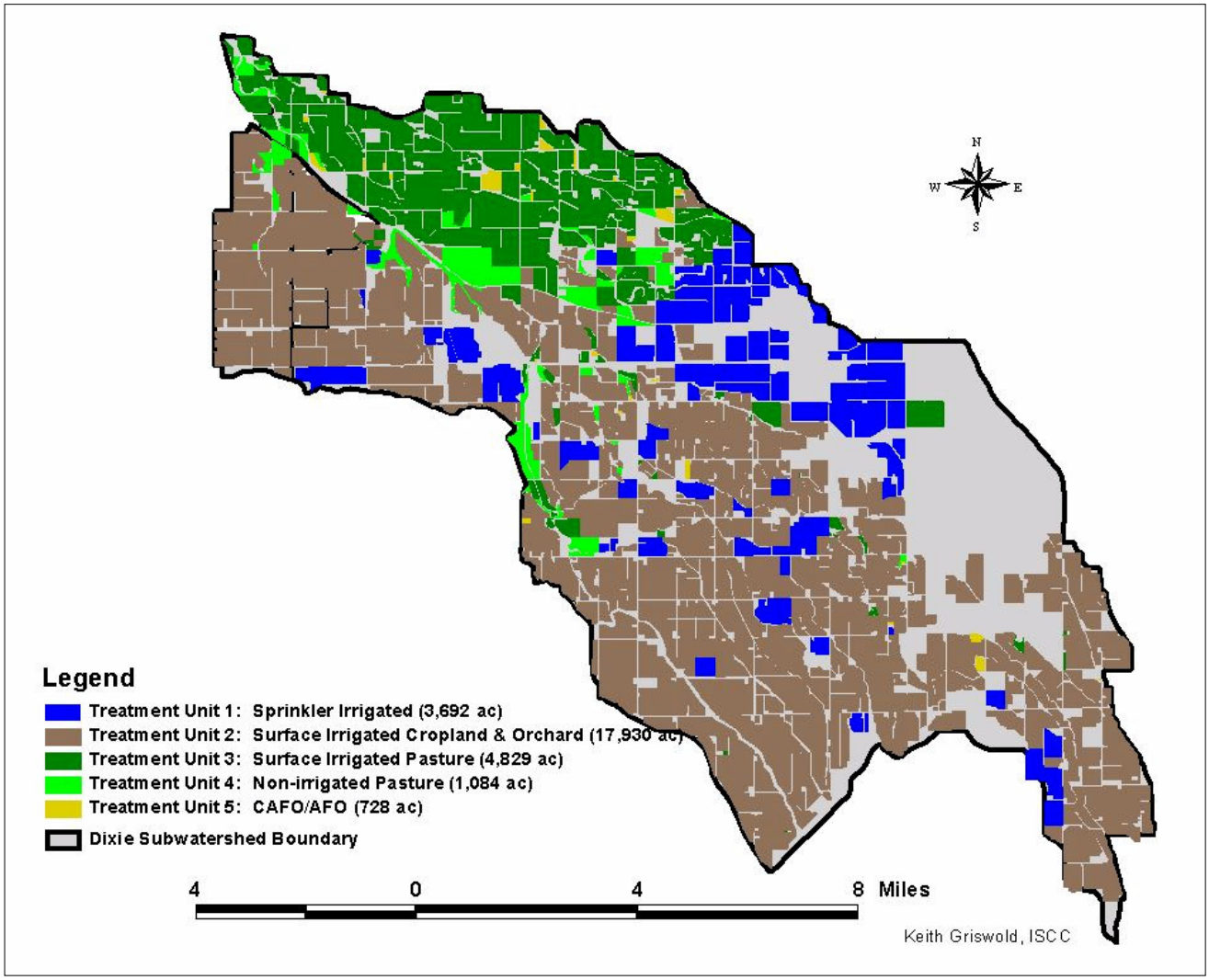
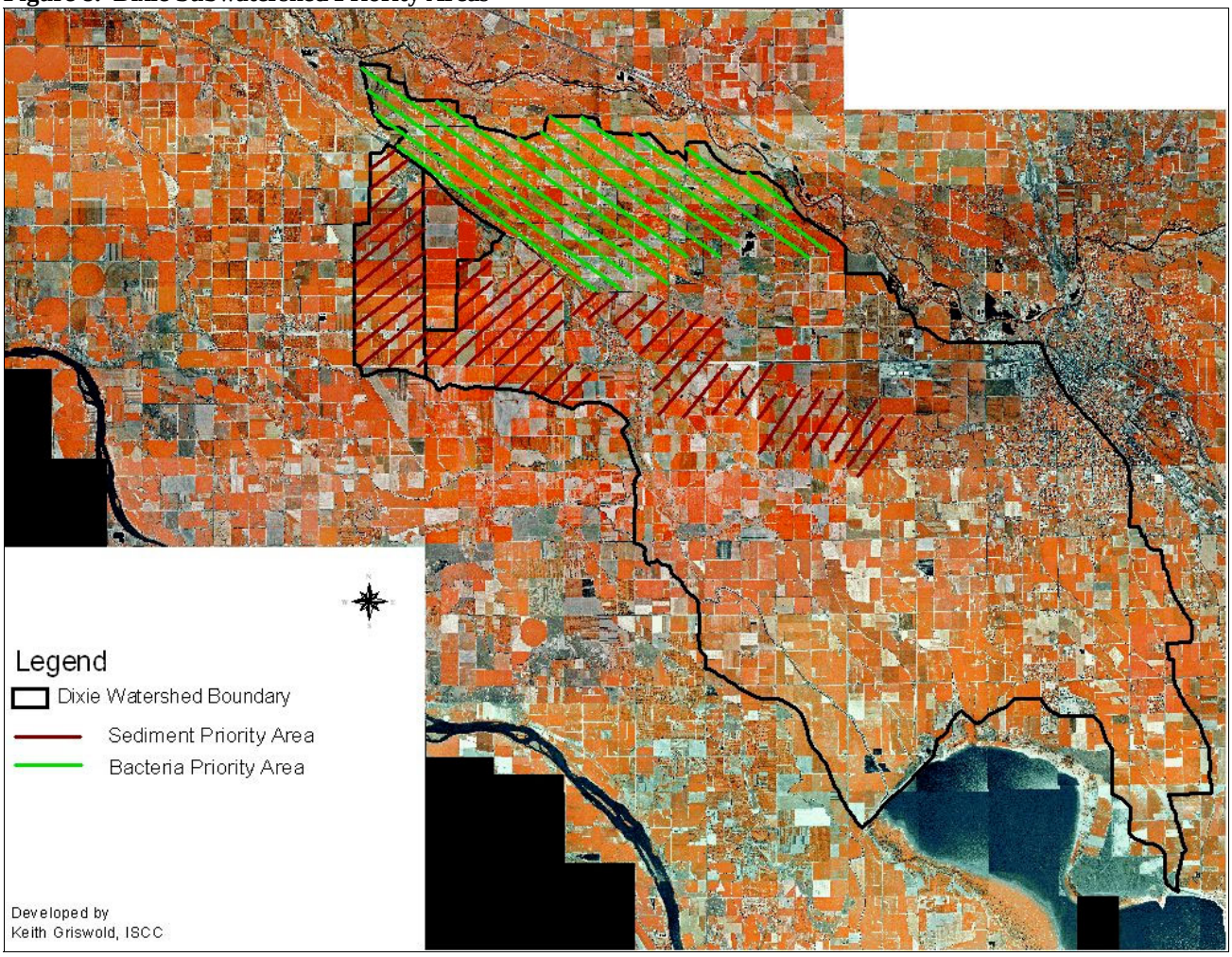


**Figure 8. Dixie Subwatershed Priority Areas**




## 5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, including Dixie Drain.

The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards change. After the TMDL targets and load reductions were established for sediment and bacteria, additional, more frequent sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been performed. This new information and water quality standards change indicate that revision of the TMDL sediment and bacteria targets is appropriate, and will continue to be evaluated with additional data as it is collected.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" in nutrient policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion.
- Lack of adequate vegetation adjacent to waterways necessary for removing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria.

## 5.1 Recreational Uses – Bacteria Objectives

The TMDL establishes a 98% bacteria reduction objective for the Dixie Drain to meet Idaho's fecal coliform criteria for protection of recreational uses (Table 4).

**Table 4. Reductions Required to Meet Bacteria Load Allocation**

| Name | Primary Geo-Mean CFU/100 ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-Mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| **Dixie Drain** | **2987** | **50** | **98** | **1156** | **200** | **83** |

(Portion of Table 22 from, page 71 Lower Boise River TMDL Subbasin Assessment)

Two developments affect this reduction objective and agricultural BMP implementation required to meet it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, DNA analysis of bacteria samples from various locations in the Lower Boise River watershed show that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, raccoon) that are beyond human control prevent attainment of the TMDL's bacteria targets and load reductions. It is likely that inputs of bacteria from cows can be significantly reduced by simply reducing their access to the Boise River and tributary water sources.

**Table 5. Description of Confined Animal Feeding Operations in Dixie Subwatershed**

| Type of Confined Animal Feeding Operation (CAFO) | Number of CAFO's in Dixie Drain Subwatershed |
|---|---|
| Dairy Cattle | 3 |
| Beef Cattle | 23 |
| Sheep | 1 |
| Horse | 3 |
| Research (Elk, Bison & Rocky Mtn Bighorn Sheep) | 1 |
| | 31 |

(Griswold, 2000)

## 5.2 Aquatic Life Uses – Sediment Objectives

The approach is to seek voluntary implementation of best management practices (BMPs) on agricultural lands to reduce Total Suspended Sediment loading rate by 37%.

**Table 6. 1995 TSS loads and allocations for Dixie Drain**

| Tributary | 1995 Loads | % of Total River Load | TSS Load Goals | % of Total Goal |
|---|---|---|---|---|
| Dixie Drain | 41.1 | 26% | 25.9 | 17% |

(IDEQ, 1998)

## 5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

**Table 7. Proposed No Net Increase (NNI) Phosphorous Load**

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| **Dixie Drain** | **444** | **81672** |

(IDEQ, 1998)

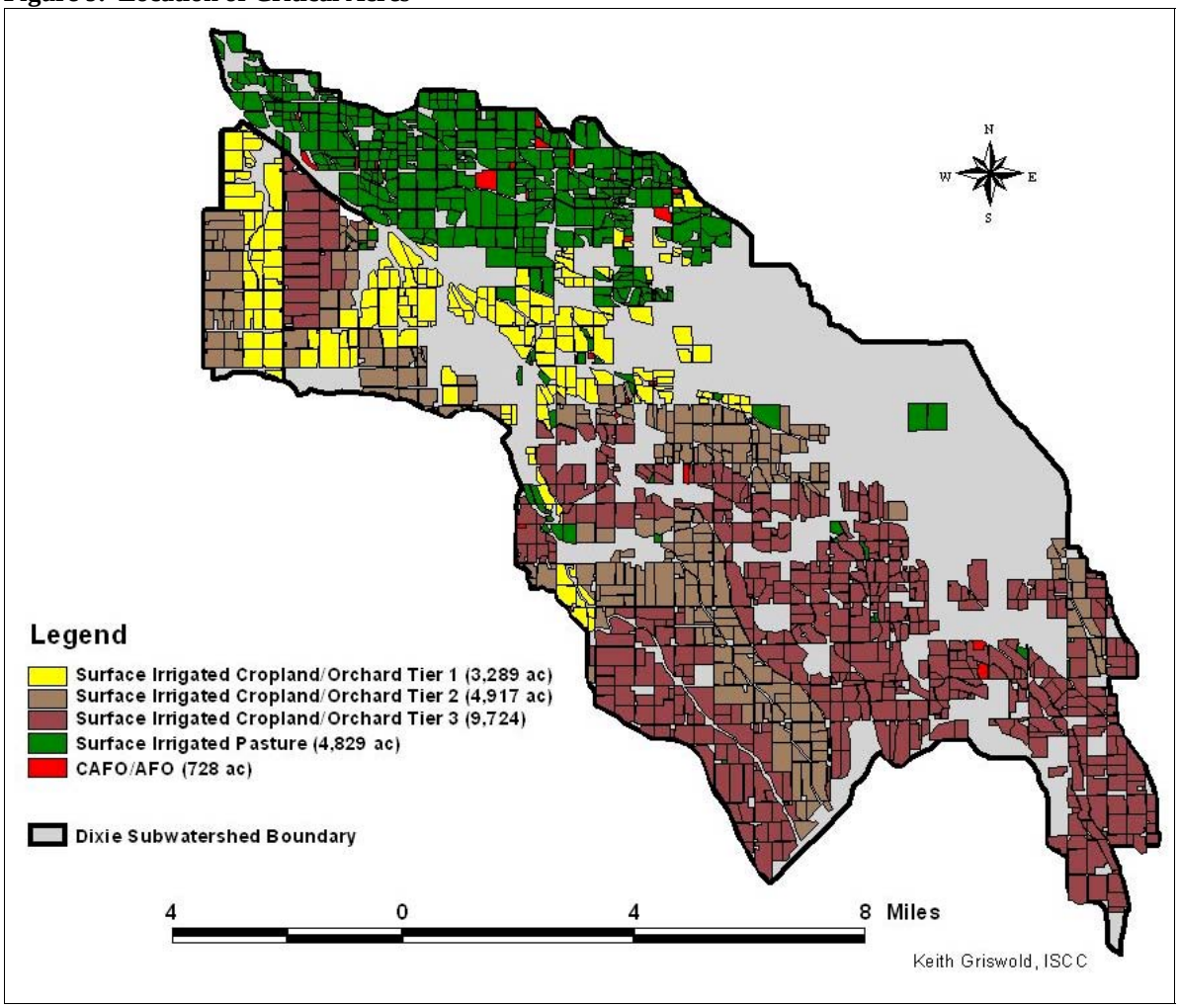
# 6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Dixie Drain. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Dixie Drain, which affects the Lower Boise River.

Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural lands that drain directly into Dixie Drain will be a Tier 1, high priority for treatment because these lands have the most immediate impact on Lower Boise River water quality. Drainage water from Tier 2 lands is reused once on Tier 1 lands before discharging to the Dixie Drain, and is given a medium priority for treatment. Tier 1 & 2 acres are the Critical Acres within Treatment Unit 2. Drainage water from Tier 3 lands is reused multiple times on Tier 1 and Tier 2 lands before discharging to the Dixie Drain, and are given a low priority for treatment.

**Figure 9. Location of Critical Acres**



**Critical Acres within each Treatment Unit:**

| | |
|---|---|
| Treatment Unit 1 | No critical acres within this unit. |
| Treatment Unit 2 | 3,289 acres of Tier 1 surface irrigated cropland<br>4,917 acres of Tier 2 surface irrigated cropland<br>9,724 acres of Tier 3 surface irrigated cropland |
| Treatment Unit 3 | 4,829 acres of surface irrigated pasture |
| Treatment Unit 4 | No critical acres within this unit |
| Treatment Unit 5 | 31 units (728 acres) of CAFO/AFO |

# 7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited, to the following:

**Table 8. Treatment Unit 2---Surface Irrigated Cropland**

| | |
|---|---|
| Agro-Tillage | Conservation Cropping Sequence |
| Conservation Tillage | Cover and Green Manure Crop |
| Filter Strips | Grassed Waterway |
| Surge Irrigation System | Sprinkler Irrigation System |
| Tailwater Recovery System | Irrigation Water Management Systems |
| Straw Mulching | Nutrient Management |
| Pest Management | Sediment Basin |
| Underground Outlet | Chiseling and Subsoiling |
| Waste Utilization | Channel Vegetation |
| Drip Irrigation System | PAM |
| Irrigation Water Conveyance | |

**Table 9. Treatment Unit 3---Surface Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Waste Utilization |
| Spring water development | Waste Storage System |
| Irrigation systems | Nutrient Management |
| Pasture and Hayland Planting | Planned Grazing System |
| Livestock Watering Facility | Pasture and Hayland Management |

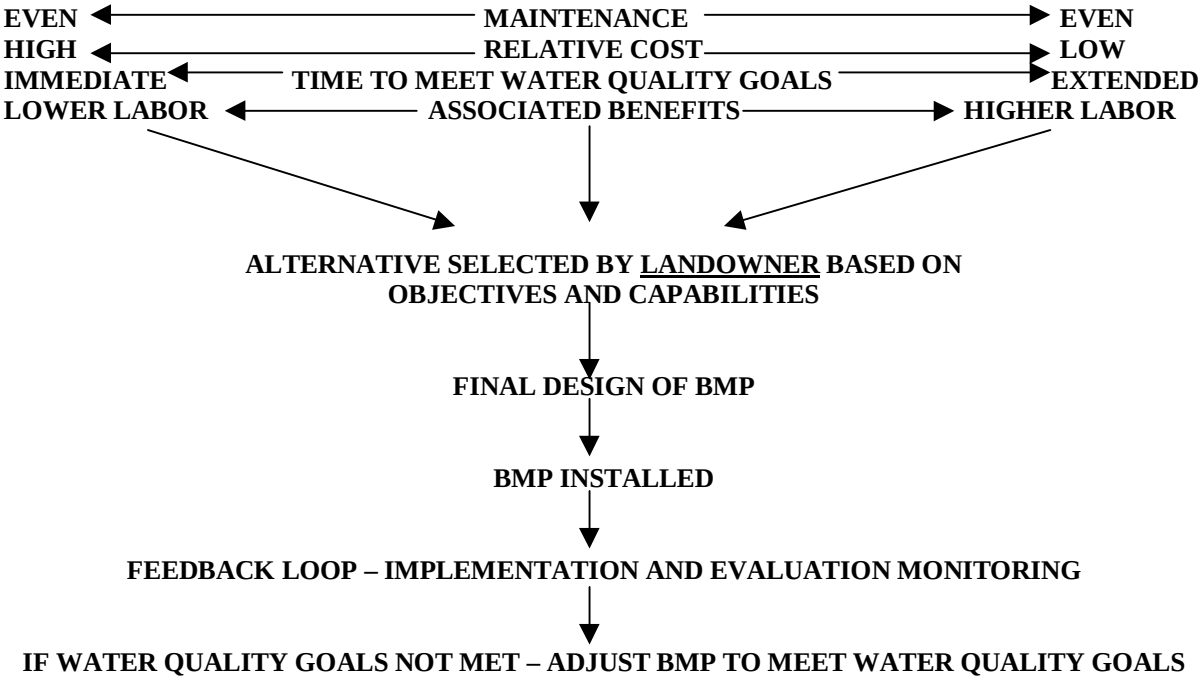
**Table 10. Treatment Unit 5---CAFO/AFO**

| | |
|---|---|
| Waste Management System | Heavy use area protection |
| Filter strips | Livestock Watering Facility |
| Nutrient Management | Fencing |

## 7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($800/ acre) | SITE SPECIFIC BMP Alternative #2 ($500/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Irrigation Water Mgt. | Irrigation Water Mgt. | Irrigation Water Mgt. |
| Sprinkler Irrigation System | Land Leveling | Concrete Ditch |
| Nutrient Mgt. | Surface Irrigation System | Filter Strip |
| Conservation Crop Rotation | Gated Pipe | PAM |
| | Tail Water Recovery System | Sediment Basin |
| | Nutrient Mgt. | Nutrient Mgt. |
| | Conservation Crop Rotation | Conservation Crop Rotation |
| | Conservation Tillage | Conservation Tillage |




(APAP, 1991)

## 7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($450/ acre) | SITE SPECIFIC BMP Alternative #2 ($350/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Livestock Watering Facility |
| Heavy Use Area Protection | Livestock Watering Facility | Irrigation Water Mgt. |
| Livestock Watering Facility | Irrigation Water Mgt. | Field Border Irrigation System |
| Irrigation Water Mgt. | Field Border Irrigation System | |
| Field Border Irrigation System | | |
| Gated Pipe | | |

## 7.3 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($50,000/ each) | SITE SPECIFIC BMP Alternative #2 ($35,000/ each) | SITE SPECIFIC BMP Alternative #3 ($25,000/ each) |
|---|---|---|
| Nutrient Mgt. | Waste Mgt. System | Waste Mgt. System |
| Heavy Use Area Protection | Nutrient Mgt. | Nutrient Mgt. |
| Livestock Watering Facility | Livestock Watering Facility | Filter strip |
| Filter strips | Filter strips | Heavy Use Area Protection |
| Waste Mgt. System | Heavy Use Area Protection | |
| Dike | | |

## 7.4 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

## 7.5 Feedback Loop

The feedback loop a process to evaluation and refinement of BMPs. The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved, the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards. (APAP, 1991)

# 8.0 Program of Implementation

Canyon Soil Conservation District selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. Significant contribution by agricultural land users in the Dixie Subwatershed toward achieving the TMDL's objectives of protecting aquatic life and recreational uses of the Lower Boise River by reducing the discharge of sediments and bacteria from the Dixie Drain to the Lower Boise River.

## 8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC) and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. NRCS and ISCC will assist Canyon SCD with certification of installed BMPs, filing payment applications, completion of annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

**Table 11. Estimated BMP Cost Summary for Treatment Unit 2, Tier 1 (Surface Irrigated Cropland—3,289 acres).**

| ALTERNATIVE | ACRES | TOTAL COSTS |
|---|---|---|
| Alternative 1 $800/AC | 3289 | $ 2,631,200 |
| Alternative 2 $500/AC | 3289 | $ 1,644,500 |
| Alternative 3 $250/AC | 3289 | $ 822,250 |

**Table 12. Estimated BMP Cost Summary for Treatment Unit 2, Tier 2 (Surface Irrigated Cropland—4,917 acres).**

| ALTERNATIVE | ACRES | TOTAL COSTS |
|---|---|---|
| Alternative 1 $800/AC | 4917 | $ 3,933,600 |
| Alternative 2 $500/AC | 4917 | $ 2,458,500 |
| Alternative 3 $250/AC | 4917 | $ 1,229,250 |

**Table 13. Estimated BMP Cost Summary for Treatment Unit 2, Tier 3 (Surface Irrigated Cropland—9,724 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 9724 | $ 7,779,200 |
| Alternative 2 | $500/AC | 9724 | $ 4,862,000 |
| Alternative 3 | $250/AC | 9724 | $ 2,431,000 |

**Table 14. Estimated BMP Cost Summary for Treatment Unit 3 (Surface Irrigated Pasture 4,829 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $450/AC | 4829 | $ 2,173,050 |
| Alternative 2 | $350/AC | 4829 | $ 1,690,150 |
| Alternative 3 | $250/AC | 4829 | $ 1,207,250 |

**Table 15. Estimated BMP Cost Summary for Treatment Unit 5 (CAFO/AFO 31 Units).**

| ALTERNATIVE | | UNITS | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $50,000/each | 31 | $ 1,550,000 |
| Alternative 2 | $35,000/each | 31 | $ 1,085,000 |
| Alternative 3 | $25,000/each | 31 | $ 775,000 |

Canyon SCD has applied for funding of the selected alternative through the State Water Quality Program for Agriculture (WQPA) administered by the Idaho Soil Conservation Commission. Canyon SCD has received funding to treat 3000 acres of surface irrigated cropland. The project will run from 2000 through 2006.

## 8.2 Operation, Maintenance, and Replacement

Participants will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Technical assistance for BMPs will be provided by NRCS and ISCC.

Inspections of installed BMPs will be made on an annual basis by Canyon SCD, NRCS, ISCC, and the participant during the life of the contract. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant. By accomplishing this objective, it is intended that the BMPs will become a part of the participant's farming operation and will continue to be operated and maintained after the contract expires.

## 8.3 Water Quality Monitoring

The ISDA collected water quality samples in Dixie Subwatershed for the year 2000. Most samples have been collected on a bimonthly basis throughout the irrigation season (April - October) and on a monthly basis throughout the rest of the year (winter). Data parameters measured thus far have included DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids) pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli. U.S. Geological Survey (USGS) has been monitoring the major tributaries to the river at their mouths since 1993 and will continue until April 2000. Sampling frequency has been upgraded to bimonthly for the subwatershed starting in April of 1999, then sampled monthly through the winter period.

ISDA along with the SCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed, for the evaluation of water quality improvements, will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated or a specific time interval.

# 9.0 References

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David F. Ferguson, Idaho Soil Conservation Commission, 1999. *Lower Boise River Drainage Delineation, Technical Report*

Bureau of Reclamation, 1996. *A Description of Bureau of Reclamation System Operation of the Boise and Payette Rivers*

Lower Boise River TMDL, 1998. *Subbasin Assessment, Total Maximum Daily Loads*

Idaho Department of Health & Welfare Division of Environmental Quality and Idaho Department of Lands Soil Conservation Commission 1991. *Idaho Agricultural Pollution Abatement Plan (APAP).*

Keith Griswold, Idaho Soil Conservation Commission, 2000. *Farm Services Agency Data*

# APPENDIX 7.

# Mason Slough Subwatershed Agricultural TMDL Implementation Plan

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# 1.0 Executive Summary

**Subwatershed:** Mason Slough Subwatershed
Total Scope: 1,591 acres
Agricultural Scope: 1,210 acres
Agricultural Critical Acres Scope: 1,210 acres

**Location:** South side of the Boise River, located east Caldwell and north of Nampa in Canyon County

**Priority Subwatershed:** Medium

**Cooperating Agricultural Agencies:** Canyon Soil Conservation District (CSCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

**Agricultural Land Uses:**

Mason Slough Agricultural Land Uses

| Landuse | Acres | Percent of Mason Slough Subwatershed |
|---|---|---|
| Surface Irrigated Cropland | 751 | 47% |
| Surface Irrigated Pasture | 297 | 19% |
| Non-Irrigated Pasture | 151 | 9% |
| CAFO/AFO | 11 | 1% |
| TOTAL | 1,210 | 76% |
| | | |

**Major Agricultural Products:** Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, specialty seed crops, vegetables, livestock, and dairy products.

**TMDL Objectives:** The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouth of the Mason Slough .The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98%.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 “SR-HC TMDL”) will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

**Implementation Plan:** This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Mason Slough Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, Polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the five different agricultural land use types (Treatment Units) within the Mason Slough Subwatershed. Estimated costs to install BMPs on lands identified for treatment are: Alternative 1 - $994,850; Alternative 2 - $664,750; and Alternative 3 - $392,200. These cost estimations do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

# 2.0 Introduction

The Mason Slough Subwatershed encompasses 1,591 acres located within the Lower Boise River Watershed. Mason Slough (as it is commonly referred to) originates near the county line and flows west toward the Boise River.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from Mason Slough. Within this plan the following elements are identified: pollutant problems within Mason Slough, sources of those pollutants, critical acres contributing pollutants to the drain, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on water quality.

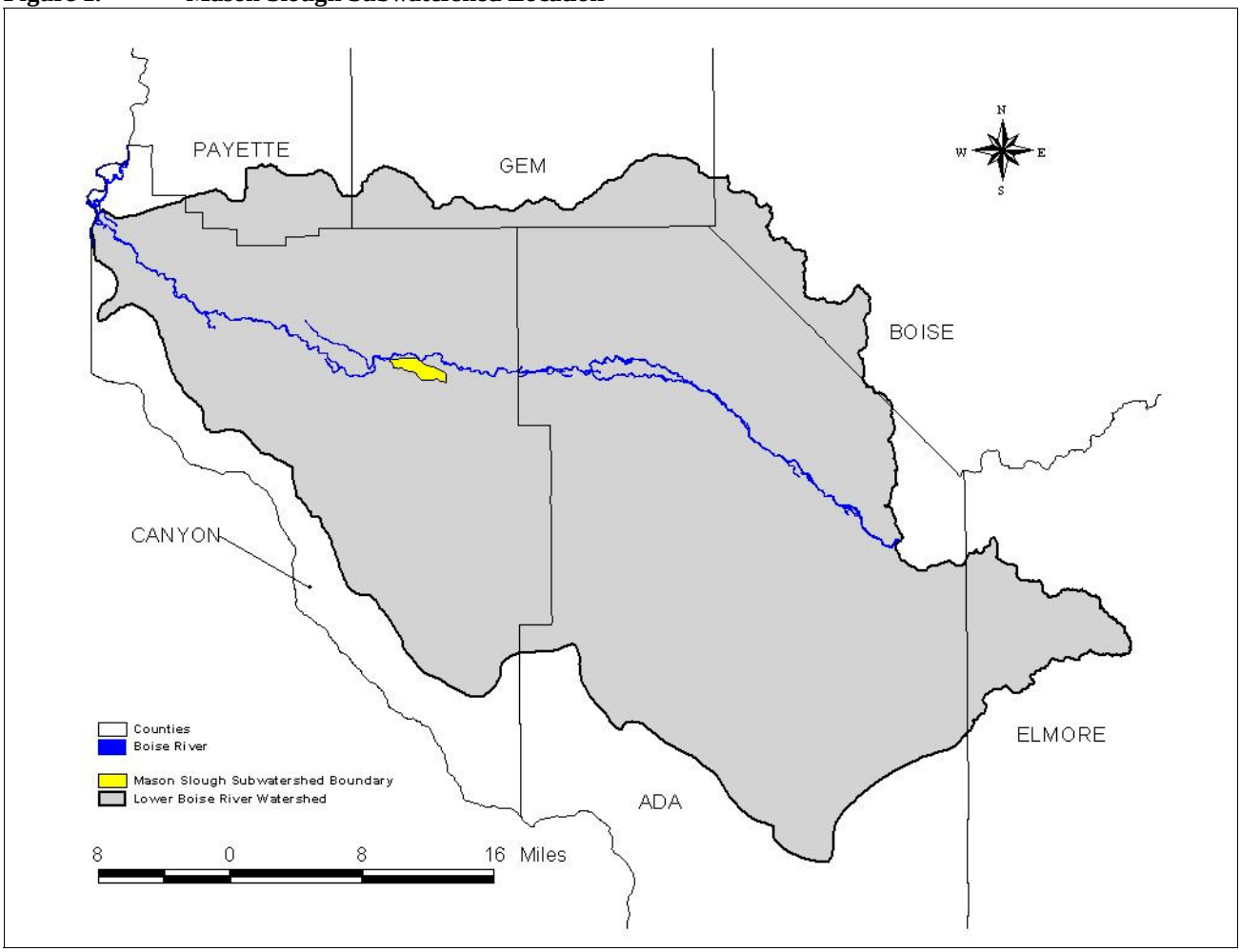
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Mason Slough Subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements at the mouth of Mason Slough. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Mason Slough Subwatershed contact the Canyon Soil Conservation District (Canyon SCD), the Natural Resources Conservation Service (NRCS), or the Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency as well as irrigation scheduling and soil moisture monitoring methods.**

**Figure 1. Mason Slough Subwatershed Location**




# 3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Mason Slough Subwatershed.

## 3.1 Soils

There is one major soil association within Mason Slough Subwatershed (U. S. Department of the Agriculture, 1972).

- Moulton-Bram-Baldock-Falk association: Moderately well and poorly drain soils on floodplains and low river terraces.

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility.

## 3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature in July for Caldwell, Idaho is 92 degrees Fahrenheit, while the average daily minimum temperature in January is 20 degrees Fahrenheit. Temperatures as low as -46 degrees Fahrenheit and as warm as 112 degrees Fahrenheit have been recorded.

Long term average annual precipitation for Caldwell is 10.48 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley. Extended periods of no rain can occur frequently during the growing season.

The average consecutive frost-free period (above 32 degrees) is 143 days, based on the Caldwell long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 125 days for this area. The average last frost (32 degrees) in the spring is around May 6 and the average first frost (32 degrees) in the fall is around September 27 (U. S. Department of the Agriculture, 1972).

## 3.3 Surface Hydrology

The Mason Slough Subwatershed ranges in elevation from approximately 2,420 feet at the headwaters to 2,370 feet at the Boise River.

Pre-existing ephemeral channels have been modified over time by channelization, bank stabilization, and the development of the existed in the watershed prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There is no major canal that supplies water to cropland in Mason Slough Subwatershed and 1 major drain that receive tailwater from the croplands and pastures or drain ground water (Table 1).

**Figure 2. Surface Hydrology**

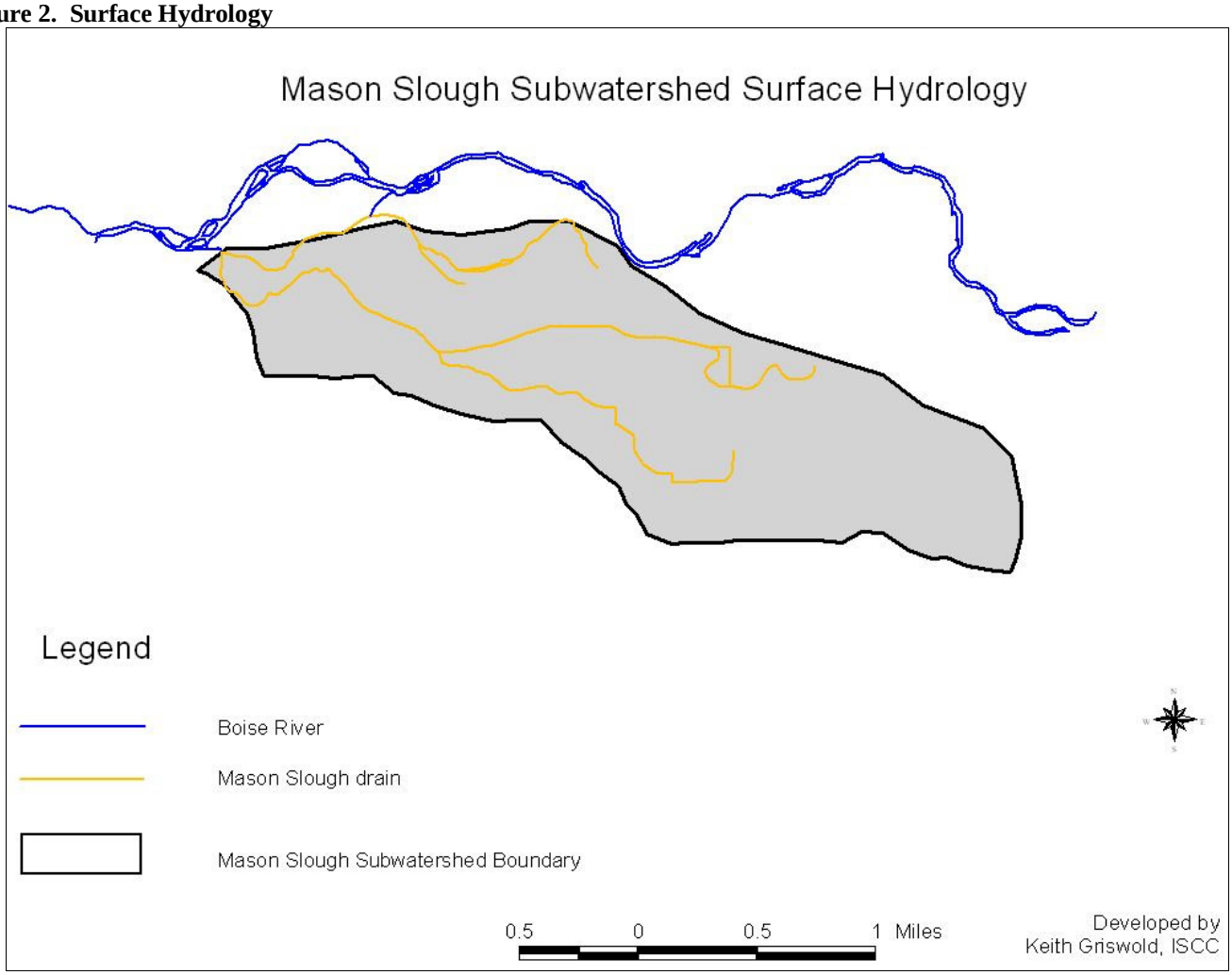
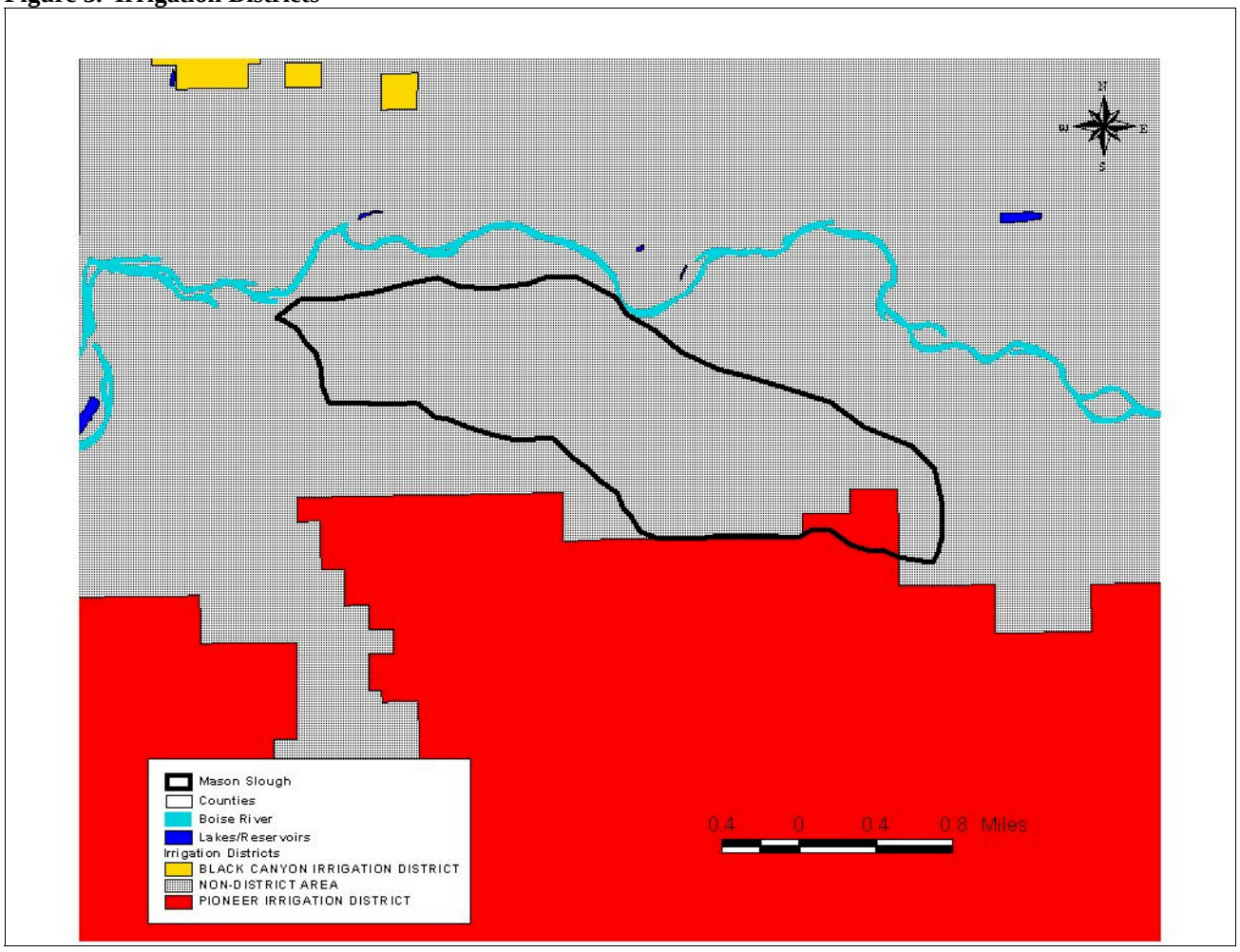


**Table 1. Surface Waterbodies in Mason Slough Subwatershed**

| Canal or Lateral | Drain, Slough or Gulch |
|---|---|
| None | Mason Slough |

**Figure 3. Irrigation Districts**




## 3.4 Ground Water Hydrology

A large, shallow, aquifer (< 200 feet) is recharged annually by seepage from surface irrigation and conveyance of water through earthen canals.

The Boise Valley deep aquifer exists under Mason Slough Subwatershed. It underlies the entire subwatershed.

## 3.5 Demographics and Economics

Demographic and Economic section is for all of Canyon County.

- Canyon County population increased over 14% from 1990 to 1996.
- Population of Canyon County increased from 90,076 in 1990 to 116,675 in 1997.
- Agricultural lands around Caldwell are being developed for residential housing and subdivisions are increasingly being constructed east of Caldwell toward Nampa.

- Types of irrigated crops include, but are not limited to: seed corn, alfalfa and clover for seed and hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, specialty seed crops and vegetables.

**Table 2. 1997 Agricultural Data for Mason Slough Subwatershed**

| Inventory: Farms & Cropland | Mason Slough Subwatershed |
|---|---|
| Total # of Farms | 22 |
| Total Acres of Farms | 1,210 |
| Average Farm Size (acres) | 55 |
| Total Acres in Crops | 751 |

(Griswold, 2001)

## 3.6 Land Ownership and Land Use

The items listed below are highlights of the Land Ownership and Land Use section in the Lower Boise River Implementation Plan.

- Mason Slough Subwatershed is 100% privately owned (Figure 4).
- Irrigated crops and pasture are the largest agricultural use

**Figure 4. Land Ownership**

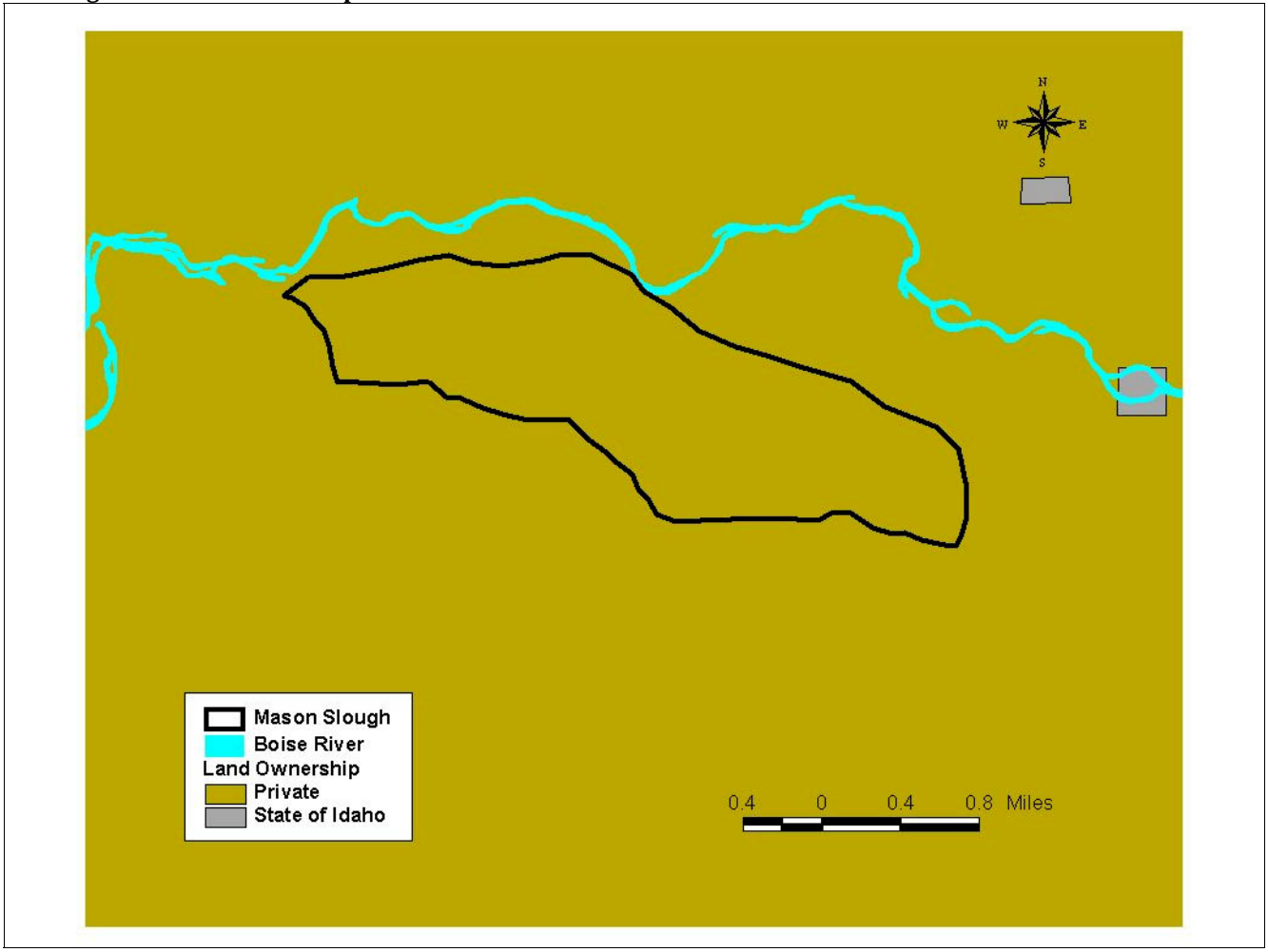


**Figure 5. Mason Slough Subwatershed K Factor Classes**

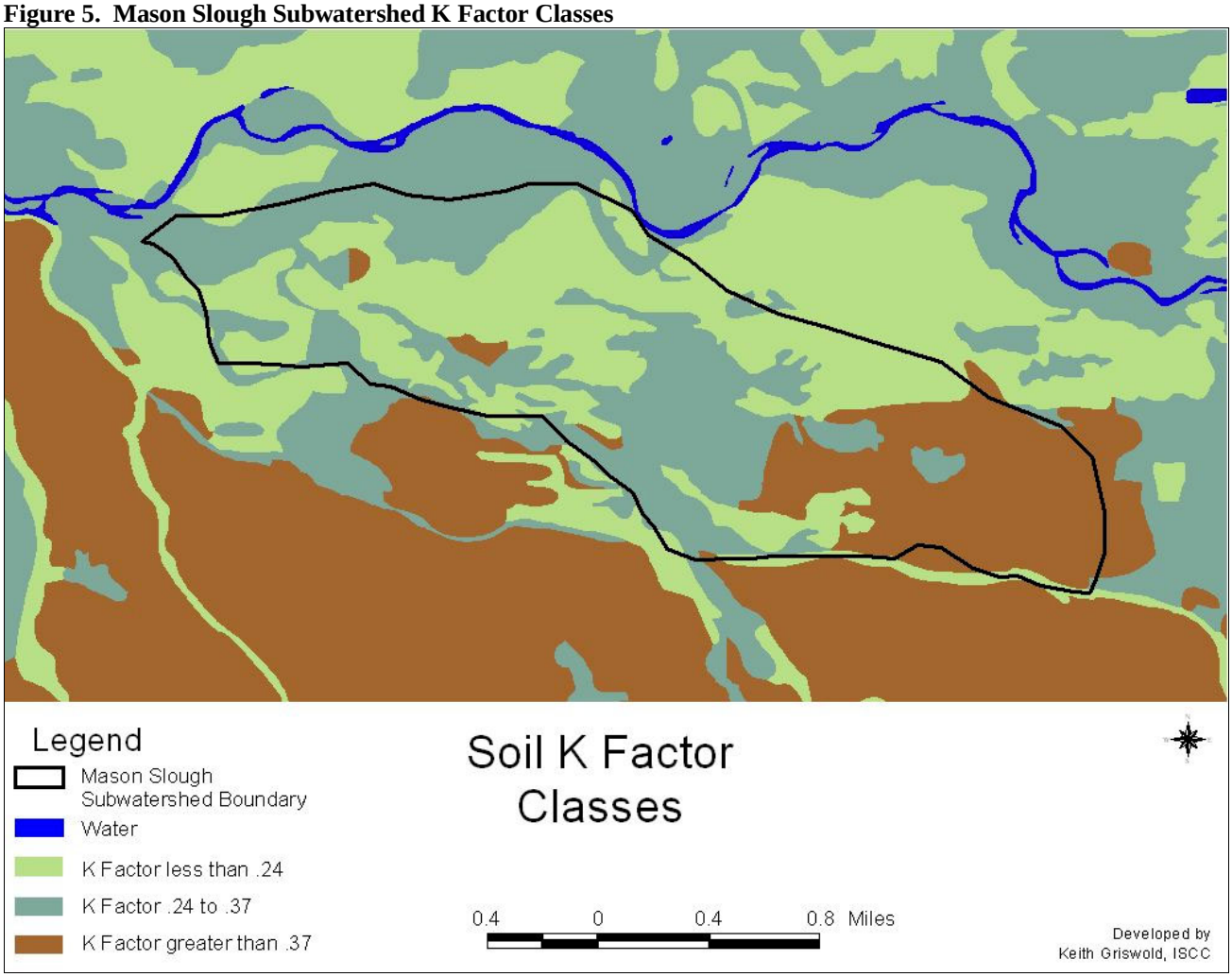
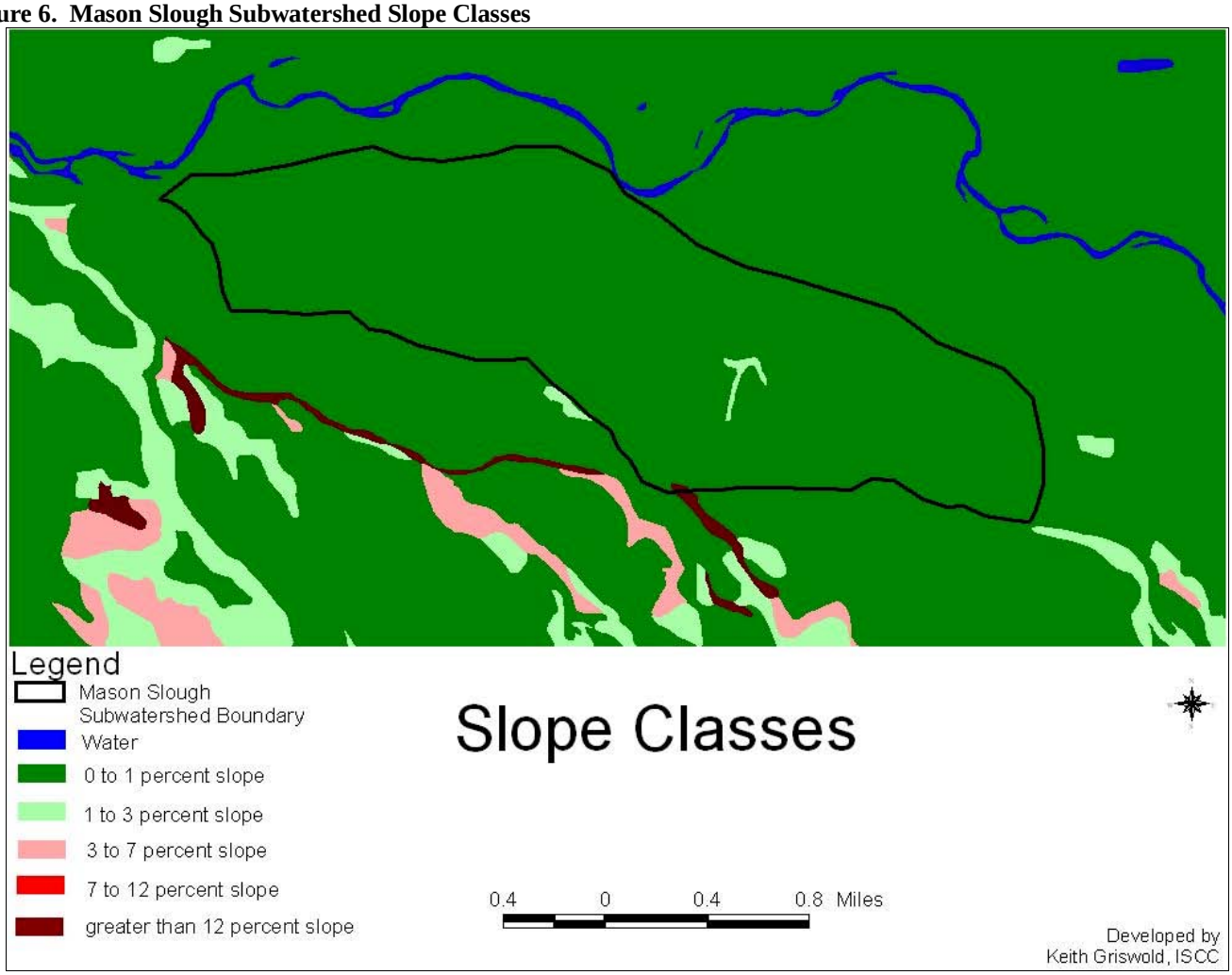


**Figure 6. Mason Slough Subwatershed Slope Classes**




## 4.0 Treatment Units

This section presents information on the individual agricultural land uses within the watershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for solving the identified problems.

The descriptions in this section are intended to provide a general overview of the TUs.

- Treatment Unit #1 – Sprinkler Irrigated Cropland, Pasture, Orchard and Vineyard, 0 acres

  This unit does not occurs in the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality because of the insignificant amount of runoff resulting from high irrigation efficiencies.

- Treatment Unit #2 – Surface Irrigated Cropland, 751 acres

  Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- Treatment Unit #3 – Surface Irrigated Pasture 297 acres

  Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures enters the Lower Boise River via Mason Slough.

- Treatment Unit #4 – Non-Irrigated Pasture 151 acres

  Non-Irrigated pastures are located in areas with high water tables. Typical vegetative growth is Cattail, Russian olive, Reed Canary Grass, and invasive plant species. Bank erosion and direct bacterial impacts occur when livestock enter the creeks for water and shade.

- Treatment Unit #5-- CAFO/AFO 11 acres

  Feedlots are small and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. See Table 5. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

**Table 3. Acres of TUs within Mason Slough Subwatershed.**

| Treatment Units | Acres |
|---|---|
| Treatment Unit 1 | 0 |
| Treatment Unit 2 | 751 |
| Treatment Unit 3 | 297 |
| Treatment Unit 4 | 151 |
| Treatment Unit 5 | 11 |
| TOTAL | 1,210 |

(Griswold, 2001)

**Figure 7. Treatment Units**

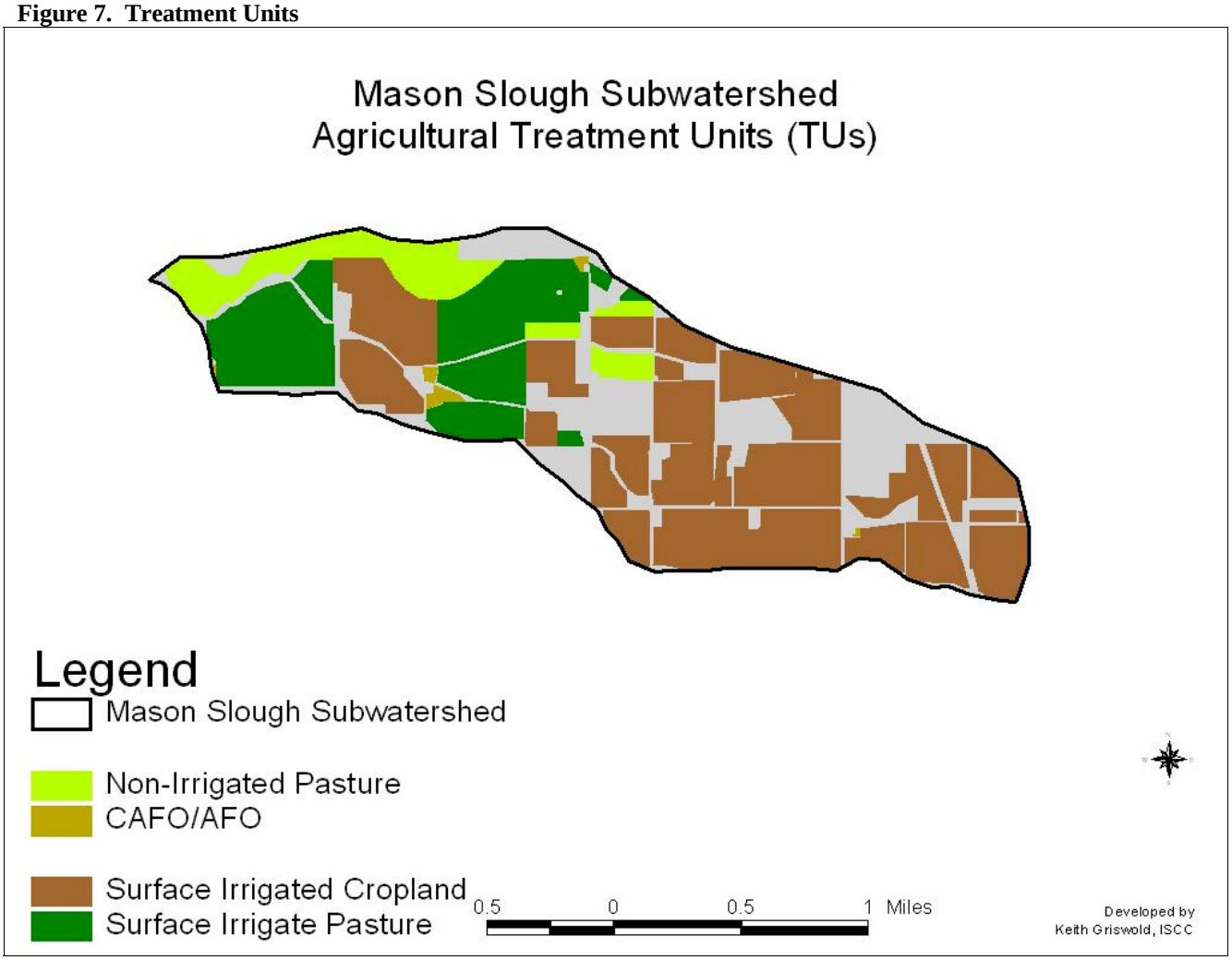
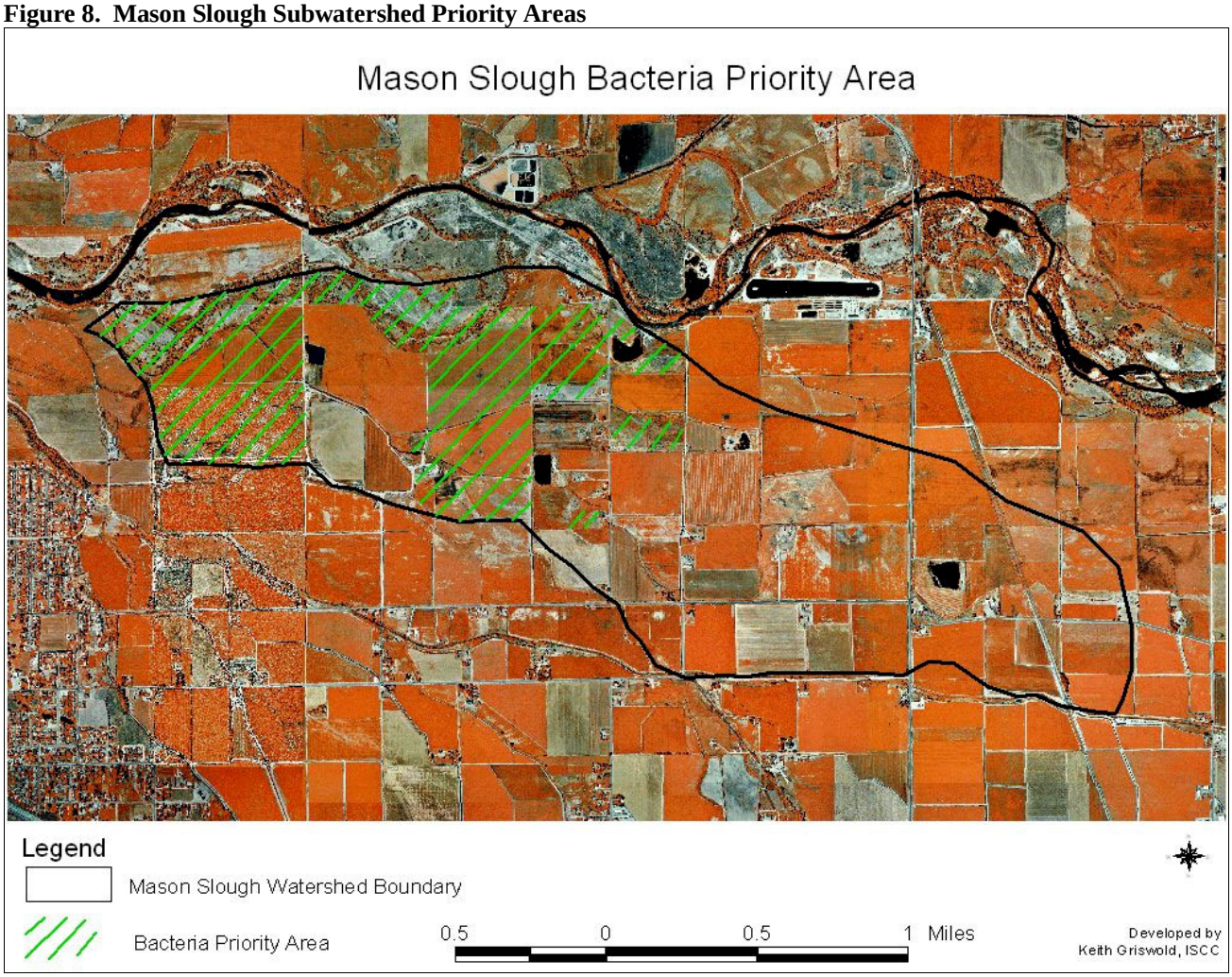


**Figure 8. Mason Slough Subwatershed Priority Areas**




## 5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, including Mason Slough.

The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards change. After the TMDL targets and load reductions were established for sediment and bacteria, additional, more frequent sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been performed. This new information and water quality standards change indicate that revision of the TMDL sediment and bacteria targets is appropriate, and will continue to be evaluated with additional data as it is collected.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" in nutrients policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion.
- Lack of adequate vegetation adjacent to waterways necessary for removing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria.

## 5.1 Recreational Uses – Bacteria Objectives

The TMDL establishes a 98% bacteria reduction objective for the Mason Slough to meet Idaho's fecal coliform criteria for protection of recreational uses (Table 4).

**Table 4. Reductions Required to Meet Bacteria Load Allocation**

| Name | Primary Geo-Mean CFU/100 ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-Mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| Mason Slough | 3507 | 50 | 99% | 1422 | 200 | 86% |

(portion of Table 22 from, page 71 Lower Boise River TMDL Subbasin Assessment)

Two developments affect this reduction objective and agricultural BMP implementation required to meet it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, DNA analysis of bacteria samples from various locations in the Lower Boise River watershed show that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, raccoon) that are beyond human control prevent attainment of the TMDL's bacteria targets and load reductions. It is likely that inputs of bacteria from cows can be significantly reduced by simply reducing their access to the Boise River and tributary water sources.

**Table 5. Description of Confined Animal Feeding Operations in Mason Slough Subwatershed**

| Type of Confined Animal Feeding Operation (CAFO) | Number of CAFO's in Mason Slough Subwatershed |
|---|---|
| Dairy Cattle | 1 |
| Beef Cattle | 3 |

(Griswold, 2001)

## 5.2 Aquatic Life Uses – Sediment Objectives

The approach is to seek voluntary implementation of best management practices (BMPs) on agricultural lands to reduce Total Suspended Sediment loading rate by 37%.

**Table 6. 1995 TSS loads and allocations for Mason Slough**

| Tributary | 1995 Loads | % of Total River Load | TSS Load Goals | % of Total Goal |
|---|---|---|---|---|
| Mason Slough | 1.9 | 1% | 1.2 | 1% |

(IDEQ, 1998)

## 5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

**Table 7. Proposed No Net Increase (NNI) Phosphorous Load**

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| Mason Slough | 59 | 10863 |

(IDEQ, 1998)

# 6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Mason Slough. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Mason Slough , which affects the Lower Boise River.

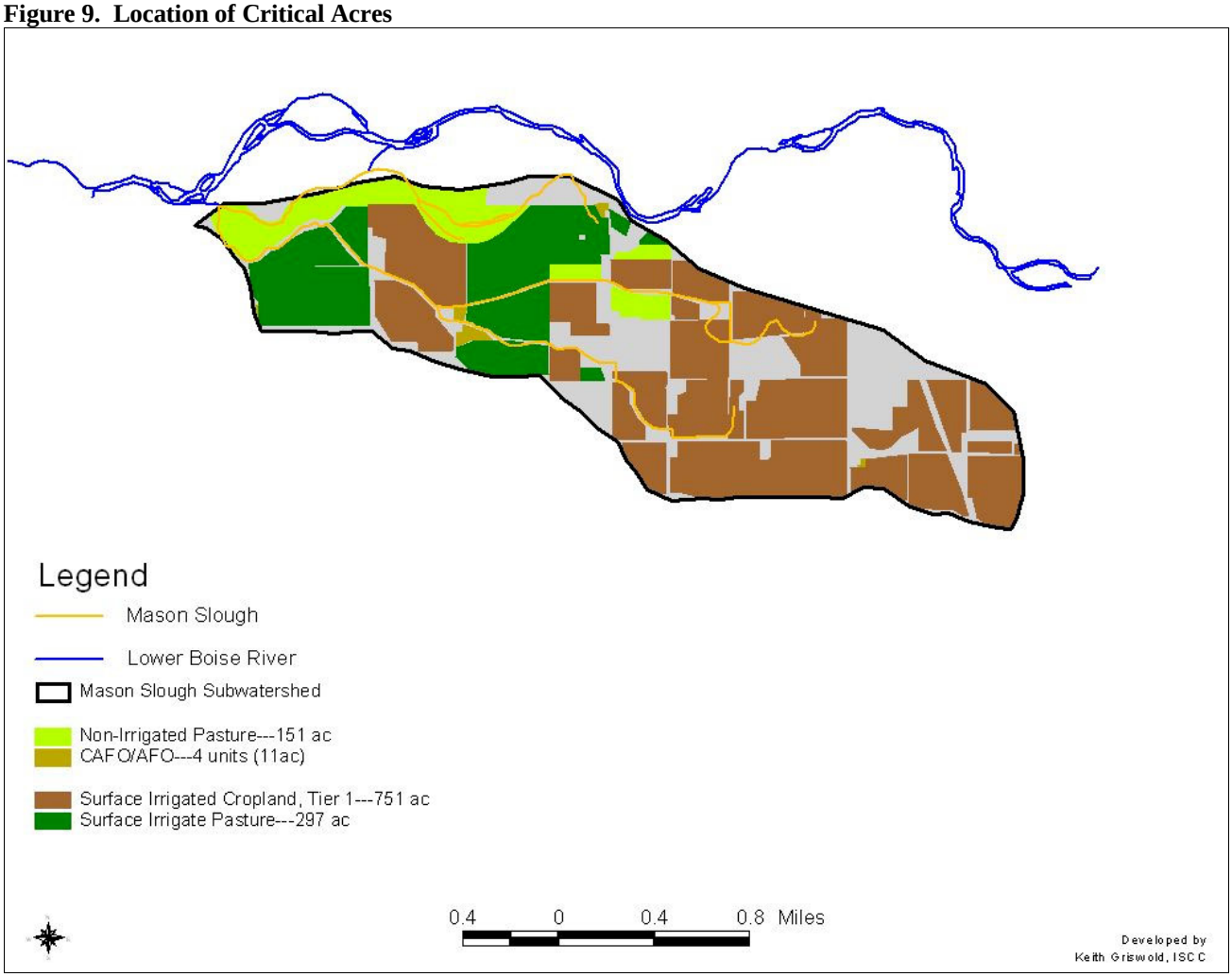
Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural lands that drain directly into Mason Slough will be a Tier 1, high priority for treatment because these lands have the most immediate impact on Lower Boise River water quality. Drainage water from Tier 2 lands is reused once on Tier 1 lands before discharging to the Mason Slough, and are given a medium priority for treatment. Tier 1 & 2 acres are the Critical Acres within Treatment Unit 2. Drainage water from Tier 3 lands is reused multiple times on Tier 1 and Tier 2 lands before discharging to the Mason Slough, and are given a low priority for treatment. There are no tier 2 or 3 lands within Mason Slough drain.

**Critical Acres within each Treatment Unit:**

| | |
|---|---|
| Treatment Unit 1 | No critical acres within this unit. |
| Treatment Unit 2 | 751 acres of Tier 1 surface irrigated cropland<br>0 acres of Tier 2 surface irrigated cropland<br>0 acres of Tier 3 surface irrigated cropland |
| Treatment Unit 3 | 297 acres of surface irrigated pasture |
| Treatment Unit 4 | 151 acres of non-irrigated pasture |
| Treatment Unit 5 | 4 units (11 acres) of CAFO/AFO |

**Figure 9. Location of Critical Acres**



# 7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited, to the following:

**Table 8. Treatment Unit 2---Surface Irrigated Cropland**

| | |
|---|---|
| Agro-Tillage | Conservation Cropping Sequence |
| Conservation Tillage | Cover and Green Manure Crop |
| Filter Strips | Grassed Waterway |
| Surge Irrigation System | Sprinkler Irrigation System |
| Tailwater Recovery System | Irrigation Water Management Systems |
| Straw Mulching | Nutrient Management |
| Pest Management | Sediment Basin |
| Underground Outlet | Chiseling and Subsoiling |
| Waste Utilization | Channel Vegetation |
| Drip Irrigation System | PAM |
| Irrigation Water Conveyance | |

**Table 9. Treatment Unit 3---Surface Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Waste Utilization |
| Spring water development | Waste Storage System |
| Irrigation systems | Nutrient Management |
| Pasture and Hayland Planting | Planned Grazing System |
| Livestock Watering Facility | Pasture and Hayland Management |

**Table 10. Treatment Unit 4---Non-Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Spring water development |
| Nutrient Management | Pasture and Hayland Planting |
| Planned Grazing System | Livestock Watering Facility |
| Pasture and Hayland Management | Riparian Forest Buffer |

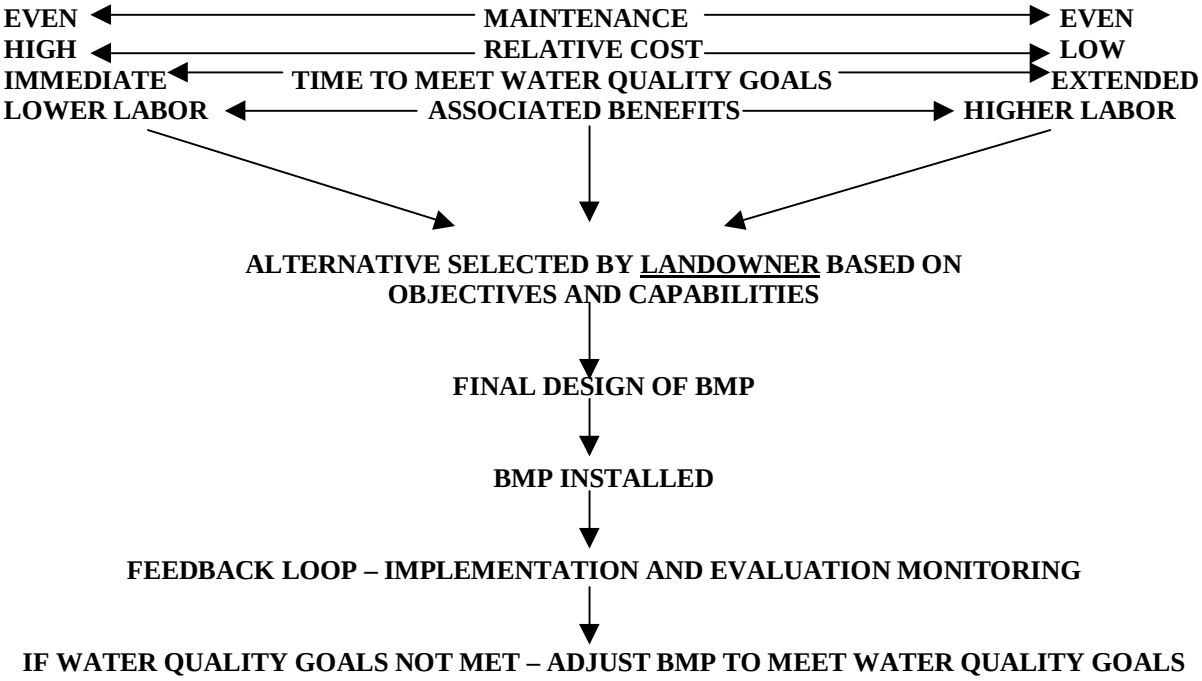
**Table 11. Treatment Unit 5---CAFO/AFO**

| | |
|---|---|
| Waste Management System | Heavy use area protection |
| Filter strips | Livestock Watering Facility |
| Nutrient Management | Fencing |

## 7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($800/ acre) | SITE SPECIFIC BMP Alternative #2 ($500/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Irrigation Water Mgt. | Irrigation Water Mgt. | Irrigation Water Mgt. |
| Sprinkler Irrigation System | Land Leveling | Concrete Ditch |
| Nutrient Mgt. | Surface Irrigation System | Filter Strip |
| Conservation Crop Rotation | Gated Pipe | PAM |
| | Tail Water Recovery System | Sediment Basin |
| | Nutrient Mgt. | Nutrient Mgt. |
| | Conservation Crop Rotation | Conservation Crop Rotation |
| | Conservation Tillage | Conservation Tillage |




(APAP, 1991)

## 7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| **SITE SPECIFIC BMP Alternative #1 ($450/ acre)** | **SITE SPECIFIC BMP Alternative #2 ($350/ acre)** | **SITE SPECIFIC BMP Alternative #3 ($250/ acre)** |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Livestock Watering Facility |
| Heavy Use Area Protection | Livestock Watering Facility | Irrigation Water Mgt. |
| Livestock Watering Facility | Irrigation Water Mgt. | Field Border Irrigation System |
| Irrigation Water Mgt. | Field Border Irrigation System | |
| Field Border Irrigation System | | |
| Gated Pipe | | |

## 7.3 Example Description of Alternatives for Non-Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| **SITE SPECIFIC BMP Alternative #1 ($400/ acre)** | **SITE SPECIFIC BMP Alternative #2 ($300/ acre)** | **SITE SPECIFIC BMP Alternative #3 ($200/ acre)** |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Filter strip |
| Heavy Use Area Protection | Livestock Watering Facility | Heavy Use Area Protection |
| Livestock Watering Facility | Filter strips | |
| Filter strips | | |

## 7.4 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| **SITE SPECIFIC BMP Alternative #1 ($50,000/ each)** | **SITE SPECIFIC BMP Alternative #2 ($35,000/ each)** | **SITE SPECIFIC BMP Alternative #3 ($25,000/ each)** |
|---|---|---|
| Nutrient Mgt. | Waste Mgt. System | Waste Mgt. System |
| Heavy Use Area Protection | Nutrient Mgt. | Nutrient Mgt. |
| Livestock Watering Facility | Livestock Watering Facility | Filter strip |
| Filter strips | Filter strips | Heavy Use Area Protection |
| Waste Mgt. System | Heavy Use Area Protection | |
| Dike | | |

## 7.5 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

## 7.6 Feedback Loop

The feedback loop a process to evaluation and refinement of BMPs. The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved, the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards. (APAP, 1991)

# 8.0 Program of Implementation

Canyon Soil Conservation District selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. Significant contribution by agricultural land users in the Mason Slough Subwatershed toward achieving the TMDL's objectives of protecting aquatic life and recreational uses of the Lower Boise River by reducing the discharge of sediments and bacteria from the Mason Slough to the Lower Boise River.

## 8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC) and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. NRCS and ISCC will assist Canyon SCD with certification of installed BMPs, filing payment applications, completion of annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

**Table 12. Estimated BMP Cost Summary for Treatment Unit 2, Tier 1 (Surface Irrigated Cropland—751 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 751 | $ 600,800 |
| Alternative 2 | $500/AC | 751 | $ 375,500 |
| Alternative 3 | $250/AC | 751 | $ 187,750 |

**Table 13. Estimated BMP Cost Summary for Treatment Unit 2, Tier 2 (Surface Irrigated Cropland—0 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 0 | $ - |
| Alternative 2 | $500/AC | 0 | $ - |
| Alternative 3 | $250/AC | 0 | $ - |

**Table 14. Estimated BMP Cost Summary for Treatment Unit 2, Tier 3 (Surface Irrigated Cropland—0 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 0 | $ - |
| Alternative 2 | $500/AC | 0 | $ - |
| Alternative 3 | $250/AC | 0 | $ - |

**Table 15. Estimated BMP Cost Summary for Treatment Unit 3 (Surface Irrigated Pasture 297 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $450/AC | 297 | $ 133,650 |
| Alternative 2 | $350/AC | 297 | $ 103,950 |
| Alternative 3 | $250/AC | 297 | $ 74,250 |

**Table 16. Estimated BMP Cost Summary for Treatment Unit 4 (Non-Irrigated Pasture 151 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $400/AC | 151 | $ 60,400 |
| Alternative 2 | $300/AC | 151 | $ 45,300 |
| Alternative 3 | $200/AC | 151 | $ 30,200 |

**Table 17. Estimated BMP Cost Summary for Treatment Unit 5 (CAFO/AFO 4 Units).**

| ALTERNATIVE | | UNITS | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $50,000/each | 4 | $ 200,000 |
| Alternative 2 | $35,000/each | 4 | $ 140,000 |
| Alternative 3 | $25,000/each | 4 | $ 100,000 |

## 8.2 Operation, Maintenance, and Replacement

Participants will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Technical assistance for BMPs will be provided by NRCS and ISCC.

Inspections of installed BMPs will be made on an annual basis by Canyon SCD, NRCS, ISCC, and the participant during the life of the contract. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant. By accomplishing this objective, it is intended that the BMPs will become a part of the participant's farming operation and will continue to be operated and maintained after the contract expires.

## 8.3 Water Quality Monitoring

U.S. Geological Survey (USGS) has been monitoring the major tributaries to the river at their mouths since 1993 and will continue until April 2000. Sampling frequency has been upgraded to bimonthly for the subwatershed starting in April of 1999, then sampled monthly through the winter period.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

# 9.0 References

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# APPENDIX 8.

# Willow Creek Subwatershed

# Agricultural TMDL Implementation Plan

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# 1.0 Executive Summary

**Subwatershed:** Willow Creek Subwatershed
Total Scope: 55,545 acres (includes contributing canal acreage)
Agricultural Scope: 4,873 acres
Agricultural Critical Acres Scope: 2,646 acres

**Location:** North side of the Boise River, originates in Gem and Boise counties and travels through Ada and Canyon counties before entering the Boise River in the town of Middleton

**Elevation:** 5,160 feet at the Crown Point in the Boise Mountains to 2,380 feet at the Boise River

**Priority Subwatershed:** Medium

**Cooperating Agricultural Agencies:** Canyon Soil Conservation District (CSCD)
Ada Soil & Water Conservation District (ASWCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

**Agricultural Land Uses:**

| Landuse | Acres | Percent of Willow Creek Subwatershed |
|---|---|---|
| Surface Irrigated Cropland | 2,362 | 4% |
| Surface Irrigated Pasture | 284 | 1% |
| Sprinkler Irrigated Cropland and Pasture | 2,227 | 4% |
| CAFO/AFO | N/A | N/A |
| | | |
| **TOTAL** | **4,873** | **9%** |

**Major Agricultural Products:** Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, specialty seed crops, vegetables, livestock, and dairy products.

**TMDL Objectives:** The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouth of the Willow Creek. The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98% for primary contact recreation.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 "SR-HC TMDL") will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

**Implementation Plan:** This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Willow Creek Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the four different agricultural land use types (Treatment Units) within the Willow Creek Subwatershed. Estimated costs to install BMPs on lands identified for treatment are: Alternative 1 - $2,117,400; Alternative 2 - $1,350,400; and Alternative 3 - $711,500. These cost estimates do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

# 2.0 Introduction

The Willow Creek Subwatershed encompasses 55,545 acres. It includes the upper portions of the watershed, consisting mostly of private non-irrigated rangeland and federal rangeland in the foothills of the Boise Mountains, as well as the lower portion of irrigated cropland and pasture near the town of Middleton. Also included are various contributing canal subwatersheds. The north and south forks of Willow Creek both flow in a southwesterly direction through rangeland before joining to form the main stem near the border between Gem and Ada counties. Willow Creek then continues to the southwest and into the irrigated portion of the subwatershed before reaching the Boise River in Middleton.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from Willow Creek. Within this plan the following elements are identified: pollutant problems within Willow Creek Subwatershed, sources of those pollutants, critical acres contributing pollutants to the subwatershed, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on improving water quality.

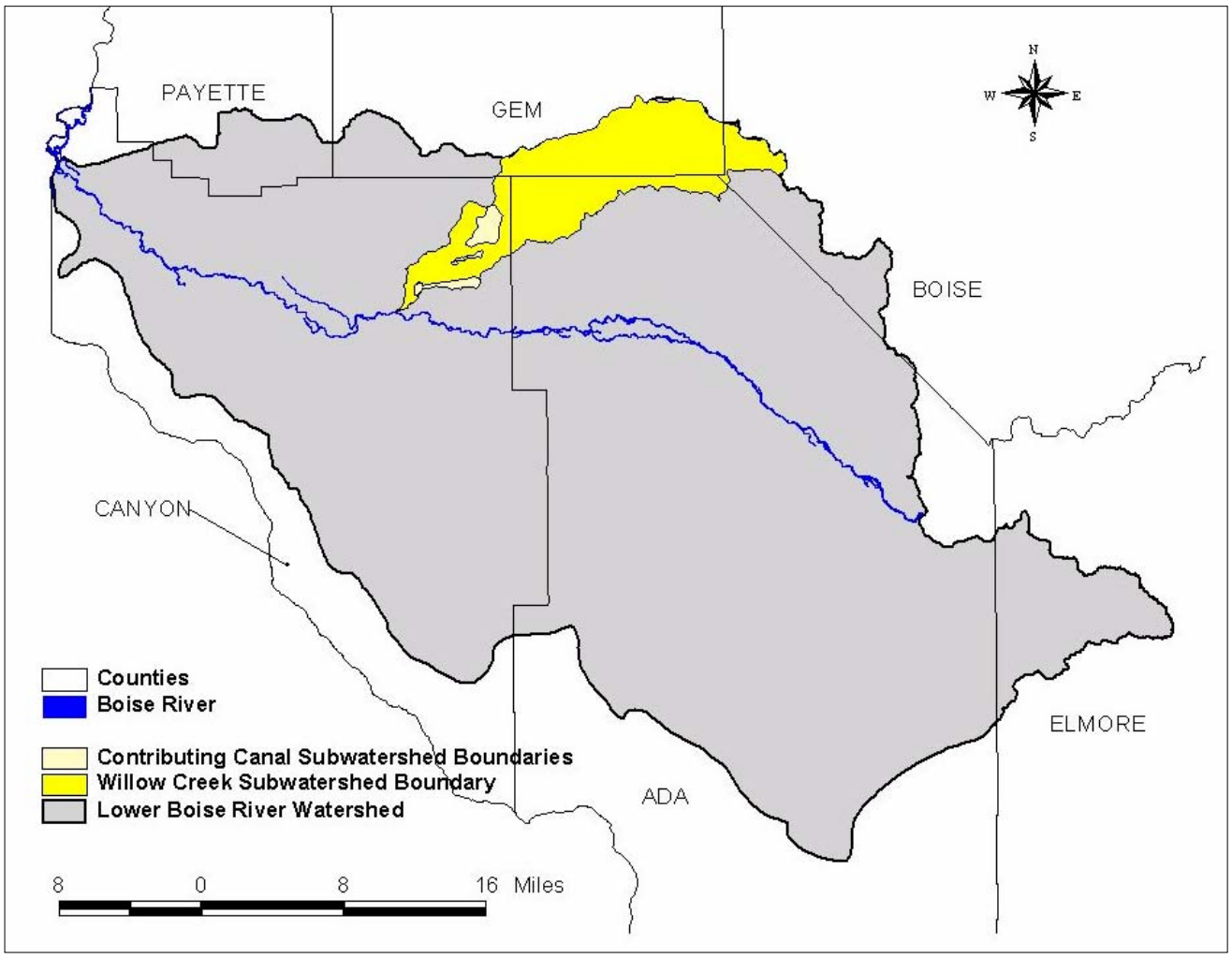
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Willow Creek Subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements at the mouth of Willow Creek. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Willow Creek Subwatershed contact the Ada Soil & Water Conservation District (Ada SWCD), Canyon Soil Conservation District (Canyon SCD), Natural Resources Conservation Service (NRCS), or Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency, as well as irrigation scheduling and soil moisture monitoring methods.**

**Figure 1. Willow Creek Subwatershed Location**




## 3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Willow Creek Subwatershed.

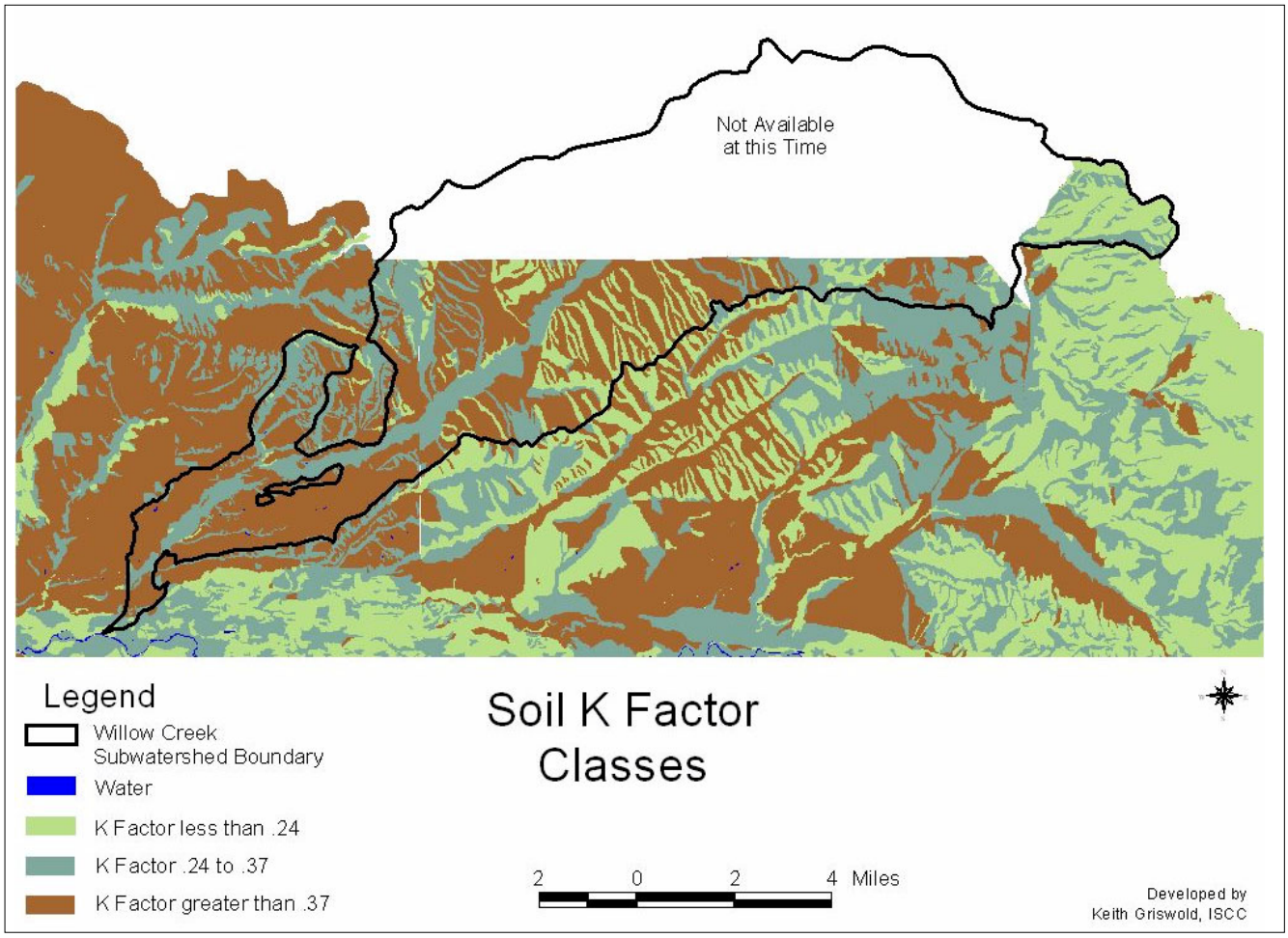
### 3.1 Soils

There are five major soil associations within Willow Creek Subwatershed (U. S. Department of the Agriculture, 1972).

- *Elijah-Lankbush-Chilcott-Lanktree:* Well drained soils on higher nearly level to rolling dissected alluvial fan terraces
- *Moulton-Bram-Baldock-Falk:* Moderately well and poorly drained soils on floodplains and low river terraces
- *Lankbush-Brent-Tindahay:* Well and somewhat excessively drained soils on sloping to steep foothills
- *Haw-Payette-Van Dusen:* Well to somewhat excessively drained soils on dissected sandy alluvial fans
- *Searles-Ladd-Ola:* Well drained soils on moderately sloping to steep granitic mountains

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility. Soil "K Factor" classes are used to determine a soils erodibility potential. The higher the K-Factor rating, the greater the potential for erosion (Figure 2). In addition to K-Factor classes, soil slope classes provide another indication of erosion potential. As with K-Factor classes, the greater the percentage of slope, the greater the potential for erosion (Figure 3).

**Figure 2. Willow Creek Subwatershed K Factor Classes**



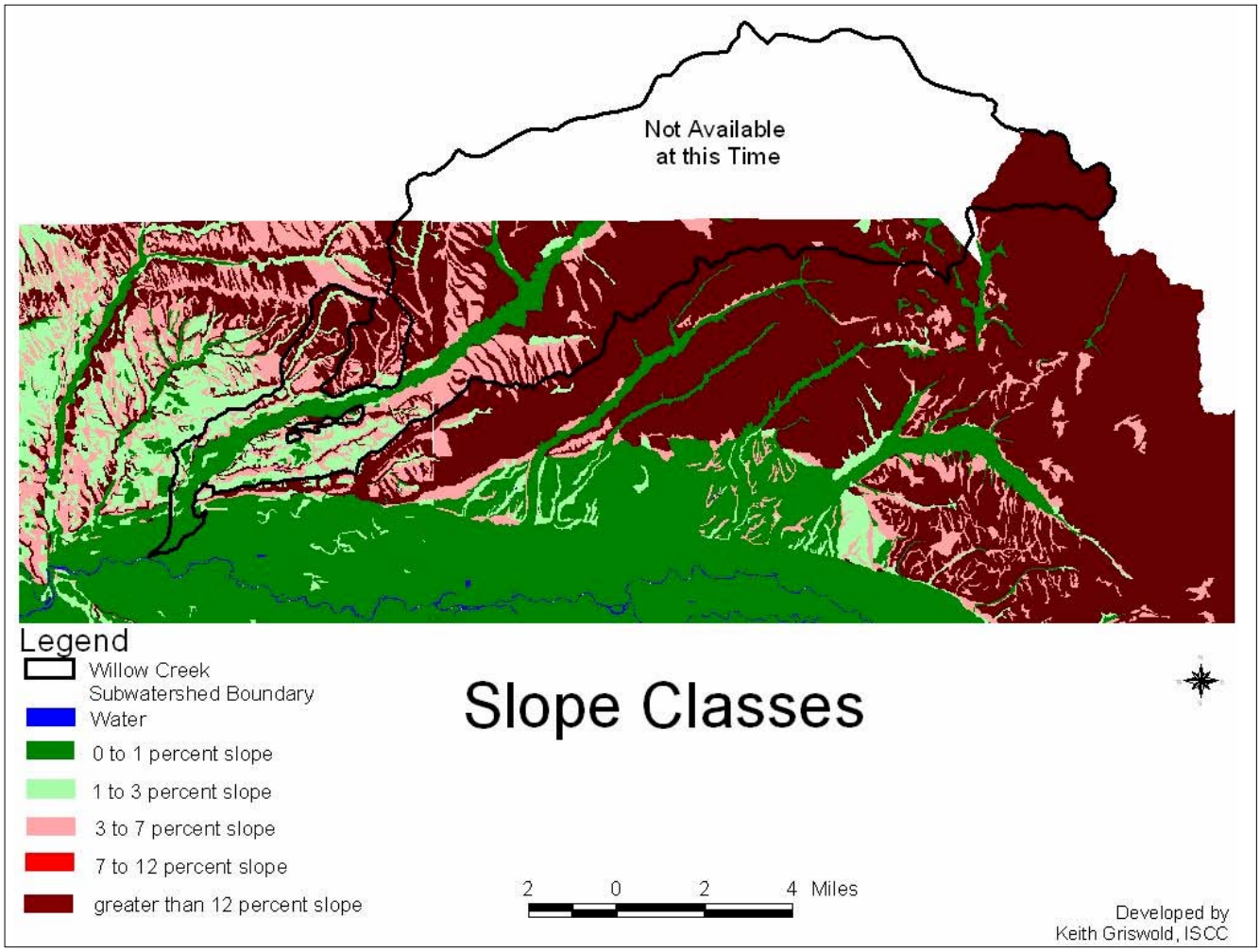

## 3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature during the summer in Boise, Idaho is 83.9°Fahrenheit, while the average daily minimum temperature during the winter is 25.9° Fahrenheit. Temperatures as low as –23.0°Fahrenheit and as warm as 111.0° Fahrenheit have been recorded (Climate Data Center, 2000).

Long term average annual precipitation for Boise is 11.9 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley, and extended periods without precipitation occur annually during the summer months.

The average consecutive frost-free period (above 32° Fahrenheit) is 152 days, based on the Boise Airport long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 135 days for this area. The average last frost (32° F) in the spring is around May 8 and the average first frost in the fall is around October 8 (U. S. Department of the Agriculture, 1977).

**Figure 3. Willow Creek Subwatershed Slope Classes**




## 3.3 Surface Hydrology

The pre-existing ephemeral channel of Willow Creek has been modified over time by channelization and bank stabilization prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There is currently one major canal (C-Line East) that supplies water to cropland in Willow Creek Subwatershed and one major drain (Willow Creek) that receives tailwater from the croplands and pastures and drains ground water.

Reuse of agricultural tailwater is not very common in the subwatershed. All of the acreage under surface irrigation in the subwatershed is located in the southwestern portion and is serviced by the C-Line Canal and a few small laterals. While wastewater from the upland acreage in the subwatershed is likely to be reused before entering Willow Creek, the creek itself is not diverted into any major canals before entering the Boise River. The upper reaches of the main channel, as well as the north and south fork, has a sandy bottom which allows surface water to sub out of the channel above the C-Line Canal. The local Conservation Districts and the Soil Conservation Commission have identified the surface irrigated acreage just upstream from Middleton as the critical acreage for treatment as a result of its potential impact on water quality.

**Figure 4. Surface Hydrology**

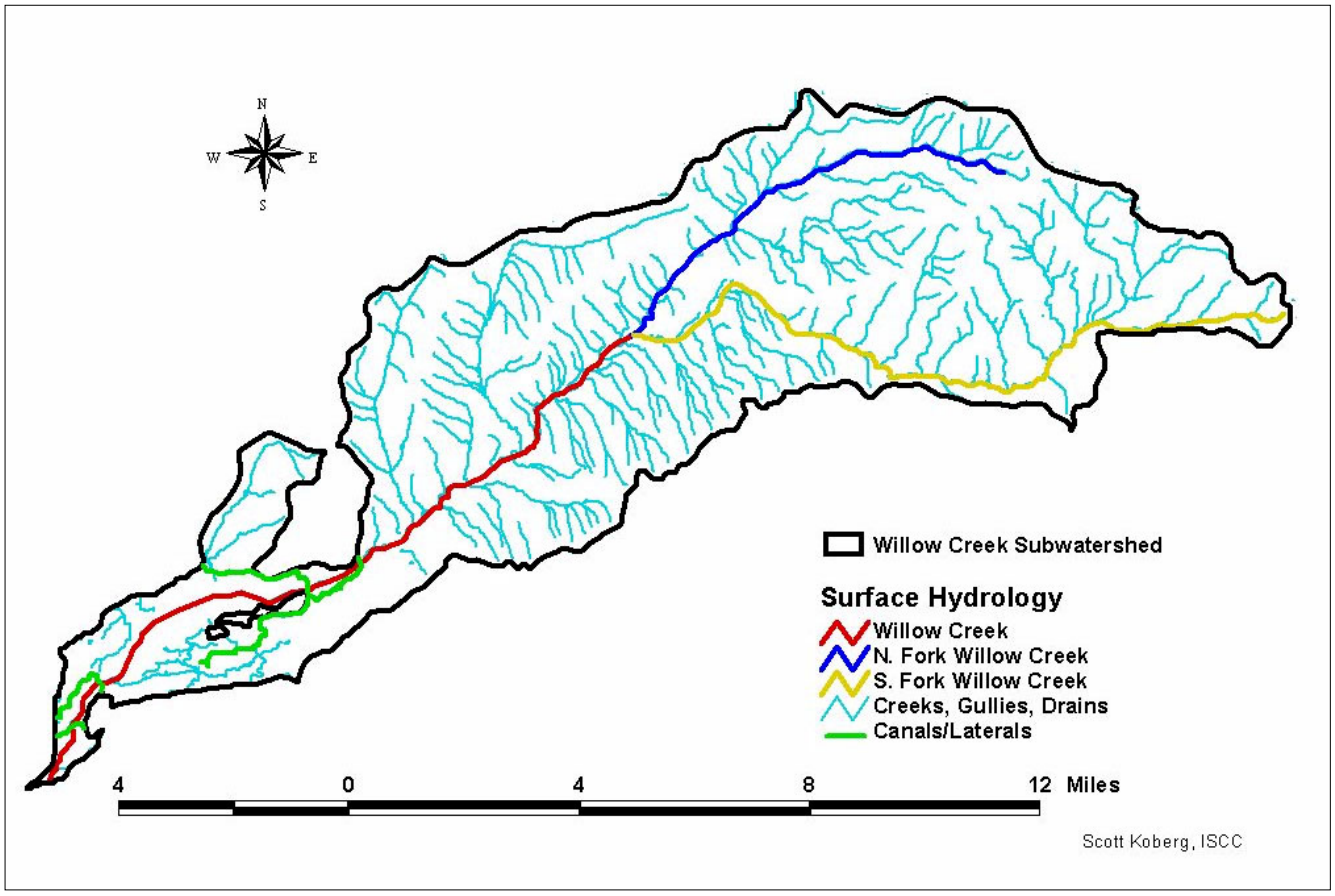
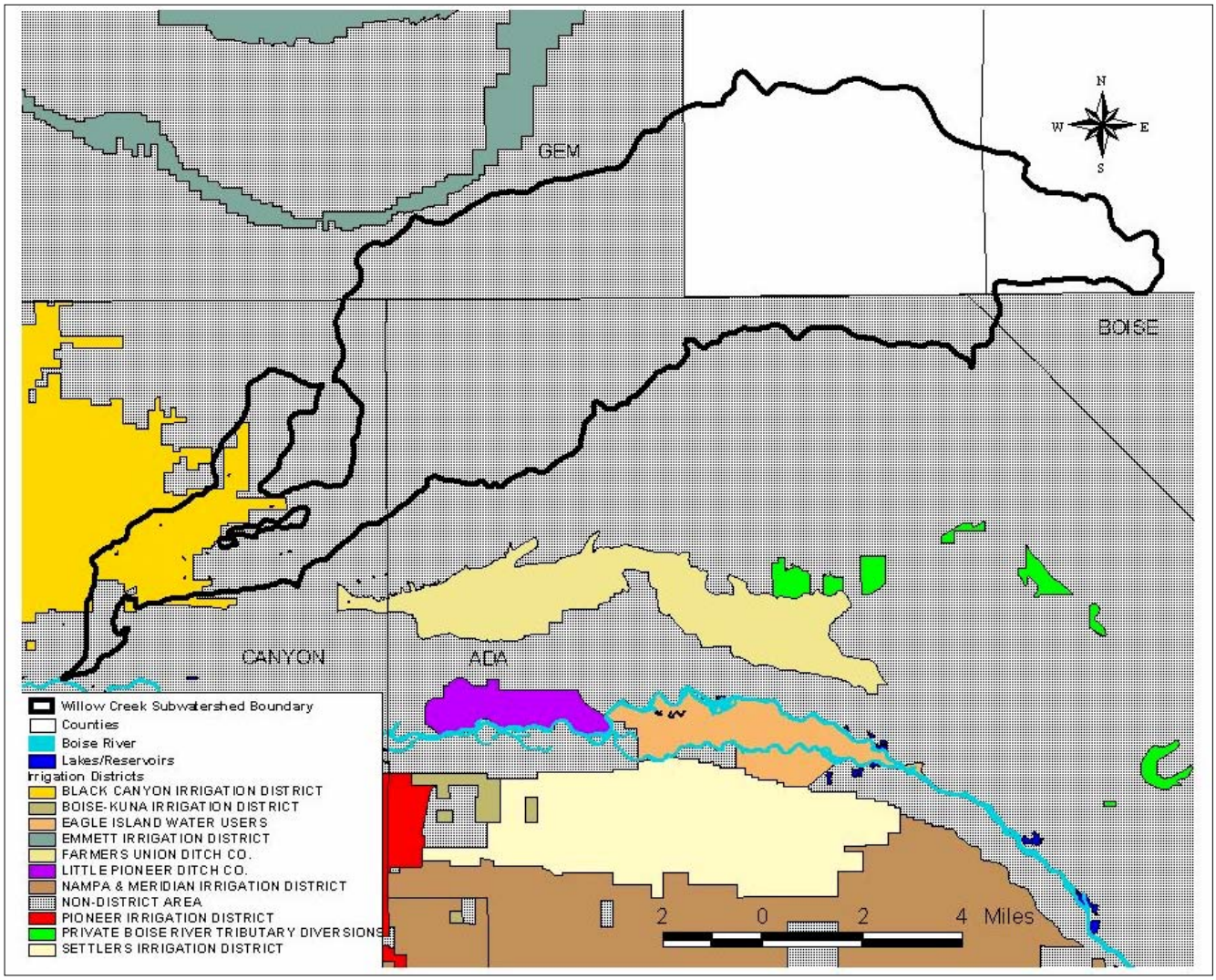


**Figure 5. Irrigation Districts**




## 3.4 Ground Water Hydrology

Prior to irrigation development during the 1900's, the large shallow aquifer under the Boise Valley did not exist. This aquifer (< 200 feet) is recharged annually by surface irrigation and earthen canals that recharge the artificial and natural drains throughout the year. Willow Creek Subwatershed is situated just to the north of the shallow Boise Valley aquifer.

## 3.5 Demographics and Economics

The Lower Boise River Watershed has experienced accelerated growth within the last 10 years. Ada and Canyon counties in particular experienced growth rates well above the state and national averages during the period from 1990 to2000. Ada County with a year 2000 population of 300,904 and Canyon County with a year 2000 population of 131,441 have increased at rates of 46.2% and 45.9% respectively (U.S. Census Bureau, 2001). These increases are huge when compared to the national average of 13.1% and Idaho state average of 28.5% during the same period.

The Willow Creek Subwatershed has yet to be impacted as significantly by the rapid growth in the Treasure Valley as some of the other subwatesheds. The upper portion of the subwatershed remains mostly as it was when the TMDL was completed for the Lower Boise River. The lower portion, particularly near the town of Middleton (population 2,978 in year 2000), is beginning to experience some of the growth affecting other urban and suburban areas in the

Lower Boise Watershed. The majority of the developments on the rural fringe have been residential subdivisions, while some parcels of land further from town have been developed as large lots or ranchettes. Although agricultural conversion of land isn't occurring as rapidly as in some of the other subwatersheds, Willow Creek Subwatershed is still experiencing a loss of agricultural land to development.

Unlike the upper portion of the subwatershed (upstream from the C-Line Canal) which consists mainly of rangeland and sprinkler irrigated cropland and pasture, the lower portion consists of a variety of high and low residue crops. High residue crops such as spring wheat, winter wheat, alfalfa, clover, and pasture are common while low residue crops such as seed corn, beans, sugar beets, sweet corn, field corn, onions, potatoes, specialty seed crops and vegetables are also grown in the irrigated lower portion.

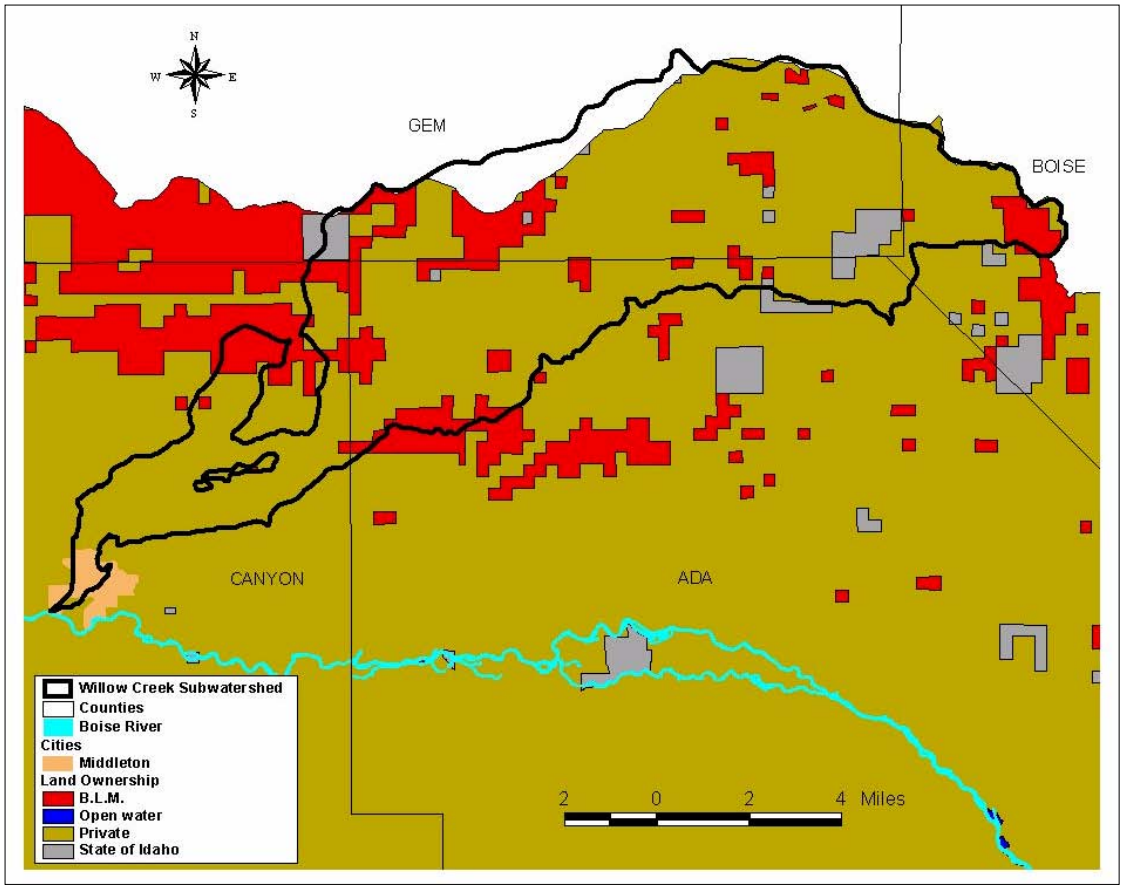
**Table 1. 2001 Agricultural Data for Willow Creek Subwatershed**

| Inventory: Farms & Cropland | Willow Creek Subwatershed |
|---|---|
| Total # of Farms (FSA Tracts) | 96 |
| Total Acres of Farms | 4,873 |
| Average Farm Size (acres) | 50.8 |
| Total Acres in Cropland | 4,589 |

## 3.6 Land Ownership and Land Use

While the majority of the land in Willow Creek is privately owned (approximately 83%), there is a significant amount of acreage owned by the federal (14%) and state (3%) governments (Figure 6). Sprinkler irrigated cropland and pasture is the largest agricultural use within the subwatershed, followed closely by surface irrigated cropland.

**Figure 6. Land Ownership**



# 4.0 Treatment Units

This section presents information on the individual agricultural land uses within the Willow Creek Subwatershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for addressing the identified problems.

- **Treatment Unit #1 – Surface Irrigated Cropland: 2,362 acres**

  Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- **Treatment Unit #2 – Surface Irrigated Pasture: 284 acres**

  Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures has the potential to enter the Lower Boise River via Willow Creek.

- **Treatment Unit #3 – Sprinkler Irrigated Cropland and Pasture: 2,227 acres**

  This unit is located throughout the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality due to high irrigation efficiencies resulting in little or no runoff.

- **Treatment Unit #4 – CAFO/AFO: 2 units**

  Feedlots are small in land area and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. See Table 5. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

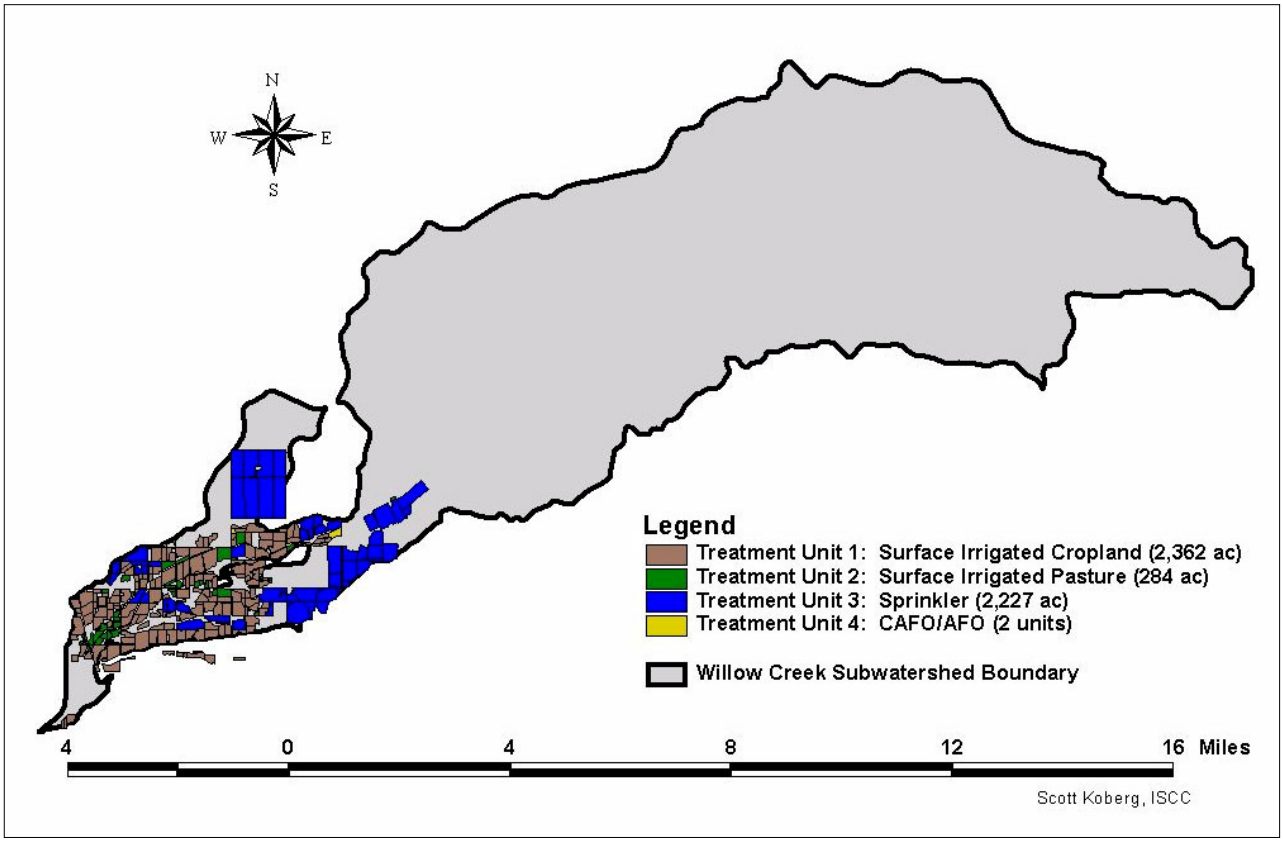
  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

**Table 2. Acres of TUs within Willow Creek Subwatershed.**

| Treatment Units | Acres |
|---|---|
| Treatment Unit 1 | 2,362 |
| Treatment Unit 2 | 284 |
| Treatment Unit 3 | 2,227 |
| Treatment Unit 4 | N/A |
| | |
| **TOTAL** | **4,873** |

(Koberg, 2001)

**Figure 7. Treatment Units**




# 5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, including Willow Creek.

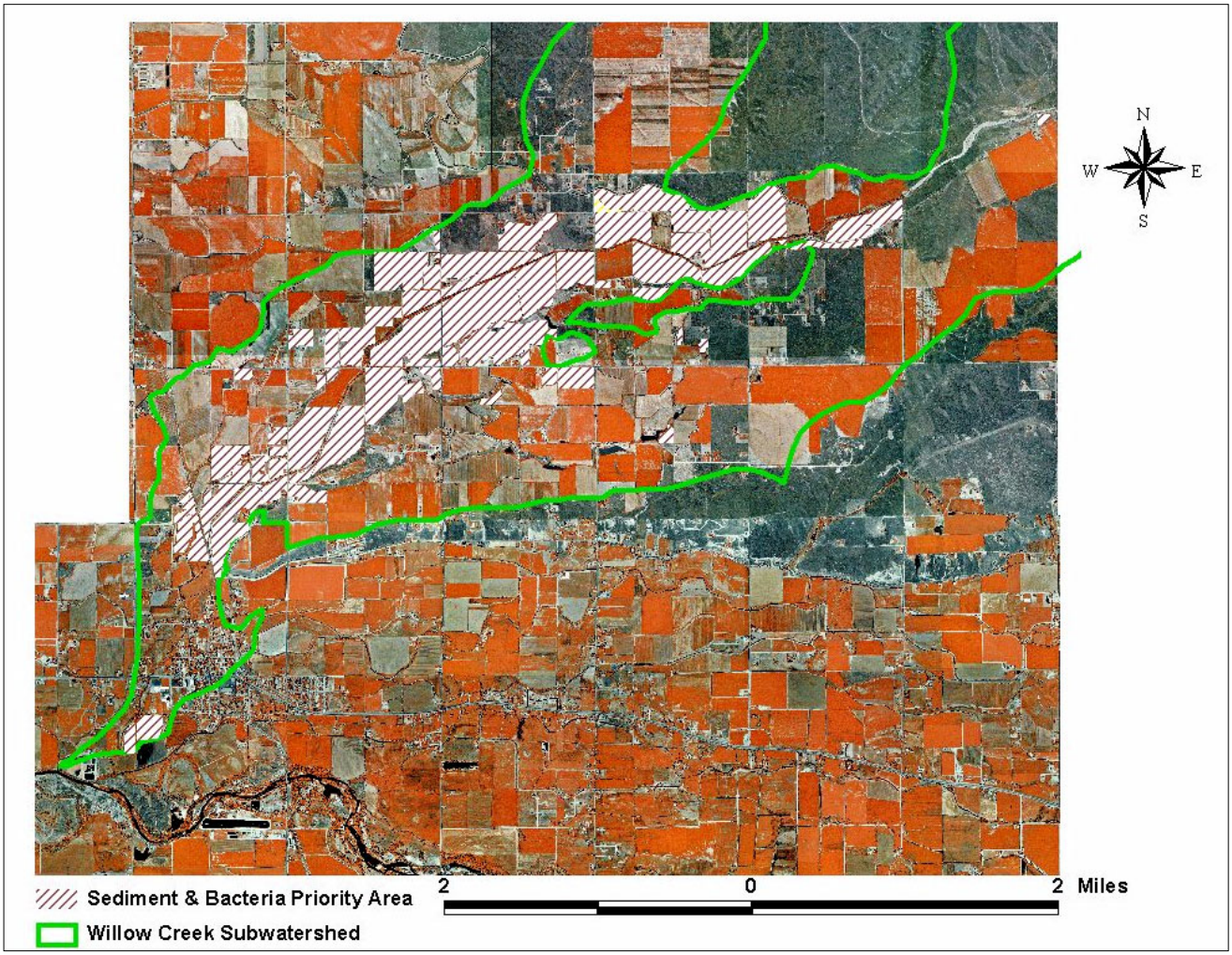
The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards adapt to reflect new developments. After the TMDL targets and load reductions were established for sediment and bacteria, additional sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been conducted. This new information and data collection indicate that the Lower Boise River may be closer to achieving its TMDL targets than originally assumed in the Subbassin Assessment.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" nutrient policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion
- Irrigation tailwater delivery to receiving water bodies
- Lack of adequate vegetation adjacent to waterways necessary for reducing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria.

**Figure 8. Willow Creek Subwatershed Priority Area**




## 5.1 Recreational Uses – Bacteria Objectives

The Lower Boise River TMDL established a 94% bacteria reduction target for primary contact recreation and a 62% reduction target for secondary contact recreation in Willow Creek to meet Idaho's fecal coliform criteria (Table 3).

**Table 3. Reductions Required to Meet Bacteria Load Allocation**

| Name | Primary Geo-Mean CFU/100 ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-Mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| **Willow Creek** | **803** | **50** | **94%** | **528** | **200** | **62%** |

(IDEQ, 1998)

Two developments affect this reduction objective and the agricultural BMP implementation that would be required to achieve it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, preliminary DNA results of bacteria samples from various locations in the Lower Boise River watershed indicate that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, and raccoon) beyond human control contribute largely to the current bacteria loads in the river. The current TMDL targets for bacteria may be unattainable as a result of these natural sources of fecal coliform and E. coli. It is likely that sources of bacteria from cows and other agricultural livestock can be reduced by implementing BMPs that limit their access to the Boise River and its tributaries while providing alternative watering sources.

**Table 4. Description of Confined Animal Feeding Operations in Willow Creek Subwatershed**

| Type of Confined Animal Feeding Operation (CAFO) | Number of CAFO's in Willow Creek Subwatershed |
|---|---|
| Dairy Cattle | 1 |
| Swine | 1 |
| **Total** | **2** |

(Koberg, 2001)

## 5.2 Aquatic Life Uses – Sediment Objectives

The approach selected by the local and state agencies responsible for addressing resource concerns on agricultural lands is to seek voluntary implementation of best management practices (BMPs) on agricultural lands with state and federal cost-share incentive programs to reduce Total Suspended Sediment loading rate by 37%.

**Table 5. 1995 TSS loads and allocations for Willow Creek**

| Tributary | 1995 Loads (Tons/day) | % of 1995 Total Watershed Load | TSS Load Allocation (Tons/day) |
|---|---|---|---|
| Willow Creek | 3.62 | 2% | 2.28 |

(IDEQ, 1998)

## 5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

**Table 6. Proposed No Net Increase (NNI) Phosphorous Load**

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| **Willow Creek** | **30** | **5,438** |

(IDEQ, 1998)

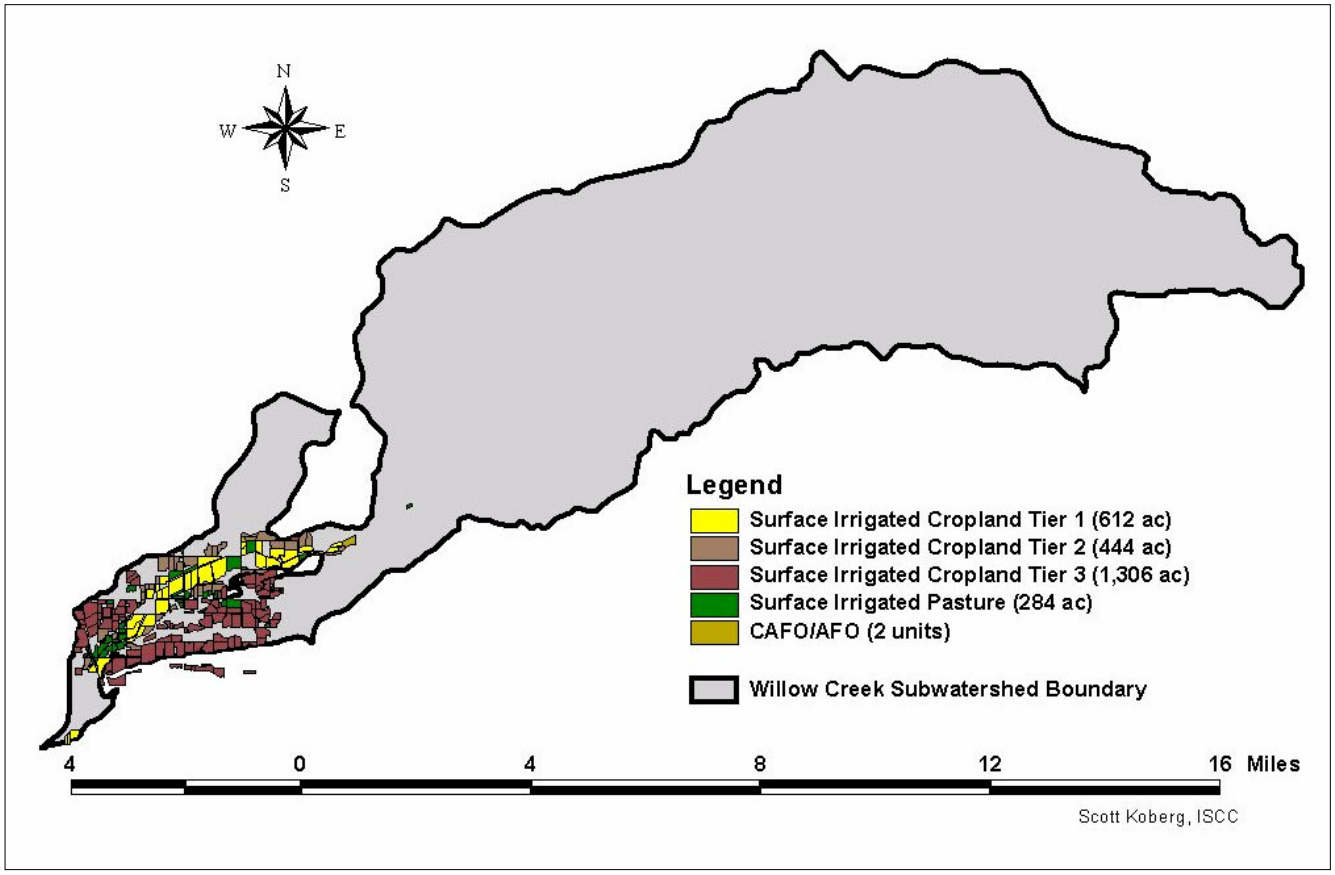
# 6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Willow Creek. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Willow Creek, which affects the Lower Boise River.

Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural land that drains directly into Willow Creek and is downstream from the C-Line Canal is included in Tier 1. Tier 1 lands have the most immediate impact on Lower Boise River water quality due to their proximity to the surface water tributaries. Unlike Tier 1 lands, Tier 2 lands are not directly adjacent to the tributaries of concern, and the wastewater from Tier 2 acreage has the potential to be reused by Tier 1 acreage before entering Willow Creek. Tier 3 acreage is located in the uplands where wastewater has the potential to be used multiple times by Tier 2 and Tier 1 acreage before entering the receiving waterbodies. In terms of BMP implementation Tier 1 is high priority, Tier 2 is medium priority, and Tier 3 is low priority (Figure 9).

**Figure 9. Location of Critical Acres**




**Critical Acres within each Treatment Unit:**

| | |
|---|---|
| Treatment Unit 1 | 612 acres of Tier 1 surface irrigated cropland<br>444 acres of Tier 2 surface irrigated cropland<br>1,306 acres of Tier 3 surface irrigated cropland |
| Treatment Unit 2 | 284 acres of surface irrigated pasture |
| Treatment Unit 3 | There are no critical acres within this treatment unit (Sprinkler) |
| Treatment Unit 4 | 2 units of CAFO/AFO |

# 7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited, to the following:

**Table 7. Treatment Unit 1: Surface Irrigated Cropland**

| | |
|---|---|
| Agro-Tillage | Conservation Cropping Sequence |
| Conservation Tillage | Cover and Green Manure Crop |
| Filter Strips | Grassed Waterway |
| Surge Irrigation System | Sprinkler Irrigation System |
| Tailwater Recovery System | Irrigation Water Management Systems |
| Straw Mulching | Nutrient Management |
| Pest Management | Sediment Basin |
| Underground Outlet | Chiseling and Subsoiling |
| Waste Utilization | Channel Vegetation |
| Drip Irrigation System | PAM |
| Irrigation Water Conveyance | |

**Table 8. Treatment Unit 2: Surface Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Waste Utilization |
| Spring water development | Waste Storage System |
| Irrigation systems | Nutrient Management |
| Pasture and Hayland Planting | Planned Grazing System |
| Livestock Watering Facility | Pasture and Hayland Management |

**Table 9. Treatment Unit 4: CAFO/AFO**

| | |
|---|---|
| Waste Management System | Heavy use area protection |
| Filter strips | Livestock Watering Facility |
| Nutrient Management | Fencing |

## 7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($800/ acre) | SITE SPECIFIC BMP Alternative #2 ($500/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Irrigation Water Mgt. | Irrigation Water Mgt. | Irrigation Water Mgt. |
| Sprinkler Irrigation System | Land Leveling | Concrete Ditch |
| Nutrient Mgt. | Surface Irrigation System | Filter Strip |
| Conservation Crop Rotation | Gated Pipe | PAM |
| | Tail Water Recovery System | Sediment Basin |
| | Nutrient Mgt. | Nutrient Mgt. |
| | Conservation Crop Rotation | Conservation Crop Rotation |
| | Conservation Tillage | Conservation Tillage |

## 7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($450/ acre) | SITE SPECIFIC BMP Alternative #2 ($350/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Livestock Watering Facility |
| Heavy Use Area Protection | Livestock Watering Facility | Irrigation Water Mgt. |
| Livestock Watering Facility | Irrigation Water Mgt. | Field Border Irrigation System |
| Irrigation Water Mgt. | Field Border Irrigation System | |
| Field Border Irrigation System | | |
| Gated Pipe | | |

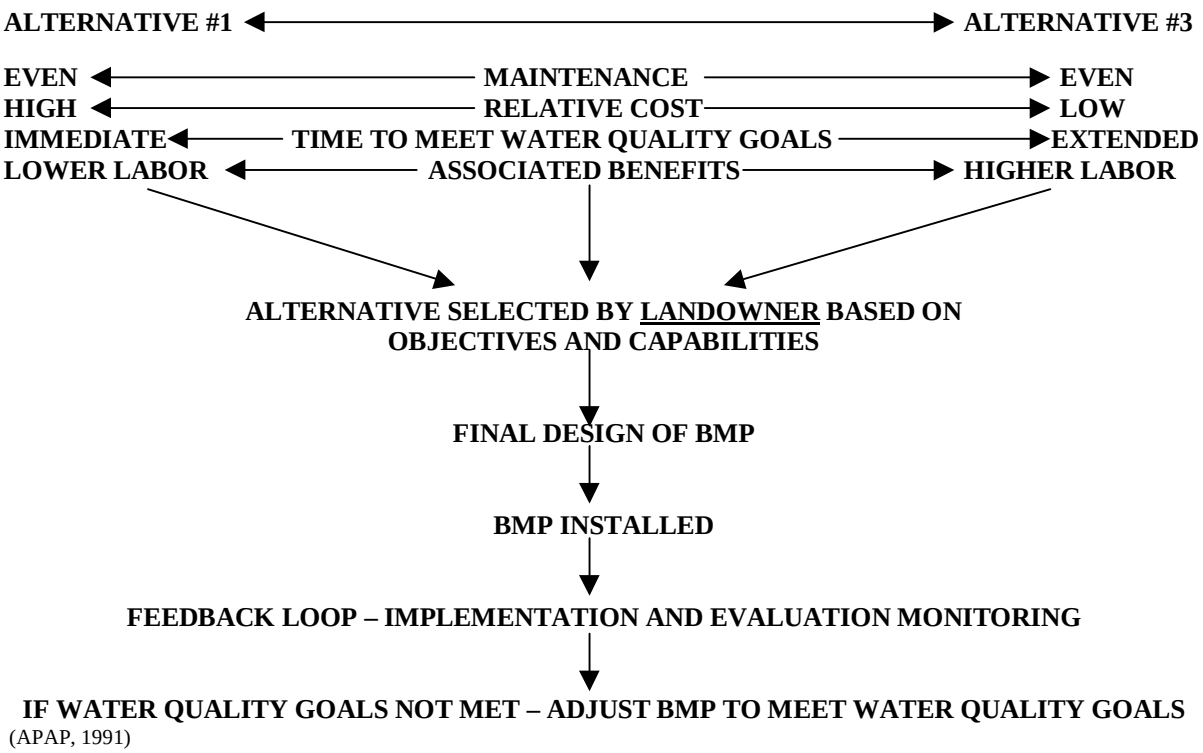
## 7.3 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($50,000/ each) | SITE SPECIFIC BMP Alternative #2 ($35,000/ each) | SITE SPECIFIC BMP Alternative #3 ($25,000/ each) |
|---|---|---|
| Nutrient Mgt. | Waste Mgt. System | Waste Mgt. System |
| Heavy Use Area Protection | Nutrient Mgt. | Nutrient Mgt. |
| Livestock Watering Facility | Livestock Watering Facility | Filter strip |
| Filter strips | Filter strips | Heavy Use Area Protection |
| Waste Mgt. System | Heavy Use Area Protection | |
| Dike | | |

## 7.4 Graphic Comparison of BMP Selection and Implementation Process

The site specific BMP Alternative is chosen based on a variety of factors, but typically reflect the landowner's objectives in conjunction with the resource concerns identified by the assisting agency. The following flow chart provides a graphic representation of selection process and some comparisons between Alternative #1(high cost), Alternative #2 (moderate cost), and Alternative #3 (low cost) for the various treatment units. The chart applies to each of the three treatment units identified in sections 7.1 through 7.3.



(APAP, 1991)

## 7.5 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

## 7.6 Feedback Loop

The feedback loop is a process used to evaluate and refine installed BMPs. Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards (APAP, 1991). The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

# 8.0 Program of Implementation

The Canyon Soil Conservation District along with the Ada Soil & Water Conservation District has selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. There are currently no sources of funding available for cost-share assistance specifically within the Willow Creek subwatershed priority area. While there are a handful of federal and state site-specific programs available to interested participants on a farm by farm basis, Willow Creek has yet to be selected as a priority area with its own specific project area. Should funding become available for use specifically in the Willow Creek Subwatershed, the implementation of BMPs and distribution of incentive payments will likely be focused within the subwatershed boundary downstream from the C-Line Canal where the majority of Tier 1 acreage is located.

## 8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC), Ada SWCD, and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. Where cost-share incentives are contracted through a state or federal program, NRCS and ISCC will assist Ada and Canyon Conservation Districts with certification of installed BMPs, filing payment applications, completing annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

**Table 10. Estimated BMP Cost Summary for Treatment Unit 1, Tier 1 (Surface Irrigated Cropland: 612 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 612 | $ 489,600 |
| Alternative 2 | $500/AC | 612 | $ 306,000 |
| Alternative 3 | $250/AC | 612 | $ 153,000 |

**Table 11. Estimated BMP Cost Summary for Treatment Unit 1, Tier 2 (Surface Irrigated Cropland: 444 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 444 | $ 355,200 |
| Alternative 2 | $500/AC | 444 | $ 222,000 |
| Alternative 3 | $250/AC | 444 | $ 111,000 |

**Table 12. Estimated BMP Cost Summary for Treatment Unit 1, Tier 3 (Surface Irrigated Cropland: 1,306 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 1306 | $ 1,044,800 |
| Alternative 2 | $500/AC | 1306 | $ 653,000 |
| Alternative 3 | $250/AC | 1306 | $ 326,500 |

**Table 13. Estimated BMP Cost Summary for Treatment Unit 2 (Surface Irrigated Pasture: 284 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $450/AC | 284 | $ 127,800 |
| Alternative 2 | $350/AC | 284 | $ 99,400 |
| Alternative 3 | $250/AC | 284 | $ 71,000 |

**Table 14. Estimated BMP Cost Summary for Treatment Unit 4 (CAFO/AFO 2 Units)**

| ALTERNATIVE | | UNITS | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $50,000/each | 2 | $ 100,000 |
| Alternative 2 | $35,000/each | 2 | $ 70,000 |
| Alternative 3 | $25,000/each | 2 | $ 50,000 |

## 8.2 Operation, Maintenance, and Replacement

Participants who install BMPs in conjunction with a state or federal cost-share incentive program will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Landowners are encouraged to maintain installed BMPs after the contract expires. Participants who install BMPs on their own or without the benefit of a cost-share incentive program are not under contract to maintain the BMPs. If the BMPs are installed in response to a conservation plan completed with them by the assisting agencies, landowners are encouraged to maintain the BMPs and incorporate them into their annual operations. It is not required, however, unless they are under contract.

Inspections of BMPs installed in conjunction with a cost-share incentive program will be made on an annual basis by Ada SWCD and Canyon SCD, NRCS, ISCC, and the participant. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant.

## 8.3 Water Quality Monitoring

Monitoring at the mouth of Willow Creek has been conducted by U.S. Geological Survey (USGS) since well before the TMDL was established (1994). In addition, the Idaho State Department of Agriculture (ISDA) collected water quality samples at the mouth of Willow Creek on a twice a month basis during 2000 and 2001. Most samples collected by the various agencies occur on a bimonthly basis throughout the irrigation season (April - October) and on a monthly basis throughout the rest of the year (winter). Data parameters measured thus far have included DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids) pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

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Scott Koberg, Idaho Soil Conservation Commission, 2001. *Farm Services Agency Data*

# APPENDIX 9.

# Mill Slough Subwatershed

# Agricultural TMDL Implementation Plan

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# 1.0 Executive Summary

**Subwatershed:** Mill Slough Subwatershed
Total Scope: 43,619 acres
Agricultural Scope: 10,609 acres
Agricultural Critical Acres Scope: 8,307 acres

**Location:** North side of the Boise River, originates in northern Ada county and travels into Canyon county before entering the Boise River near the town of Middleton

**Elevation:** 3,800 feet in the Boise Mountains to 2,380 feet at the Boise River.

**Priority Subwatershed:** Medium

**Cooperating Agricultural Agencies:** Ada Soil & Water Conservation District (ASWCD)
Canyon Soil Conservation District (CSCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

**Agricultural Land Uses:**

| Landuse | Acres | Percent of Mill Slough Subwatershed |
|---|---|---|
| Surface Irrigated Cropland | 6,714 | 15% |
| Surface Irrigated Pasture | 1,593 | 4% |
| Sprinkler Irrigated Cropland and Pasture | 2,302 | 5% |
| CAFO/AFO | N/A | N/A |
| | | |
| **TOTAL** | **10,609** | **24%** |

**Major Agricultural Products:** Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, specialty seed crops, vegetables, livestock, and dairy products.

**TMDL Objectives:** The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouth of the Mill Slough. The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98% for primary contact recreation.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 "SR-HC TMDL") will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

**Implementation Plan:** This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Mill Slough Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the four different agricultural land use types (Treatment Units) within the Mill Slough Subwatershed. Estimated costs to install BMPs on lands identified for treatment are: Alternative 1 - $6,588,050; Alternative 2 - $4,264,550; and Alternative 3 - $2,326,750. These cost estimates do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

# 2.0 Introduction

The Mill Slough Subwatershed encompasses 43,619 acres. It includes the upper portions of the watershed, consisting mostly of private non-irrigated rangeland and federal rangeland in the foothills of the Boise Mountains, as well as the lower portion of irrigated cropland and pasture near the towns of Star and Middleton. A number of creeks and gullies flow in a southwesterly direction toward Mill Slough, but when water is present it is typically intercepted by the Farmers Union Canal. Mill Slough originates west of Star and accepts all irrigation wastewater below the Farmers Union Canal as it flows in a southwesterly direction before reaching the Boise River near Middleton.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from Mill Slough. Within this plan the following elements are identified: pollutant problems within Mill Slough Subwatershed, sources of those pollutants, critical acres contributing pollutants to the subwatershed, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on improving water quality.

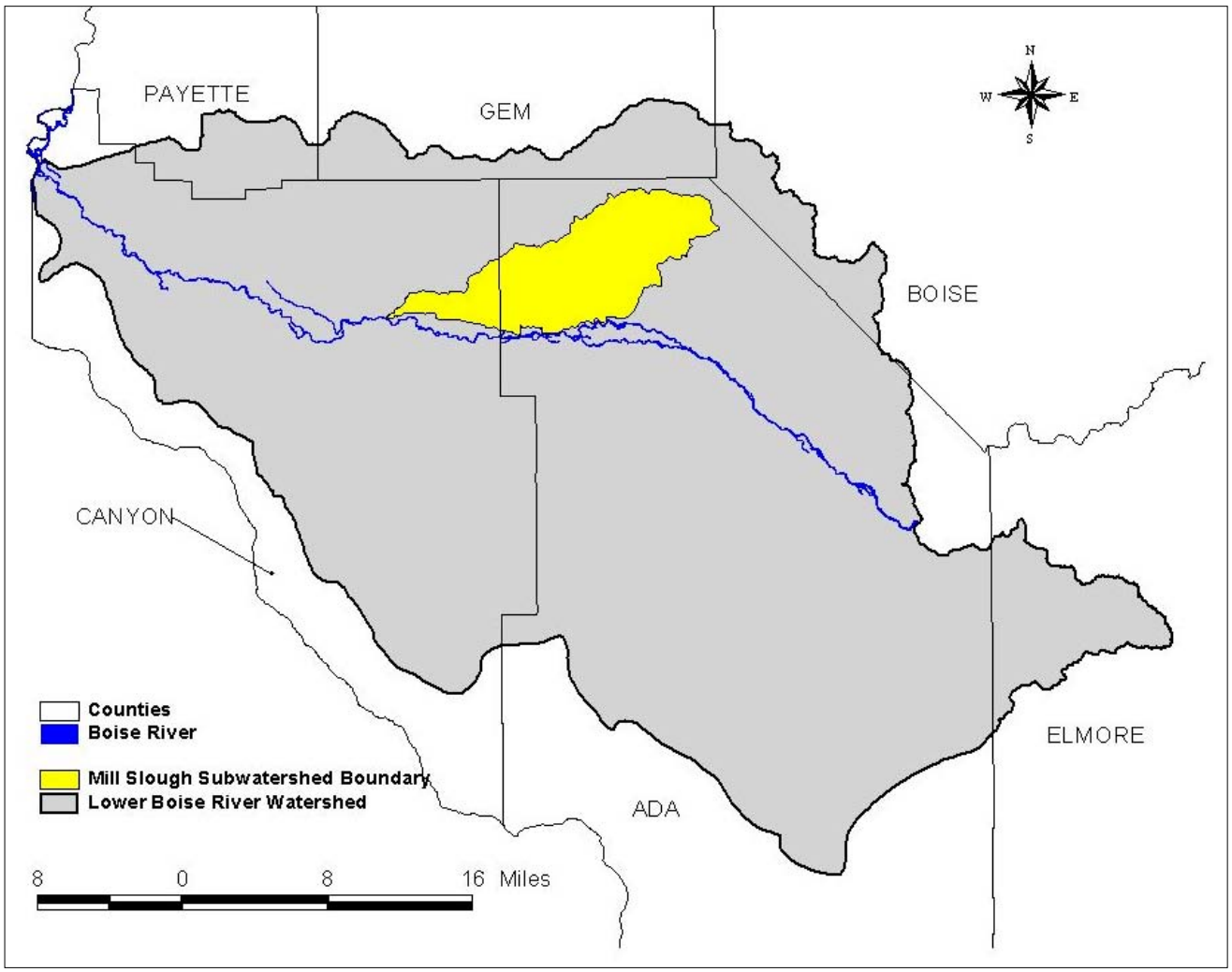
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Mill Slough Subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements at the mouth of Mill Slough. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Mill Slough Subwatershed contact the Ada Soil & Water Conservation District (Ada SWCD), Canyon Soil Conservation District (Canyon SCD), Natural Resources Conservation Service (NRCS), or Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency, as well as irrigation scheduling and soil moisture monitoring methods.**

**Figure 1. Mill Slough Subwatershed Location**




## 3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Mill Slough Subwatershed.

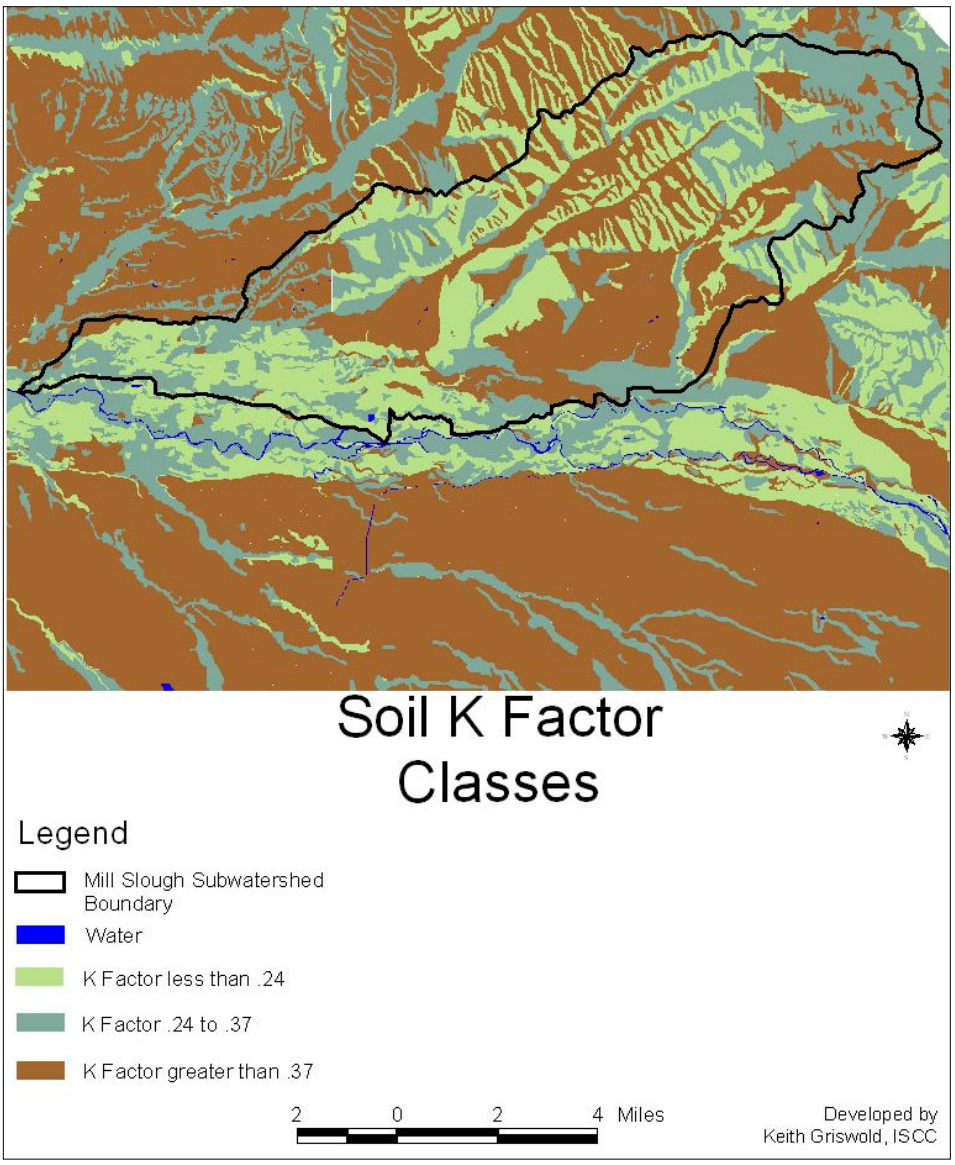
### 3.1 Soils

There are three major soil associations within Mill Slough Subwatershed (U. S. Department of the Agriculture, 1972).

- *Moulton-Bram-Baldock-Falk:* Moderately well and poorly drained soils on floodplains and low river terraces
- *Lankbush-Brent-Tindahay:* Well and somewhat excessively drained soils on sloping to steep foothills
- *Cashmere-Tindahay:* Somewhat excessively drained soils in drainageways and on low alluvial fans

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility. Soil "K Factor" classes are used to determine a soils erodibility potential. The higher the K-Factor rating, the greater the potential for erosion (Figure 2). In addition to K-Factor classes, soil slope classes provide another indication of erosion potential. As with K-Factor classes, the greater the percentage of slope, the greater the potential for erosion (Figure 3).

**Figure 2. Mill Slough Subwatershed K Factor Classes**



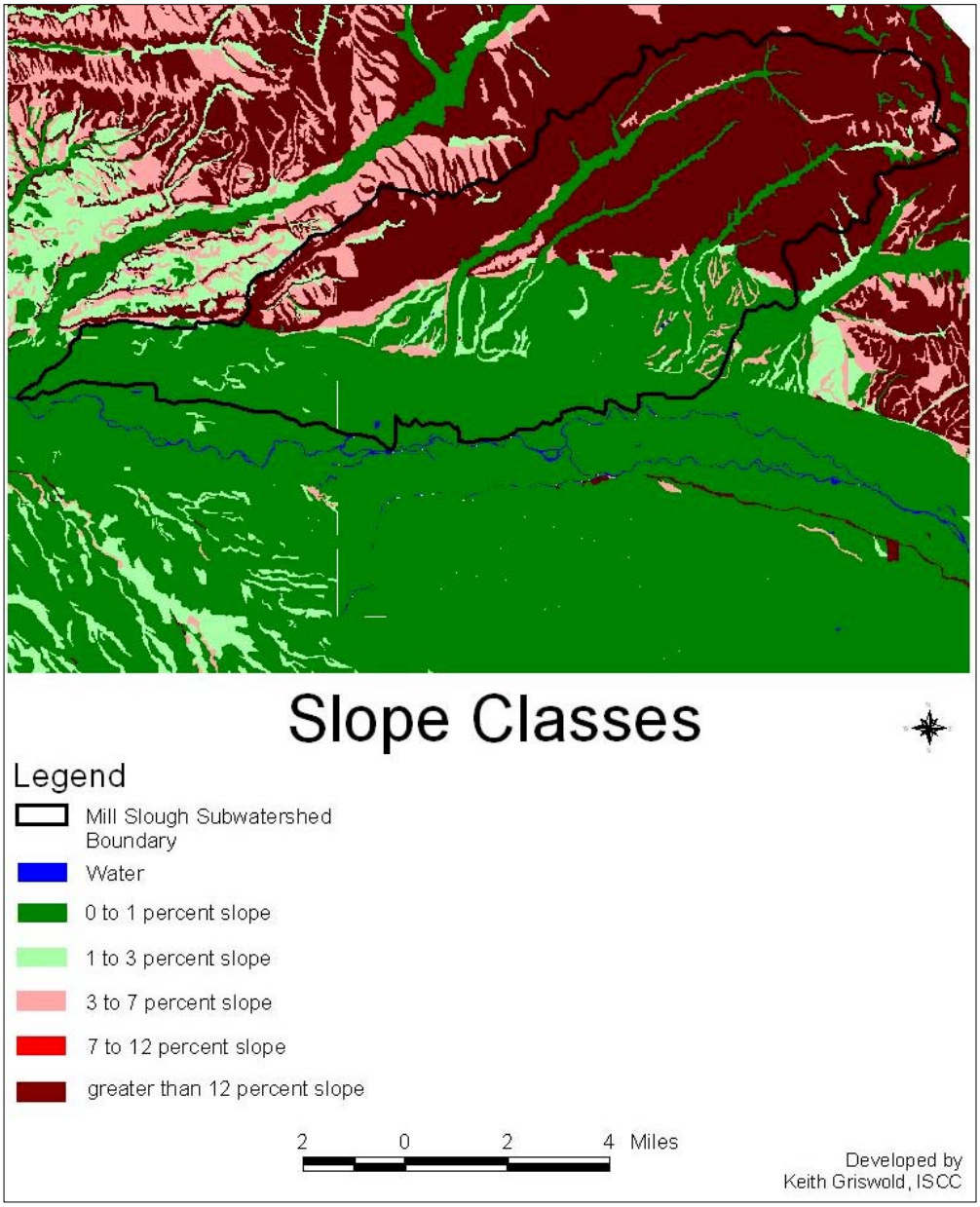

## 3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature during the summer in Boise, Idaho is 83.9°Fahrenheit, while the average daily minimum temperature during the winter is 25.9° Fahrenheit. Temperatures as low as –23.0°Fahrenheit and as warm as 111.0° Fahrenheit have been recorded (Climate Data Center, 2000).

Long term average annual precipitation for Boise is 11.9 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley, and extended periods without precipitation occur annually during the summer months.

The average consecutive frost-free period (above 32 degrees) is 152 days, based on the Boise Airport long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 135 days for this area. The average last frost (32° degrees) in the spring is around May 8 and the average first frost in the fall is around October 8 (U. S. Department of the Agriculture, 1977).

**Figure 3. Mill Slough Subwatershed Slope Classes**




## 3.3 Surface Hydrology

Pre-existing ephemeral channels have been modified over time by channelization and bank stabilization prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There is currently four major canals (Farmers Union, Dry Creek, Middleton, and Kennedy) that supply water to cropland in Mill Slough Subwatershed and one major drain (Mill Slough) that receives tailwater from the croplands and pastures and drains ground water.

Reuse of agricultural tailwater is not very common in the subwatershed. All of the acreage under surface irrigation in the subwatershed is located in the southwestern portion and is serviced by the Farmers Union, Dry Creek, Middleton, and Kennedy canals. While wastewater from the upland acreage in the subwatershed is likely to be reused before entering Mill Slough, the water from the slough itself is not diverted into any major canals before entering the Boise River. The local Conservation Districts and the Soil Conservation Commission have identified the surface irrigated acreage just upstream from Middleton as the critical acreage for treatment as a result of its potential impact on water quality.

**Figure 4. Surface Hydrology**

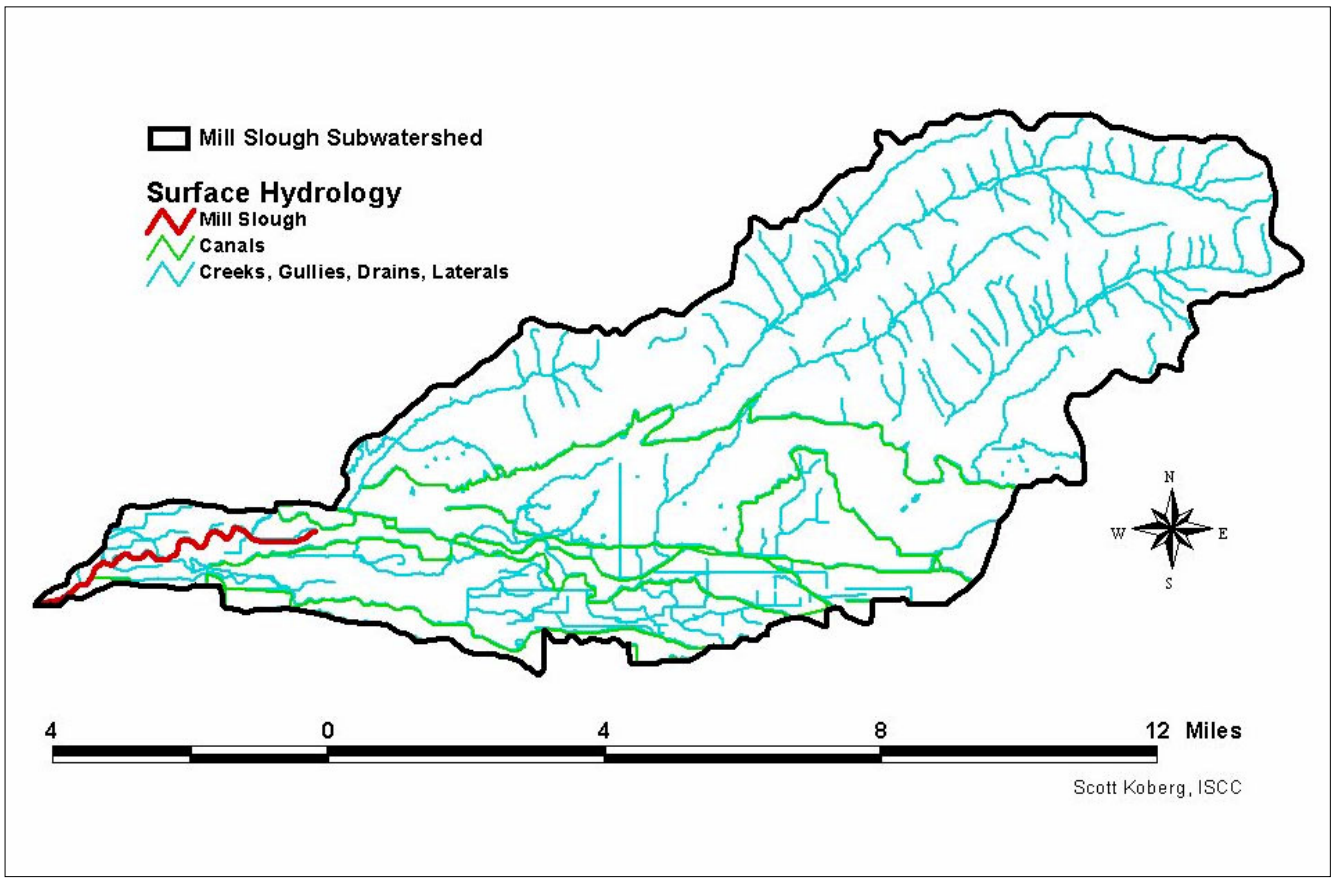
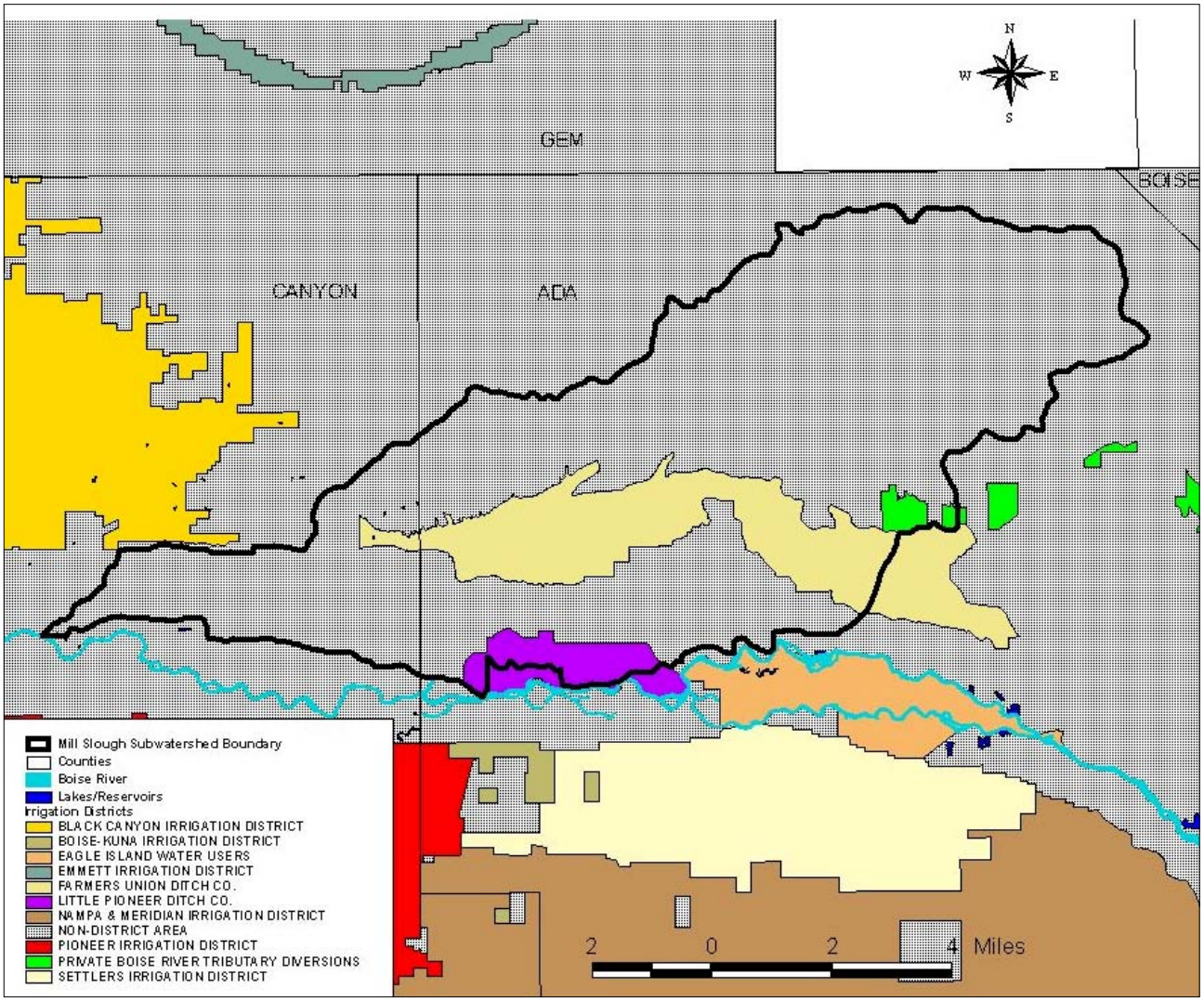


**Figure 5. Irrigation Districts**




## 3.4 Ground Water Hydrology

Prior to irrigation development during the 1900's, the large shallow aquifer under the Boise Valley did not exist. This aquifer (< 200 feet) is recharged annually by surface irrigation and earthen canals that recharge the artificial and natural drains throughout the year. Mill Slough Subwatershed sits atop the shallow Boise Valley aquifer and contributes to its recharge through surface irrigation and seepage.

## 3.5 Demographics and Economics

The Lower Boise River Watershed has experienced accelerated growth within the last 10 years. Ada and Canyon counties in particular experienced growth rates well above the state and national averages during the period from 1990 to2000. Ada County with a year 2000 population of 300,904 and Canyon County with a year 2000 population of 131,441 have increased at rates of 46.2% and 45.9% respectively (U.S. Census Bureau, 2001). These increases are huge when compared to the national average of 13.1% and Idaho state average of 28.5% during the same period.

The Mill Slough Subwatershed has yet to be impacted as significantly by the rapid growth in the Treasure Valley as some of the other subwatesheds. The upper portion of the subwatershed remains mostly as it was when the TMDL was completed for the Lower Boise River, although some of the growth from the expanding city of Eagle (population 11,085) is beginning to push its way north into the subwatershed. The lower portion, particularly north of the towns

of Star (pop. 1,795) and Middleton (pop. 2,978), is also beginning to experience some of the growth affecting other urban and suburban areas in the Lower Boise Watershed. The majority of the developments on the rural fringe have been residential subdivisions, while some larger parcels of land further north of the towns have been developed as large lots or ranchettes. Although agricultural conversion of land isn't occurring as rapidly as in some of the other subwatersheds, Mill Slough Subwatershed is still experiencing a loss of agricultural land to development.

Unlike the upper portion of the subwatershed (upstream from Farmers Union Canal) which consists mainly of rangeland and sprinkler irrigated cropland and pasture, the lower portion consists of a variety of high and low residue crops under surface irrigation. High residue crops such as spring wheat, winter wheat, alfalfa, clover, and pasture are common while low residue crops such as seed corn, beans, sugar beets, sweet corn, field corn, onions, potatoes, specialty seed crops and vegetables are also grown in the irrigated lower portion.

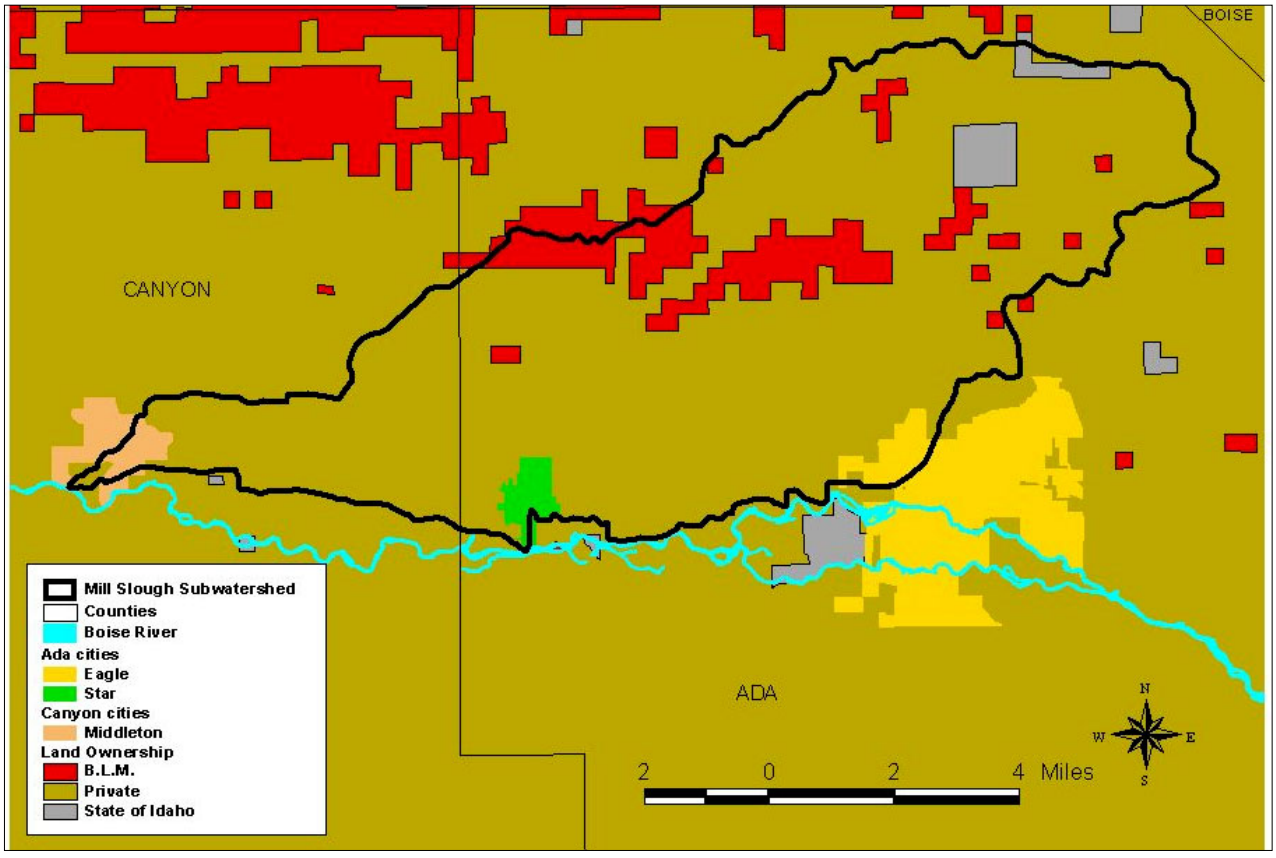
**Table 1. 2001 Agricultural Data for Mill Slough Subwatershed**

| Inventory: Farms & Cropland | Mill Slough Subwatershed |
|---|---|
| Total # of Farms (FSA Tracts) | 263 |
| Total Acres of Farms | 10,609 |
| Average Farm Size (acres) | 40.3 |
| Total Acres in Cropland | 9,016 |

## 3.6 Land Ownership and Land Use

While the majority of the land in Mill Slough is privately owned (90%), there are sporadic portions of acreage owned by the federal (8%) and state (2%) governments (Figure 6). Surface irrigated cropland is the largest agricultural use within the subwatershed, followed distantly by sprinkler irrigated cropland and pasture.

**Figure 6. Land Ownership**



# 4.0 Treatment Units

This section presents information on the individual agricultural land uses within the Mill Slough Subwatershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for addressing the identified problems.

- **Treatment Unit #1 – Surface Irrigated Cropland: 6,714 acres**

  Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- **Treatment Unit #2 – Surface Irrigated Pasture: 1,593 acres**

  Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures has the potential to enter the Lower Boise River via Mill Slough.

- **Treatment Unit #3 – Sprinkler Irrigated Cropland and Pasture: 2,302 acres**

  This unit is located throughout the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality due to high irrigation efficiencies resulting in little or no runoff.

- **Treatment Unit #4 – CAFO/AFO: 10 units**

  Feedlots are small in land area and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. See Table 5. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

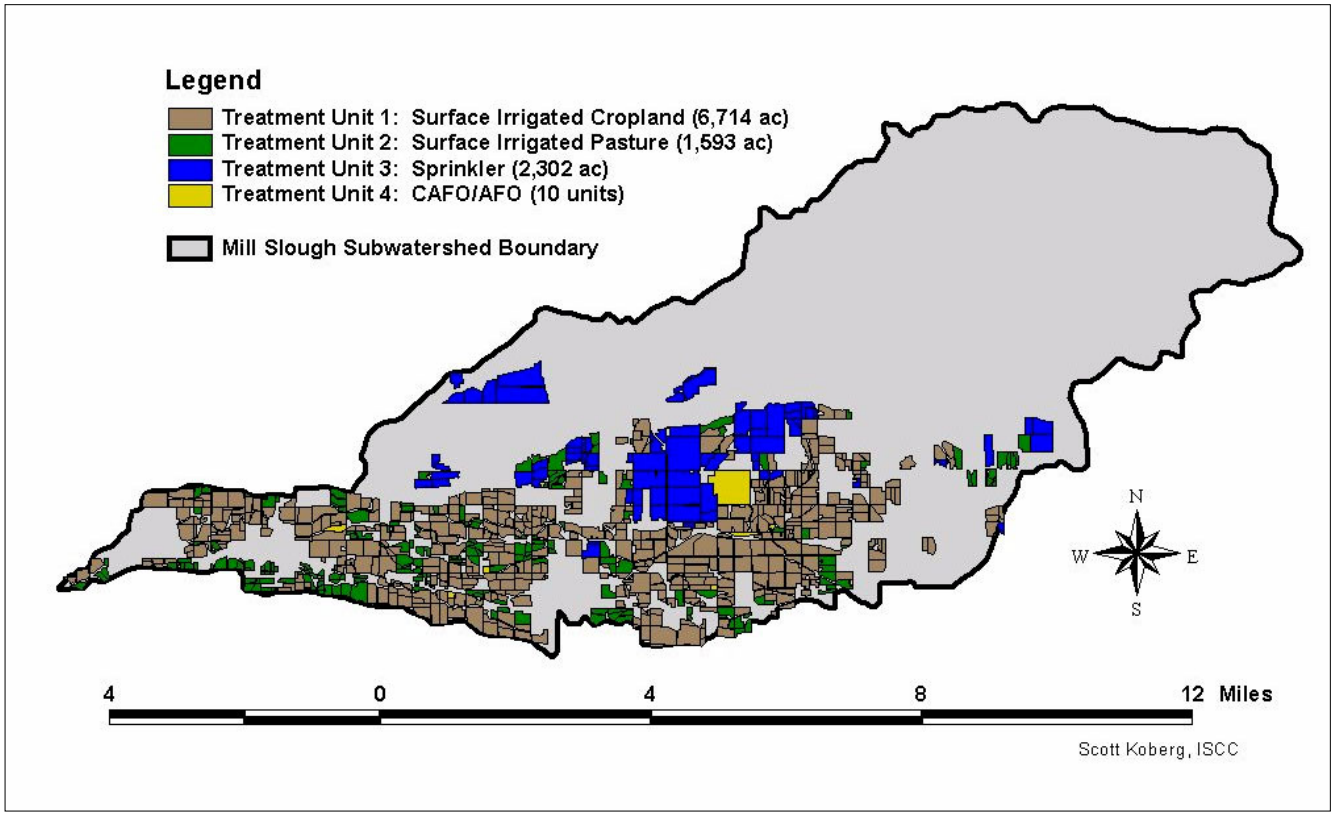
  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

**Table 2. Acres of TUs within Mill Slough Subwatershed.**

| Treatment Units | Acres |
|---|---|
| Treatment Unit 1 | 6,714 |
| Treatment Unit 2 | 1,593 |
| Treatment Unit 3 | 2,302 |
| Treatment Unit 4 | N/A |
| | |
| **TOTAL** | **10,609** |

(Koberg, 2001)

**Figure 7. Treatment Units**




## 5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, including Mill Slough.

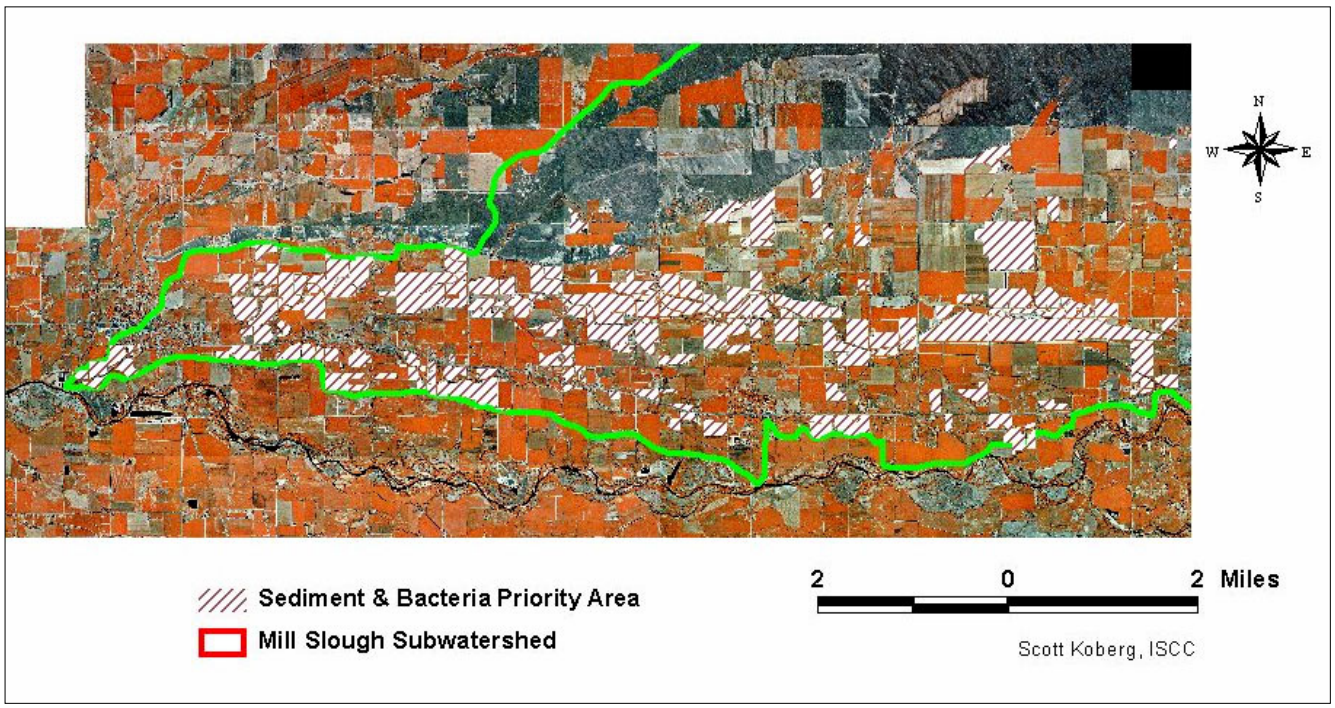
The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards adapt to reflect new developments. After the TMDL targets and load reductions were established for sediment and bacteria, additional sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been conducted. This new information and data collection indicate that the Lower Boise River may be closer to achieving its TMDL targets than originally assumed in the Subbasin Assessment.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" nutrient policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion
- Irrigation tailwater delivery to receiving water bodies
- Lack of adequate vegetation adjacent to waterways necessary for reducing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria.

**Figure 8. Mill Slough Subwatershed Priority Area**




## 5.1 Recreational Uses – Bacteria Objectives

The Lower Boise River TMDL established a 96% bacteria reduction target for primary contact recreation and a 64% reduction target for secondary contact recreation in Mill Slough to meet Idaho's fecal coliform criteria (Table 3).

**Table 3. Reductions Required to Meet Bacteria Load Allocation**

| Name | Primary Geo-Mean CFU/100 ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-Mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| **Mill Slough** | **1,282** | **50** | **96%** | **556** | **200** | **64%** |

(IDEQ, 1998)

Two developments affect this reduction objective and the agricultural BMP implementation that would be required to achieve it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, preliminary DNA results of bacteria samples from various locations in the Lower Boise River watershed indicate that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, and raccoon) beyond human control contribute largely to the current bacteria loads in the river. The current TMDL targets for bacteria may be unattainable as a result of these natural sources of fecal coliform and E. coli. It is likely that sources of bacteria from cows and other agricultural livestock can be reduced by implementing BMPs that limit their access to the Boise River and its tributaries while providing alternative watering sources.

**Table 4. Description of Confined Animal Feeding Operations in Mill Slough Subwatershed**

| Type of Confined Animal Feeding Operation (CAFO) | Number of CAFO's in Mill Slough Subwatershed |
|---|---|
| Dairy Cattle | 8 |
| Beef Cattle | 2 |
| **Total** | **10** |

(Koberg, 2001)

## 5.2 Aquatic Life Uses – Sediment Objectives

The approach selected by the local and state agencies responsible for addressing resource concerns on agricultural lands is to seek voluntary implementation of best management practices (BMPs) on agricultural lands with state and federal cost-share incentive programs to reduce Total Suspended Sediment loading rate by 37%.

**Table 5. 1995 TSS loads and allocations for Mill Slough**

| Tributary | 1995 Loads (Tons/day) | % of 1995 Total Watershed Load | TSS Load Allocation (Tons/day) |
|---|---|---|---|
| Mill Slough | 11.24 | 7% | 7.08 |

(IDEQ, 1998)

## 5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

**Table 6. Proposed No Net Increase (NNI) Phosphorous Load**

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| **Mill Slough** | **197** | **36,277** |

(IDEQ, 1998)

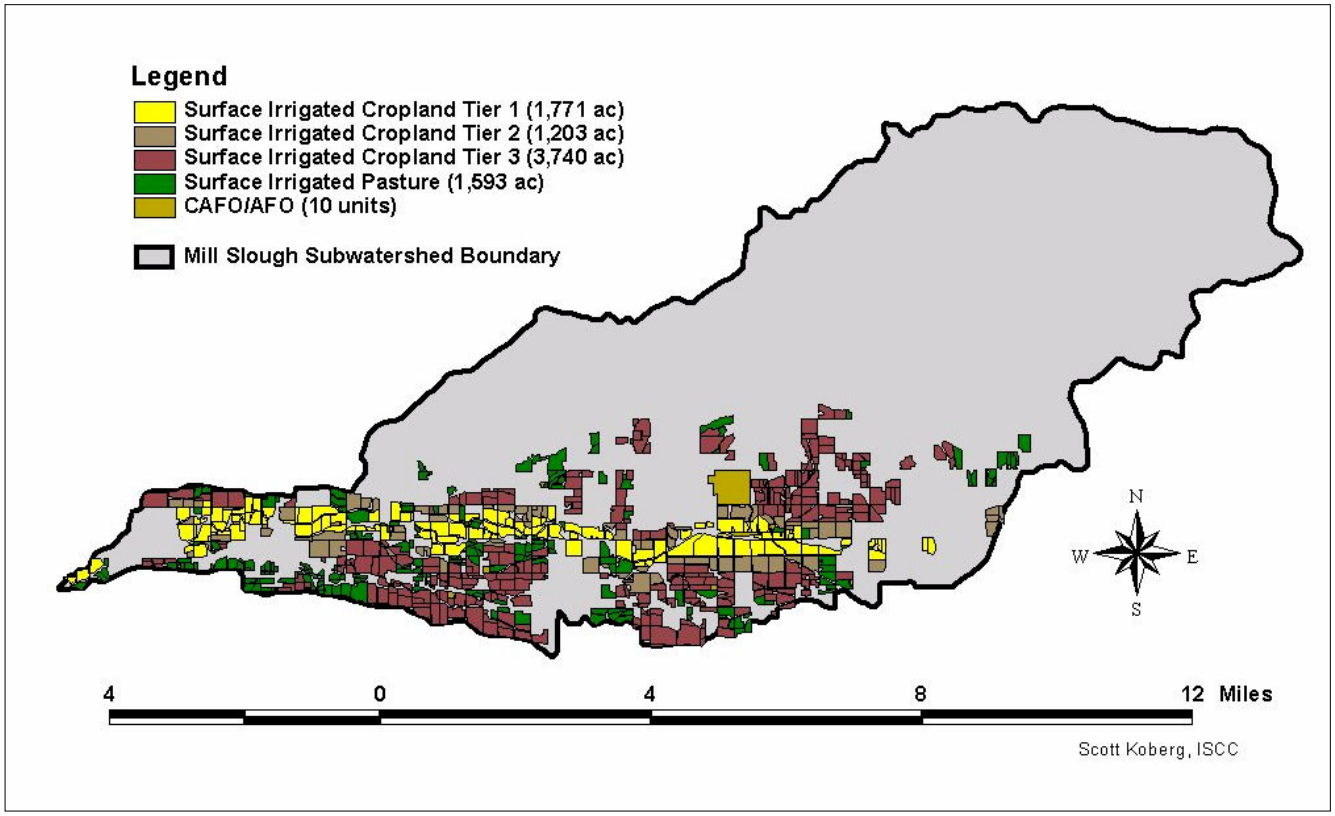
# 6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Mill Slough. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Mill Slough, which affects the Lower Boise River.

Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural land that drains directly into Mill Slough or its direct tributaries and is downstream from the Farmers Union Canal is included in Tier 1. Tier 1 lands have the most immediate impact on Lower Boise River water quality due to their proximity to the surface water tributaries. Unlike Tier 1 lands, Tier 2 lands are not directly adjacent to the tributaries of concern, and the wastewater from Tier 2 acreage has the potential to be reused by Tier 1 acreage before entering Mill Slough. Tier 3 acreage is located in the uplands where wastewater has the potential to be used multiple times by Tier 2 and Tier 1 acreage before entering the receiving waterbodies. In terms of BMP implementation Tier 1 is high priority, Tier 2 is medium priority, and Tier 3 is low priority (Figure 9).

**Figure 9. Location of Critical Acres**




**Critical Acres within each Treatment Unit:**

| | |
|---|---|
| Treatment Unit 1 | 1,771 acres of Tier 1 surface irrigated cropland<br>1,203 acres of Tier 2 surface irrigated cropland<br>3,740 acres of Tier 3 surface irrigated cropland |
| Treatment Unit 2 | 1,593 acres of surface irrigated pasture |
| Treatment Unit 3 | There are no critical acres within this treatment unit (Sprinkler) |
| Treatment Unit 4 | 10 units of CAFO/AFO |

# 7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited, to the following:

**Table 7. Treatment Unit 1: Surface Irrigated Cropland**

| | |
|---|---|
| Agro-Tillage | Conservation Cropping Sequence |
| Conservation Tillage | Cover and Green Manure Crop |
| Filter Strips | Grassed Waterway |
| Surge Irrigation System | Sprinkler Irrigation System |
| Tailwater Recovery System | Irrigation Water Management Systems |
| Straw Mulching | Nutrient Management |
| Pest Management | Sediment Basin |
| Underground Outlet | Chiseling and Subsoiling |
| Waste Utilization | Channel Vegetation |
| Drip Irrigation System | PAM |
| Irrigation Water Conveyance | |

**Table 8. Treatment Unit 2: Surface Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Waste Utilization |
| Spring water development | Waste Storage System |
| Irrigation systems | Nutrient Management |
| Pasture and Hayland Planting | Planned Grazing System |
| Livestock Watering Facility | Pasture and Hayland Management |

**Table 9. Treatment Unit 4: CAFO/AFO**

| | |
|---|---|
| Waste Management System | Heavy use area protection |
| Filter strips | Livestock Watering Facility |
| Nutrient Management | Fencing |

## 7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($800/ acre) | SITE SPECIFIC BMP Alternative #2 ($500/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Irrigation Water Mgt. | Irrigation Water Mgt. | Irrigation Water Mgt. |
| Sprinkler Irrigation System | Land Leveling | Concrete Ditch |
| Nutrient Mgt. | Surface Irrigation System | Filter Strip |
| Conservation Crop Rotation | Gated Pipe | PAM |
| | Tail Water Recovery System | Sediment Basin |
| | Nutrient Mgt. | Nutrient Mgt. |
| | Conservation Crop Rotation | Conservation Crop Rotation |
| | Conservation Tillage | Conservation Tillage |

## 7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($450/ acre) | SITE SPECIFIC BMP Alternative #2 ($350/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Livestock Watering Facility |
| Heavy Use Area Protection | Livestock Watering Facility | Irrigation Water Mgt. |
| Livestock Watering Facility | Irrigation Water Mgt. | Field Border Irrigation System |
| Irrigation Water Mgt. | Field Border Irrigation System | |
| Field Border Irrigation System | | |
| Gated Pipe | | |

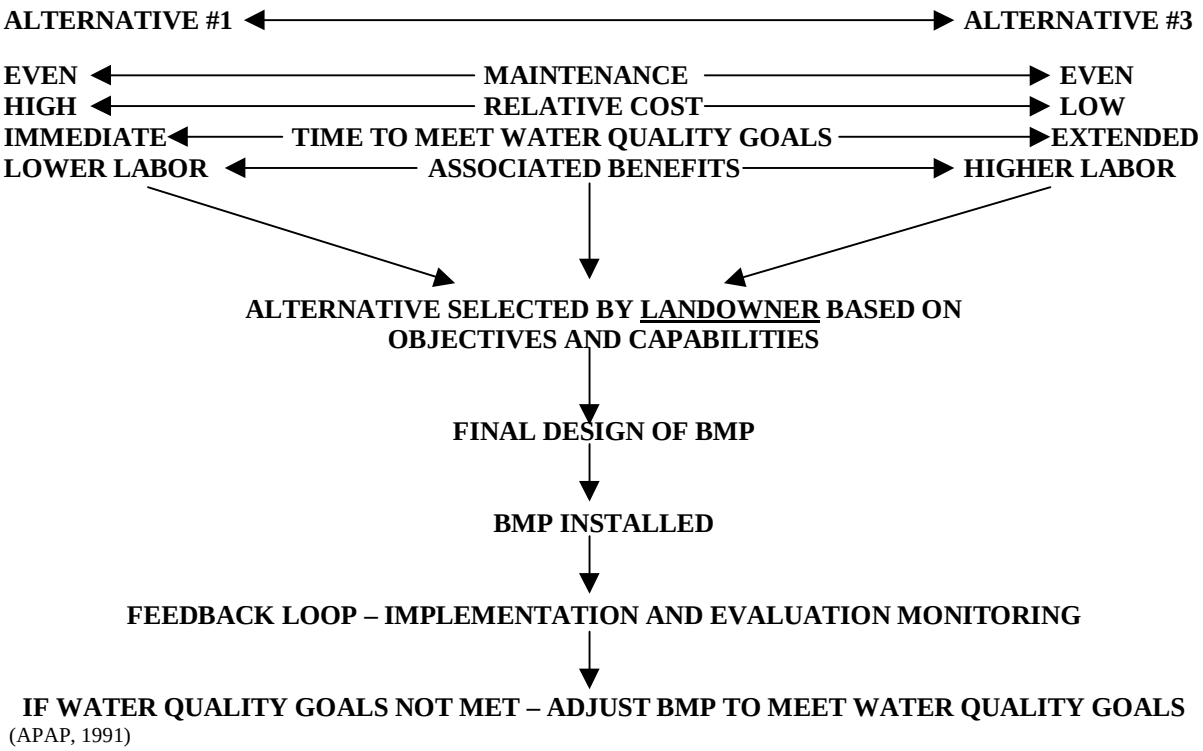
## 7.3 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($50,000/ each) | SITE SPECIFIC BMP Alternative #2 ($35,000/ each) | SITE SPECIFIC BMP Alternative #3 ($25,000/ each) |
|---|---|---|
| Nutrient Mgt. | Waste Mgt. System | Waste Mgt. System |
| Heavy Use Area Protection | Nutrient Mgt. | Nutrient Mgt. |
| Livestock Watering Facility | Livestock Watering Facility | Filter strip |
| Filter strips | Filter strips | Heavy Use Area Protection |
| Waste Mgt. System | Heavy Use Area Protection | |
| Dike | | |

## 7.4 Graphic Comparison of BMP Selection and Implementation Process

The site specific BMP Alternative is chosen based on a variety of factors, but typically reflect the landowner's objectives in conjunction with the resource concerns identified by the assisting agency. The following flow chart provides a graphic representation of selection process and some comparisons between Alternative #1(high cost), Alternative #2 (moderate cost), and Alternative #3 (low cost) for the various treatment units. The chart applies to each of the three treatment units identified in sections 7.1 through 7.3.



(APAP, 1991)

## 7.5 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

## 7.6 Feedback Loop

The feedback loop is a process used to evaluate and refine installed BMPs. Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards (APAP, 1991). The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

# 8.0 Program of Implementation

The Canyon Soil Conservation District along with the Ada Soil & Water Conservation District has selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. There are currently no sources of funding available for cost-share assistance specifically within the Mill Slough subwatershed priority area. While there are a handful of federal and state site-specific programs available to interested participants on a farm by farm basis, Mill Slough has yet to be selected as a priority area with its own specific project area. Should funding become available for use specifically in the Mill Slough Subwatershed, the implementation of BMPs and distribution of incentive payments will likely be focused within the subwatershed boundary downstream from the Farmers Union Canal where the majority of Tier 1 acreage is located.

## 8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC), Ada SWCD, and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. Where cost-share incentives are contracted through a state or federal program, NRCS and ISCC will assist Ada and Canyon Conservation Districts with certification of installed BMPs, filing payment applications, completing annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

**Table 10. Estimated BMP Cost Summary for Treatment Unit 1, Tier 1 (Surface Irrigated Cropland: 1,771 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 1771 | $ 1,416,800 |
| Alternative 2 | $500/AC | 1771 | $ 885,500 |
| Alternative 3 | $250/AC | 1771 | $ 442,750 |

**Table 11. Estimated BMP Cost Summary for Treatment Unit 1, Tier 2 (Surface Irrigated Cropland: 1,203 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 1203 | $ 962,400 |
| Alternative 2 | $500/AC | 1203 | $ 601,500 |
| Alternative 3 | $250/AC | 1203 | $ 300,750 |

**Table 12. Estimated BMP Cost Summary for Treatment Unit 1, Tier 3 (Surface Irrigated Cropland: 3,740 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 3740 | $ 2,992,000 |
| Alternative 2 | $500/AC | 3740 | $ 1,870,000 |
| Alternative 3 | $250/AC | 3740 | $ 935,000 |

**Table 13. Estimated BMP Cost Summary for Treatment Unit 2 (Surface Irrigated Pasture: 1,593 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $450/AC | 1593 | $ 716,850 |
| Alternative 2 | $350/AC | 1593 | $ 557,550 |
| Alternative 3 | $250/AC | 1593 | $ 398,250 |

**Table 14. Estimated BMP Cost Summary for Treatment Unit 4 (CAFO/AFO 10 Units)**

| ALTERNATIVE | | UNITS | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $50,000/each | 10 | $ 500,000 |
| Alternative 2 | $35,000/each | 10 | $ 350,000 |
| Alternative 3 | $25,000/each | 10 | $ 250,000 |

## 8.2 Operation, Maintenance, and Replacement

Participants who install BMPs in conjunction with a state or federal cost-share incentive program will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Landowners are encouraged to maintain installed BMPs after the contract expires. Participants who install BMPs on their own or without the benefit of a cost-share incentive program are not under contract to maintain the BMPs. If the BMPs are installed in response to a conservation plan completed with them by the assisting agencies, landowners are encouraged to maintain the BMPs and incorporate them into their annual operations. It is not required, however, unless they are under contract.

Inspections of BMPs installed in conjunction with a cost-share incentive program will be made on an annual basis by Ada SWCD and Canyon SCD, NRCS, ISCC, and the participant. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant.

## 8.3 Water Quality Monitoring

Monitoring at the mouth of Mill Slough has been conducted by U.S. Geological Survey (USGS) since well before the TMDL was established (1994), but on a sporadic basis. Two samples were collected in 1994, two more in 1995, one in 1996, four in 1997, and two in 1998. In addition , the Idaho State Department of Agriculture (ISDA) collected water quality samples at the mouth of Mill Slough on a twice a month basis during 2000 and 2001. Data parameters measured thus far have included DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids) pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

# 9.0 References

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# APPENDIX 10.

# Hartley Gulch Subwatershed Agricultural TMDL Implementation Plan

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# 1.0 Executive Summary

**Subwatershed:** Hartley Gulch Subwatershed
Total Scope: 29,216 acres
Agricultural Scope: 10,546 acres
Agricultural Critical Acres Scope: 6,404 acres

**Location:** North side of the Boise River, located north of Caldwell in Canyon County

**Priority Subwatershed:** Medium

**Cooperating Agricultural Agencies:** Canyon Soil Conservation District (CSCD)
Gem Soil and Water Conservation District (GSWCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

**Agricultural Land Uses:**

Hartley Gulch Agricultural Land Uses

| Landuse | Acres | Percent of Hartley Gulch Subwatershed |
|---|---|---|
| Sprinkler Irrigated Cropland, and Pasture | 3,516 | 12% |
| Surface Irrigated Cropland | 5,954 | 20% |
| Surface Irrigated Pasture | 188 | 1% |
| Non-Irrigated Pasture | 626 | 2% |
| CAFO/AFO | 262 | 1% |
| | | |
| TOTAL | 10,546 | 36% |

**Major Agricultural Products:** Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops, vegetables, livestock, and dairy products.

**TMDL Objectives:** The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouth of the Hartley Gulch. The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98%.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 "SR-HC TMDL") will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

**Implementation Plan:** This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Hartley Gulch Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the five different agricultural land use types (Treatment Units) within the Hartley Gulch Subwatershed. Estimated costs to install BMPs on lands identified for treatment are: Alternative 1 - $6,047,800; Alternative 2 - $3,882,800; and Alternative 3 - $2,135,500. These cost estimates do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

# 2.0 Introduction

The Hartley Gulch Subwatershed encompasses 29,216 acres. Hartley Gulch (as it is commonly referred to) originates in Gem County and flows southwest toward the Lower Boise River. Surface irrigation water starts at the "C" Line canal in Canyon County. Parts of Middleton are located within the Hartley Gulch Subwatershed boundary.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from Hartley Gulch. Within this plan the following elements are identified: pollutant problems within Hartley Gulch, sources of those pollutants, critical acres contributing pollutants to the drain, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on improving water quality.

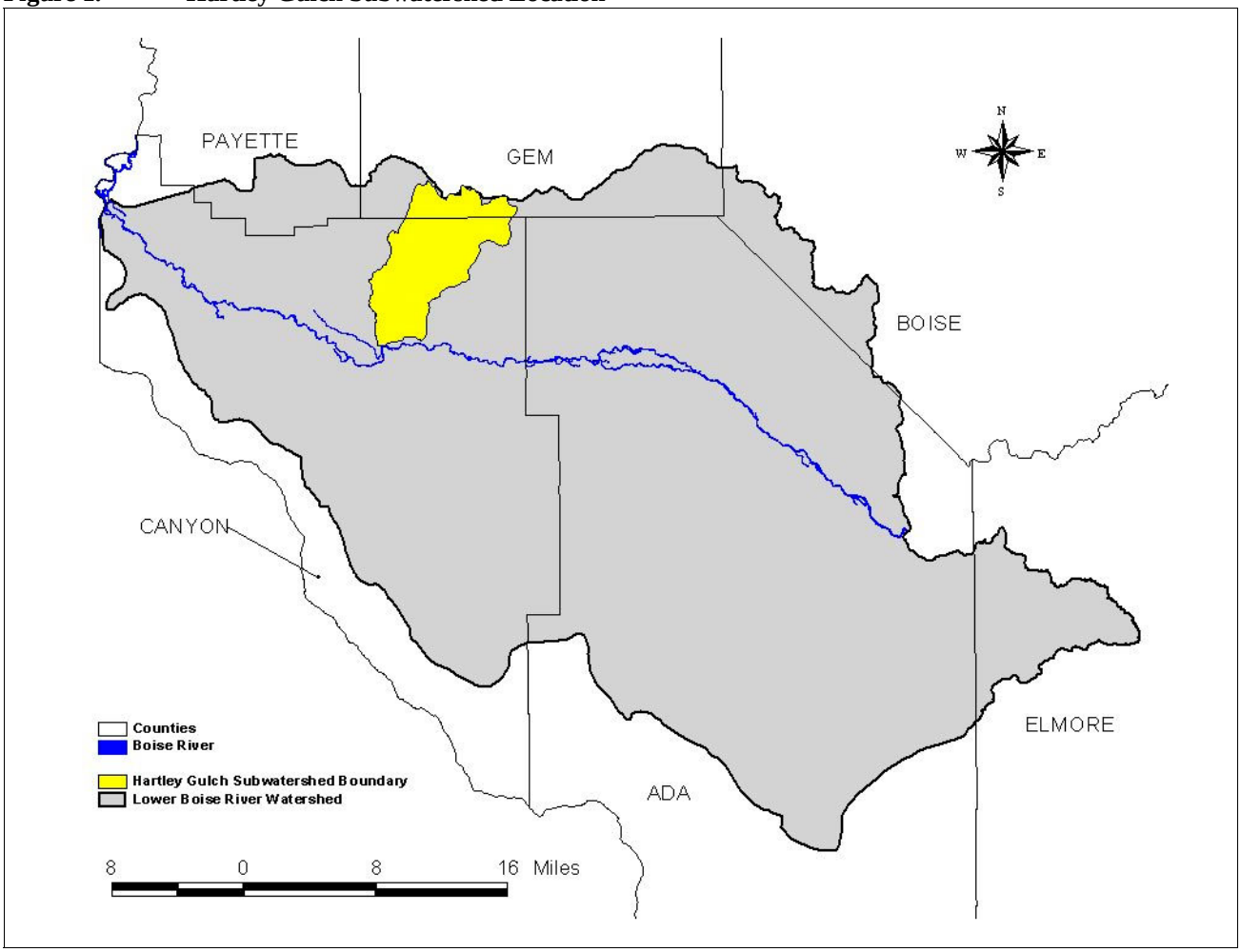
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Hartley Gulch Subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements at the mouth of Hartley Gulch. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Hartley Gulch Subwatershed contact the Canyon Soil Conservation District (Canyon SCD), Gem Soil and Water Conservation District (Gem SWCD), the Natural Resources Conservation Service (NRCS), or the Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency as well as irrigation scheduling and soil moisture monitoring methods.**

**Figure 1. Hartley Gulch Subwatershed Location**




## 3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Hartley Gulch Subwatershed.

### 3.1 Soils

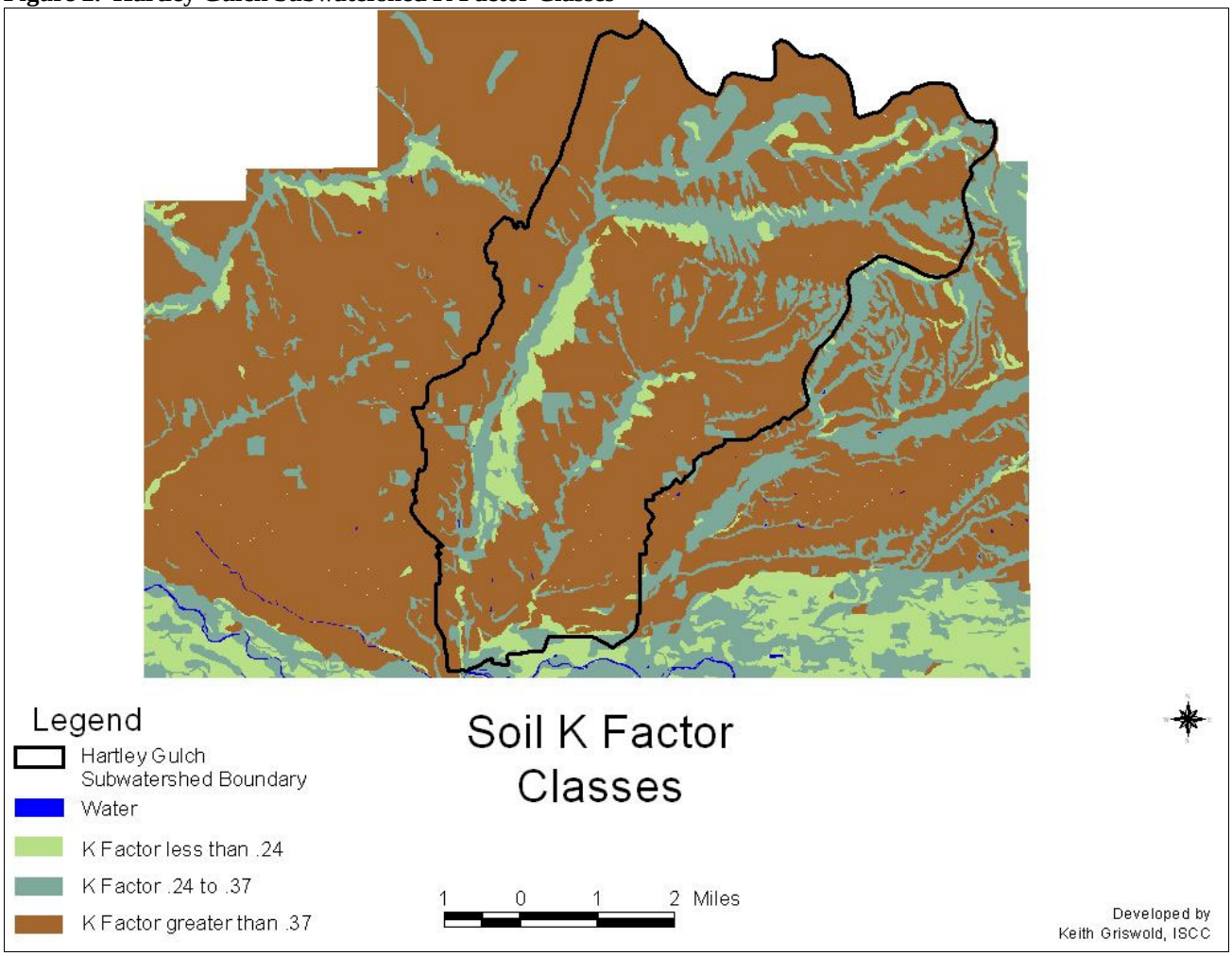
There are two major soil associations within Hartley Gulch Subwatershed (U. S. Department of the Agriculture, 1972).

- *Elijah-Lankbush-Chilcott-Lanktree:* Well drained soils on higher nearly level to rolling dissected alluvial fan terraces
- *Moulton-Bramt-Baldock-Falk:* Moderately well and poorly drained soils on floodplains and low river terraces

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility.

Figure 2. Shows the "K-Factor" of the soils within Hartley Gulch. "K-Factor" rating explains the erodibility of a soil. The higher the number, the greater the erosion potential.

**Figure 2. Hartley Gulch Subwatershed K Factor Classes**



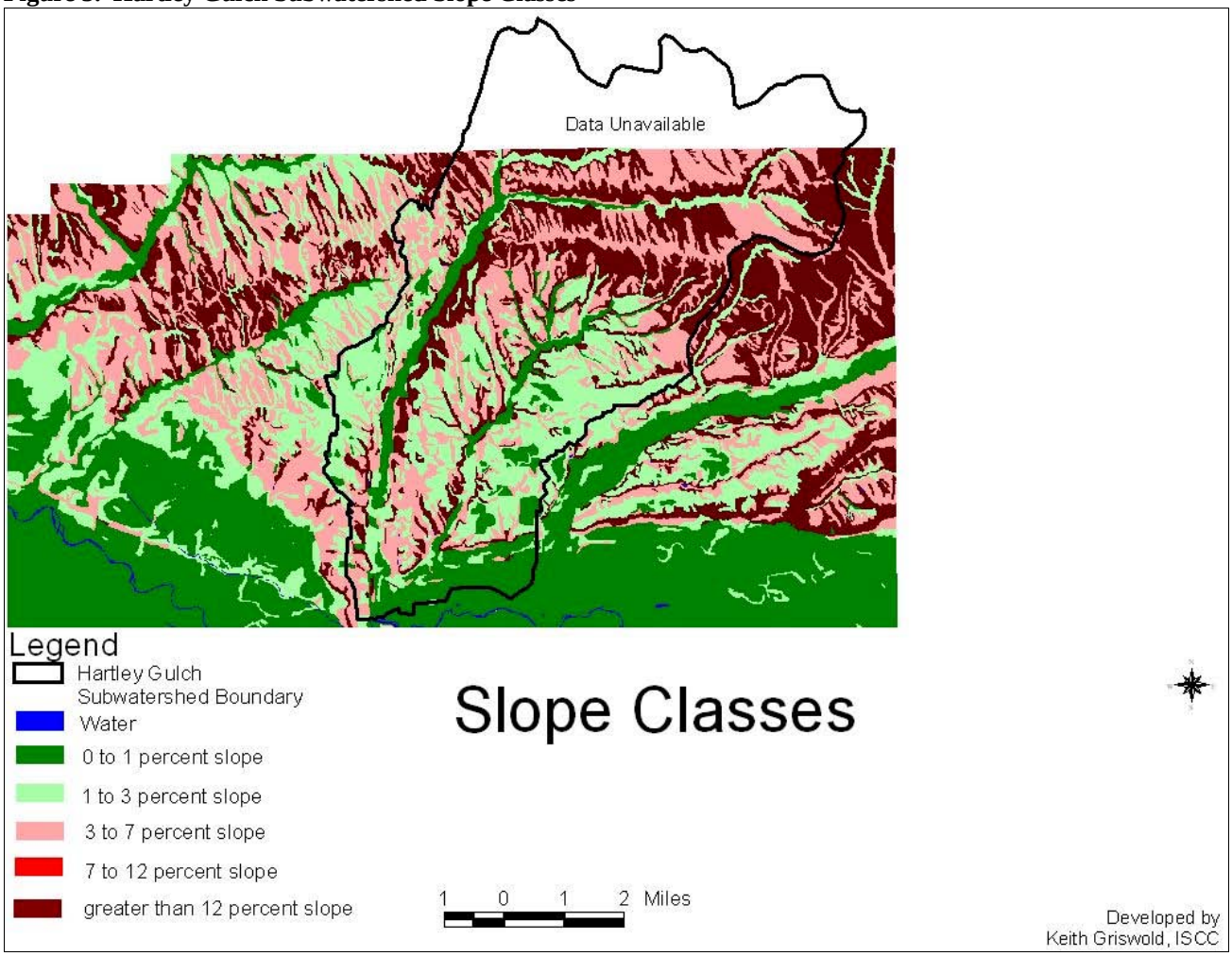

## 3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature in July for Caldwell, Idaho is 92 degrees Fahrenheit, while the average daily minimum temperature in January is 20 degrees Fahrenheit. Temperatures as low as -46 degrees Fahrenheit and as warm as 112 degrees Fahrenheit have been recorded.

Long term average annual precipitation for Caldwell is 10.48 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley. Extended periods of no rain can occur frequently during the growing season.

The average consecutive frost-free period (above 32 degrees) is 143 days, based on the Caldwell long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 125 days for this area. The average last frost (32 degrees) in the spring is around May 6 and the average first frost (32 degrees) in the fall is around September 27 (U. S. Department of the Agriculture, 1972).

**Figure 3. Hartley Gulch Subwatershed Slope Classes**




## 3.3 Surface Hydrology

The Hartley Gulch Subwatershed ranges in elevation from approximately 2,560 feet at the headwaters to 2,280 feet at the Boise River.

Pre-existing ephemeral channels have been modified over time by channelization and bank stabilization prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There are currently 2 major canals or laterals that supply water to cropland in Hartley Gulch Subwatershed and 1 major drain that receive tailwater from the croplands and pastures or drain ground water (Table 1). Agricultural wells supply some water to the upper portions of the subwatershed.

Water supplies for Hartley Gulch come from two major systems. The upper portion of the subwatershed has water supplied by Black Canyon Irrigation water (Payette River). The lower portion of the subwatershed has water supplied by Boise River water.

**Figure 4. Surface Hydrology**

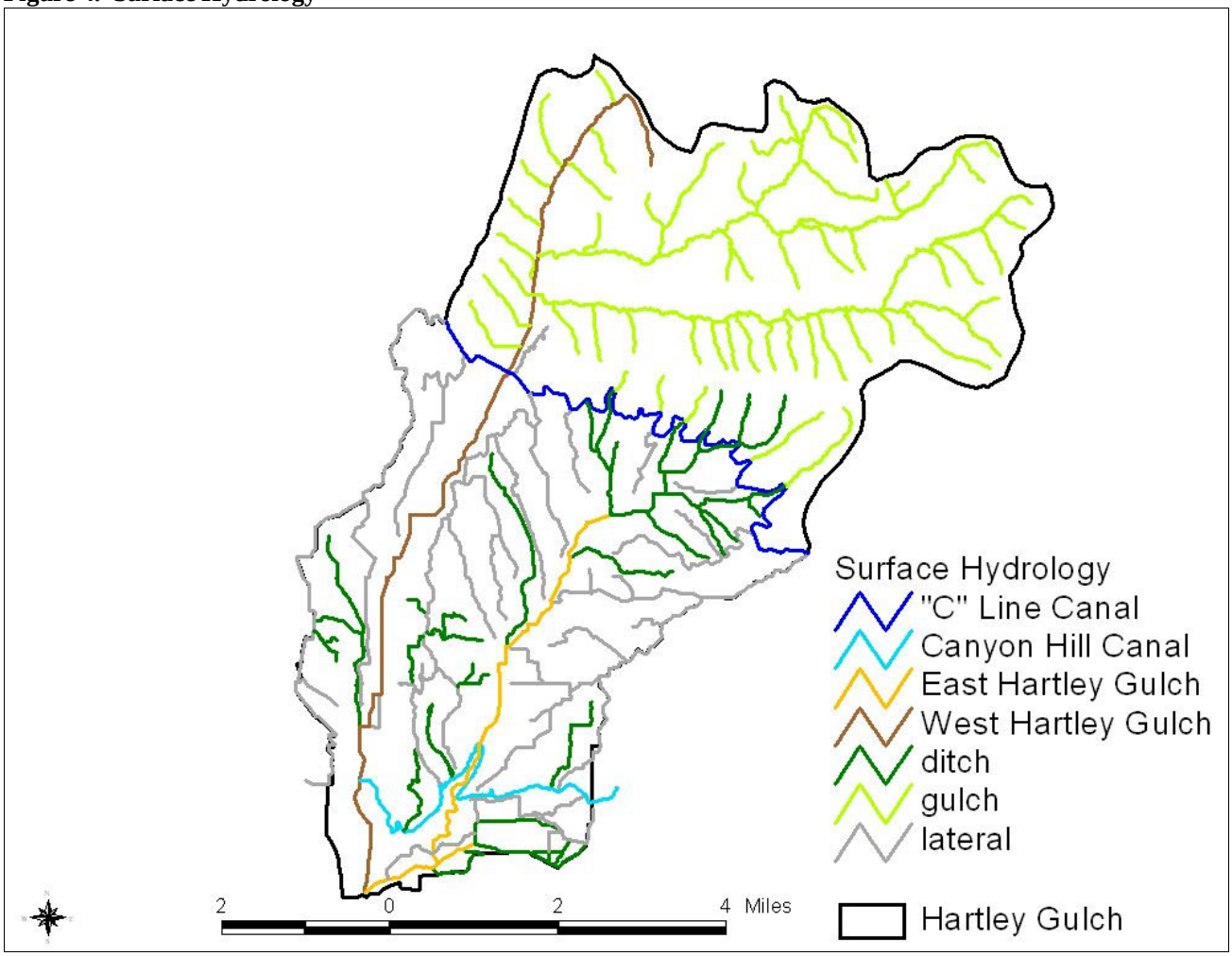
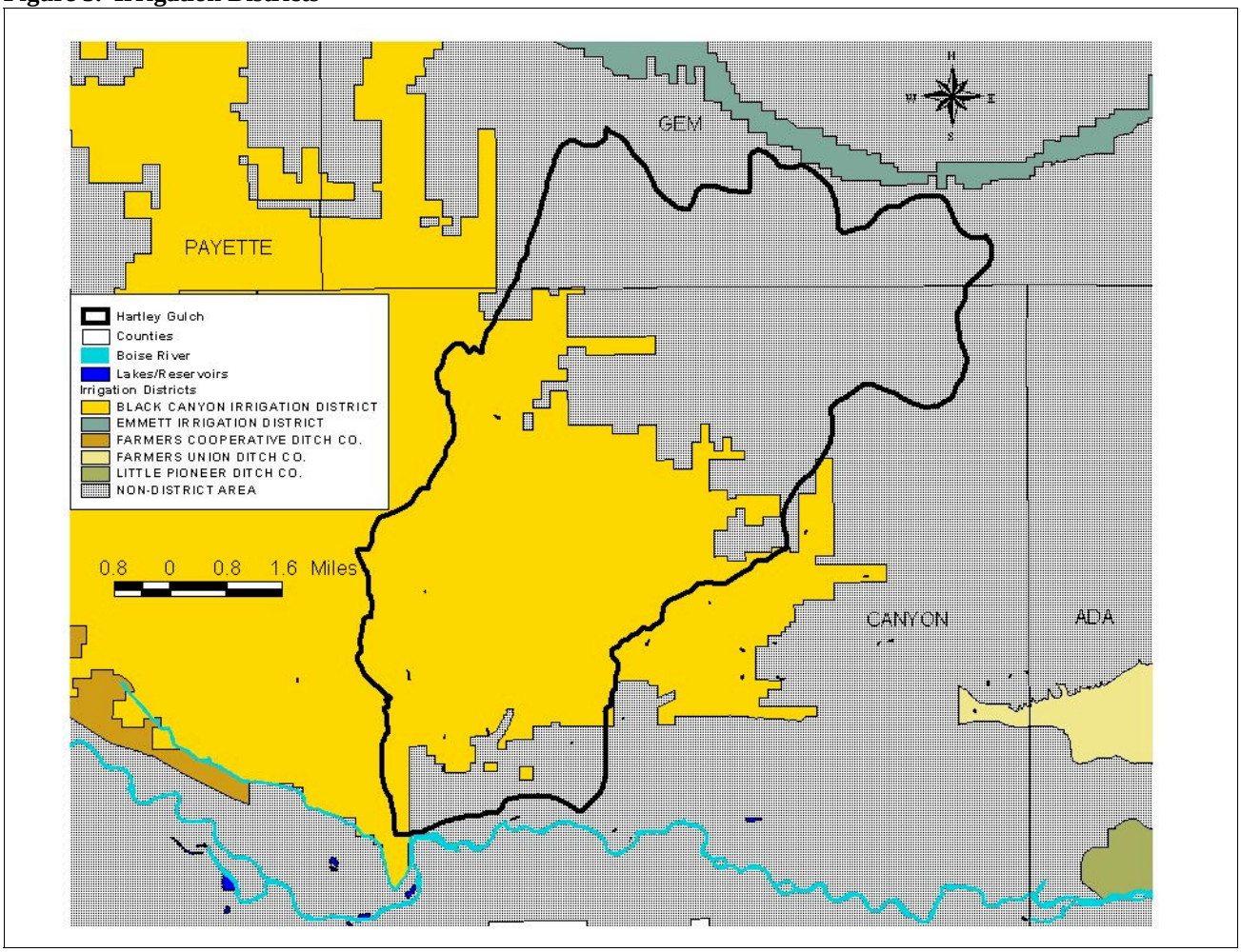



**Table 1. Surface Waterbodies in Hartley Gulch Subwatershed**

| Canal, Lateral or Reservoir | Drain, Slough or Gulch |
|---|---|
| "C" Line Canal | West Hartley Gulch |
| Canyon Hill Canal | East Hartley Gulch |

**Figure 5. Irrigation Districts**




## 3.4 Ground Water Hydrology

A large, shallow, aquifer (< 200 feet) is recharged annually by seepage from surface irrigation and conveyance of water through earthen canals. A deep aquifer exists under Hartley Gulch Subwatershed. The Boise Valley deep aquifer underlies the subwatershed.

## 3.5 Demographics and Economics

Demographic and Economic section is for all of Canyon County.

- Population of Canyon County increased from 90,076 in 1990 to 116,675 in 1997.
- Types of irrigated crops include, but are not limited to: seed corn, alfalfa and clover for seed and hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops and vegetables.

**Table 2. 2001 Agricultural Data for Hartley Gulch Subwatershed**

| Inventory: Farms & Cropland | Hartley Gulch Subwatershed |
|---|---|
| Total # of Farms | 185 |
| Total Acres of Farms | 10,546 |
| Average Farm Size (acres) | 57.0 |
| Total Acres in Crops | 10,284 |

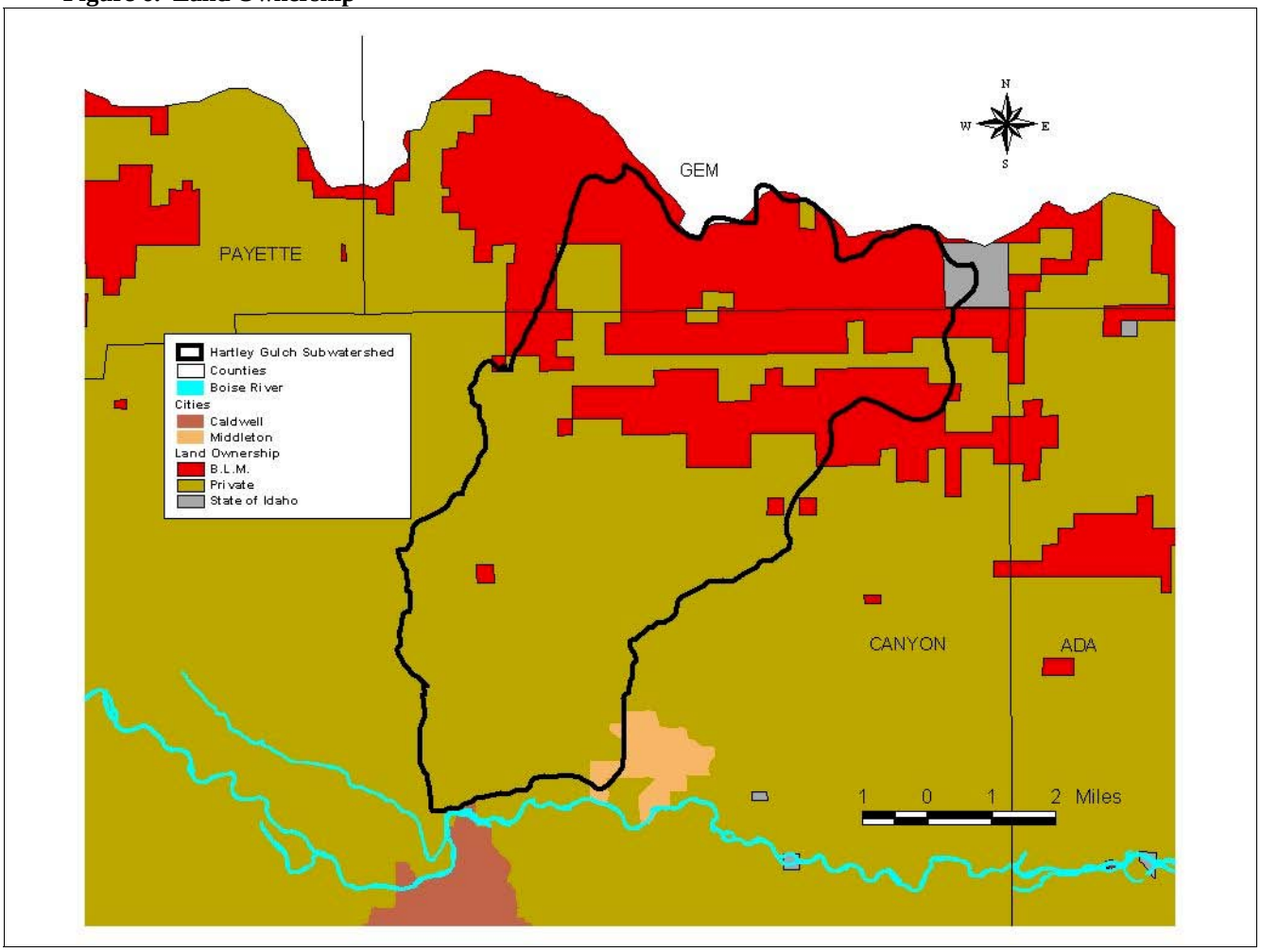
(Griswold, 2001) "Farm"--- A tract of land according to Farm Service Agency delineation, a minimum of 20 acres.

## 3.6 Land Ownership and Land Use

The items listed below are highlights of the Land Ownership and Land Use section in the Lower Boise River Implementation Plan.

- Hartley Gulch Subwatershed is 65% privately owned (Figure 6).
- Irrigated crops are the largest agricultural use

**Figure 6. Land Ownership**



# 4.0 Treatment Units

This section presents information on the individual agricultural land uses within the watershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for solving the identified problems.

The descriptions in this section are intended to provide a general overview of the TUs.

- Treatment Unit #1 – Sprinkler Irrigated Cropland, and Pasture 3,516 acres

  This unit is located throughout the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality because of high irrigation efficiencies resulting in insignificant amount of runoff.

- Treatment Unit #2 – Surface Irrigated Cropland, 5,954 acres

  Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- Treatment Unit #3 – Surface Irrigated Pasture 188 acres

  Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures enters the Lower Boise River via Hartley Gulch.

- Treatment Unit #4 – Non-Irrigated Pasture 626 acres

  Non-Irrigated pasture occurs mostly at the upper end of the watershed.

- Treatment Unit #5-- CAFO/AFO 262 acres (24 units)

  Feedlots are small and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. See Table 5. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

**Table 3. Acres of TUs within Hartley Gulch Subwatershed.**

| Treatment Units | Acres |
|---|---|
| Treatment Unit 1 | 3,516 |
| Treatment Unit 2 | 5,954 |
| Treatment Unit 3 | 188 |
| Treatment Unit 4 | 626 |
| Treatment Unit 5 | 262 |
| | |
| TOTAL | 10,546 |

(Griswold, 2001)

**Figure 7. Treatment Units**

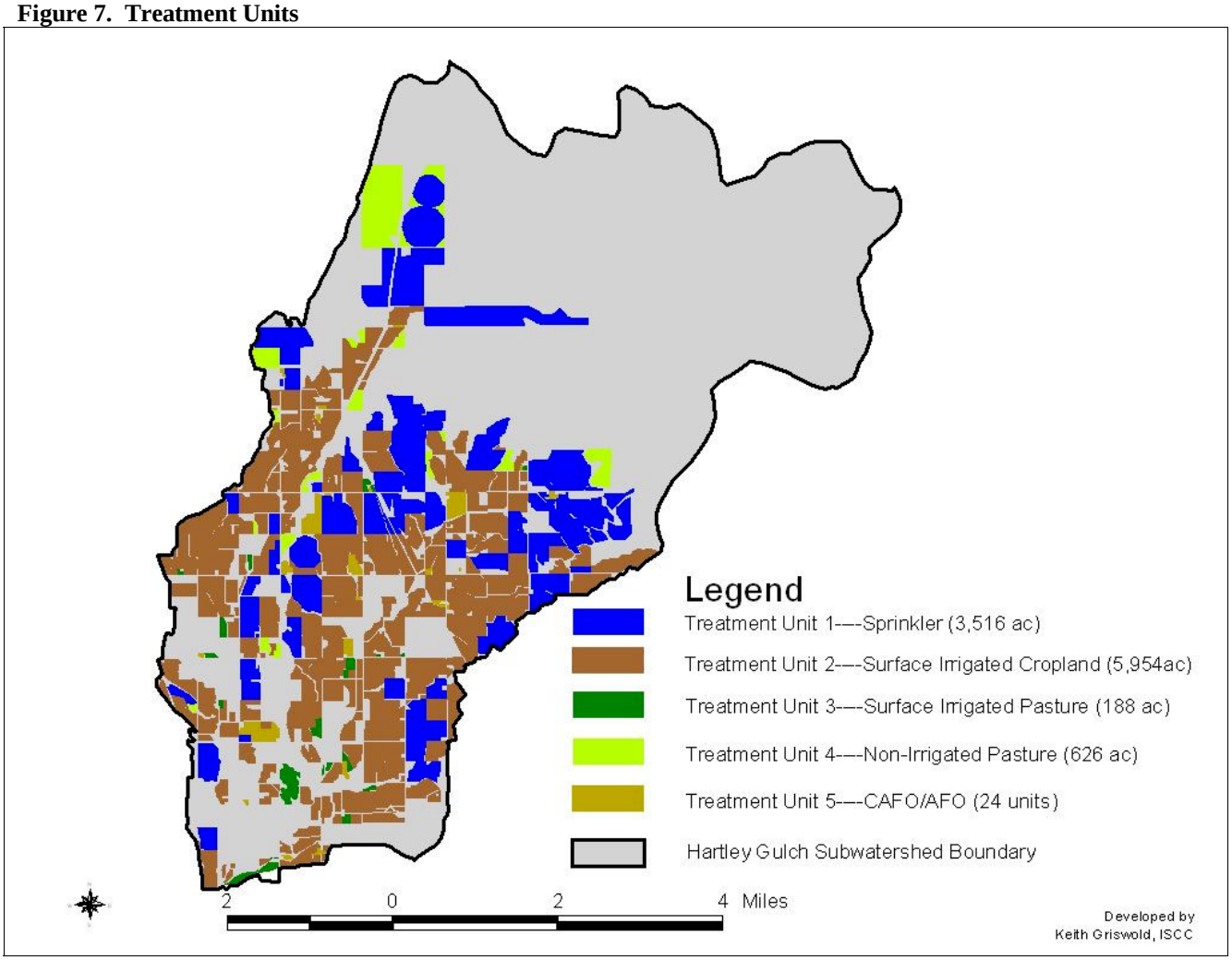
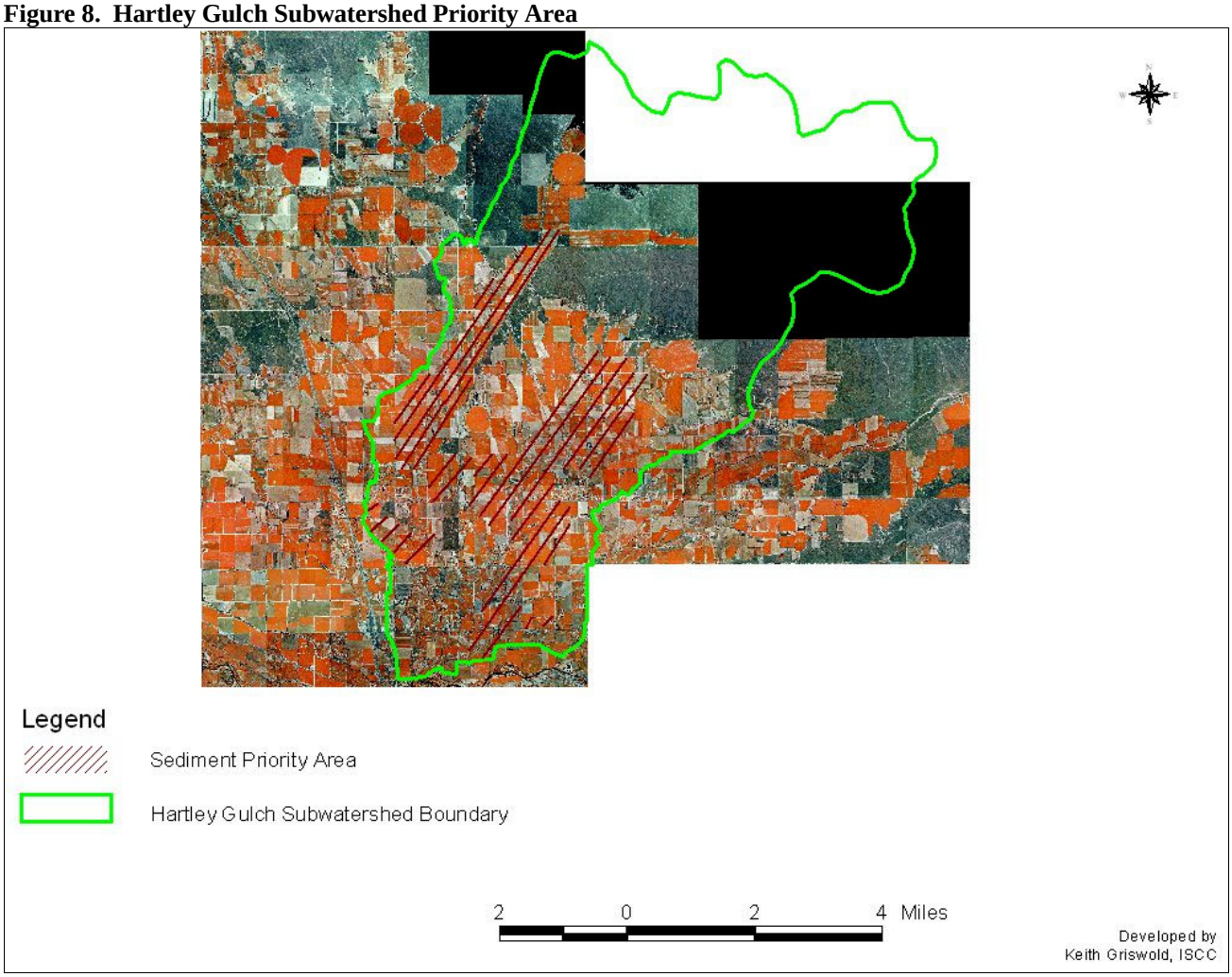


**Figure 8. Hartley Gulch Subwatershed Priority Area**




## 5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, including Hartley Gulch.

The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards change. After the TMDL targets and load reductions were established for sediment and bacteria, additional, more frequent sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been performed. This new information and water quality standards change indicate that revision of the TMDL sediment and bacteria targets is appropriate, and will continue to be evaluated with additional data as it is collected.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" in nutrients policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion.
- Lack of adequate vegetation adjacent to waterways necessary for removing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria.

## 5.1 Recreational Uses – Bacteria Objectives

The TMDL establishes a 98% bacteria reduction objective for the Hartley Gulch to meet Idaho's fecal coliform criteria for protection of recreational uses (Table 4).

**Table 4. Reductions Required to Meet Bacteria Load Allocation**

| Name | Primary Geo-Mean CFU/100 ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-Mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| **Hartley Gulch** | **2296** | **50** | **98%** | **565** | **200** | **65%** |

(portion of Table 22 from, page 71 Lower Boise River TMDL Subbasin Assessment)

Two developments affect this reduction objective and agricultural BMP implemention required to meet it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, DNA analysis of bacteria samples from various locations in the Lower Boise River watershed show that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, raccoon) that are beyond human control prevent attainment of the TMDL's bacteria targets and load reductions. It is likely that inputs of bacteria from cows can be reduced by simply limiting their access to the Boise River and tributary water sources.

**Table 5. Description of Confined Animal Feeding Operations in Hartley Gulch Subwatershed**

| Type of Confined Animal Feeding Operation (CAFO) | Number of CAFO's in Hartley Gulch Subwatershed |
|---|---|
| Dairy Cattle | 11 |
| Beef Cattle | 4 |
| Horse | 7 |
| Emu | 1 |
| Sheep | 1 |
| **Total** | **24** |

(Griswold, 2001)

## 5.2 Aquatic Life Uses – Sediment Objectives

The approach is to seek voluntary implementation of best management practices (BMPs) on agricultural lands to reduce Total Suspended Sediment loading rate by 37%.

**Table 6. 1995 TSS loads and allocations for Hartley Gulch**

| Tributary | 1995 Loads | % of Total River Load | TSS Load Goals | % of Total Goal |
|---|---|---|---|---|
| Hartley Gulch | 8.4 | 5% | 5.3 | 3% |

(IDEQ, 1998)

## 5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

**Table 7. Proposed No Net Increase (NNI) Phosphorous Load**

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| **Hartley Gulch** | **136** | **25009** |

(IDEQ, 1998)

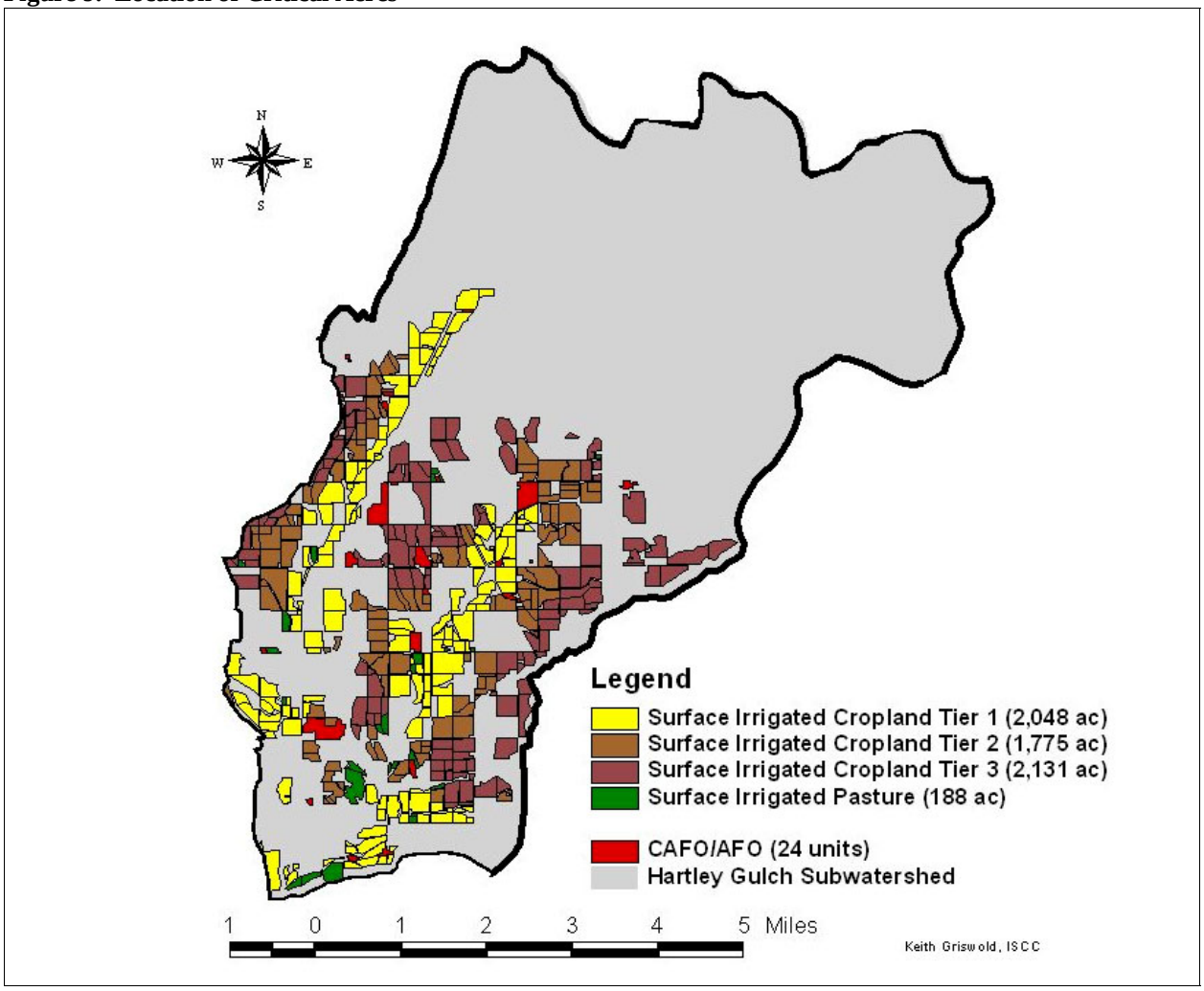
# 6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Hartley Gulch. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Hartley Gulch, which affects the Lower Boise River.

Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural lands that drain directly into Hartley Gulch will be a Tier 1, high priority for treatment because these lands have the most immediate impact on Lower Boise River water quality. Drainage water from Tier 2 lands is reused once on Tier 1 lands before discharging to the Hartley Gulch, and are given a medium priority for treatment. Tier 1 & 2 acres are the Critical Acres within Treatment Unit 2. Drainage water from Tier 3 lands is reused multiple times on Tier 1 and Tier 2 lands before discharging to the Hartley Gulch, and are given a low priority for treatment.

**Figure 9. Location of Critical Acres**



**Critical Acres within each Treatment Unit:**

| | |
|---|---|
| Treatment Unit 1 | No critical acres within this unit |
| Treatment Unit 2 | 2,048 acres of Tier 1 surface irrigated cropland<br>1,775 acres of Tier 2 surface irrigated cropland<br>2,131 acres of Tier 3 surface irrigated cropland |
| Treatment Unit 3 | 188 acres of surface irrigated pasture |
| Treatment Unit 4 | No critical acres within this unit |
| Treatment Unit 5 | 24 units of CAFO/AFO |

# 7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited, to the following:

**Table 8. Treatment Unit 2---Surface Irrigated Cropland**

| | |
|---|---|
| Agro-Tillage | Conservation Cropping Sequence |
| Conservation Tillage | Cover and Green Manure Crop |
| Filter Strips | Grassed Waterway |
| Surge Irrigation System | Sprinkler Irrigation System |
| Tailwater Recovery System | Irrigation Water Management Systems |
| Straw Mulching | Nutrient Management |
| Pest Management | Sediment Basin |
| Underground Outlet | Chiseling and Subsoiling |
| Waste Utilization | Channel Vegetation |
| Drip Irrigation System | PAM |
| Irrigation Water Conveyance | |

**Table 9. Treatment Unit 3---Surface Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Waste Utilization |
| Spring water development | Waste Storage System |
| Irrigation systems | Nutrient Management |
| Pasture and Hayland Planting | Planned Grazing System |
| Livestock Watering Facility | Pasture and Hayland Management |

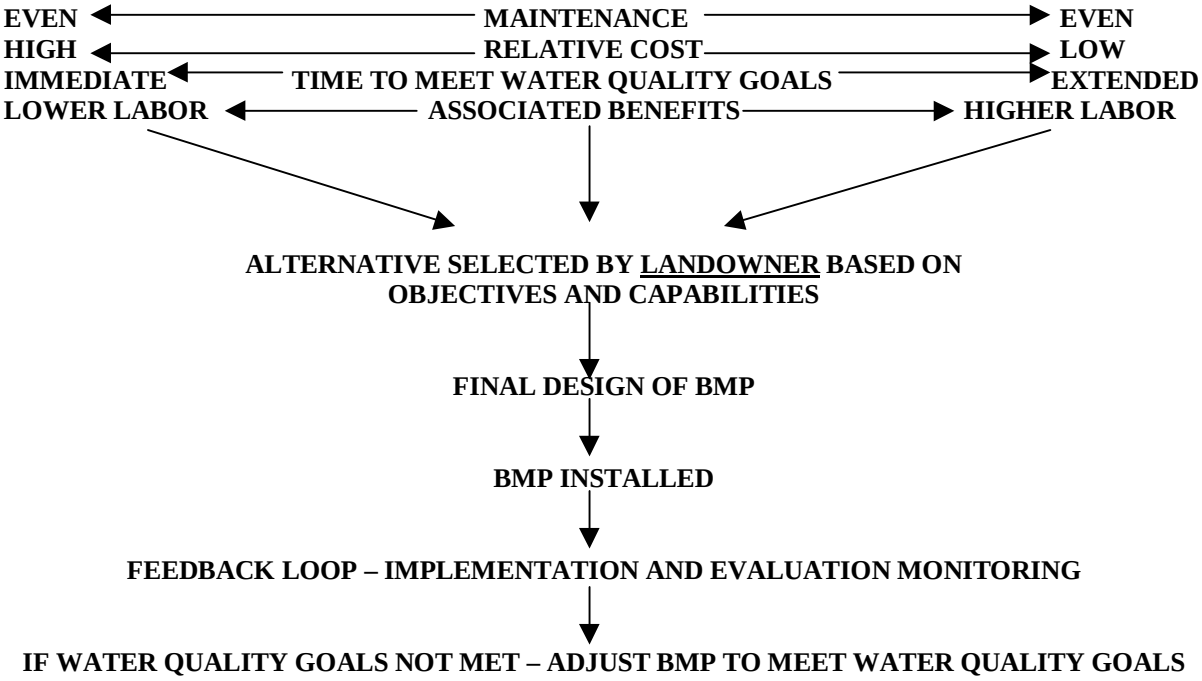
**Table 10. Treatment Unit 5---CAFO/AFO**

| | |
|---|---|
| Waste Management System | Heavy use area protection |
| Filter strips | Livestock Watering Facility |
| Nutrient Management | Fencing |

## 7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($800/ acre) | SITE SPECIFIC BMP Alternative #2 ($500/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Irrigation Water Mgt. | Irrigation Water Mgt. | Irrigation Water Mgt. |
| Sprinkler Irrigation System | Land Leveling | Concrete Ditch |
| Nutrient Mgt. | Surface Irrigation System | Filter Strip |
| Conservation Crop Rotation | Gated Pipe | PAM |
| | Tail Water Recovery System | Sediment Basin |
| | Nutrient Mgt. | Nutrient Mgt. |
| | Conservation Crop Rotation | Conservation Crop Rotation |
| | Conservation Tillage | Conservation Tillage |




(APAP, 1991)

## 7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($450/ acre) | SITE SPECIFIC BMP Alternative #2 ($350/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Livestock Watering Facility |
| Heavy Use Area Protection | Livestock Watering Facility | Irrigation Water Mgt. |
| Livestock Watering Facility | Irrigation Water Mgt. | Field Border Irrigation System |
| Irrigation Water Mgt. | Field Border Irrigation System | |
| Field Border Irrigation System | | |
| Gated Pipe | | |

## 7.3 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($50,000/ each) | SITE SPECIFIC BMP Alternative #2 ($35,000/ each) | SITE SPECIFIC BMP Alternative #3 ($25,000/ each) |
|---|---|---|
| Nutrient Mgt. | Waste Mgt. System | Waste Mgt. System |
| Heavy Use Area Protection | Nutrient Mgt. | Nutrient Mgt. |
| Livestock Watering Facility | Livestock Watering Facility | Filter strip |
| Filter strips | Filter strips | Heavy Use Area Protection |
| Waste Mgt. System | Heavy Use Area Protection | |
| Dike | | |

## 7.4 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

## 7.5 Feedback Loop

The feedback loop a process to evaluation and refinement of BMPs. The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved, the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards. (APAP, 1991)

# 8.0 Program of Implementation

Canyon Soil Conservation District have selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. Significant contribution by agricultural land users in the Hartley Gulch Subwatershed toward achieving the TMDL's objectives of protecting aquatic life and recreational uses of the Lower Boise River by reducing the discharge of sediments and bacteria from the Hartley Gulch to the Snake River.

## 8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC), Gem SWCD, and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. NRCS and ISCC will assist Canyon SCD with certification of installed BMPs, filing payment applications, completion of annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

**Table 11. Estimated BMP Cost Summary for Treatment Unit 2, Tier 1 (Surface Irrigated Cropland—2,048 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 2048 | $ 1,638,400 |
| Alternative 2 | $500/AC | 2048 | $ 1,024,000 |
| Alternative 3 | $250/AC | 2048 | $ 512,000 |

**Table 12. Estimated BMP Cost Summary for Treatment Unit 2, Tier 2 (Surface Irrigated Cropland—1,775 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 1775 | $ 1,420,000 |
| Alternative 2 | $500/AC | 1775 | $ 887,500 |
| Alternative 3 | $250/AC | 1775 | $ 443,750 |

**Table 13. Estimated BMP Cost Summary for Treatment Unit 2, Tier 3 (Surface Irrigated Cropland—2,131 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 2131 | $ 1,704,800 |
| Alternative 2 | $500/AC | 2131 | $ 1,065,500 |
| Alternative 3 | $250/AC | 2131 | $ 532,750 |

**Table 14. Estimated BMP Cost Summary for Treatment Unit 3 (Surface Irrigated Pasture 188 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $450/AC | 188 | $ 84,600 |
| Alternative 2 | $350/AC | 188 | $ 65,800 |
| Alternative 3 | $250/AC | 188 | $ 47,000 |

**Table 15. Estimated BMP Cost Summary for Treatment Unit 5 (CAFO/AFO 24 Units).**

| ALTERNATIVE | | UNITS | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $50,000/each | 24 | $ 1,200,000 |
| Alternative 2 | $35,000/each | 24 | $ 840,000 |
| Alternative 3 | $25,000/each | 24 | $ 600,000 |

## 8.2 Operation, Maintenance, and Replacement

Participants will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Technical assistance for BMPs will be provided by NRCS and ISCC.

Inspections of installed BMPs will be made on an annual basis by Canyon SCD, Gem SWCD, NRCS, ISCC, and the participant during the life of the contract. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant. By accomplishing this objective, it is intended that the BMPs will become a part of the participant's farming operation and will continue to be operated and maintained after the contract expires.

## 8.3 Water Quality Monitoring

The ISDA has is collected water quality samples in Hartley Gulch Subwatershed for 2001 irrigation season. Most samples were collected on a bimonthly basis throughout the irrigation season (April - October) and on a monthly basis throughout the rest of the year (winter). Data parameters measured thus far have included DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids) pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli. U.S. Geological Survey (USGS) has been monitoring the major tributaries to the river at their mouths since 1993 and will continue until April 2000. Sampling frequency has been upgraded to bimonthly for the subwatershed starting in April of 1999, then sampled monthly through the winter period.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

# 9.0 References

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# APPENDIX 11.

# Conway Gulch Subwatershed Agricultural TMDL Implementation Plan

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# 1.0 Executive Summary

**Subwatershed:** Conway Gulch Subwatershed
Total Scope: 7,616 acres
Agricultural Scope: 5,842 acres
Agricultural Critical Acres Scope: 3,691 acres

**Location:** North side of the Boise River, located northeast of Notus in Canyon County

**Priority Subwatershed:** Medium

**Cooperating Agricultural Agencies:** Canyon Soil Conservation District (CSCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

**Agricultural Land Uses:**

Conway Gulch Agricultural Land Uses

| Landuse | Acres | Percent of Conway Gulch Subwatershed |
|---|---|---|
| Sprinkler Irrigated Cropland, and Pasture | 1,674 | 22% |
| Surface Irrigated Cropland | 3,565 | 47% |
| Surface Irrigated Pasture | 99 | 1% |
| Non-Irrigated Pasture | 477 | 6% |
| CAFO/AFO | 27 | 1% |
| | | |
| TOTAL | 5,842 | 77% |

**Major Agricultural Products:** Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops, vegetables, livestock, and dairy products.

**TMDL Objectives:** The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouth of the Conway Gulch. The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98%.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 "SR-HC TMDL") will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

**Implementation Plan:** This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in Conway Gulch Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the five different agricultural land use types (Treatment Units) within the Conway Gulch Subwatershed. Estimated costs to install BMPs on lands identified for treatment are: Alternative 1 - $3,246,550; Alternative 2 - $2,062,150; and Alternative 3 - $1,091,000. These cost estimates do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

# 2.0 Introduction

The Conway Gulch Subwatershed encompasses 7,616 acres. Conway Gulch (as it is commonly referred to) originates near the "C" Line canal in Canyon County and flows southwest toward the Lower Boise River. Parts of Notus are located within the Conway Gulch Subwatershed boundary.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from Conway Gulch. Within this plan the following elements are identified: pollutant problems within Conway Gulch, sources of those pollutants, critical acres contributing pollutants to the drain, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on improving water quality.

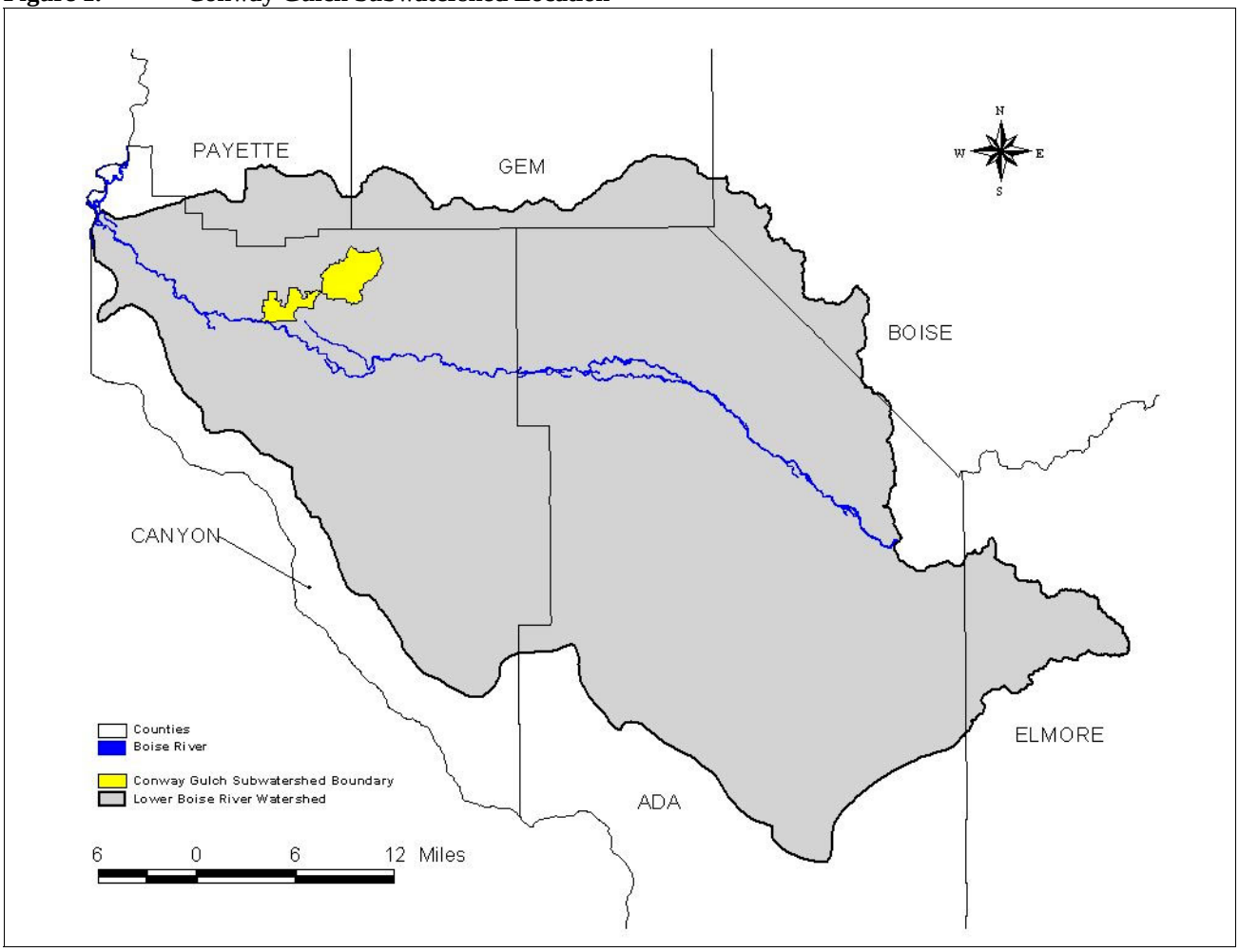
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Conway Gulch Subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements at the mouth of Conway Gulch. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Conway Gulch Subwatershed contact the Canyon Soil Conservation District (Canyon SCD), the Natural Resources Conservation Service (NRCS), or the Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency as well as irrigation scheduling and soil moisture monitoring methods.**

**Figure 1. Conway Gulch Subwatershed Location**




## 3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Conway Gulch Subwatershed.

### 3.1 Soils

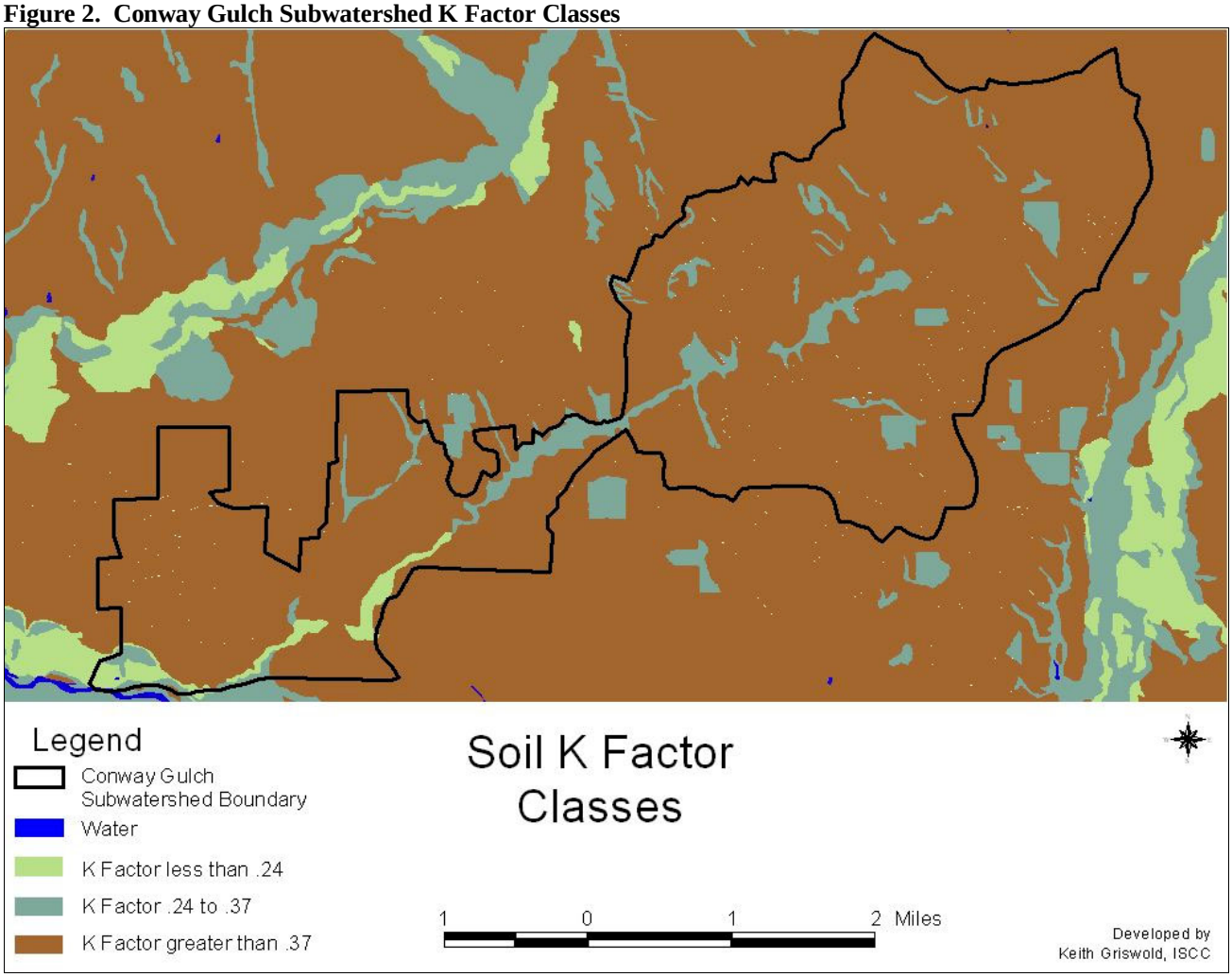
There are three major soil associations within Conway Gulch Subwatershed (U. S. Department of the Agriculture, 1972).

- *Elijah-Lankbush-Chilcott-Lanktree:* Well drained soils on higher nearly level to rolling dissected alluvial fan terraces
- *Greenleaf-Nyssaton-Owyhee:* Well drained silt loam soils on lacustrine terraces
- *Moulton-Bramt-Baldock-Falk:* Moderately well and poorly drained soils on floodplains and low river terraces

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility.

Figure 2. Shows the "K-Factor" of the soils within Conway Gulch. "K-Factor" rating explains the erodibility of a soil. The higher the number, the greater the erosion potential.

**Figure 2. Conway Gulch Subwatershed K Factor Classes**



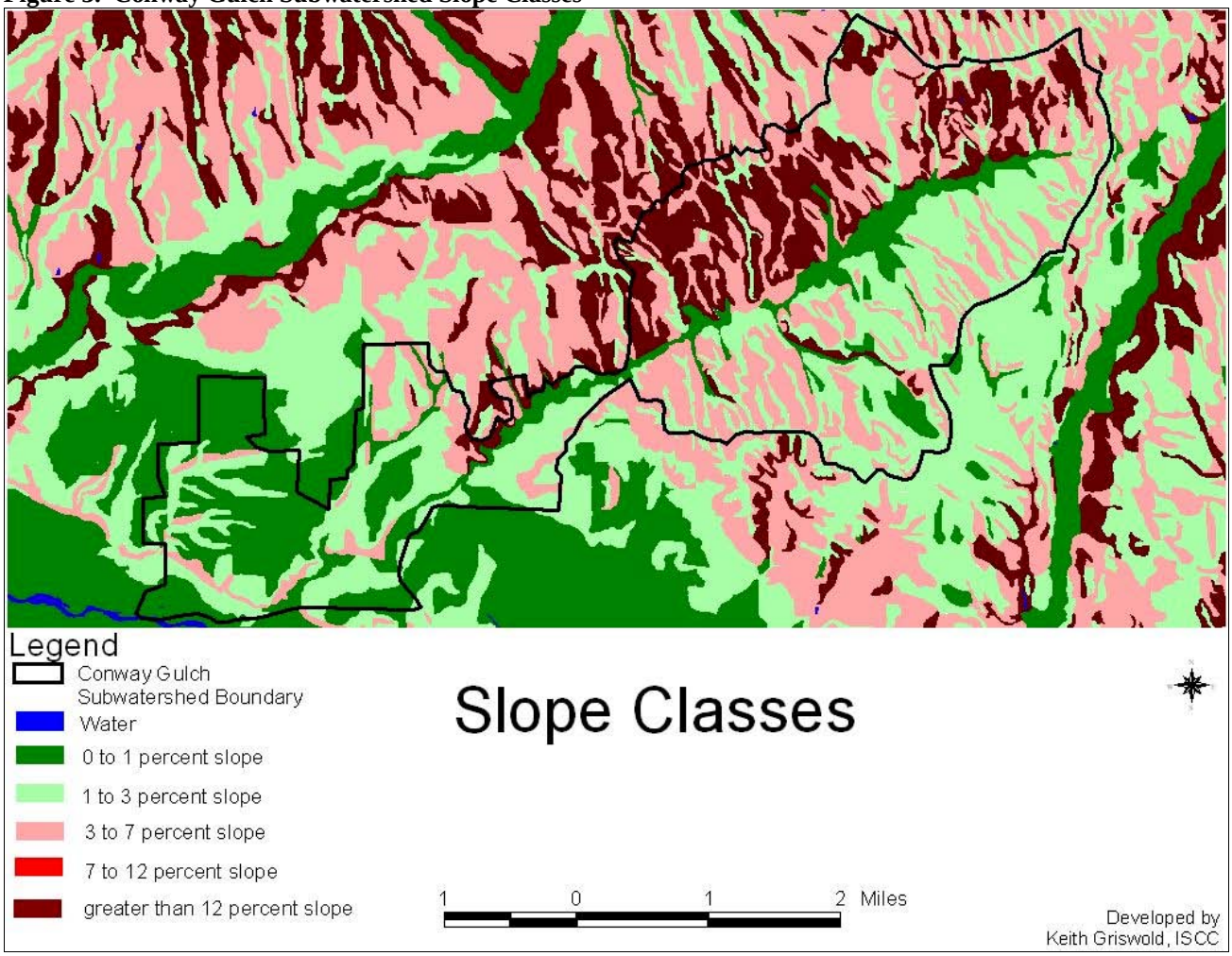

## 3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature in July for Caldwell, Idaho is 92 degrees Fahrenheit, while the average daily minimum temperature in January is 20 degrees Fahrenheit. Temperatures as low as -46 degrees Fahrenheit and as warm as 112 degrees Fahrenheit have been recorded.

Long term average annual precipitation for Caldwell is 10.48 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley. Extended periods of no rain can occur frequently during the growing season.

The average consecutive frost-free period (above 32 degrees) is 143 days, based on the Caldwell long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 125 days for this area. The average last frost (32 degrees) in the spring is around May 6 and the average first frost (32 degrees) in the fall is around September 27 (U. S. Department of the Agriculture, 1972).

**Figure 3. Conway Gulch Subwatershed Slope Classes**




## 3.3 Surface Hydrology

The Conway Gulch Subwatershed ranges in elevation from approximately 2,560 feet at the headwaters to 2,280 feet at the Boise River.

Pre-existing ephemeral channels have been modified over time by channelization and bank stabilization prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There are currently 2 major canals or laterals that supply water to cropland in Conway Gulch Subwatershed and 1 major drain that receive tailwater from the croplands and pastures or drain ground water (Table 1). Agricultural wells supply some water to the upper portions of the subwatershed.

Water supplies for Conway Gulch come from two major systems. The upper portion of the subwatershed has water supplied by Black Canyon Irrigation water (Payette River). The lower portion of the subwatershed has water supplied by Boise River water.

**Figure 4. Surface Hydrology**

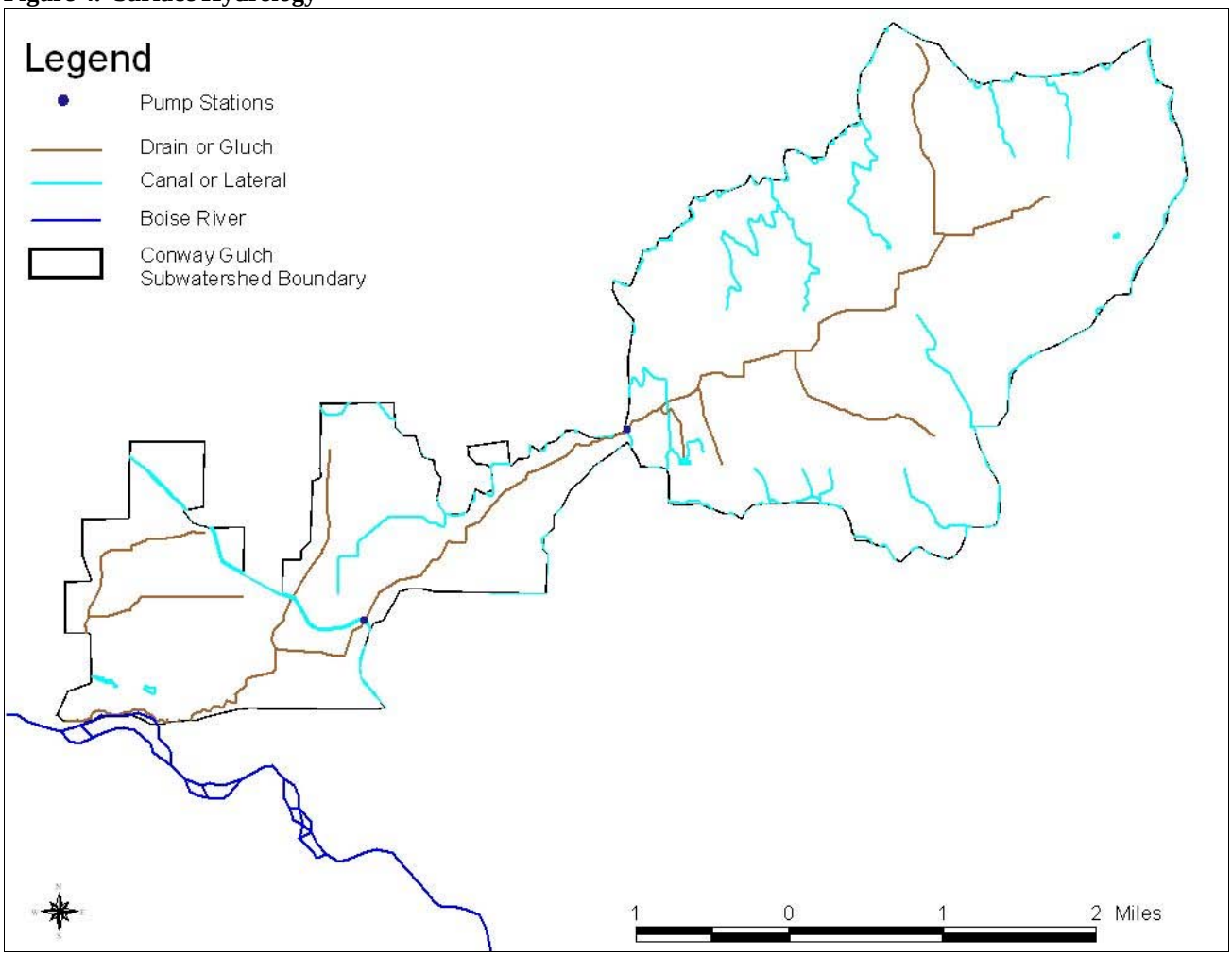
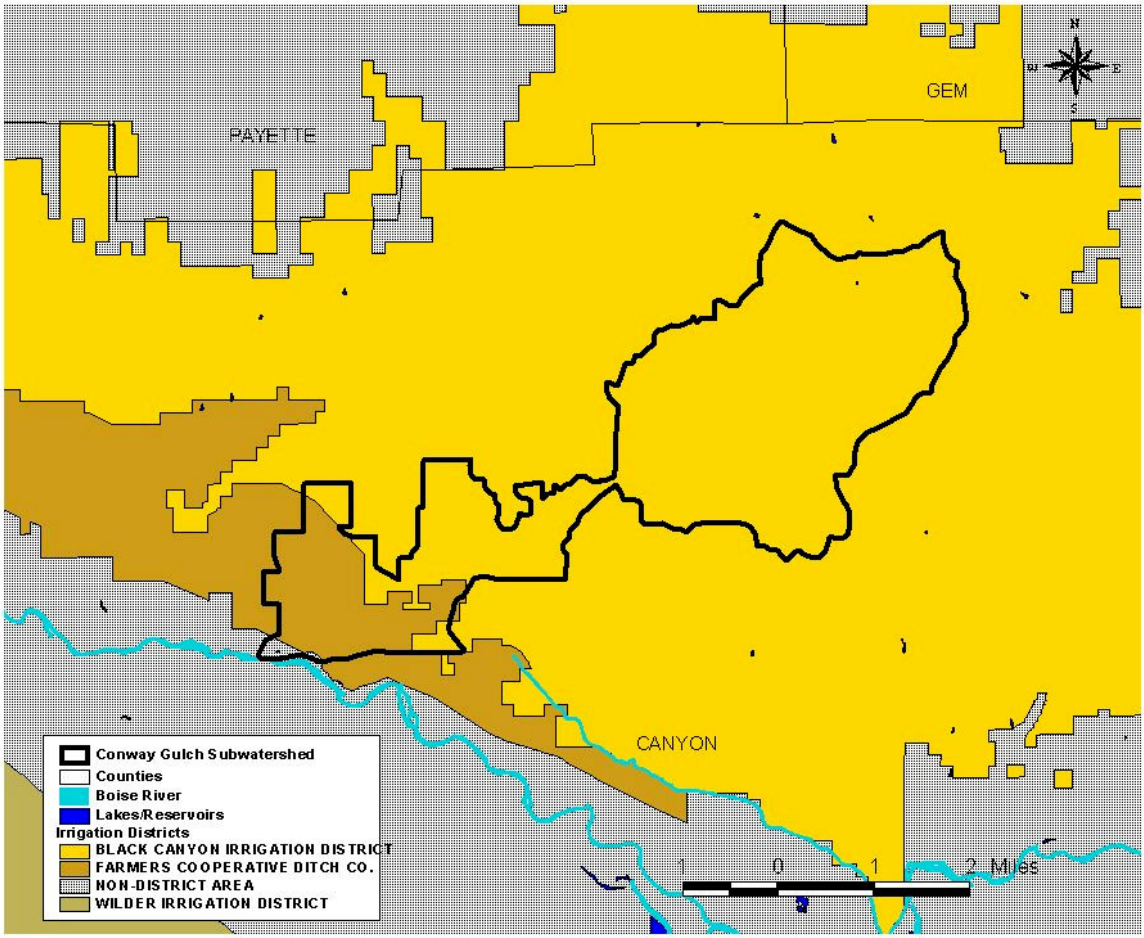



**Table 1. Surface Waterbodies in Conway Gulch Subwatershed**

| Canal, Lateral or Reservoir | Drain, Slough or Gulch |
|---|---|
| Farmers Coop Sebree Canal<br>Notus Canal | Conway Gulch |

**Figure 5. Irrigation Districts**




## 3.4 Ground Water Hydrology

A large, shallow, aquifer (< 200 feet) is recharged annually by seepage from surface irrigation and conveyance of water through earthen canals. A deep aquifer exists under Conway Gulch Subwatershed. The Boise Valley deep aquifer underlies the subwatershed.

## 3.5 Demographics and Economics

Demographic and Economic section is for all of Canyon County.

- Population of Canyon County increased from 90,076 in 1990 to 116,675 in 1997.
- Types of irrigated crops include, but are not limited to: seed corn, alfalfa and clover for seed and hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops and vegetables.

**Table 2. 2001 Agricultural Data for Conway Gulch Subwatershed**

| Inventory: Farms & Cropland | Conway Gulch Subwatershed |
|---|---|
| Total # of Farms | 95 |
| Total Acres of Farms | 5,842 |
| Average Farm Size (acres) | 61.5 |
| Total Acres in Crops | 5,815 |

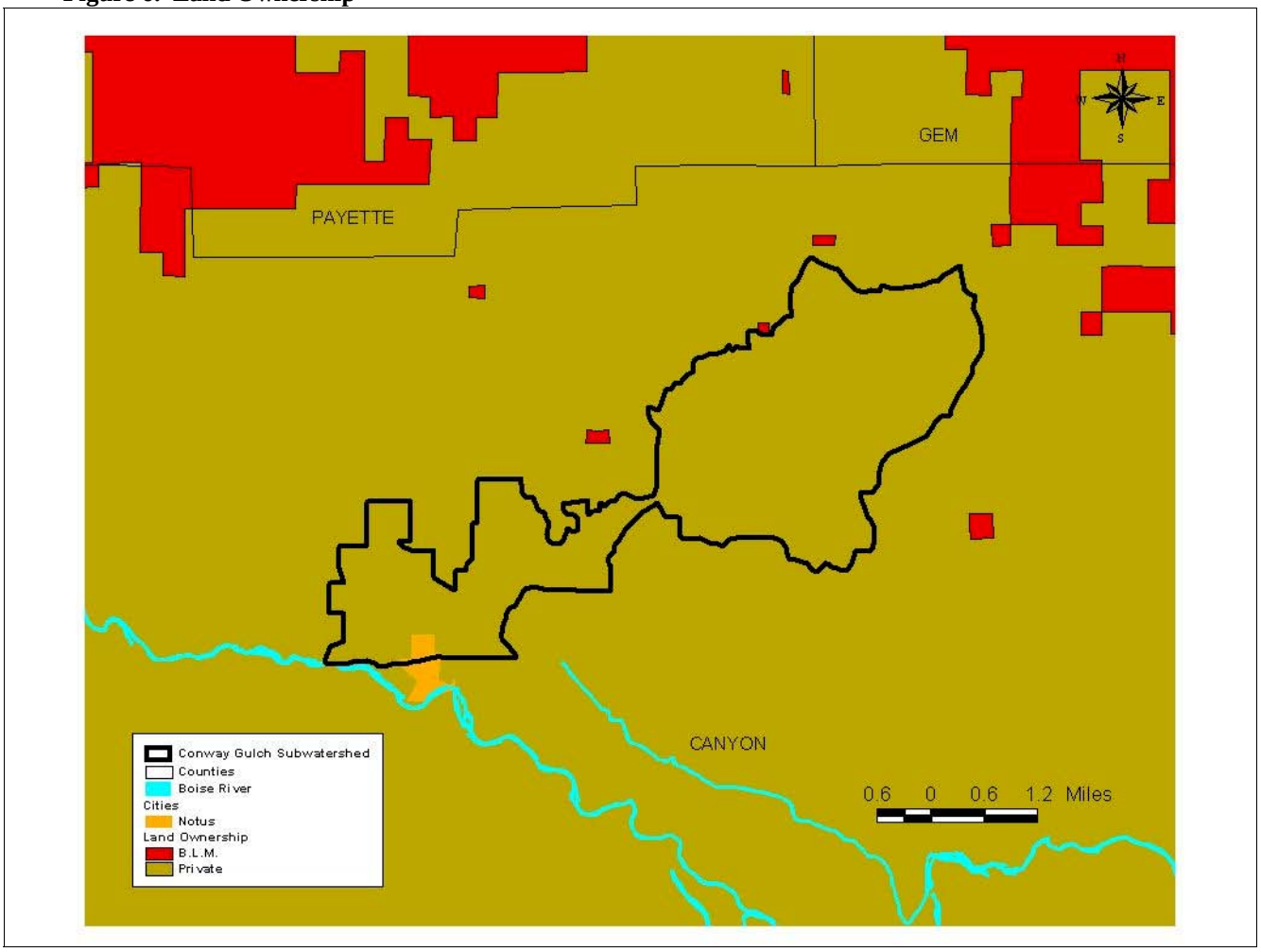
(Griswold, 2001) "Farm"--- A tract of land according to Farm Service Agency delineation, a minimum of 20 acres.

## 3.6 Land Ownership and Land Use

The items listed below are highlights of the Land Ownership and Land Use section in the Lower Boise River Implementation Plan.

- Conway Gulch Subwatershed is 99% privately owned (Figure 6).
- Irrigated crops are the largest agricultural use

**Figure 6. Land Ownership**



# 4.0 Treatment Units

This section presents information on the individual agricultural land uses within the watershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for solving the identified problems.

The descriptions in this section are intended to provide a general overview of the TUs.

- Treatment Unit #1 – Sprinkler Irrigated Cropland, and Pasture 1,674 acres

  This unit occurs most at the upper end of the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality because of high irrigation efficiencies resulting in insignificant amount of runoff.

- Treatment Unit #2 – Surface Irrigated Cropland, 3,565 acres

  Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- Treatment Unit #3 – Surface Irrigated Pasture 99 acres

  Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures enters the Lower Boise River via Conway Gulch.

- Treatment Unit #4 – Non-Irrigated Pasture 477 acres

  Non-Irrigated pasture is located throughout the watershed.

- Treatment Unit #5-- CAFO/AFO 27 acres (7 units)

  Feedlots are small and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. See Table 5. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

**Table 3. Acres of TUs within Conway Gulch Subwatershed.**

| Treatment Units | Acres |
|---|---|
| Treatment Unit 1 | 1,674 |
| Treatment Unit 2 | 3,565 |
| Treatment Unit 3 | 99 |
| Treatment Unit 4 | 477 |
| Treatment Unit 5 | 27 |
| | |
| TOTAL | 5,842 |

(Griswold, 2001)

**Figure 7. Treatment Units**

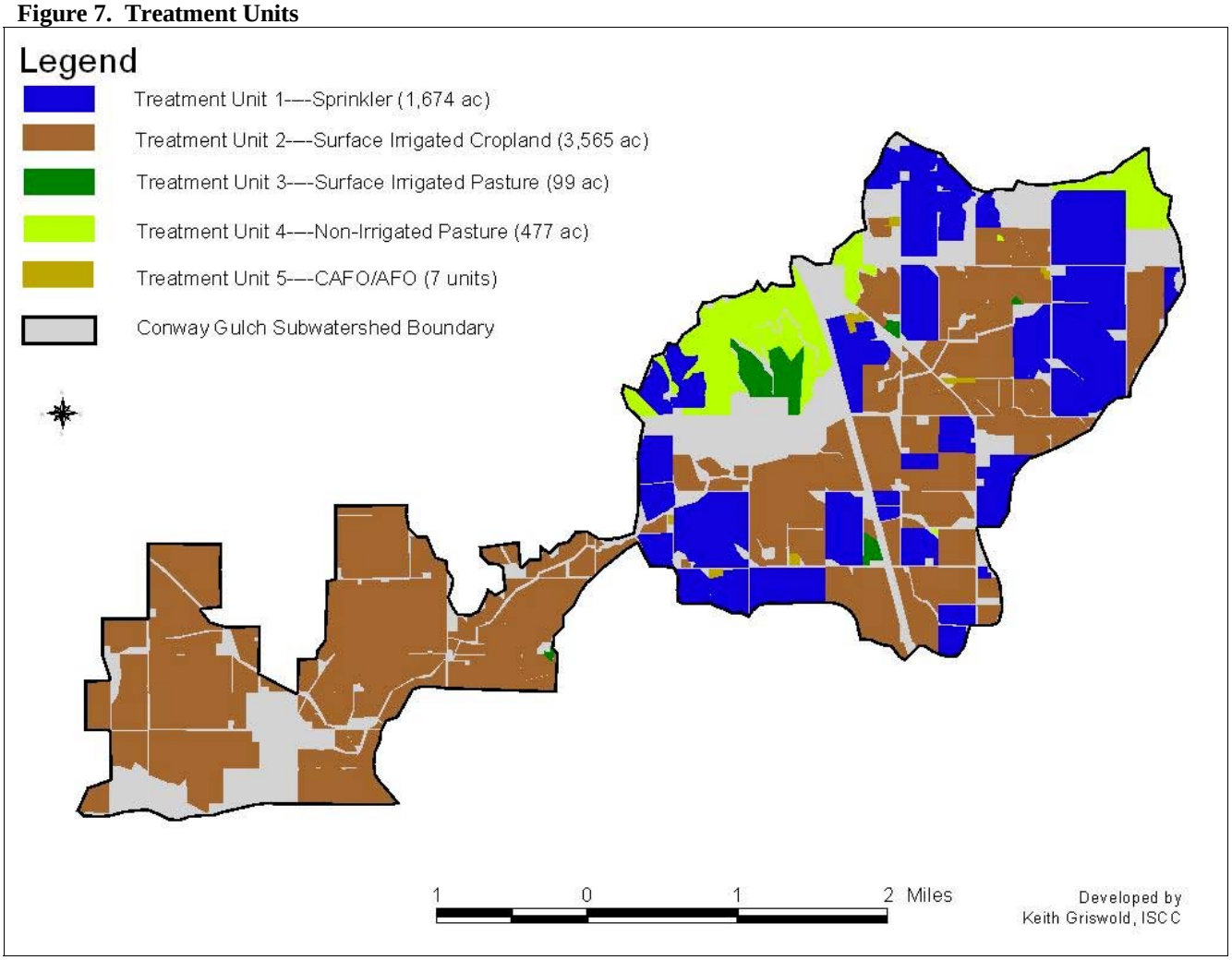
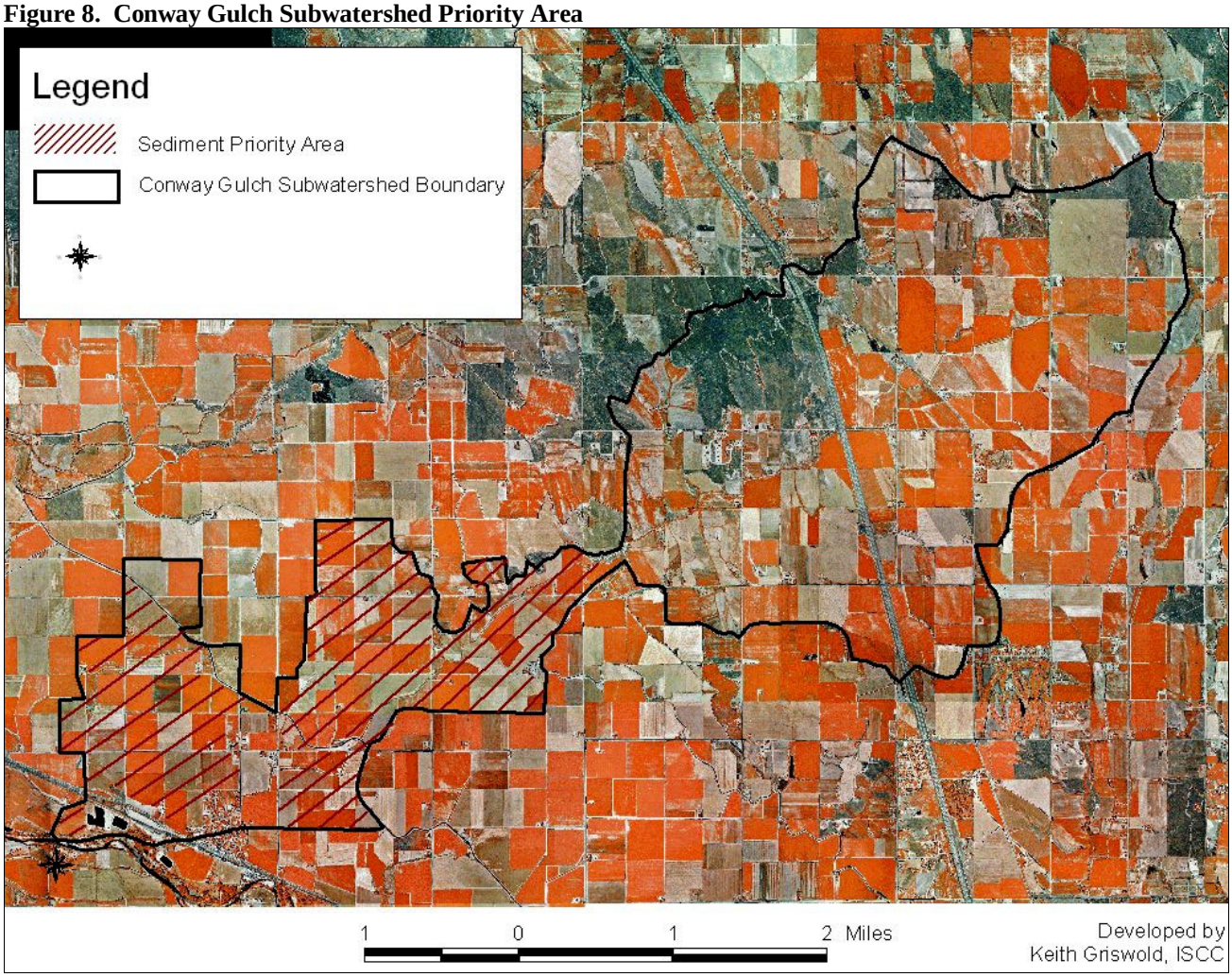


**Figure 8. Conway Gulch Subwatershed Priority Area**




## 5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, including Conway Gulch.

The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards change. After the TMDL targets and load reductions were established for sediment and bacteria, additional, more frequent sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been performed. This new information and water quality standards change indicate that revision of the TMDL sediment and bacteria targets is appropriate, and will continue to be evaluated with additional data as it is collected.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" in nutrients policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion.
- Lack of adequate vegetation adjacent to waterways necessary for removing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria.

## 5.1 Recreational Uses – Bacteria Objectives

The TMDL establishes a 98% bacteria reduction objective for the Conway Gulch to meet Idaho's fecal coliform criteria for protection of recreational uses (Table 4).

**Table 4. Reductions Required to Meet Bacteria Load Allocation**

| Name | Primary Geo-Mean CFU/100 ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-Mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| **Conway Gulch** | **723** | **50** | **98%** | **1156** | **200** | **83%** |

(portion of Table 22 from, page 71 Lower Boise River TMDL Subbasin Assessment)

Two developments affect this reduction objective and agricultural BMP implemention required to meet it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, DNA analysis of bacteria samples from various locations in the Lower Boise River watershed show that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, raccoon) that are beyond human control prevent attainment of the TMDL's bacteria targets and load reductions. It is likely that inputs of bacteria from cows can be reduced by simply limiting their access to the Boise River and tributary water sources.

**Table 5. Description of Confined Animal Feeding Operations in Conway Gulch Subwatershed**

| Type of Confined Animal Feeding Operation (CAFO) | Number of CAFO's in Conway Gulch Subwatershed |
|---|---|
| Dairy Cattle | 3 |
| Beef Cattle | 3 |
| Horse | 1 |
| | |
| **Total** | **7** |

(Griswold, 2001)

## 5.2 Aquatic Life Uses – Sediment Objectives

The approach is to seek voluntary implementation of best management practices (BMPs) on agricultural lands to reduce Total Suspended Sediment loading rate by 37%.

**Table 6. 1995 TSS loads and allocations for Conway Gulch**

| Tributary | 1995 Loads | % of Total River Load | TSS Load Goals | % of Total Goal |
|---|---|---|---|---|
| Conway Gulch | 11.3 | 7% | 7.1 | 5% |

(IDEQ, 1998)

## 5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

**Table 7. Proposed No Net Increase (NNI) Phosphorous Load**

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| **Conway Gulch** | **101** | **18648** |

(IDEQ, 1998)

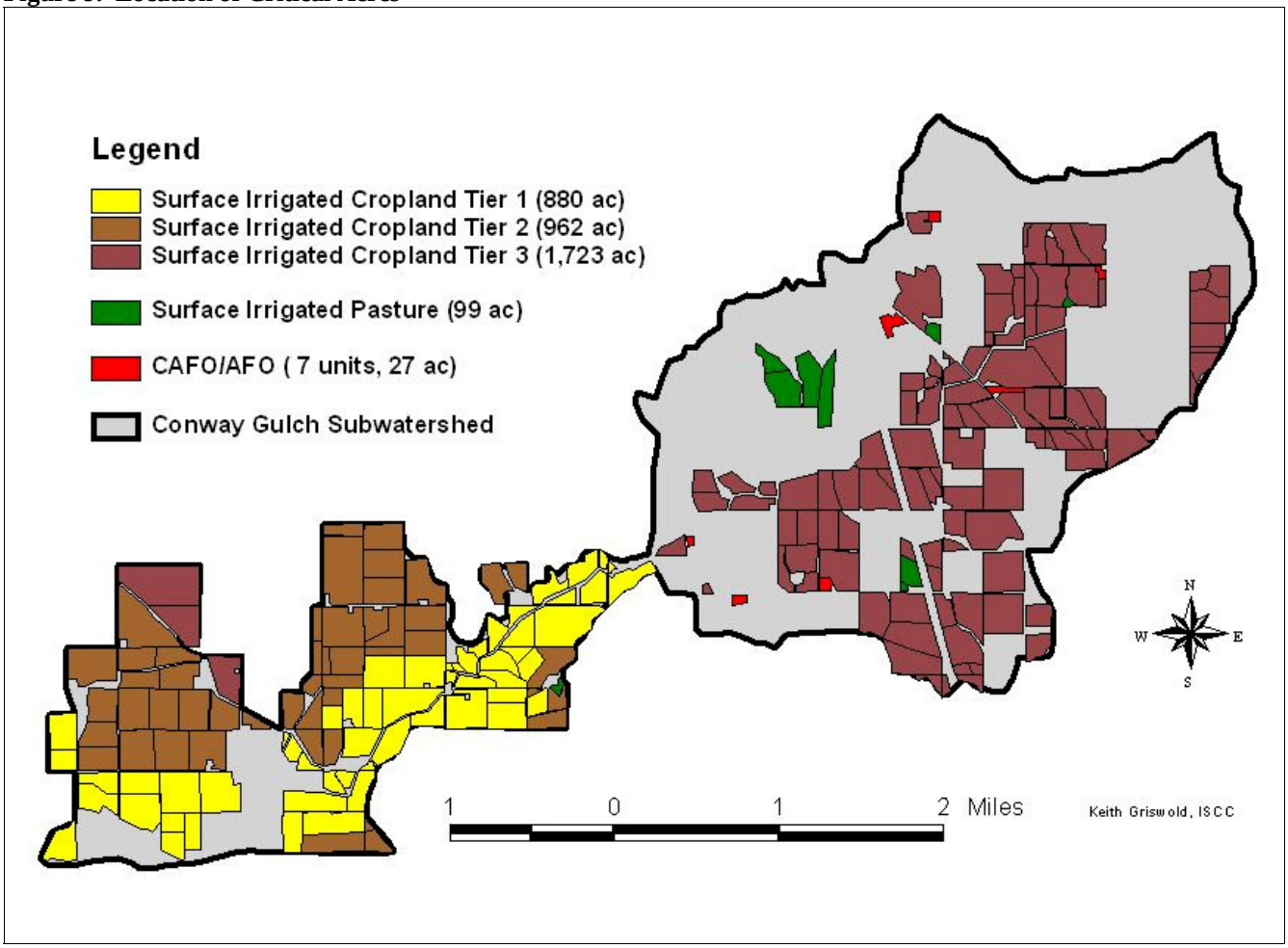
# 6.0 Identification of Critical Acres

An initial watershed inventory was completed to determine the land areas that affect Conway Gulch. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Conway Gulch, which affects the Lower Boise River.

Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural lands that drain directly into Conway Gulch will be a Tier 1, high priority for treatment because these lands have the most immediate impact on Lower Boise River water quality. Drainage water from Tier 2 lands is reused once on Tier 1 lands before discharging to the Conway Gulch, and are given a medium priority for treatment. Tier 1 & 2 acres are the Critical Acres within Treatment Unit 2. Drainage water from Tier 3 lands is reused multiple times on Tier 1 and Tier 2 lands before discharging to the Conway Gulch, and are given a low priority for treatment.

**Figure 9. Location of Critical Acres**



**Critical Acres within each Treatment Unit:**

| | |
|---|---|
| Treatment Unit 1 | No critical acres within this unit |
| Treatment Unit 2 | 880 acres of Tier 1 surface irrigated cropland<br>962 acres of Tier 2 surface irrigated cropland<br>1,723 acres of Tier 3 surface irrigated cropland |
| Treatment Unit 3 | 99 acres of surface irrigated pasture |
| Treatment Unit 4 | No critical acres within this unit |
| Treatment Unit 5 | 7 units of CAFO/AFO |

# 7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited, to the following:

**Table 8. Treatment Unit 2---Surface Irrigated Cropland**

| | |
|---|---|
| Agro-Tillage | Conservation Cropping Sequence |
| Conservation Tillage | Cover and Green Manure Crop |
| Filter Strips | Grassed Waterway |
| Surge Irrigation System | Sprinkler Irrigation System |
| Tailwater Recovery System | Irrigation Water Management Systems |
| Straw Mulching | Nutrient Management |
| Pest Management | Sediment Basin |
| Underground Outlet | Chiseling and Subsoiling |
| Waste Utilization | Channel Vegetation |
| Drip Irrigation System | PAM |
| Irrigation Water Conveyance | |

**Table 9. Treatment Unit 3---Surface Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Waste Utilization |
| Spring water development | Waste Storage System |
| Irrigation systems | Nutrient Management |
| Pasture and Hayland Planting | Planned Grazing System |
| Livestock Watering Facility | Pasture and Hayland Management |

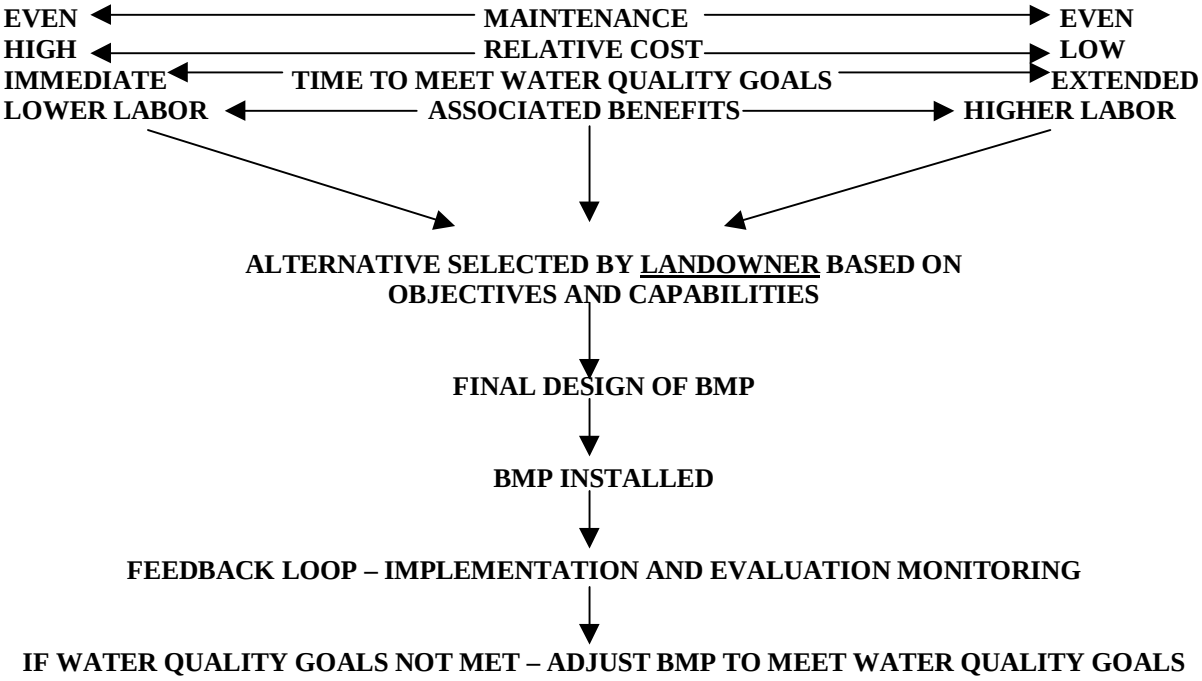
**Table 10. Treatment Unit 5---CAFO/AFO**

| | |
|---|---|
| Waste Management System | Heavy use area protection |
| Filter strips | Livestock Watering Facility |
| Nutrient Management | Fencing |

## 7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($800/ acre) | SITE SPECIFIC BMP Alternative #2 ($500/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Irrigation Water Mgt. | Irrigation Water Mgt. | Irrigation Water Mgt. |
| Sprinkler Irrigation System | Land Leveling | Concrete Ditch |
| Nutrient Mgt. | Surface Irrigation System | Filter Strip |
| Conservation Crop Rotation | Gated Pipe | PAM |
| | Tail Water Recovery System | Sediment Basin |
| | Nutrient Mgt. | Nutrient Mgt. |
| | Conservation Crop Rotation | Conservation Crop Rotation |
| | Conservation Tillage | Conservation Tillage |




(APAP, 1991)

## 7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($450/ acre) | SITE SPECIFIC BMP Alternative #2 ($350/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Livestock Watering Facility |
| Heavy Use Area Protection | Livestock Watering Facility | Irrigation Water Mgt. |
| Livestock Watering Facility | Irrigation Water Mgt. | Field Border Irrigation System |
| Irrigation Water Mgt. | Field Border Irrigation System | |
| Field Border Irrigation System | | |
| Gated Pipe | | |

## 7.3 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($50,000/ each) | SITE SPECIFIC BMP Alternative #2 ($35,000/ each) | SITE SPECIFIC BMP Alternative #3 ($25,000/ each) |
|---|---|---|
| Nutrient Mgt. | Waste Mgt. System | Waste Mgt. System |
| Heavy Use Area Protection | Nutrient Mgt. | Nutrient Mgt. |
| Livestock Watering Facility | Livestock Watering Facility | Filter strip |
| Filter strips | Filter strips | Heavy Use Area Protection |
| Waste Mgt. System | Heavy Use Area Protection | |
| Dike | | |

## 7.4 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

## 7.5 Feedback Loop

The feedback loop a process to evaluation and refinement of BMPs. The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved, the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

Implementing the feedback loop to modify BMPs until water quality standards are met results in full voluntary compliance with the standards. (APAP, 1991)

# 8.0 Program of Implementation

Canyon Soil Conservation District have selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. Significant contribution by agricultural land users in the Conway Gulch Subwatershed toward achieving the TMDL's objectives of protecting aquatic life and recreational uses of the Lower Boise River by reducing the discharge of sediments and bacteria from the Conway Gulch to the Snake River.

## 8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC), and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. NRCS and ISCC will assist Canyon SCD with certification of installed BMPs, filing payment applications, completion of annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

**Table 11. Estimated BMP Cost Summary for Treatment Unit 2, Tier 1 (Surface Irrigated Cropland—880 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 880 | $ 704,000 |
| Alternative 2 | $500/AC | 880 | $ 440,000 |
| Alternative 3 | $250/AC | 880 | $ 220,000 |

**Table 12. Estimated BMP Cost Summary for Treatment Unit 2, Tier 2 (Surface Irrigated Cropland—962 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 962 | $ 769,600 |
| Alternative 2 | $500/AC | 962 | $ 481,000 |
| Alternative 3 | $250/AC | 962 | $ 240,500 |

**Table 13. Estimated BMP Cost Summary for Treatment Unit 2, Tier 3(Surface Irrigated Cropland—1,723 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 1723 | $ 1,378,400 |
| Alternative 2 | $500/AC | 1723 | $ 861,500 |
| Alternative 3 | $250/AC | 1723 | $ 430,750 |

**Table 14. Estimated BMP Cost Summary for Treatment Unit 3 (Surface Irrigated Pasture 99 acres).**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $450/AC | 99 | $ 44,550 |
| Alternative 2 | $350/AC | 99 | $ 34,650 |
| Alternative 3 | $250/AC | 99 | $ 24,750 |

**Table 15. Estimated BMP Cost Summary for Treatment Unit 5 (CAFO/AFO 7 Units).**

| ALTERNATIVE | | UNITS | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $50,000/each | 7 | $ 350,000 |
| Alternative 2 | $35,000/each | 7 | $ 245,000 |
| Alternative 3 | $25,000/each | 7 | $ 175,000 |

Canyon SCD applied for State Agricultural Water Quality Program (SAWQP) funding in 1983 for Conway Gulch Subwatershed and other surrounding lands outside of the watershed. The project treated 7,740 acres of agricultural lands throughout Conway Gulch watershed other surrounding lands outside of the watershed. The project life was from 1983 through 1997. The total cost of this project was $1,263,085. $607,029 was cost-shared funds from SAWQP and $656,056 from participating landowners.

## 8.2 Operation, Maintenance, and Replacement

Participants will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Technical assistance for BMPs will be provided by NRCS and ISCC.

Inspections of installed BMPs will be made on an annual basis by Canyon SCD, NRCS, ISCC, and the participant during the life of the contract. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant. By accomplishing this objective, it is intended that the BMPs will become a part of the participant's farming operation and will continue to be operated and maintained after the contract expires.

## 8.3 Water Quality Monitoring

The ISDA has not collected water quality samples in Conway Gulch Subwatershed for the past couple of years. U.S. Geological Survey (USGS) has been monitoring the major tributaries to the river at their mouths since 1993 and will continue until April 2000. Sampling frequency has been upgraded to bimonthly for the subwatershed starting in April of 1999, then sampled monthly through the winter period.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

# 9.0 References

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# APPENDIX 12.

# Boise River Riparian & Small Drainage (Thurman, Eagle, Dry, Fivemile Drain, and Mammon) Agricultural TMDL Implementation Plan

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# 1.0 Executive Summary

**Subwatersheds:** Lower Boise River Riparian and Small Drainage Subwatershed
Total Scope: 189,112 acres
Agricultural Scope: 44,726 acres
Agricultural Critical Acres Scope: 38,902 acres

**Location:** Lower Boise River Subwatershed, Dry Creek Subwatershed, Eagle Drain Subwatershed, Mammon Gulch Subwatershed, Thurman Drain Subwatershed, Fivemile Drain Subwatershed, and isolated Canal portions located in Canyon and Ada Counties

**Priority Subwatershed:** High

**Cooperating Agricultural Agencies:** Canyon Soil Conservation District (CSCD)
Ada Soil and Water Conservation District (ASWCD)
Natural Resources Conservation Service (NRCS)
Idaho Soil Conservation Commission (ISCC)

**Agricultural Land Uses:**

Lower Boise River Riparian and Small Drainage Subwatershed Agricultural Land Uses

| Landuse | Acres | Percent of Lower Boise River Riparian and Small Drainage Subwatershed |
|---|---|---|
| Sprinkler Irrigated Cropland, and Pasture | 5,824 | 3% |
| Surface Irrigated Cropland | 29,440 | 16% |
| Surface Irrigated Pasture | 9,120 | 5% |
| CAFO/AFO | 342 | .2% |
| | | |
| **TOTAL** | **44,726** | **24%** |

**Major Agricultural Products:** Seed corn, alfalfa and clover for seed and/or hay, beans, sugar beets, winter and spring wheat, sweet and field corn, barley, potatoes, onions, hops, specialty seed crops, vegetables, livestock, and dairy products.

**TMDL Objectives:** The Idaho Soil Conservation Commission (ISCC) has prepared this plan to implement the Total Maximum Daily Load (TMDL) for the Lower Boise River. The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the river. The TMDL establishes instream targets for total suspended solids (TSS) and bacteria and sets goals for reducing the loads of sediment and bacteria from the tributaries to the Lower Boise River in order to achieve the instream targets The instream targets are to be attained within the river near the cities of Middleton and Parma. The purpose of the instream TSS targets is to protect fish species that may be adversely impacted by instream TSS levels that exceed the concentration and duration components of the targets. The purpose of the bacteria target is to protect human health.

The TSS instream concentration is 50 mg/L for no more than 60 days, and 80 mg/L for no more than 14 days. To attain these durational instream concentration targets, the TMDL sets a sediment reduction goal of 37% at the mouths of each of the main tributaries to the river. The bacteria target requires a maximum geometric mean no greater than 50 CFU/100 mL based on a minimum of five samples taken over a thirty-day period (IDAPA 16.10.02.250.01.a). To attain this target, the TMDL seeks to reduce bacteria colonies in the river by 76% at Middleton and 93% at Parma, and calls for bacteria reduction goals for the tributaries ranging from 92% to 98% for primary contact recreation.

The TMDL does not establish nutrient targets for the Lower Boise River or nutrient reduction goals for the tributaries because there is no nutrient-caused impairment (i.e. excessive aquatic plant or algae growth) in the Lower Boise River. It is expected, however, that the TMDL for the Hells Canyon reach of the Snake River (RM 409 to RM 288 "SR-HC TMDL") will establish nutrient-reduction goals for the Boise River and other tributaries and upstream sources to the SR-HC TMDL reach. In anticipation of a nutrient-reduction goal for the Boise River, the Lower Boise TMDL calls for no net increase (NNI) of current TP loads to the Lower Boise River.

**Implementation Plan:** This Implementation Plan identifies best management practices (BMPs) and prioritizes agricultural lands in the Lower Boise River Riparian and Small Drainage Subwatershed for BMP implementation to achieve the TMDL's objectives within the Lower Boise River watershed. Proposed BMPs include, but are not limited to, sprinkler irrigation systems, surge irrigation systems, drip irrigation systems, sediment basins, filter strips, polyacrylamide (PAM) application, irrigation water management*****, pest management, nutrient management, conservation tillage, and livestock grazing management.

Three BMP installation alternatives are evaluated for each of the four different agricultural land use types (Treatment Units) within the Lower Boise River Riparian and Small Drainage Subwatershed. Estimated cost to install BMPs on lands identified for treatment are: Alternative 1 - $30,006,000; Alternative 2 - $19,557,000; and Alternative 3 - $10,815,000. These cost estimates do not include costs of acquiring necessary real property interests and permits, or annual operation and maintenance costs.

# 2.0 Introduction

The Lower Boise River Riparian and Small Drainage Subwatershed encompasses 189,112 acres. It includes the portion of the Boise River from Lucky Peak Reservoir to its confluence with the Snake River in addition to various small drainages and portions of contributing canal subwatersheds. The river flows in a northwesterly direction through Ada and Canyon counties before entering the Snake River at the Idaho-Oregon border near the town of Parma. Portions of Boise, Garden City, Eagle, Meridian, Star, Middleton, Caldwell, Notus, and Wilder are located within the Lower Boise River Riparian and Small Drainage Subwatershed boundary.

This implementation plan will address the nonpoint, agricultural sources of sediment, nutrients, and bacteria that impact the Lower Boise River from the Riparian and Small Drainage Subwatershed. Within this plan the following elements are identified: pollutant problems within Lower Boise River Riparian & Small Drainage Subwatershed, sources of those pollutants, critical acres contributing pollutants to the drain, priority areas for treatment, and Best Management Practices (BMPs) that, when applied, will have the greatest effect on improving water quality.

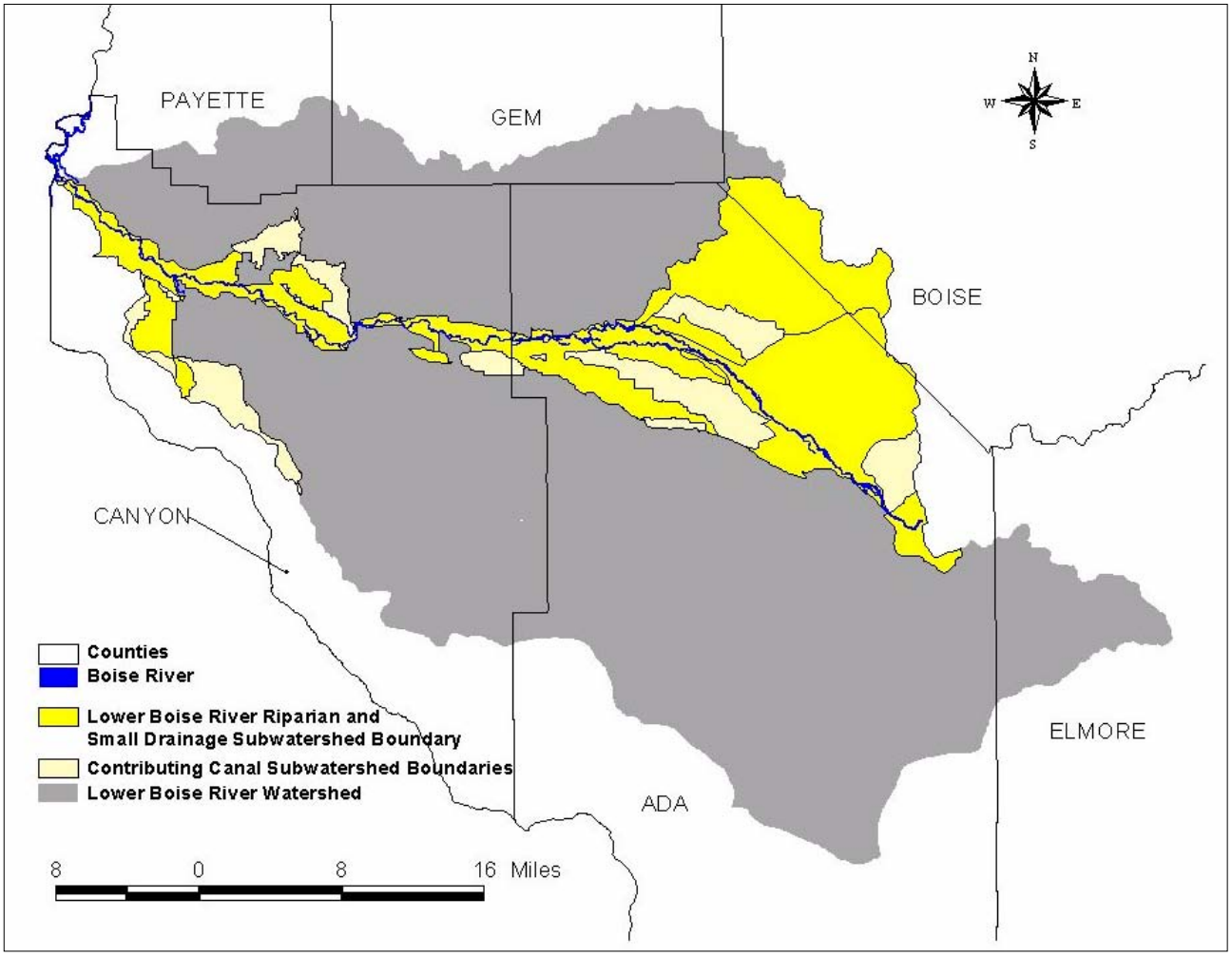
Efforts to gather additional bacteria, sediment, and nutrient data are either underway or planned. Information developed through these efforts may be used to revise the appropriate portions of the Implementation Plan, and determine and adjust appropriate implementation methods and control measures.

The costs to install BMPs on agricultural lands are estimated in this plan to provide the local community, government agencies, and watershed stakeholders some perspective on the economic demands of meeting the TMDL goals. Availability of cost-share funds to agricultural producers within the Lower Boise River Riparian and Small Drainage Subwatershed will be necessary for the success of this plan and the final reduction of pollutants necessary to meet the TMDL requirements within the Lower Boise River. Sources of available funding and technical assistance for the installation of BMPs on private agricultural land are outlined in Appendix 2 of the Lower Boise River Agricultural Implementation Plan.

It is recommended that landowners within Lower Boise River Riparian & Small Drainage Subwatershed contact the Canyon Soil Conservation District (Canyon SCD), Ada Soil and Water Conservation District (Ada SWCD), the Natural Resources Conservation Service (NRCS), or the Idaho Soil Conservation Commission (ISCC) to help determine the need to address water quality and other natural resource concerns on their land. This plan is not intended to identify which specific BMPs are appropriate for specific properties, but rather provides a subwatershed approach for addressing water quality problems attributed to runoff from agricultural lands.

*** Irrigation Water Management (IWM) involves providing the correct amount of water at the right times to optimize crop yield, while at the same time protecting the environment from excess surface runoff and deep percolation. Irrigation water management includes techniques to manage irrigation system hardware for peak uniformity and efficiency as well as irrigation scheduling and soil moisture monitoring methods.**

**igure 1. Lower Boise River Riparian and Small Drainage Subwatershed Location**




## 3.0 Watershed Characterization

This section describes watershed characteristics that affect the types, locations, and effectiveness of BMPs proposed in this implementation plan. These characteristics include soils, climate, surface hydrology, demographics and economics, ground water hydrology, and land ownership and land use in Lower Boise River Riparian and Small Drainage Subwatershed.

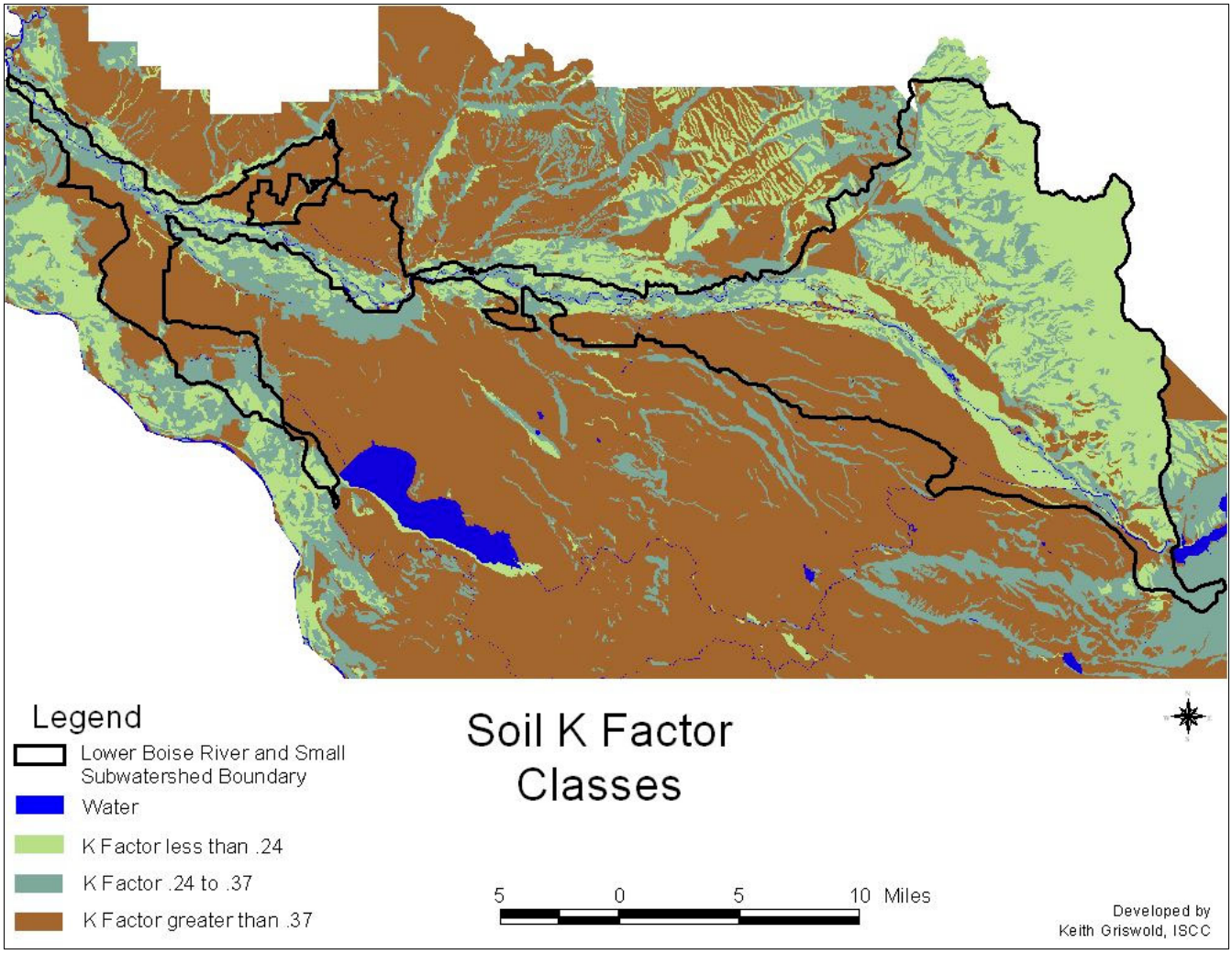
### 3.1 Soils

There are six major soil associations within Lower Boise River Riparian and Small Drainage Subwatershed (U. S. Department of the Agriculture, 1972).

- *Greenleaf-Nyssaton-Owyhee:* Well drained silt loam soils on lacustrine terraces
- *Moulton-Bramt-Baldock-Falk:* Moderately well and poorly drained soils on floodplains and low river terraces
- *Power-Purdam:* Well drained silt loams on nearly level to moderately sloping alluvial fan terraces
- *Lankbush-Brent-Tindahay:* Well and somewhat excessively drained soils on sloping to steep foothills
- *Cashmere-Tindahay:* Somewhat excessively drained soils in drainageways and on low alluvial fans
- *Searles-Ladd-Ola:* Well drained soils on moderately sloping to steep granitic mountains

Due to the arid and temperate climate, soils generally have weakly developed profiles, are unleached, are alkaline and have a high natural fertility. Soil "K Factor" classes are used to determine a soils erodibility potential. The higher the K-Factor rating, the greater the potential for erosion (Figure 2). In addition to K-Factor classes, soil slope classes provide another indication of erosion potential. As with K-Factor classes, the greater the percentage of slope, the greater the potential for erosion (Figure 3).

**Figure 2. Lower Boise River Riparian and Small Drainage Subwatershed K Factor Classes**



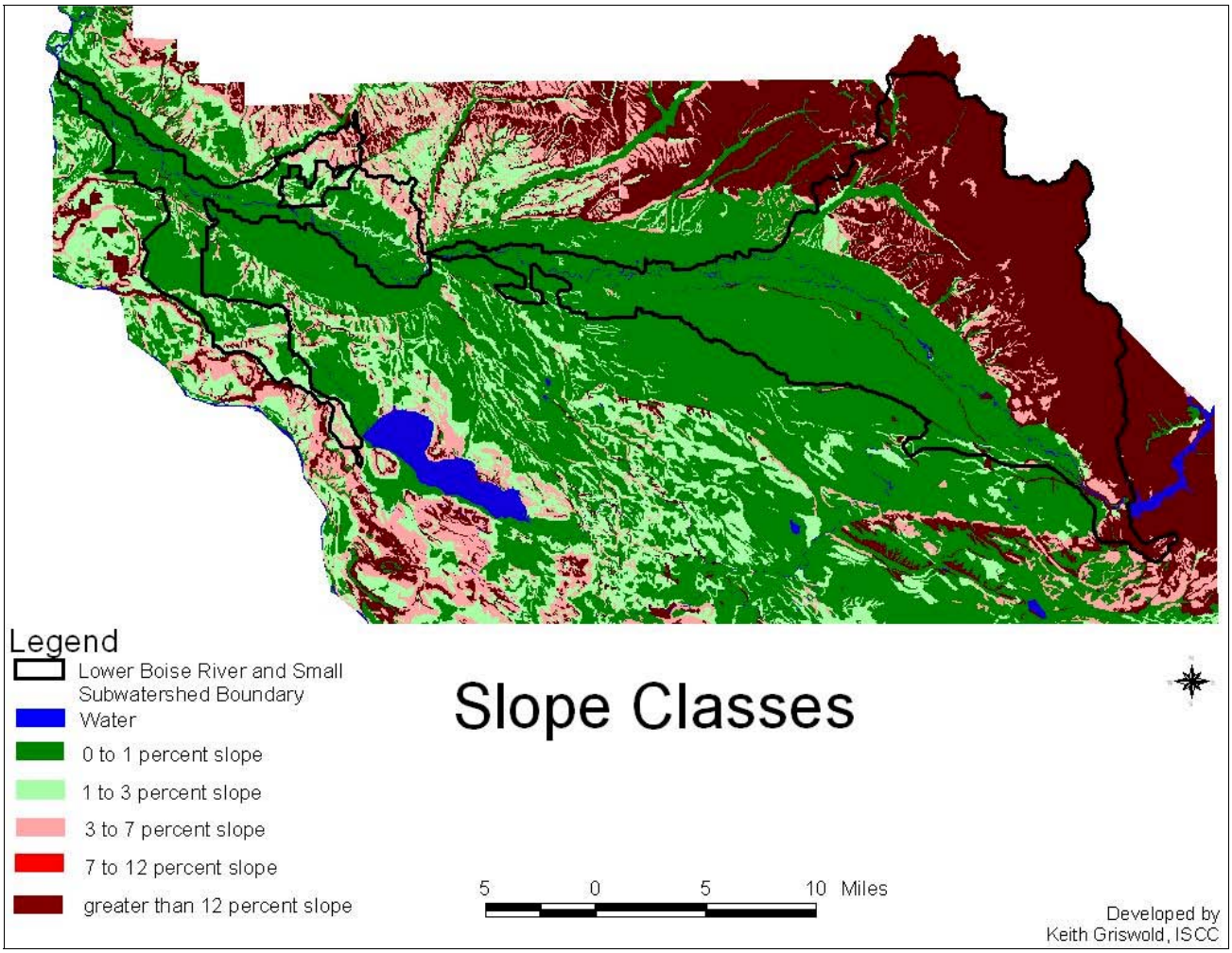

## 3.2 Climate

Climate in this area is characterized by cool, moist winters and hot, dry summers. The average daily maximum temperature during the summer in Boise, Idaho is 83.9° Fahrenheit, while the average daily minimum temperature during the winter is 25.9° Fahrenheit. Temperatures as low as –23.0° Fahrenheit and as warm as 111.0° Fahrenheit have been recorded (Climate Data Center, 2000).

Long term average annual precipitation for Boise is 11.9 inches. Approximately 57 percent of the yearly precipitation occurs during the November through March period. Average precipitation during the April to September growing season is less than 4 inches in the valley, and extended periods without precipitation occur annually during the summer months.

The average consecutive frost-free period (above 32 ° F) is 152 days, based on the Boise Airport long-term climatic data station. A probability analysis of the data shows 8 years in 10 will have a frost-free season of at least 135 days for this area. The average last frost (32 ° F) in the spring is around May 8 and the average first frost in the fall is around October 8 (U. S. Department of the Agriculture, 1977).

**Figure 3. Lower Boise River Riparian and Small Drainage Subwatershed Slope Classes**




## 3.3 Surface Hydrology

The Lower Boise River itself ranges in elevation from 2,860 feet at the base of Lucky Peak Reservoir to 2,180 feet at its confluence with the Snake River; however, the Lower Boise River Riparian and Small Drainage Subwatershed boundary reaches its highest elevation (6,737 feet) in the upper portion of the Dry Creek drainage in the Boise Mountains.

Pre-existing ephemeral channels have been modified over time by channelization and bank stabilization prior to the construction of irrigation and drainage systems for water delivery and drainage for croplands and pastures. There are currently 14 major canals that supply water to Lower Boise River Riparian and Small Drainage Subwatershed and 11 major drains that receive tailwater or drain ground water (Figure 4). Agricultural wells also supply water to the upper portions of some of the small drainage subwatersheds.

Water supplies for Lower Boise River Riparian and Small Drainage Subwatershed come from 2 major systems. The upper portion of the Subwatersheds has water supplied by Boise River water. The lower portion of the Subwatersheds has water supplied by Boise River water and wastewater from other subwatershed. The wastewater sources include Payette River water, Snake River water, Boise River water, and well water.

**Figure 4. Surface Hydrology**

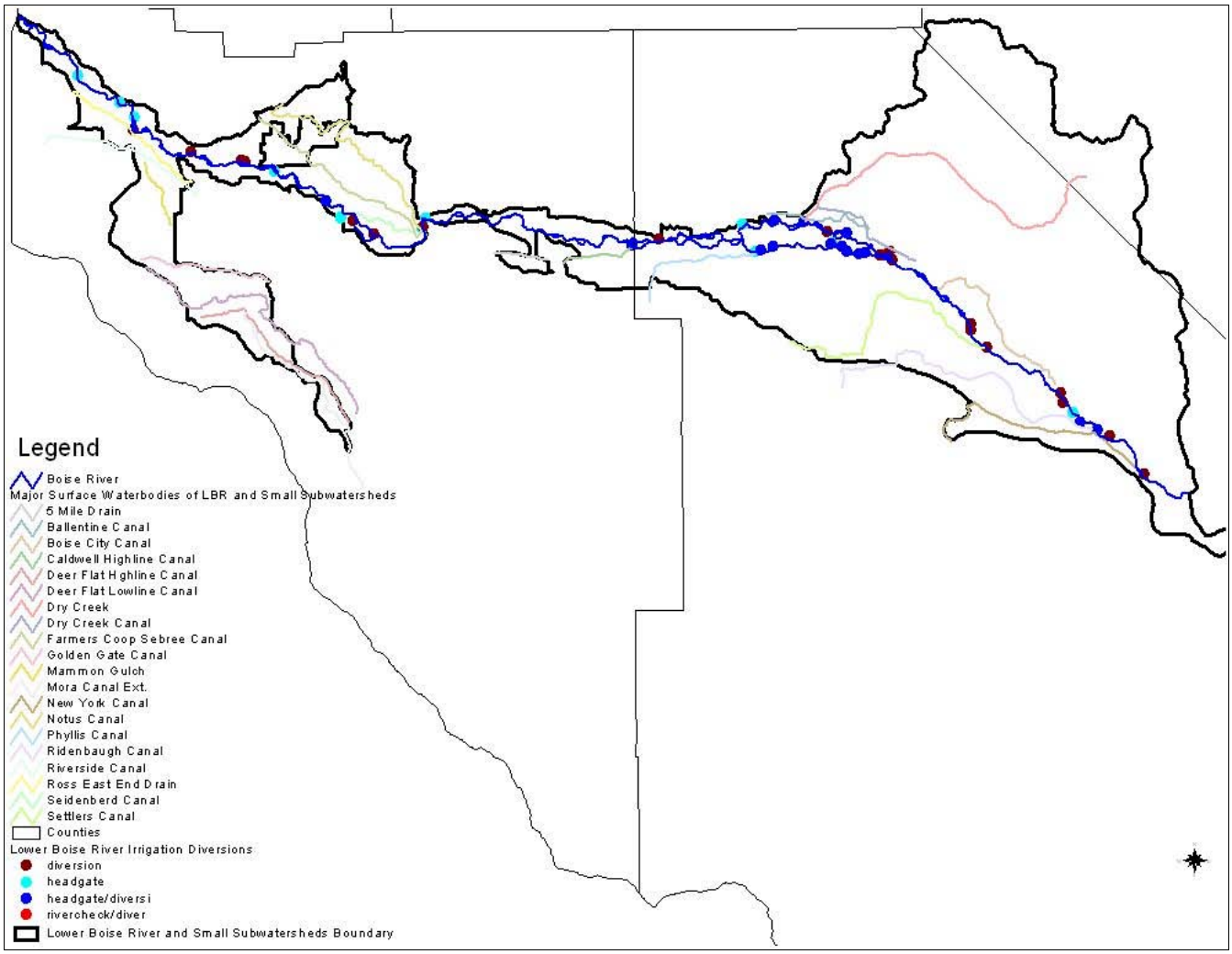
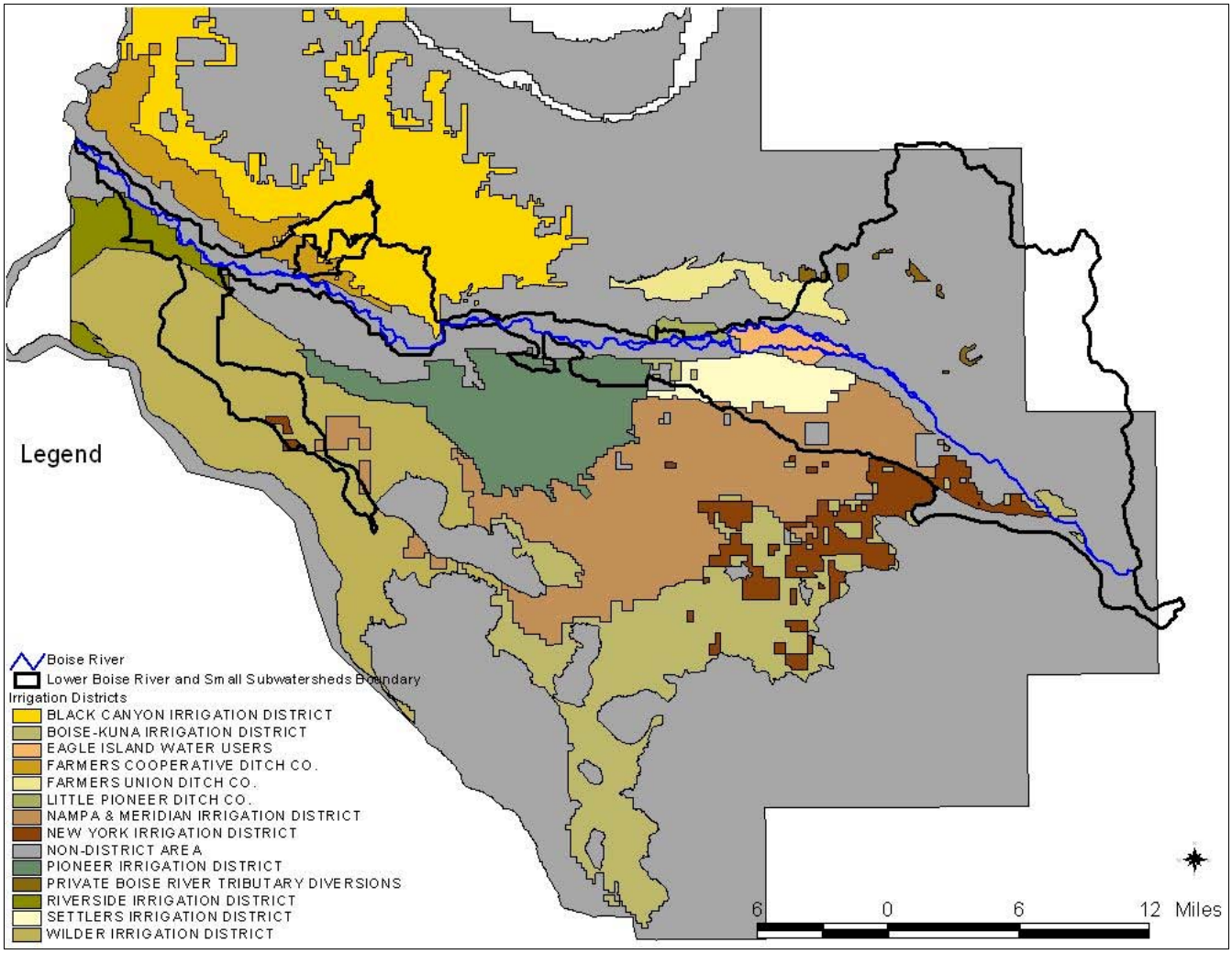


**Figure 5. Irrigation Districts**




## 3.4 Ground Water Hydrology

Prior to irrigation development during the 1900's, the large shallow aquifer under the Boise Valley did not exist. This aquifer (< 200 feet) is recharged annually by surface irrigation and earthen canals that recharge the artificial and natural drains throughout the year. Lower Boise River Riparian and Small Drainage Subwatershed sits atop the shallow Boise Valley aquifer and contributes to its recharge through surface irrigation and seepage.

## 3.5 Demographics and Economics

The Lower Boise River Watershed has experienced accelerated growth within the last 10 years. Ada and Canyon counties in particular experienced growth rates well above the state and national averages during the period from 1990 to2000. Ada County with a year 2000 population of 300,904 and Canyon County with a year 2000 population of 131,441 have increased at rates of 46.2% and 45.9% respectively (U.S. Census Bureau, 2001). These increases are huge when compared to the national average of 13.1% and Idaho state average of 28.5% during the same period.

The Lower Boise River Riparian and Small Drainage Subwatershed has been impacted significantly by the rapid growth in the Treasure Valley. Much of the upper portion of the subwatershed in Ada County is already under urban and suburban land use as the cities of Boise (pop. 185,787), Garden City (pop. 10,624), and Eagle (pop. 11,085) continue to dominate the land area along the Lower Boise Riparian area corridor. The city of Meridian (Pop. 38,446) is also encroaching on the southern portion of the subwatershed boundary in Ada County, while a smaller portion of Caldwell (pop. 25,967) and some of the smaller cities continue to expand with urban and suburban growth within the subwatershed boundary.

Downstream from the city of Eagle, the subwatershed remains largely agricultural in use as it crosses over from Ada into Canyon County. Typical cropping sequences within the subwatershed consist mainly of higher residue crops such as alfalfa, clover, spring wheat, winter wheat, and pasture; however, lower residue crops such as seed corn, beans, sugar beets, sweet corn, field corn, onions, potatoes, specialty seed crops and vegetables are also present.

**Table 1. 2001 Agricultural Data for Lower Boise River Riparian and Small Drainage Subwatershed**

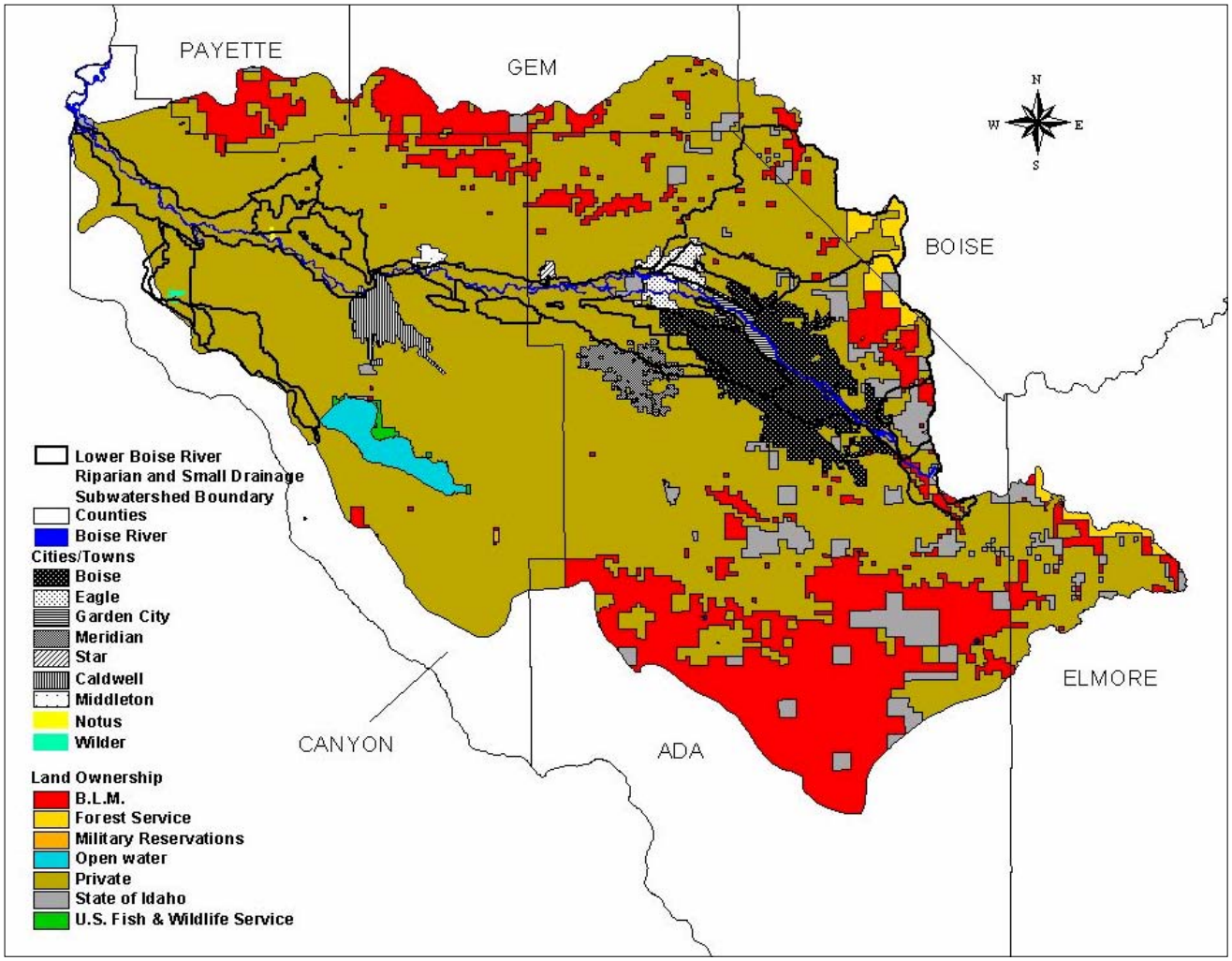
| Inventory: Farms & Cropland | Lower Boise River Riparian and Small Drainage Subwatershed |
|---|---|
| Total # of Farms (FSA Tracts) | 827 |
| Total Acres of Farms | 44,726 |
| Average Farm Size (acres) | 54.1 |
| Total Acres in Cropland | 44,384 |

(Griswold and Koberg, 2001)

## 3.6 Land Ownership and Land Use

While the majority of the land in Lower Boise Riparian and Small Drainage Subwatershed is privately owned (approx. 85%), there are small portions of acreage owned by BLM (6%), State of Idaho (6%) and the U.S. Forest Service (3%). Most of the non-private acreage occurs near the upper reaches of the subwatershed in the Boise Mountains and foothills (Figure 6). Surface irrigated cropland and pasture is the largest agricultural use within the subwatershed.

**Figure 6. Land Ownership**



# 4.0 Treatment Units

This section presents information on the individual agricultural land uses within the watershed. Each land use is divided into one or more Treatment Units (TUs) (Figure 7). The TUs describe areas with similar use, management, soils, productivity, resource concerns, and treatment needs. The TUs not only provide a method for delineating and describing land use but are also used in evaluating land use impacts to water quality and in the formulation of alternatives for solving the identified problems.

The descriptions in this section are intended to provide a general overview of the TUs.

- **Treatment Unit #1 – Surface Irrigated Cropland: 29,440 acres**

  Surface irrigation occurs on silt loam and loam soils on slopes from 0-12%, with the majority of the cropland less than 3% slope. Typical cropping sequence is alfalfa seed or hay, row crops, and grain. Row crops include potatoes, sugar beets, beans, onions, and corn. Most of the wastewater enters an extensive system of low gradient excavated drain ditches or canals.

- **Treatment Unit #2 – Surface Irrigated Pasture: 9,120 acres**

  Surface irrigated pastures are characterized by silt loam soils with slopes ranging from 0-12% with the majority of pastures less than 3% slope. Pastures are typically grazed throughout much of the season (Spring-Fall) with little re-growth allowed in the Fall. Some pastures are used for feeding areas for large herds of livestock during the winter. Wastewater runoff from the surface irrigated pastures has the potential to enter the Lower Boise River via the riparian area and its small drainage tributaries.

- **Treatment Unit #3 – Sprinkler Irrigated Cropland and Pasture: 5,824 acres**

  This unit is located throughout the subwatershed. Typical cropping sequence is alfalfa hay, row crops and grain. Row crops include potatoes, sugar beets, mint, and corn. This area has little or no impact on Lower Boise River water quality due to high irrigation efficiencies resulting in little or no runoff.

- **Treatment Unit #4 – CAFO/AFO 47 units: 342 acres**

  Feedlots are small in land area and generally occupied by cattle during the winter and spring months (November through April), with most located on farmsteads. Dairies and feedlots are under regulations or strict recommendations to eliminate runoff up to a 25 year, 24 hour storm events as well as average 5-year runoff rates from the feeding and milking facilities. Where animal wastes are applied to croplands, existing State and NRCS standards are required for dairy operators.

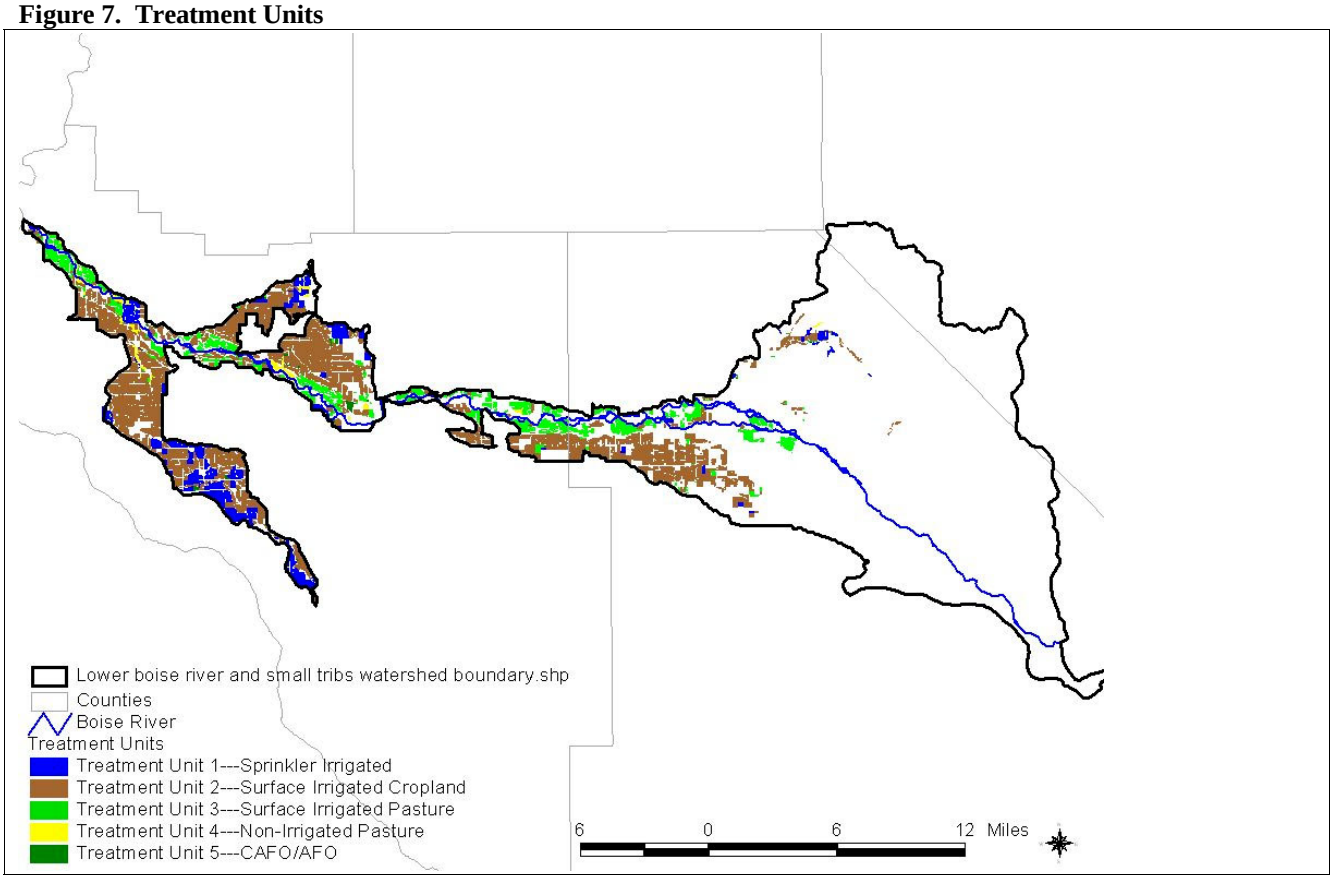
  As required by Idaho State Law, all producing and selling dairy facilities have submitted a Nutrient Management Plan submitted to Idaho Department of Agriculture.

**Table 2. Acres of TUs within Lower Boise River Riparian and Small Drainage Subwatershed**

| Treatment Units | Acres |
|---|---|
| Treatment Unit 1 | 29,440 |
| Treatment Unit 2 | 9,120 |
| Treatment Unit 3 | 5,824 |
| Treatment Unit 4 | 342 |
| | |
| TOTAL | 44,726 |

(Griswold and Koberg, 2001)

**Figure 7. Treatment Units**




# 5.0 TMDL Objectives

The overall objective of the TMDL is to achieve water quality that will support appropriate designated uses for the Lower Boise River. To support aquatic life and recreational uses, the TMDL seeks to meet state bacteria criteria and a Total Suspended Sediment (TSS) target in the Boise River by establishing "load" reduction goals for several drains or tributaries to the Lower Boise River, as well as establishing load reductions in the river itself.

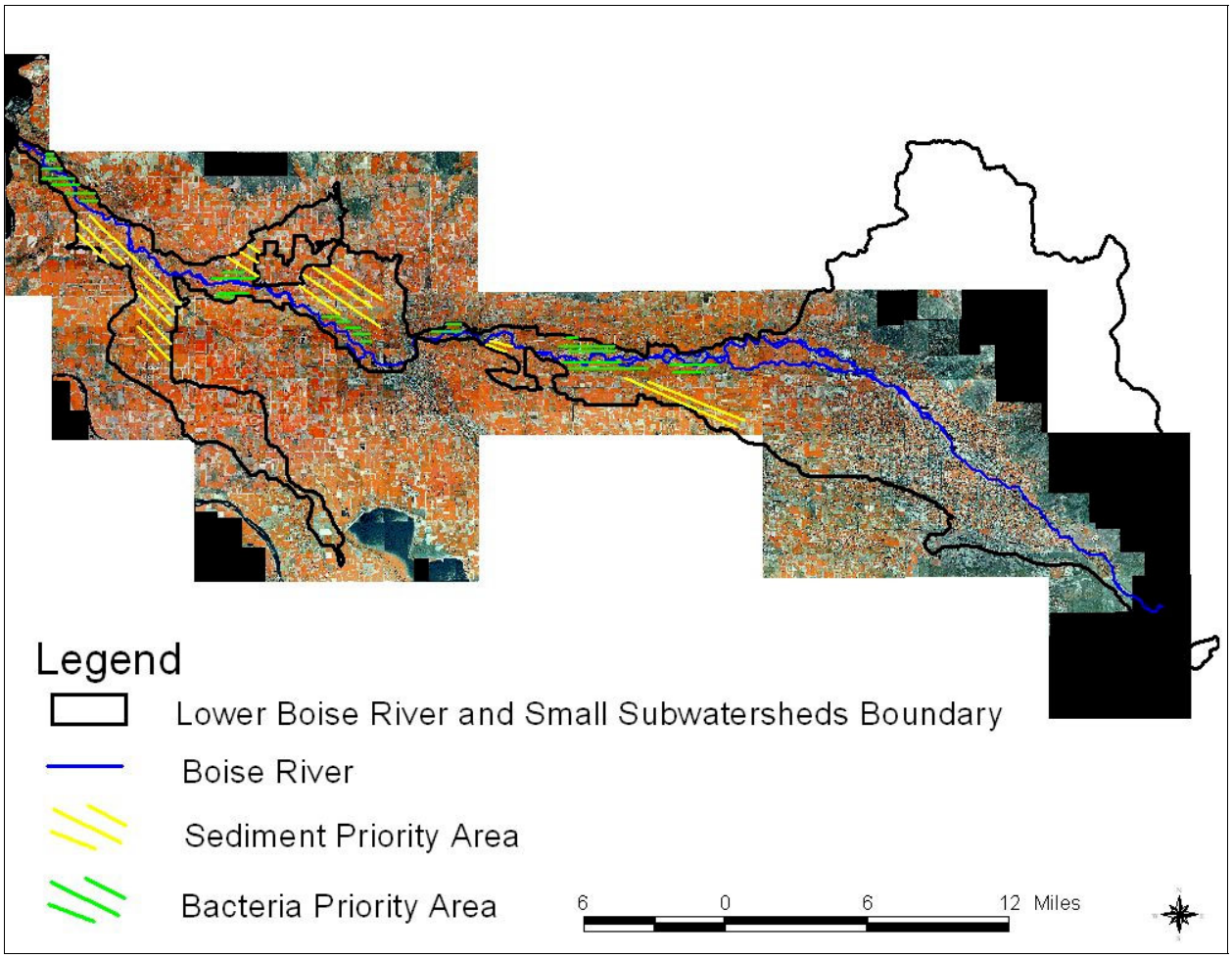
The TMDL recognizes that the targets and load reductions may be revised as additional data is collected, as understanding of water quality in the river improves, and as state water quality standards adapt to reflect new developments. After the TMDL targets and load reductions were established for sediment and bacteria, additional sediment data have been collected, the State of Idaho's bacteria criteria has changed, and a DNA analysis of bacteria to determine bacteria sources has been conducted. This new information and data collection indicate that the Lower Boise River may be closer to achieving its TMDL targets than originally assumed in the Subbassin Assessment.

While there is no nutrient-caused impairment of the Lower Boise River, IDEQ expects to require nutrient load reductions in the Lower Boise River watershed to reduce algae production in the Snake River as part of the Snake River – Hells Canyon (SR-HC) TMDL. The SR-HC TMDL is due to be submitted to EPA at the end of 2001. After EPA approval, IDEQ will expect the Lower Boise River Watershed Advisory Group (WAG) to identify actions necessary to meet the new load reduction targets at the mouth of the Lower Boise River. Until then, this implementation plan will be based on IDEQ's "No Net Increase" nutrient policy for the Lower Boise River.

Agricultural sources of sediment, bacteria and nutrients include surface irrigated cropland and pastures, animal feedlots, livestock grazing waterways and ditch maintenance**.** BMPs can be implemented to address the following:

- Irrigation induced erosion
- Irrigation tailwater delivery to receiving water bodies
- Lack of adequate vegetation adjacent to waterways necessary for reducing sediment, nutrients, and pathogens from runoff.
- Animal feedlots in and adjacent to waterways delivering excess sediment, nutrients, and bacteria

**Figure 8. Lower Boise River Riparian and Small Drainage Subwatershed Priority Areas**




## 5.1 Recreational Uses – Bacteria Objectives

The TMDL establishes a 76% bacteria reduction target at Middleton and a 93% bacteria reduction target at Parma for the Lower Boise River to meet primary contact recreation use. Two of the small drainage tributaries addressed in this plan (Eagle and Thurman) also received bacteria reduction targets at their confluence with the Boise River (Table 3).

**Table 3. Reductions Required to Meet Bacteria Load Allocation**

| Name | Primary Geo-Mean CFU/100 ml | Primary Load Allocation CFU/100 ml geometric mean | Primary Percent Reduction | Secondary Geo-Mean CFU/100 ml | Secondary Load Allocation CFU/100 ml geometric mean | Secondary Percent Reduction |
|---|---|---|---|---|---|---|
| Eagle Drain | 604 | 50 | 92% | 579 | 200 | 65% |
| Thurman Drain | 758 | 50 | 93% | 512 | 200 | 61% |
| B. River at Middleton | 208 | 50 | 76 | 106 | 200 | 1% |
| B. River at Parma | 703 | 50 | 93 | 344 | 200 | 42% |

(IDEQ, 1998)

Two developments affect this reduction objective and the agricultural BMP implementation that would be required to achieve it. Idaho's bacteria criteria was changed from fecal coliform to E. Coli (Escherichia coli). Data show that Lower Boise E. Coli levels do not exceed the new criteria. In addition, preliminary DNA results of bacteria samples from various locations in the Lower Boise River watershed indicate that natural sources of bacteria (e.g. birds, ducks, geese, deer, rodents, and raccoon) beyond human control contribute largely to the current bacteria loads in the river. The current TMDL targets for bacteria may be unattainable as a result of these natural sources of fecal coliform and E. coli. It is likely that sources of bacteria from cows and other agricultural livestock can be reduced by implementing BMPs that limit their access to the Boise River and its tributaries while providing alternative watering sources.

**Table 4. Description of CAFOs in Lower Boise River Riparian and Small Drainage Subwatershed**

| Type of Confined Animal Feeding Operation (CAFO) | Number of CAFO's in Lower Boise River Riparian and Small Drainage Subwatershed |
|---|---|
| Dairy Cattle | 4 |
| Beef Cattle | 35 |
| Horse | 7 |
| Mink | 1 |
| **Total** | **45** |

(Griswold and Koberg, 2001)

## 5.2 Aquatic Life Uses – Sediment Objectives

The approach selected by the local and state agencies responsible for addressing resource concerns on agricultural lands is to seek voluntary implementation of best management practices (BMPs) on agricultural lands with state and federal cost-share incentive programs to reduce Total Suspended Sediment loading rate in the Lower Boise River by 37%.

**Table 5. 1995 TSS loads and allocations for Lower Boise River Riparian and Small Drainage Subwatershed**

| Tributary | 1995 Loads | % of Total River Load | TSS Load Goals | % of Total Goal |
|---|---|---|---|---|
| Eagle Drain | 1.6 | 1% | 1.6 | 1% |
| Thurman Drain | .3 | 0% | .3 | 0% |
| Boise River, Middleton | | | 1.9 | |
| Star Feeder | 2.8 | 2% | 1.7 | 1% |
| Long Feeder | .6 | 0% | .3 | 0% |
| Watts Drain | .5 | 0% | .3 | 0% |
| Boise River, Parma | | | 96.5 | |

(IDEQ, 1998)

## 5.3 Aquatic Life Uses – Phosphorus Objectives

As per the *Lower Boise River TMDL Subbasin Assessment*, total phosphorus is subject to a No Net Increase (NNI) temporary recommendation until IDEQ establishes its SR-HC phosphorus TMDL.

**Table 6. Proposed No Net Increase (NNI) Phosphorous Load**

| Tributary Name | Seasonal Average TP Load, lbs/day | Seasonal Total Load, lbs |
|---|---|---|
| **Eagle Drain** | **30** | **5566** |
| **Thurman Drain** | **19** | **3563** |

(IDEQ, 1998)

# 6.0 Identification of Critical Acres

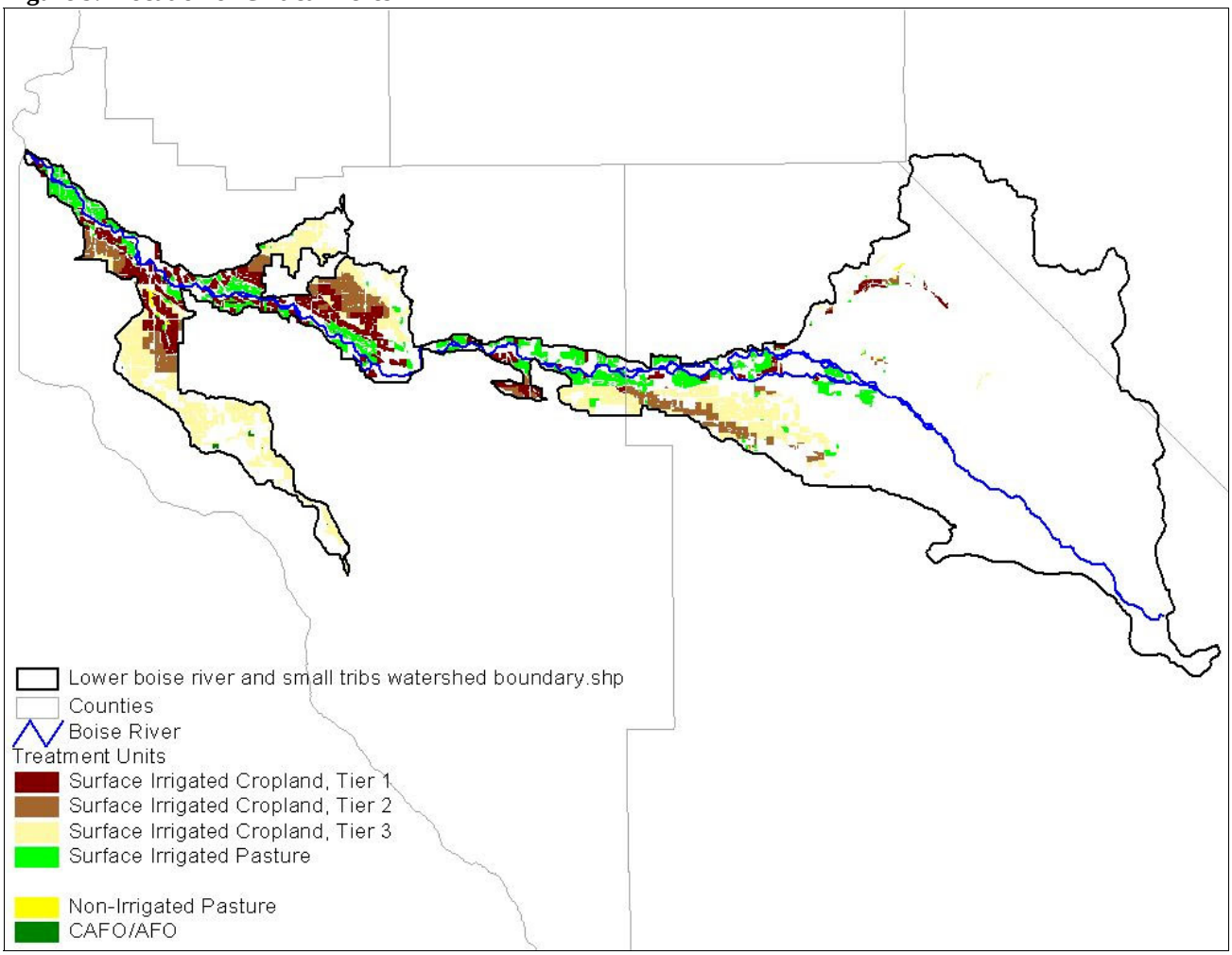
An initial watershed inventory was completed to determine the land areas that affect Lower Boise River Riparian and Small Drainage Subwatershed. Aerial photos, topographic maps and field investigations were all utilized to determine the land areas that impact the water quality of Lower Boise River Riparian and Small Drainage Subwatershed.

Drainage ditches, irrigation supply canals, topography transitions, and roads determine the route of the irrigation wastewater and natural drainage. Irrigation wastewater flows can be intercepted by the canals, drains or reused by neighboring farms, then in turn be reused or intercepted by other drains or canals.

Land treatment though BMP installation will be pursued in three tiers. Agricultural lands that drain directly into Lower Boise River Riparian and Small Drainage Subwatershed will be a Tier 1, high priority for treatment because these lands have the most immediate impact on Lower Boise River water quality. Drainage water from Tier 2 lands is reused once

on Tier 1 lands before discharging to the Lower Boise River Riparian and Small Drainage Subwatershed, and are given a medium priority for treatment. Tier 1 & 2 acres are the Critical Acres within Treatment Unit 2. Drainage water from Tier 3 lands is reused multiple times on Tier 1 and Tier 2 lands before discharging to the Lower Boise River Riparian and Small Drainage Subwatershed, and are given a low priority for treatment.

**Figure 9. Location of Critical Acres**




**Critical Acres within each Treatment Unit:**

| | |
|---|---|
| Treatment Unit 1 | 7,902 acres of Tier 1 surface irrigated cropland<br>6,119 acres of Tier 2 surface irrigated cropland<br>15,419 acres of Tier 3 surface irrigated cropland |
| Treatment Unit 2 | 9,120 acres of surface irrigated pasture |
| Treatment Unit 3 | There are no critical acres within this treatment unit (Sprinkler) |
| Treatment Unit 4 | 47 units of CAFO/AFO |

# 7.0 Implementation Plan BMPs

Agricultural conservation and soil erosion practices are typically referred to as Best Management Practices (BMPs). These practices are nationally derived systems to control, reduce, or prevent soil erosion and sedimentation on agricultural landuses (APAP, 1991). BMPs are selected to reduce irrigation-induced and streambank erosion, contain and filter sediment, nutrients, and bacteria from irrigation wastewater, contain and properly dispose of animal wastes, and reduce leaching of nutrients and pesticides. This will improve the quality of surface waters in the project area and reduce pollutant loading to the Lower Boise River. The status of the beneficial uses for these waters will be maintained or improved with the implementation of this alternative.

BMPs include, but are not limited to, the following:

**Table 7. Treatment Unit 1: Surface Irrigated Cropland**

| | |
|---|---|
| Agro-Tillage | Conservation Cropping Sequence |
| Conservation Tillage | Cover and Green Manure Crop |
| Filter Strips | Grassed Waterway |
| Surge Irrigation System | Sprinkler Irrigation System |
| Tailwater Recovery System | Irrigation Water Management Systems |
| Straw Mulching | Nutrient Management |
| Pest Management | Sediment Basin |
| Underground Outlet | Chiseling and Subsoiling |
| Waste Utilization | Channel Vegetation |
| Drip Irrigation System | PAM |
| Irrigation Water Conveyance | |

**Table 8. Treatment Unit 2: Surface Irrigated Pasture**

| | |
|---|---|
| Fencing | Stream channel stabilization |
| Heavy use area protection | Offsite watering |
| Filter strips | Waste Utilization |
| Spring water development | Waste Storage System |
| Irrigation systems | Nutrient Management |
| Pasture and Hayland Planting | Planned Grazing System |
| Livestock Watering Facility | Pasture and Hayland Management |

**Table 9. Treatment Unit 4: CAFO/AFO**

| | |
|---|---|
| Waste Management System | Heavy use area protection |
| Filter strips | Livestock Watering Facility |
| Nutrient Management | Fencing |

## 7.1 Example Description of Alternatives for Surface Irrigated Cropland

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($800/ acre) | SITE SPECIFIC BMP Alternative #2 ($500/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Irrigation Water Mgt. | Irrigation Water Mgt. | Irrigation Water Mgt. |
| Sprinkler Irrigation System | Land Leveling | Concrete Ditch |
| Nutrient Mgt. | Surface Irrigation System | Filter Strip |
| Conservation Crop Rotation | Gated Pipe | PAM |
| | Tail Water Recovery System | Sediment Basin |
| | Nutrient Mgt. | Nutrient Mgt. |
| | Conservation Crop Rotation | Conservation Crop Rotation |
| | Conservation Tillage | Conservation Tillage |

## 7.2 Example Description of Alternatives for Surface Irrigated Pasture

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($450/ acre) | SITE SPECIFIC BMP Alternative #2 ($350/ acre) | SITE SPECIFIC BMP Alternative #3 ($250/ acre) |
|---|---|---|
| Fencing | Fencing | Fencing |
| Planned Grazing System | Planned Grazing System | Pasture & Hayland Mgt. |
| Pasture & Hayland Mgt. | Pasture & Hayland Mgt. | Nutrient Mgt. |
| Nutrient Mgt. | Nutrient Mgt. | Livestock Watering Facility |
| Heavy Use Area Protection | Livestock Watering Facility | Irrigation Water Mgt. |
| Livestock Watering Facility | Irrigation Water Mgt. | Field Border Irrigation System |
| Irrigation Water Mgt. | Field Border Irrigation System | |
| Field Border Irrigation System | | |
| Gated Pipe | | |

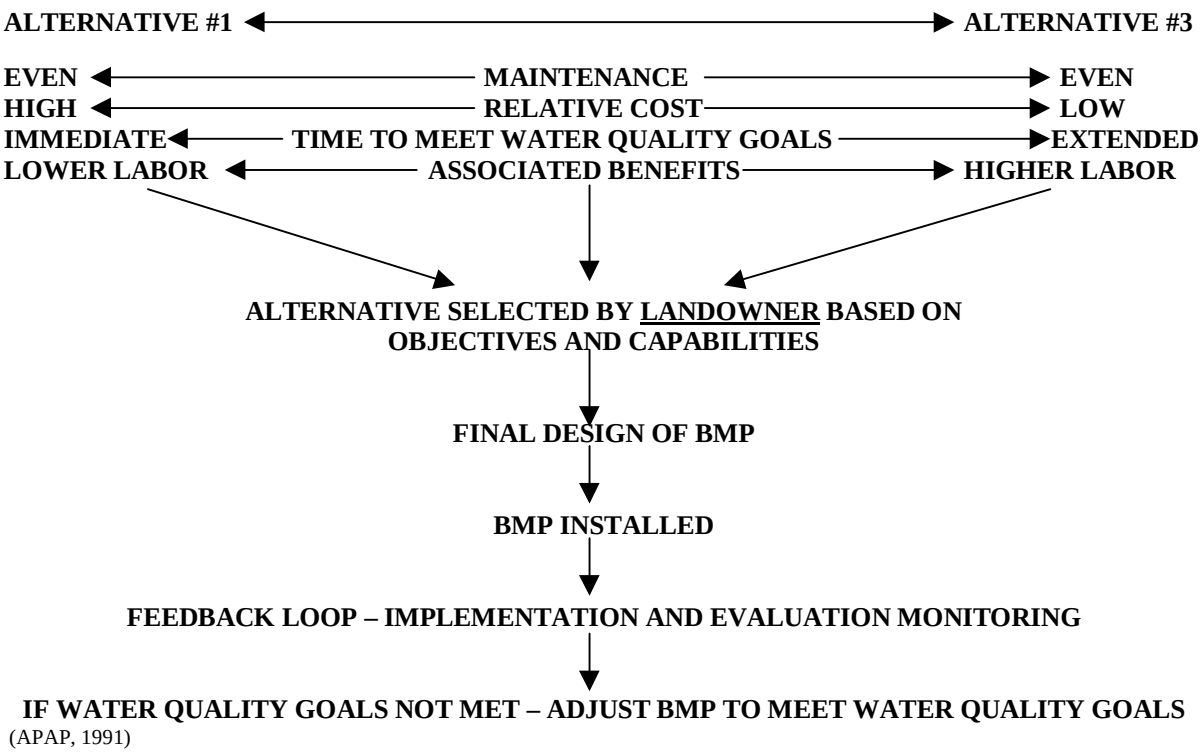
## 7.3 Example Description of Alternatives for CAFO/AFO

Procedure: Conduct Resource Inventory and Site Assessment, Evaluate Data to Develop Site Specific BMP Alternatives.

| SITE SPECIFIC BMP Alternative #1 ($50,000/ each) | SITE SPECIFIC BMP Alternative #2 ($35,000/ each) | SITE SPECIFIC BMP Alternative #3 ($25,000/ each) |
|---|---|---|
| Nutrient Mgt. | Waste Mgt. System | Waste Mgt. System |
| Heavy Use Area Protection | Nutrient Mgt. | Nutrient Mgt. |
| Livestock Watering Facility | Livestock Watering Facility | Filter strip |
| Filter strips | Filter strips | Heavy Use Area Protection |
| Waste Mgt. System | Heavy Use Area Protection | |
| Dike | | |

## 7.4 Graphic Comparison of BMP Selection and Implementation Process

The site specific BMP Alternative is chosen based on a variety of factors, but typically reflect the landowner's objectives in conjunction with the resource concerns identified by the assisting agency. The following flow chart provides a graphic representation of selection process and some comparisons between Alternative #1(high cost), Alternative #2 (moderate cost), and Alternative #3 (low cost) for the various treatment units. The chart applies to each of the three treatment units identified in sections 7.1 through 7.3.



(APAP, 1991)

## 7.5 BMP Costs

Due to the variability in agriculture, these prices per acre are best professional judgement. With changes in technology, land ownership, crops, agricultural commodities, landuse, and public perception, these costs and acres will change.

Lower cost BMPs are usually temporary in nature and do not address underlying issues relating to irrigation systems and irrigation water management. The yearly maintenance and labor cost of Alternative 3 BMPs are higher than those for Alternative 1 BMPs.

## 7.6 Feedback Loop

The feedback loop a process to evaluation and refinement of BMPs. The feedback loop occurs in four steps:

1. The process begins by developing water quality criteria to protect the identified beneficial uses of the water resource.
2. The existing water quality as compared to the water quality criteria established in Step 1, is the basis for developing or modifying BMPs.
3. The BMP is implemented on-site and evaluated for technical adequacy of design and installation.
4. The effectiveness of the BMP in achieving the criteria established in Step 1 is evaluated by comparison to water quality monitoring data. If the established criteria are achieved, the BMP is adequate as designed, installed and maintained. If not, the BMP is modified and the process of the feedback loop continues.

# 8.0 Program of Implementation

The Canyon Soil Conservation District along with the Ada Soil & Water Conservation District has selected land treatment through application of a combination of BMPs including improved irrigation systems, nutrient and sediment control systems, and management practices. There are currently no sources of funding available for cost-share assistance specifically within the Lower Boise River Riparian and Small Drainage Subwatershed priority area. While there are a handful of federal and state site-specific programs available to interested participants on a farm by farm basis, Lower Boise River Riparian and Small Drainage Subwatershed has yet to be selected as a priority area with its own specific project area. Should funding become available for use specifically in the Subwatershed, the implementation of BMPs and distribution of incentive payments will likely be focused within the riparian corridor downstream from the city of Star where the majority of Tier 1 acreage is located.

## 8.1 Installation and Financing

The USDA Natural Resources Conservation Service (NRCS) is the technical agency that will assist the Idaho Soil Conservation Commission (ISCC), Ada SWCD, and Canyon SCD in developing water quality plans and designs. BMPs will be installed according to standards and specifications contained in the NRCS Field Office Technical Guide. NRCS and ISCC will assist Canyon SCD with certification of installed BMPs, filing payment applications, completion of annual status reviews on contracts, annual development of an average cost list, and will provide any needed follow-up assistance such as that required for contract modification.

Each participant will be responsible for installing the BMPs scheduled within their contract as planned in the Conservation Plan. Any needed land rights, easements or permits necessary for construction and inspection will be the sole responsibility of the participant. Each participant will also be required to make their own arrangements for financing their share of installation costs.

**Table 10. Estimated BMP Cost Summary for Treatment Unit 1, Tier 1 (Surface Irrigated Cropland: 7,902 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 7902 | $ 6,321,600 |
| Alternative 2 | $500/AC | 7902 | $ 3,951,000 |
| Alternative 3 | $250/AC | 7902 | $ 1,975,500 |

**Table 11. Estimated BMP Cost Summary for Treatment Unit 1, Tier 2 (Surface Irrigated Cropland: 6,119 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 6119 | $ 4,895,200 |
| Alternative 2 | $500/AC | 6119 | $ 3,059,500 |
| Alternative 3 | $250/AC | 6119 | $ 1,529,750 |

**Table 12. Estimated BMP Cost Summary for Treatment Unit 1, Tier 3 (Surface Irrigated Cropland: 15,419 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $800/AC | 15,419 | $ 12,335,200 |
| Alternative 2 | $500/AC | 15,419 | $ 7,709,500 |
| Alternative 3 | $250/AC | 15,419 | $ 3,854,750 |

**Table 13. Estimated BMP Cost Summary for Treatment Unit 1 (Surface Irrigated Pasture: 9,120 acres)**

| ALTERNATIVE | | ACRES | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $450/AC | 9120 | $ 4,104,000 |
| Alternative 2 | $350/AC | 9120 | $ 3,192,000 |
| Alternative 3 | $250/AC | 9120 | $ 2,280,000 |

**Table 14. Estimated BMP Cost Summary for Treatment Unit 5 (CAFO/AFO 47 Units).**

| ALTERNATIVE | | UNITS | TOTAL COSTS |
|---|---|---|---|
| Alternative 1 | $50,000/each | 47 | $ 2,350,000 |
| Alternative 2 | $35,000/each | 47 | $ 1,645,000 |
| Alternative 3 | $25,000/each | 47 | $ 1,175,000 |

## 8.2 Operation, Maintenance, and Replacement

Participants who install BMPs in conjunction with a state or federal cost-share incentive program will be responsible for maintaining the installed BMPs for the life of their contract. The contract will outline the responsibility of the participant regarding operation and Maintenance (O&M) for each BMP. Landowners are encouraged to maintain installed BMPs after the contract expires. Participants who install BMPs on their own or without the benefit of a cost-share incentive program are not under contract to maintain the BMPs. If the BMPs are installed in response to a conservation plan completed with them by the assisting agencies, landowners are encouraged to maintain the BMPs and incorporate them into their annual operations. It is not required, however, unless they are under contract.

Inspections of BMPs installed in conjunction with a cost-share incentive program will be made on an annual basis by Ada SWCD and Canyon SCD, NRCS, ISCC, and the participant. The intent is to develop a system of BMPs that will protect water quality and is socially and economically feasible to the participant.

## 8.3 Water Quality Monitoring

The City of Boise, USGS and other groups have collected water quality samples in Lower Boise River Riparian and Small Drainage Subwatershed for 2001 irrigation season. U.S. Geological Survey (USGS) has been monitoring the major tributaries to the river at their mouths since 1993. Sampling frequency by USGS has been upgraded to bimonthly for the Subwatersheds starting in April of 1999, then sampled monthly through the winter period. Most samples collected by the various agencies occur on a bimonthly basis throughout the irrigation season (April - October) and on a monthly basis throughout the rest of the year (winter). Data parameters measured thus far have included DO (dissolved oxygen), temperature, % saturation, conductivity, TDS (total dissolved solids) pH, discharge (cfs), TSS (total suspended solids), TVS (total volatile solids), nitrate/nitrite, TP (total phosphorus), OP (dissolved ortho-phosphorus), fecal coliform, and E-coli.

ISDA along with the ISCC and the Idaho Association of Soil Conservation Districts (ISACD) will develop a water quality monitoring plan that will allow trend analysis of water quality and gauge progress toward meeting the TMDL load reductions. The proper time to revisit the subwatershed for evaluation of water quality improvements will be decided through joint agency cooperation, data review, and BMP implementation evaluation. This could be based on a number of factors including percent of critical acres treated, number of major contributors treated, or a specific time interval.

# 9.0 References

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Scott Koburg, Idaho Association of Conservation Districts, 2001. *Farm Services Agency Data*

Appendix D

# Potential Funding Sources for Stakeholders

**Appendix D: Potential Funding Sources for Stakeholders in the Lower Boise River Watershed**

| Program Name | Sponsoring Agency | Web-Site | Category | | | | | Note |
|---|---|---|---|---|---|---|---|---|
| | | | Pollution Prevention/ Point Source | Stormwater Urban and Suburban/BMP | Agriculture/Non-point Source | Other | All | |
| Water and Waste Disposal Direct and Guaranteed Loans and Grants for Rural Areas - Idaho | USDA - Rural Development | www.usda.gov | X | X | | | | Grant and loan funding to improve water and wastewater facilities and storm drainage systems in rural areas. |
| Acid Mine Drainage Grant | Department of Interior | aspe.os.dhhs.gov | X | | | | | Pollution prevention grants for acid mine drainage clean-up. |
| Public Works and Development Facilities Program | Economic Development Administration | www.doc.gov/eda | X | | | | | Funding for water and wastewater treatment facilities in financially disadvantaged communities. |
| Public Works and Economic Development Program | Economic Development Administration | www.osec.doc.gov | X | | | | | Funding for public works in financially disadvantage communities. |
| Capitalization Grants for Drinking Water State Revolving Fund | Environmental Protection Agency | www.epa.gov | X | | | | | A portion of the drinking water funding may be used for pollution prevention activities. |
| Region 10 Pollution Prevention Grant Program | Environmental Protection Agency | www.epa.gov | X | | | | | Funding for state governments to help industries incorporate better environmental compliance strategies. |
| Planning Grant Program for Wastewater Facilities-Idaho | Idaho Department of Environmental Quality | www.deq.state.id.us | X | | | | | Grant funds for wastewater treatment plant infrastructure improvements. |
| Drinking Water Revolving Loan Fund - Idaho | Idaho Department of Environmental Quality | www.deq.state.id.us | X | | | | | Low interest loans for drinking water improvements. Some funds can be used to improve source water. |
| Planning Grant Program for Drinking Water Facilities - Idaho | Idaho Department of Environmental Quality | www.deq.state.id.us | X | | | | | Grant funding for drinking water improvements. Some funds can be used to improve source water. |
| State Revolving Fund (SRF) | Idaho Department of Water Resources | www.idwr.state.id.us | X | | | | | Loan and grant funds for wastewater treatment improvements. |
| Idaho Water Resource Board Funding Programs | Idaho Department of Water Resources | www.idwr.state.id.us | X | | | | | Loan and grant funds for water infrastructure improvements. Funds to be used for engineering and technical work. |
| Community Facilities Direct and Guaranteed Loans and Grants for Rural Area- Idaho | USDA - Rural Development | www.rurdev.usda.gov | X | | | | | Grant and loan funds to improve essential community facilities in rural areas. |
| Guaranteed Water And Waste Disposal Loans | USDA - Rural Development | www.rurdev.usda.gov | X | | | | | Loans to improve water and wastewater facilities in rural areas. |

**Appendix D: Potential Funding Sources for Stakeholders in the Lower Boise River Watershed**

| Program Name | Sponsoring Agency | Web-Site | Category | | | | | Note |
|---|---|---|---|---|---|---|---|---|
| | | | Pollution Prevention/ Point Source | Stormwater Urban and Suburban/BMP | Agriculture/Non-point Source | Other | All | |
| Range Improvement Fund - 8100 | Bureau of Land Management | www.fs.fed.us | | X | | | | Funding for rangeland management, including grazing. |
| Clean Water Act Water Quality Cooperative Agreements | Environmental Protection Agency | www.epa.gov | | X | | | | Coordination grants for unique approaches to stormwater management. |
| Nonpoint Source Grants-National (319) | Environmental Protection Agency/Idaho Department of Environmental Quality | www.epa.gov, www.deq.state.id.us | | X | | | | Funding for long term solutions to non-point source and stormwater pollution. Includes implementation of BMPs. |
| Transportation Environmental Research Program (TERP) | Federal Highway Administration | www.fhwa.dot.gov | | X | | | | Loan and grant funds available for environmental issues including stormwater improvements. |
| Transportation Equity Act for the 21st Century (TEA-21) - Idaho | Federal Highway Administration/Idaho Transportation Department | www.fhwa.dot.gov | | X | | | | States may spend 20% of grant money for environmental restoration and pollution prevention, including stormwater treatment systems. |
| Idaho Water Resources Board Financial Programs | Idaho Department of Water Resources | www.idwr.state.id.us | | X | | | | Grant funding for drinking water infrastructure and drainage system improvements. |
| Conservation Technical Assistance (CTA) | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | X | | | | Technical assistance for creating a conservation plan. Financial assistance for implementing BMPs. |
| Secure Rural Schools & Community self-determination | Bureau of Land Management | www.fs.fed.us | | | X | | | Funding for forest ecosystem protection/restoration including water quality. |
| Water Quality Special Research Grants Program | Cooperative State Research Education and Extension Service | www.reusda.gov | | | X | | | Research and planning grants for agriculture-related water quality issues. |
| Educational Foundation of America, Environmental Grant Program, The | Educational Foundation of America | www.efaw.org | | | X | | | Funding to develop approaches to sustainable agriculture and water quality restoration. |
| Conservation Reserve Program | Farm Service Agency | www.fsa.usda.gov | | | X | | | Equipment rental assistance for improving non-point source pollution on farm lands. |
| Water Quality Incentives Projects | Farm Service Agency | www.fsa.usda.gov | | | X | | | $25/acre incentive to reduce non-point pollution on farm lands. |
| Farm Services Agency Direct Loan Program | Farm Services Agency | www.fsa.usda.gov | | | X | | | Low interest loans to improve or build pollution abatement structures on farm lands. |

**Appendix D: Potential Funding Sources for Stakeholders in the Lower Boise River Watershed**

| Program Name | Sponsoring Agency | Web-Site | Category | | | | | Note |
|---|---|---|---|---|---|---|---|---|
| | | | Pollution Prevention/ Point Source | Stormwater Urban and Suburban/BMP | Agriculture/Non-point Source | Other | All | |
| Stewardship Incentives Program (SIP) | Idaho Department of Lands | www2.state.id.us/lands | | | X | | | Technical and financial assistance for protection of natural resources on privately owned forested lands. |
| Natural Resource Conservation Tax Credit | Idaho Soil Conservation Commission | www.scc.state.id.us | | | X | | | Landowner tax credit for conservation expenditures. |
| Resource Conservation and Range Development Program (RCRDP) Loans | Idaho Soil Conservation Commission | www.scc.state.id.us | | | X | | | Long-term and low-interest loans to farmers and ranchers for resource management improvements. |
| Water Quality Program for Agriculture (WQPA) | Idaho Soil Conservation Commission | www.scc.state.id.us | | | X | | | Financial incentives for conservation improvements on agricultural land. |
| Resource Conservation and Rangeland Development Program (RCRDP) | Idaho Soil Conservation Commission | www.scc.state.id.us | | | X | | | Grants and loans for rangeland and riparian improvements. |
| State Agricultural Water Quality Program (SAWQP), (1980-1999); Water Quality Cost-Share Program for Agriculture | Idaho Soil Conservation Commission/Idaho State Department of Agriculture | www.scc.state.id.us | | | X | | | Incentives for non-point pollution and water quality improvements. |
| Idaho Riparian Tax Credit (RTC) (Idaho Code §63-3024B) | Interagency State Tax Commission | | | | X | | | Tax incentives to improve or rehabilitate forest, range, and farm lands. |
| Conservation Security Program | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | X | | | Grant funding for water conservation improvements on private lands. |
| Conservation Operations Program (CO-01) | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | X | | | Technical assistance for implementing water quality and conservation measures. |
| Conservation Research and Education | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | X | | | Research grants for conservation improvements on private lands. |
| Conservation Reserve Program (CRP) | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | X | | | Financial incentives to improve cover on highly erodible and environmentally sensitive lands. |
| Environmental Quality Incentives Program (EQIP) | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | X | | | Technical assistance and grant funding where agricultural improvements can improve water quality. |
| Hydrologic Unit Areas (HUAs) | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | X | | | Technical and financial resources for farmers and ranchers to improve non-point pollution. |

**Appendix D: Potential Funding Sources for Stakeholders in the Lower Boise River Watershed**

| Program Name | Sponsoring Agency | Web-Site | Category | | | | | Note |
|---|---|---|---|---|---|---|---|---|
| | | | Pollution Prevention/ Point Source | Stormwater Urban and Suburban/BMP | Agriculture/Non-point Source | Other | All | |
| National Conservation Buffer Initiative | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | X | | | Cost-share funds for protection of riparian resources on farm lands. |
| Resource Conservation and Development (RC&D) | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | X | | | Technical and financial assistance for water quality and conservation efforts and non-point pollution control. |
| Wetlands Reserve Program (WRP) | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | X | | | Cost-share funds for wetland protection and restoration. |
| Wildlife Habitat Incentive Program (WHIP) | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | X | | | Cost-share funds for protection and improvement of fish and wildlife habitat on private lands. |
| Partners for Wildlife (Partners) | US Fish & Wildlife Service | offices.fws.gov | | | X | | | Financial assistance to restore and enhance fish and wildlife habitat on private lands. |
| Common Counsel Foundation (Acorn Foundation) | Acorn Foundation | www.commoncounsel.org | | | | X | | Non-profit environmental group funding. |
| Ben and Jerry's Foundation | Ben & Jerry's Foundation | www.benjerry.com | | | | X | | Non-profit environmental group funding. |
| Planning/Technical Assistance Program | Bureau of Reclamation | www.usbr.gov | | | | X | | Data Collection grants for water resources and natural resource management. |
| Environmental Monitoring for Public Access and Community Tracking (EMPACT) | Environmental Protection Agency | www.epa.gov | | | | X | | Funding to improve public access to water quality monitoring data. |
| Watershed Assistance Grants | Environmental Protection Agency | www.rivernetwork.org | | | | X | | Water Advisory Group (WAG) funding. |
| Science to Achieve Results Program | Environmental Protection Agency | www.epa.gov | | | | X | | Research grants to improve pollution prevention and ecological risk assessment. |
| FishAmerica Grant Program | FishAmerica Foundation | www.asafishing.org | | | | X | | Grant funding for fish habitat and water quality improvements. |
| Fund for Wild Nature Grant Program | Fund for Wild Nature | www.fundwildnature.org | | | | X | | Grant funding for research related to native species and wild ecosystems. |

**Appendix D: Potential Funding Sources for Stakeholders in the Lower Boise River Watershed**

| Program Name | Sponsoring Agency | Web-Site | Category | | | | | Note |
|---|---|---|---|---|---|---|---|---|
| | | | Pollution Prevention/ Point Source | Stormwater Urban and Suburban/BMP | Agriculture/Non-point Source | Other | All | |
| Water Resources Research Institute | Idaho Water Resources Research Institute | www.uidaho.edu | | | | X | | Research funding to improve water management and quality. |
| Lawrence Foundation, The | Lawrence Foundation | www.thelawrencefoundation.org | | | | X | | Grants for pressing environmental issues to non-profit organizations. |
| Mountaineers Foundation Environmental Program, The | Mountaineers Foundation | www.mountaineersfoundation.org | | | | X | | Grants for study and enhancement of mountains, forests, and streams in the Pacific Northwest. |
| National Fish and Wildlife Foundation, The | National Fish and Wildlife Foundation | www.nfwf.org | | | | X | | Grants for wildlife, fish, plant, and habitat conservation. |
| Patagonia Environmental Grants | Patagonia | www.patagonia.com | | | | X | | Grant funding to non-profit organizations for long-term environmental improvements. |
| Paul G. Allen Forest Protection Foundation, The | Paul G. Allen Forest Protection Foundation | www.pgafoundations.com | | | | X | | Grant funding to non-profit organizations for Northwest watershed improvements. |
| Pew Charitable Trusts Environmental Program, The | Pew Charitable Trusts | www.pewtrusts.com | | | | X | | Grant funding for forest, wilderness, and marine eco-system protection. |
| Pheasants Forever | Pheasants Forever | www.pheasantsforever.org | | | | X | | Cost-share funding for wildlife habitat enhancements. |
| Public Welfare Foundation - Environment Grants | Public Welfare Foundation | www.publicwelfare.org | | | | X | | Grant funding to non-profit organizations for pollution control in disadvantage communities. |
| Cooperative Endangered Species Conservation Fund | US Fish & Wildlife Service | offices.fws.gov/statelinks.html | | | | X | | Financial assistance to protect endangered species. |
| Rural Community Assistance Program | US Forest Service | www.fs.fed.us | | | | X | | Technical and financial assistance to protect and improve forest and natural resources in small communities. |
| Emergency Community Water Assistance Grant Program | USDA - Rural Development | www.rurdev.usda.gov | | | | X | | Emergency funds to improve water quality in rural areas. |
| National Research Initiative Competitive Grant Programs | USDA - US Department of Agriculture | www.usda.gov | | | | X | | Research grants for study of water resources assessment and protection. |

**Appendix D: Potential Funding Sources for Stakeholders in the Lower Boise River Watershed**

| Program Name | Sponsoring Agency | Web-Site | Category | | | | | Note |
|---|---|---|---|---|---|---|---|---|
| | | | Pollution Prevention/ Point Source | Stormwater Urban and Suburban/BMP | Agriculture/Non-point Source | Other | All | |
| Water Conservation Program | USDA - US Department of Agriculture | www.usda.gov/farmbill | | | | X | | Cost-share incentives for surface water conservation. |
| Bonneville Environmental Foundation Watershed Program, The | Bonneville Environmental Foundation | www.b-e-f.org | | | | | X | Watershed restoration grants. |
| Bullitt Foundation (Rivers, Wetlands, Estuaries, and Marine Ecosystems Grant Program), The | Bullitt Foundation | www.bullitt.org | | | | | X | Aquatic resources protection grants. |
| Challenge Cost-share Program | Bureau of Land Management | www.fs.fed.us | | | | | X | Funding for fish and wildlife enhancement. |
| Doris Duke Charitable Foundation, The | Doris Duke Charitable Foundation | www.fdncenter.org | | | | | X | General environmental and sustainable natural resource grants. |
| Water Pollution Control - State and Interstate Program Support | Environmental Protection Agency | www.epa.gov | | | | | X | Water pollution prevention grants. |
| Wetland Protection, Restoration, and Stewardship Discretionary Funding | Environmental Protection Agency | www.epa.gov | | | | | X | Funding for wetland restoration and sediment management. |
| Tribal and State Wetland Planning and Protection Grants | Environmental Protection Agency | www.epa.gov | | | | | X | Funding for state and local governments to improve wetland resources. |
| Water Pollution Control - State Revolving Loan Fund - Idaho | Idaho Department of Environmental Quality/Environmental | www.deq.state.id.us | | | | | X | Loans for point source, non-point source, and stormwater pollution control. |
| Small Watersheds (PL-566) | Natural Resources Conservation Service | www.wi.nrcs.usda.gov | | | | | X | Technical and financial assistance for water quality, flood control, and water conservation improvements. |
| Rockefeller Family Fund (Environmental Grants Program) | Rockefeller Family Fund | www.rffund.org | | | | | X | Grants funds for environmental clean-up, pollution control, and natural resources conservation. |
| Skaggs Foundation, The | The Skaggs Foundation | www.skaggs.net | | | | | X | Grant funds for water quality improvements to non-profit organizations. |
| Strong Foundation for Environmental Values, The | The Strong Foundation for Environmental Values | | | | | | X | Grant funds for water resources projects in rural communities. |

**Appendix D: Potential Funding Sources for Stakeholders in the Lower Boise River Watershed**

| Program Name | Sponsoring Agency | Web-Site | Category | | | | | Note |
|---|---|---|---|---|---|---|---|---|
| | | | Pollution Prevention/ Point Source | Stormwater Urban and Suburban/BMP | Agriculture/Non-point Source | Other | All | |
| Turner Foundation Environmental Grant Programs | Turner Foundation | www.turnerfoundation.org | | | | | X | Grant funding to protect water and environment. |
| Basinwide Restoration New Starts General Investigation | US Army Corp of Engineers | www.usace.army.mil | | | | | X | Cost-share funding for basin restoration projects and research. |
| Aquatic Ecosystem Restoration | US Army Corp of Engineers | www.usace.army.mil | | | | | X | Financial assistance for aquatic, riparian, and wetland restoration and protection projects. |
| Environmental Restoration | US Army Corp of Engineers | www.usace.army.mil | | | | | X | Funds for improving impacts of Corp of Engineer projects on fish and wildlife habitat. |
| Planning Assistance | US Army Corp of Engineers | www.usace.army.mil | | | | | X | Corp of Engineer assistance in preparing plans for conservation of water and related resources. |
| Small Watershed Rehabilitation Program | USDA - US Department of Agriculture | www.usda.gov/farmbill | | | | | X | Funding for rehabilitation of small watershed impoundments. |

NOTES:
For further information on program funding, contact information, and application deadlines, visit the Directory of Watershed Resources and perform a keyword search.
This directory can be found on-line at ssrc.boisestate.edu. For questions about the directory call the Environmental Finance Center at Boise State University 1-866-627-9847.

This appendix documents the comments received during the 43-day comment period for the Lower Boise River Total Maximum Daily Load Implementation Plan. The originally scheduled comment period extended from June 27, 2003 to July 25, 2003. However, several stakeholders requested an extension and the comment period was extended to August 8, 2003.

| **Comments From:**<br>Keith Griswold<br>Natural Resource Conservation Commission<br>Received via e-mail: July 7, 2003 | **Response:** |
|---|---|
| 1) Pg29 Third paragraph, third sentence. Please add Indian Creek to this list of creeks for location, loads and growth. | Ok. |
| 2) Pg 39 & 40 Last paragraph on page 39 and the rest of the paragraph on pg 40. I do not believe this statement to be true. There are quite a few older houses throughout Canyon and Ada counties that have grey water from septic systems going into drains. I have personal knowledge of houses hooked pipelines that flowed into drains. As for the system failure backing up into the house, that is not true in sandy soils. Old septic tanks could leak into the soil profile and not be noticed by the homeowner. I think CDHD and SWDHD need to inventory older houses and determine the probability of old septic systems contributions to the water. Look at the DNA sampling with Human hits. | The CDHD and SWDHD were consulted when this section was prepared. As such, the information reflects their current thinking. They are the agency with authority over these issues. This suggestion may be an appropriate task as part of the Adaptive Management strategy if bacteria concentrations do not show improvement. |
| 3) Pg43 Last paragraph. A discussion about increasing riparian habitat along the Lower Boise River indicates that more wildlife habitat could be created. A disclaimer statement about the possibility of increased E-coli from wildlife along the riparian area should be mentioned. That brings up a question? Is the increased quantity of E-coli from wildlife concentrations along the riparian corridor anthropogenic? Something to think about. | The possibility of increased E-coli from wildlife along the riparian area due to an increase in riparian habitat would be based on speculation. The DNA data show that “wildlife’ are a source, but does not show where the wildlife reside. In any event, the plan clearly states that while there is a large percentage of wildlife-related bacteria sources, controllable sources such as humans, livestock, and pets still need to be controlled . |
| 4) Pg48 Table 14. The river corridor and small watershed acreage needs to be included in this table. It is missing about 44,000 acres within the LBR watershed. | Table 14 focuses on the major sub-watersheds identified in the TMDL; adding the other 44,000 acres does not provide additional information relevant to the point of this table. |
| 5) Pg55 Table 15. What does "R" and "V" stand for? There is no description for these labels. | Ok. Table 15 has been modified to define R (Required) and V (Voluntary). |
| 6) Figure 6, 7 &11. TVF and COMPASS maps. Indian Creek watershed has a subwatershed named "Wilson Drain". That needs to be added to all the maps on Figure 6, 7 &11. | Ok. Because the large agricultural drain known as Wilson Drain enters Indian Creek above its confluence with the lower Boise River, the Wilson Drain watershed will be added to Figures 6 and 11 (Figure 7 is a figure of the Boise River Corridor, which is unrelated to the Wilson Drain). |
| 7) MAP1 & 2 of the Urban/Suburban Plan. TVF map. Indian Creek watershed has a subwatershed named "Wilson Drain". That needs to be added to all of the MAP 1&2. | Ok. Because the large agricultural drain known as Wilson Drain enters Indian Creek above its confluence with the lower Boise River, the Wilson Drain watershed will be added to MAP 1 & 2. |

| **Comments From:**<br>Keith Griswold<br>Natural Resource Conservation Commission<br>Received via e-mail: July 7, 2003 | **Response:** |
|---|---|
| 8) Pg33 of the Urban/Suburban Plan. Second paragraph. I do not agree with this paragraph at all. Most of the development around Caldwell is located in Dixie Slough. New subdivisions and ranchettes continue to be built off of Ustick and Homedale roads in between Florida and Wagner roads. Most of the subdivisions are located near Valliview High school on the corner Homedale and Montana. This paragraph needs to be significantly changed or totally removed! Urban/suburban land uses are increasing every year and the projected low growth potential is wrong! Go for a drive and look at the quantity of houses less than 5 year old. Field truth is a must. | Ok. Relative to the other sub-watersheds listed in Table 15 of the Umbrella Plan, Dixie Slough has experienced less growth and urban development. Future projections to 2020 may not represent current conditions, particularly near Caldwell in Dixie Slough. This paragraph has been modified to focus more on Hartley Gulch as a low-growth sub-watershed. |

| **Comments From:**<br>Albert Barker<br>Boise Project Board of Control<br>Received via e-mail: August 8, 2003 | **Response:** |
|---|---|
| 1) The Boise Project commends the Department for recognizing that active involvement of the local community in this implementation plan is extremely important. The Boise Project also commends the Department for recognizing that controls over nonpoint sources are entirely voluntarily, both as a legal matter and as a practical matter. Because of the voluntarily nature of the nonpoint source controls, it is imperative that the public entities involved in the TMDL Implementation Plan recognize that collaboration with the landowners is critical to the success of this project, and that locating funding and making funding available for the measures in the Implementation Plan is equally critical. Without adequate funding, the TMDL Implementation Plan will remain nothing more than a plan. The next stages in carrying out this plan must focus on identifying and obtaining sources of funds and making those funds available through the appropriate state and local agencies. | Comment noted. Funding assistance is a task that has been identified within the FY2003 and FY2004 work plan for the LBRWQP. |
| 2) The testing done under the TMDL and water body assessment process for the Lower Boise has identified a number of nontraditional sources of pollution to the river, including wildlife, waterfowl and household pets. Unfortunately, the Implementation Plan does not seem to adequately address these less traditional sources of loading of pollutants, and their contribution to bacteria loading to the Lower Boise River. | The implementation plan addresses the DNA data to the maximum extent possible, given the constraints of the data. The DNA data were not quantified in terms of source. As such, the relative contribution from each “non-traditional” source cannot be quantified. However, these data should be used to help prioritize funding and application of resources, particularly to “traditional” controllable sources. As additional E. coli monitoring data are collected and bacteria loads are reallocated, “uncontrollable” sources are anticipated to be addressed. |

| **Comments From:**<br>Albert Barker<br>Boise Project Board of Control<br>Received via e-mail: August 8, 2003 | **Response:** |
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| 3) Page 3 of the TMDL Implementation states that the river segment for Lucky Peak to Barber Park is a listed segment for "flow alteration" as a pollutant. The DEQ and EPA have made it clear that flow alteration is not a pollutant. That segment should come off the 303d listed segment, and the TMDL should not make any "pollution budgets" for flow alteration. | This Implementation Plan summarizes the basis and conclusions of the approved TMDL. Since the TMDL was approved, DEQ has developed an updated integrated 2002 303(d)/305(b) list. Flow and habitat alteration will appear on Section 4C of the 2002 303(d) list. This section is reserved for non-traditional pollutants for which a TMDL cannot be prepared. |
| 4) The Implementation Plan at pages 5 and 6 is unclear on the interplay between the Plan and the storm water discharge regulations. The Implementation Plan should make it clear that all storm water discharge that falls under Phase I or Phase II Programs must, at the very least, meet those guidelines, and may be subject to additional measures if necessary to achieve water quality standards. The Ninth Circuit Court of Appeals has stated in its decision affirming the Phase II regulations that "storm water runoff is one of the most significant sources of water pollution in the nation, at times comparable to, if not greater than, contamination from industrial and sewage sources. Storm waters carry suspended metals, sediments, algae-promoting nutrients (nitrogen and phosphorous), floatable trash, used motor oil, raw sewage, pesticides, and other toxic contaminants into streams, rivers, lakes, and estuaries across the United States. . . . Among the sources of storm water contamination are urban development, industrial facilities, construction sites, and illicit discharges and connections to storm sewer systems." *Environmental Defense Center, Inc. v. Environmental Protection Agency,* Case No. 00-70014 (Jan.14, 2003). These storm water regulations are directed at a significant issue in the Lower Boise River, expanding urban and suburban development. The court and EPA has identified this as a potentially significant, if not the most significant, source of pollutants, and the Lower Boise Implementation Plan must focus on the storm water regulations, and such other measures as are necessary to prevent urban and suburban development runoff from causing impairment to the Boise River. | This section focuses on the background for the Implementation Plan; actual activities identified to meet the requirements of the TMDL are outlined in subsequent sections of the plan. For example, in *Urban and Suburban Storm Drainage Pollution Control Efforts*, the plan clearly states that "all entities within the watershed must meet EPA stormwater requirement to meet the goals of the TMDL." As part of the Adaptive Management strategy outlined in the document, additional measures that may be necessary (including point discharges and nonpoint source runoff) will be identified within a phased framework.<br>DEQ and LBRWQP understand that recent court decisions have recognized the importance of managing storm water for the protection of water quality. In the lower Boise River, studies conducted by USGS and local stakeholders (e.g., DEQ 2000 and Kjelstrom 1995) suggest that elevated sediment and bacteria concentrations are more commonly associated with the rural downstream portion of the watershed. As all areas of the watershed are further developed, the plan indicates that stakeholders must comply with EPA Phase I and II NPDES stormwater regulations to prevent urban and suburban development runoff from causing impairment to the lower Boise River. |

| **Comments From:**<br>Albert Barker<br>Boise Project Board of Control<br>Received via e-mail: August 8, 2003 | **Response:** |
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| 5) Indeed, the Lower Boise River TMDL Implementation for Agriculture, at page 15, states that, "the landscape of the Lower Boise River watershed is changing every year as prime agricultural lands are rapidly being subdivided for housing and converted to urban and suburban areas." This conversion of agricultural land to urban and suburban areas is, and has been, recognized by the EPA as a significant source of contribution to water body impairment. Where, as here, the impairments are from sediment and bacteria found in urban and suburban runoff, and particularly runoff from areas being converted from farm ground, and the impairment from bacteria primarily arise from nontraditional sources in runoff, including wildlife, waterfowl, and pets, the agricultural users of the Boise River are concerned that insufficient attention is paid to these urban and suburban areas and nontraditional pollution, when compared to agricultural uses. For example, at page 22 of the Agricultural Implementation Plan, it states, "land uses not having a significant exposed soil surface, such as urban streets and residential areas, do not contribute much sediment to the river because of minimal precipitation and limited exposed soil." However, what this statement fails to recognize is the significant exposed soil surface that occurs during the process of conversion from farms to housing, which is rapidly underway in portions of the Lower Boise River drainage. The statement also does not acknowledge storm water as the source of these other pollutants identified by EPA and the Ninth Circuit. | Analyses in the lower Boise River TMDL have shown that both urban and suburban stormwater runoff and agricultural runoff are contributors to nonpoint source pollution and the Implementation Plan addresses both of these sources. Because the development of rural land has the potential to disturb soil, EPA's General Permit for Construction Activities (issued in 2003) covers construction activities associated with new development. As appropriate, urbanizing areas are also required to comply with EPA Phase I and II NPDES stormwater permits. |
| 6) The section in the Draft Implementation Plan concerning the bacterial DNA testing project, pages 18-22, recognizes that large percentages of runoff of bacteria sources are from wildlife 15.4%, waterfowl 34.9%, and pets 21.6%. Livestock makes up only 10.9% of the runoff, and human sources equals 17.1% of the identifiable samples. Control for the human sources of bacteria should be dealt with through the wastewater treatment facilities or POTWs. The livestock contribution can be dealt with, to some degree, by the agriculture BMPs identified in the Implementation Plan. The difficulty with the TMDLs Implementation Plan is it does not provide much of a plan for dealing with wildlife, waterfowl and pet contributions to the bacteria violations which make up 72% of the loading. While contributions from pets are listed as a controllable source, the methods of controlling that source of bacteria loading are not adequately identified in the Implementation Plan. | The emphasis of the plan is to identify the sources that are controllable using BMPs. For that reason, methods to control wildlife and waterfowl sources are not addressed and are beyond the scope of this plan. Regarding the control of pet waste, the Phase I permit currently in place and the Phase II permits that will soon be in place throughout the valley will largely address that issue. |

| **Comments From:**<br>Albert Barker<br>Boise Project Board of Control<br>Received via e-mail: August 8, 2003 | **Response:** |
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| 7) Both the Implementation Plan and the Agricultural Implementation Plan state that irrigation water management is the most effective way for addressing water quality concerns. The Plans state that sprinkler and drip irrigation are the type of advanced irrigation systems which are most effective in irrigation water management. In the Boise drainage, there are a number of small farms where sprinkler irrigation is not cost effective to install or operate. There are also many seed crops which do not respond properly to sprinkler irrigation. The Plan, at least as it affects many land uses and water users in the Boise, places too much emphasis on these advanced water management programs such as sprinklers. The Implementation Plan should further recognize that there are other, unintended consequences of moving to more intensive water management methods, particularly sprinkler and drip irrigation. The recharge of the groundwater and the recharge to the Boise River from groundwater will be diminished with these measures aggressively pursued. There will be water quantity and water quality implications to surface and groundwater from conversion to this water management concept that are not thought-through in this Plan. | From a water quality protection standpoint, sprinkler and drip irrigation methods have been shown to be very effective at controlling sediment, bacteria, and nutrient runoff. However, DEQ and LBRWQP agree that these methods may not be appropriate or feasible for every farm. Further, DEQ and LBRWQP recognize that conversion to sprinkler and drip irrigation methods may have consequences on water quantity and groundwater return flows. These are issues that will continue to be addressed as the water resources in the Treasure Valley are managed for future growth. |
| 8) The Plan also describes the effluent trading demonstration project. The Plan should emphasize ways to provide funding for and maximize the use of effluent trading by point source and storm water dischargers to assist in providing the Agricultural BMPs, which is not being used to a significant degree at this time. | Comment noted. Funding assistance is a task that has been identified within the FY2003 and FY2004 work plan for the LBRWQP. |
| 9) The Implementation Plan identifies a cost of $73.7 million for a “moderate” level of BMPs on critical acres. The Boise Project is concerned that the $73.7 million estimate may not be sufficient based on other estimates that have been prepared for implementing agricultural BMPs in the Boise drainage. | The costs were estimated by the SCC, which is the designated management agency for agricultural non-point source activities. Other projections based on different methodologies would be expected to provide different estimates. |

| **Comments From:**<br>Albert Barker<br>Boise Project Board of Control<br>Received via e-mail: August 8, 2003 | **Response:** |
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| 10) The Appendix C Implementation Plan for Agriculture states that the goal of the agricultural BMP is to enhance both surface water quality and groundwater quality. While the TMDL Implementation Plan may have incidental benefits to groundwater quality, the goal of the TMDL process is based upon the authority of the federal government under the Clean Water Act, which applies to surface waters, not to groundwater. The reference to groundwater quality enhancement, as a goal of the TMDL Implementation Plan, should be removed because it overstates the authority of the TMDL process. | DEQ and LBRWQP clearly understand that the CWA regulates surface waters and not groundwater; it is not the intent of the TMDL or the Implementation Plan to overstate the authority of this regulation. Despite preliminary USGS data that indicate a link between groundwater quality and surface water quality (particularly for phosphorus), this goal has been removed from the Agricultural Implementation Plan. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| Individual sections appear to have been written at different times. I would recommend that the entire document undergo technical editorial review to ensure that the technical terms used are consistent; up to date data, information, and reports have been utilized; and the organization of information presented is more cohesive. | The DEQ and LBRWQP agree that technical sections should contain up-to-date data and information. In terms of reorganizing the plan to provide a more cohesive document, the LBRWQP elected to delay this step until the plan is revised to incorporate implementation requirements resulting from the Snake River-Hells Canyon TMDL. |
| 1) Organization of Plan, Page 1, Paragraph 1: The Plan would benefit from additional discussion of the state statue (58.01.02.054) and guidance concerning implementation plans. The Idaho TMDL Guidance document (June 8, 1999) contains discussion of implementation plans on pages 11-12. | Comment noted. The 1999 Idaho TMDL guidance document discussion is consistent with the EPA 2003 Draft Watershed Rule that is already summarized in *Organization of the Plan*. |
| 2) Summary of Basin Assessment and TMDL, Page 3, Table 1: Assessment Unit (AU) boundaries. The TMDL and Plan use the AUs contained in the original listings and approved TMDLs. Recently IDEQ changed the AUs for the lower Boise River, some rather substantially. We recommend that the Plan include the "original" AUs contained in the final approved TMDL. | Ok. |
| 3. Subbasin Assessment and TMDL Development Page 4, Paragraph 2: This discussion would be improved if the following items were added:<br>1. "non-impairment" findings in LBR TMDL for nutrients and subsequent work;<br>2. NNI for nutrients with allowance for trading;<br>3. Anticipation that controls to address SR-HC would be forth coming; | This information is summarized within the *Sediment TMDL Load and Wasteload Allocation* and *Bacteria TMDL Load and Wasteload Allocation* subsections. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 4) Subbasin Assessment and TMDL Development Page 5, Paragraph 1: This section would benefit from additional discussion concerning the Bacteria studies and the TMDL objective to meet water quality standards, including anticipated future at the time and now adopted E. coli criteria. | This information is summarized within the *Bacteria TMDL Load and Wasteload Allocation* subsection. |
| 5) Subbasin Assessment and TMDL Development Page 6, Paragraph 2: Delete "appropriate" and use "currently adopted" or "applicable guidance". | Ok. |
| 6) Sediment TMDL Load and Wasteload Allocations, Page 6, Paragraph 1: Is the sediment TMDL seasonal? If so, this needs to be clarified so that monitoring and assessment actions discussed later in the Plan are conducted during the proper timeframes and with the appropriate data. | Application of the targets is not seasonal, it is annual because beneficial uses that are to be protected occur on a year-round basis. However, the critical period upon which the TMDL was based is seasonal (February 15 – June 14) because this is the period that coincides with when the lowest mainstem flow receives the largest sediment inputs to the river. Monitoring should, at a minimum, occur in this time frame to determine whether load reductions during this period are being achieved. |
| 7) Page 7, Paragraph 2: The spring flow period was the identified critical period the allocations were based on. | Ok |
| 8) Page 7, Paragraph 2 and 3: The final SRHC TMDL has been submitted to the EPA. The descriptions included here should be updated. | Ok. |
| 9) Page 7, Footnote 2: Add "with provision for trading" after "no-net-increases". | . This footnote is from an earlier draft version and was deleted from the public draft version. |
| 10) Sediment Wasteload Allocations for Point Sources, Page 8, Paragraph 1: This section would benefit from additional discussion to clarify this point. We suggest something like "provide treatment well beyond the instream targets, and provide additional assimilative capacity" after "already remove 85 percent or more suspended solids,".<br>And "plus a reserve for future growth" after "either in current or draft permits". | Ok. |
| 11) Bacteria TMDL Load and Wasteload Allocations, Page 11, Paragraph 1: This section would benefit from additional discussion -clarification, something like the following proposed text: "Compliance with the lower Boise River bacteria TMDL will be evaluated using the applicable state water quality standards (E. coli) to maintain the intent of the TMDL will remain the same (to protect human health using the applicable standard). | Ok. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
|---|---|
| 12) Bacteria Load Allocations for Non-Point Sources, Page 15, Paragraph 4: A figure of the Phase 1 sampling locations is strongly recommended. This map will demonstrate that not all of the storm drains monitored enter the Boise River directly. | Because the locations of the Phase 1 monitoring locations may change as part of the next permit reissue process, this fact will be stated within the text and a figure is not included. |
| 13) Table 6, Page 17. This table would benefit from two additions,<br>1. reiteration of the applicable standards; and,<br>2. addition of a second column titled "% of TMDL Target" with calculated percentages for the monthly geomean standard. | Ok. The applicable standards have been added for context. Point #2 is not appropriate because NPDES Permit limits are based on monthly, weekly and daily limits. As such, comparing the average CFU geometric mean to the TMDL target is not necessarily accurate. However, the reiteration of the former fecal coliform standards illustrates the relatively low contribution from point sources. |
| 14) Bacteria Wasteload Allocations for Point Sources, Page 17, Paragraph 1: We suggest that the first sentence be clarified as follows: "Wasteload allocation for municipal NPDES discharges were **included as** permit limits, which are the water quality criteria in effect at the time of permit issuance." | Ok |
| 15). Bacteria DNA Testing Project, Page 18, Paragraph 1: We suggest the following modification to the third sentence to read: "The DNA Testing was used to identify potential sources of bacteria at selected sampling locations in the Boise River and major tributaries." | Ok |
| 16) Testing Results and Analysis, Page 18, Paragraph 1: The draft would benefit from use of consistent nomenclature concerning E coli in this section. Strains, isolates and colonies are all used in this section. We suggest the use of "colonies" throughout the Plan. | Ok |
| 17) Testing Results and Analysis, Page 19, Paragraph 3: We suggest that additional discussion regarding water quality standards compliance to put E. coli data in perspective at or near here (e.g. probably needs to be on prior page). | Ok. Language has been added regarding the *E. coli* water quality standard has been added, but the plan will not include any conclusions regarding support status. \ |
| 18) Potential Impact on Bacteria TMDL Goals, Page 20, Paragraph 1: In the first sentence, change "identifiable isolates" to "identifiable colonies." | Ok. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 19) Potential Impact on Bacteria TMDL Goals, Page 21, Paragraph 3: We suggest:<br>1. the second sentence change from "E. coli standard is not necessary." To "E. coli standard **was** not necessary"; and,<br>2. the fifth sentence change "complying with either standard ensures that public health is protected." to "complying with **the E. coli standard** ensures that water quality standards are satisfied and that public health is protected.";<br>3. discussion on Page 10-11 be added regarding water quality standards; and,<br>4. Deletion of the last two sentences of the third paragraph. | Ok except for Point #4. Additional language has been added to clarify aquatic life beneficial uses and recreational beneficial uses, in order to provide more context to the last two sentences of the third paragraph. |
| 20) Point Source Pollution Control Efforts, Page 23, Paragraph 1: Change "WWTP" in the paragraph and document to "WWTF". | Ok |
| 21) Urban and Suburban Storm Drainage Pollution Control Efforts, Page 26, Paragraph 3: The Boise Phase I co-permittees are normally identified as Boise City, the Ada County Highway District (ACHD), Ada County Drainage District 3 (DD3), Garden City, Boise State University (BSU), and the Idaho Transportation Department District 2 (ITD3). | Ok |
| 22) Sediment and Bacteria Control Measures, Page 28, Paragraph 1: The Plan would benefit from:<br>1. documentation/citation of "the interim permitting approach uses BMPs in first-round stormwater permits"; and,<br>2. emphasis added to "where necessary, to provide for the attainment of water quality standards (WQS)." | Ok |
| 23) Sediment and Bacteria Control Measures, Page 29, Paragraph 4: This section would benefit from citation of the applicable Phase II regulations. | Ok |
| 24) Costs of Implementation, Page 30, Paragraph 2: Clarification of the time period associated with the (e.g. annual) Phase II costs. | Ok. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 25) Agricultural Non-Point Source Pollution Control Efforts, Page 32, Paragraph 1: This section would benefit from:<br>1. addition of a new paragraph that describes the federal Clean Water Act and associated regulation/guidance framework/expectation for non-point source actions (e.g. feasible and cost effective BMPs with citation to regulations) including the appropriate citations;<br>2. Clarification of whether the Plan includes phosphorus control or if it is restricted to only sediment and bacteria allocation contained in the approved TMDLs; and<br>3. If phosphorus is included, then the proposed 20 year timeframe appears too short (e.g. 70 years for phosphorus control included in the Final SR-HC TMDL). It might be best to characterize the timeframes for each pollutant separately (e.g. 20 years for sediment and bacteria and if appropriate, 70 years for phosphorus). | Ok. |
| 26) Agricultural Non-Point Source Pollution Control Efforts, Page 32, Paragraph 3: Typographical error at the beginning of paragraph 3 (extra period). | Ok. |
| 27) Agricultural Non-Point Source Pollution Control Efforts, Page 33, Paragraph 1:<br>1. The discussion and table regarding irrigated agricultural acres is confusing and needs to be clarified. If there is a correct figure for agricultural acres (508,789 vs. 163,270, some number in between). In the first part of the paragraph it is listed as 508,798 or 61%, then in the bottom part of the paragraph it lists 163,270 acres. The 163,270 acres estimate figure appears low for total agricultural acreage within the watershed and is not consistent with the 117,000 acre estimate contained in Table 14 and in Page 49 text.<br>2. The scheduled date for the Lake Lowell TMDL would be helpful.<br>3. This section would benefit from a discussion of the agriculture to urban land use transition (rate, areas…) and its anticipated effect on bacteria and sediment TMDL (e.g. urbanization produces substantially lower bacteria and sediment loads). | Of the total watershed acreage of 839,835 acres, approximately 508,798 acres drain directly to the lower Boise River (the remaining acres are located in Upper Fivemile, Upper Tenmile, Upper Indian, and Sand Hollow watersheds that do not drain directly to the lower Boise River or in Lake Lowell that will be dealt with under a separate TMDL process scheduled for 2006). Of the 508,798 acres that drain directly into the lower Boise River watershed, 163,270 acres (32 percent) are classified as agricultural and are addressed by the Implementation Plan for Agriculture in Appendix C.<br>Text has been added to refer the reader to the section in the plan that describes land use transitions occurring within the watershed. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 28) Sediment Control Actions, Page 34, Paragraph 2: This section would benefit from documentation to support the sediment and stormwater events statement concerning "significant soil movement". | This section is taken from Appendix C, which was prepared by the NRCS and SCC, which are the designated management agencies for describing and controlling agricultural non-point source activities. In addition, the TMDL concludes that "the most significant sources of sediment from agricultural practices are likely surface irrigated land and streambank trampling..." (page 50). |
| 29) Sediment Control Actions, Page 35, Paragraph 2: This section seems to include text and table contents that are contradictory concerning the most important BMPs to address water quality in the lower Boise. The table and text need to be consistent regarding the statement/conclusion that irrigation water management is the "most important BMP" (text) and the table characterization of BMP effectiveness as "moderate". Which is it, most important or only moderately effective? | Irrigation Water Management is the most important BMP that can used to address water quality concerns because although it has moderate effectiveness, the installation and maintenance costs are low. Thus, the overall benefit-cost for this BMPs is good. Other BMPs that are more effective are also associated with either moderate to high installation and/or maintenance costs, so their overall benefit-cost ratios are relatively low. Clarifying text has been added. |
| 30. Bacteria Control Actions, Page 36, Paragraph 1: This section would benefit from a more robust discussion of this issue and the recent 9th Circuit ruling in the Bosma Case. Our understanding is that CAFO waste applied to fields are included as CAFO NPDES permit controlled "facilities". If the "no runoff" condition applies to fields where CAFO regulated solids/liquids have been applied, and the valley is primarily surface irrigated, that could substantially limit available lands for application of CAFO regulated solids/liquids.<br>The question that needs to be answered is, Is the approach anticipated in the plan consistent with the Bosma decision and current interpretation of how the program must be implemented? | Comment noted. The appropriate designated management agencies continue to determine how the management of CAFO solids/liquids are to be handled, particularly as legal actions such as Bosma are resolved and regulation evolve. |
| 31) Costs of Implementation, Page 37, Paragraph 1: The Plan would benefit from identification of timeperiods (e.g. annual, 20 year, capital or O&M…) associated with costs provided through out the report. In this particular section, this information is needed to determine the significant, impact, and affordability of the $73.7 (Tier 1-3) and $28.8 million (Tier 1 only) cost estimates. Additionally, we need to know if the cost estimates are to meet the bacteria and sediment TMDLs or if phosphorus control at same level is included in these estimates. | Yes. The plan would benefit from time estimates. Unfortunately, the "time" it would take to fully implement BMPs is highly variable and depends on many factors for which we don't have readily available data. At the present level of funding ($708K per year), the high-end estimate would take over 100 years to implement. For the Tier 1 only estimate, the timeframe is over 40 years. Both of these funding estimates include treating sediment, bacteria, and phosphorus, but do not include maintenance costs. |
| 32) Septic Systems, Page 39, Paragraph 1: We suggest modification of the first sentence to read "indicate that human sources are present throughout the watershed." | Ok. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 33) Septic Systems, Page 40, Paragraph 1: We suggest changing the first sentence text from "eventually" to "potentially". | Ok. |
| 34) Leaky Sewer Lines, Page 41, Paragraph 1 and 2. We agree that identification of orphan sources of bacteria and sediment are necessary. The Plan does a good job of identification of potentially significant urban sources. The Plan would benefit from a similar discussion of "orphan" agricultural sources (e.g. animal feeding operations/dairies under the size thresholds for consideration, leaky lagoons for regulated and unregulated animal operations, proximity of regulated and unregulated operations to shallow groundwater, regulated and unregulated CAFO/dairy/AFO operation within the watershed, "size" of the regulated and unregulated CAFO/AFO/dairies in equivalent human populations, % compliance of regulated CAFO/AFO/Dairies with application rates…). | Additional orphan sources associated with the rural portion of the watershed that are not addressed by the designated management agency do include the items listed. These items have been added to the plan; however, limited financial resources will constrain addressing these sources because they are a lower priority than other agricultural sources. |
| 35) Effluent Trading within the Watershed, Page 43, Paragraph 2, 3, and 4: This section would benefit from follow-up and inclusion of the latest information on IDEQs Trading Guidance document if that document is complete.<br>Additionally, we suggest the following change to the first paragraph, third sentence:<br>1. change "effluent trading program was" to "effluent trading program **is**". | The DEQs pollution trading guidance document is not complete. Ok for other language changes. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 36) Land Uses Changes, Page 46, Paragraph 1: We suggest that in the center of the paragraph "misleadingly suggests", be changed to "incorrectly suggests".<br>Additional discussion on the methods used to determine the corrected % decrease in sediment load would be useful. The discussion should address/document how the 8 percent sediment load decrease was determined (e.g. geomean, average, flow weighted..). Also, how was the 32% recalculated to get 8%? | . Sediment load values between 1998 through 2000 were calculated within each sub-watershed based on the geometric mean for all monthly data available for the period Feb 15 - June 15. The period was chosen to be consistent with the assumptions used to determine the original TMDL sediment concentrations. Thus, the % decrease in sediment loads is a comparison of the TMDL concentrations and the concentrations measured between 1998-2000. The watershed average (-8%) is simply the arithmetic mean value of the individual sub-watershed % changes in sediment concentration. Similarly, the 1998-2000 discharges were calculated similarly to the discharges used in the TMDL by calculating the 30-day low flow based on data from Feb - June of each year. Thus, the % decrease in discharge is a comparison of the TMDL discharges and the discharges measured between 1998-2000. The watershed average (-32%) is simply the arithmetic mean value of the individual sub-watershed % changes in discharge. Finally, the watershed average % change in load (-41%) is the arithmetic mean of each of the sub-watershed % changes in load based on comparing the TMDL loads with the 1998-2000 loads using the values described above. |
| 37) Land Uses Changes, Page 48, Paragraph 3: This section would benefit from additional discussion on how we determined that the "sediment loads in the mainstream may have only decreased by 19 percent"? | Ok. Additional clarifying text has been added. |
| 38) Table 14, Page 49: We suggest that additional discussion/information be added to this section concerning the total or average watershed acres in 1994, 2000, and 2000-2001. There appears to be a large discrepancy in the SCC and IDWR estimates for 2000-2001 (e.g. > 40,000 acres). Is there an IDWR estimate of acreage in 2001? | The discrepancy between the SCC and IDWR numbers for 2000-2001 is the major point of the table (that is, the IDWR estimates of agricultural acreage overestimate the actual amount of such land uses). There is no IDWR estimate of acreage for 2001, but the SCC numbers were taken from field truth surveys conducted between 2000-2001. The last column in the table has been modified to reflect a comparison against the 2000 IDWR estimates, not the 1994 IDWR estimates. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 39) Ramifications of Snake River-Hells Canyon TMDL, Page 51, Paragraph 1 and Title: We suggest modification of the title from "Ramifications of Snake River-Hells Canyon TMDL" to "Snake River-Hells Canyon TMDL".<br>The draft was written prior to finalization of the submittal of the SR-HC TMDL. The final is out and this section should be re-written to include the details contained in the final SR-HC TMDL.<br>Replace paragraph 1 with updated information contained in the final SR-HC TMDL submitted to EPA for review, possibly similar to the proposed paragraph below:<br>The final Snake River-Hells Canyon TMLD was submitted to EPA on July 17, 2003. Load allocations were assigned to the tributaries, including the lower Boise River watershed for nutrients, pesticides, and temperature. The mercury TMDL has been deferred until 2006. These loads will then be distributed to point and non-point sources throughout the watershed as part of the TMDL/Implementation Plan process. | Ok. |
| 40) Ramifications of Snake River-Hells Canyon TMDL, Page 51, Paragraph 2: We suggest replacing paragraph 2 with the following paragraph: The original lower Boise River TMDL for nutrients was never completed because no impairment was found. However, the SBA recognized the scheduled SR-HC TMDL would likely result in allocation for nutrients to address impairments in the Snake River and Brownlee Reservoir. The SBA included a no WET increase provision for nutrients (Appendix J of the TMDL), DEQ admitted to a detailed subbasin assessment for nutrients that was completed in 2001 (DEQ, 2001b). DEQ concluded that nutrients are not impairing aquatic life or recreational beneficial uses in the lower Boise River. | Ok. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 41) Ramifications of Snake River-Hells Canyon TMDL, Page 51, Paragraph 3: We suggest replacing paragraph 3 with the following paragraphs:<br>Phosphorus reductions and potentially trading will be required in the lower Boise River watershed to meet the 256 kg/d total phosphorus load allocation, (77% reduction) included in the final Snake River-Hells Canyon TMDL. The TMDL concludes that nutrients that originate within the tributaries to the Snake, including the lower Boise River watershed, are contributing to the impairment of beneficial uses in the Snake River and Brownlee Reservoir. Because DEQ must take into consideration the water quality and standards of downstream waters, nutrient reductions driven by the Snake River-Hells Canyon TMDL are required. The Snake-River Hells Canyon TMDL allocates a total phosphorous load to the mouth of the lower Boise River to help restore the impaired beneficial uses in the Snake River and Brownlee Reservoir to full support. The final TMDL nutrient is based on a goal for total phosphorus target of 0.07 mg/L, which translates to a total phosphorus load allocation of 256 kg/day for the lower Boise River (a 77% reduction from existing loads).<br>The load and wasteload allocations for phosphorous sources within the lower Boise River watershed will be determined in a separate TMDL to be completed within 18 months of approval of the SR-HC TMDL. An implementation plan will be developed by LBRWQP and supporting agencies in accordance with state and federal guidance. Upon approval of the LBR nutrient TMDL, NPDES permits in the watershed will be modified or reissued to include a phosphorus limit with authorization for effluent trading provisions. | Ok |
| 42) Ramifications of Snake River-Hells Canyon TMDL, Page 51, Paragraph 3: We suggest deletion of the word “issues” in the first sentence after phosphorus. | Ok. |
| 43) Ramifications of Snake River-Hells Canyon TMDL, Page 51, Paragraph 4 and 5: We suggest revision of this discussion with information from final SR-HC TMDL. | Ok. |
| 44) Ramifications of Lower Boise River Tributary TMDLs, Page 52, Title: Remove “Ramifications of” from the title. It should read “Lower Boise River Tributary TMDLs.” | Ok. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 45) Ramifications of Lower Boise River Tributary TMDLs, Page 53, Paragraph 1: We suggest that clarification concerning de-listing of Indian Creek occur. Our understanding is that IDEQ has policies concerning de-listing and that certain elements/requirements are needed for listing to occur. While this is really not our issue, it appears from our perspective that retention of Indian Creek on the 303(d) list is inconsistent with EPA/DEQ listing policy and that either 3, 4a, or 4 c listing would be more appropriate. | The required elements to de-list/list pollutants in Indian Creek are present as part of the Indian Creek Subbasin Assessment. However, we agree that there may be other, more appropriate, sections of the integrated list on which Indian Creek should appear. These sections were not available when the Indian Creek Subbasin Assessment was prepared. |
| 46) Roles and Responsibilities, Page 55, Bullets:<br>We suggest modification of:<br>1. bullet one to read: "DEQ intends to review the progress of TMDL implementation on a 5-year cycle".; and,<br>2. bullet six, deletion of the final sentence. | Ok except for Point #2. Language has been added to clarify the LBRWQP role in this process. |
| 47) Page 57 and Page 58, Table 15: The readability of the Table would be greatly improved with a key or text in the prior paragraph that identifies what R and V represent. | Ok. |
| 48) Milestones, Page 59, Paragraph 1: We suggest that the milestones discussion, and particularly the suggestion that "Each source group determined their own respective milestones based on available resources." is inconsistent with state water quality standards (58.01.02.054) and state statute (IDAPA 39.3616). These responsibilities are assigned responsibilities of the WAG as defined at IDAPA 39.3616. | 58.01.02.054(c) indicates that entities other than the WAG ("designated agencies and landowners") should participate in developing pollution control strategies, which can be interpreted as including milestones. However, we agree that IDAPA also gives the BAGs and WAGs the ability to review existing activates and make recommendations where necessary. |
| 49) Agricultural Non-Point Source Pollution Control Efforts, Page 60, Paragraph 1:<br>We suggest a broader discussion of non-point funding sources, particularly with the changes that have been incorporated into the new Farm Bill. We suggest the second sentence should read something like: "These milestones are based on voluntary actions that are dependent on anticipated state, federal (e.g. Farm Bill) and local funding sources…." | The suggested change has been made but a more detailed discussion of potential funding sources, including the federal Farm Bill, will be included in the next update/iteration of the plan. . |
| 50) Agricultural Non-Point Source Pollution Control Efforts, Page 61, Paragraph 2: We suggest modification of this section to incorporate the new Farm Bill components, programs, incentives and associated USDA and state policies. | A more detailed discussion of potential funding sources, including the federal Farm Bill, will be included in the next update/iteration of the plan. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 51) Urban/Suburban BMP Monitoring, Page 63:<br>The first paragraph should be limited to a more detailed description of the permit monitoring requirements. The additional monitoring as suggested by the Design Manual is primarily for site specific BMP performance (i.e., at a site scale) and does not provide any contribution to overall program performance with respect to potential impacts to receiving waters. | Ok. Clarifying language has been added. |
| 52) Overview, Page 63, Second Bullet: There appear to be a couple of omissions in this section. The second bullet should read "ACHD, Boise City, ITD District #3, **BSU, Garden City**, and …." | Ok. |
| 53) BMP Effectiveness Monitoring, Page 65,<br>Paragraph 1: We suggest that additional discussion be included concerning the BMP effectiveness issue. The second sentence suggests that source groups constructing BMP projects **should** include budget allowances for effectiveness monitoring. Where funds are not provided for BMP effectiveness monitoring default literature values could be used. This concept should be included in the discussion. | Ok. Clarifying language has been added. |
| 54) Agricultural BMP Monitoring, Page 65, Paragraph 3: We have concerns with the funding sources for monitoring. Maybe a better approach would be to recount how the existing monitoring data have been funded and suggest that these and other methods are anticipated for future funding of monitoring, including "BMP projects funded through water quality and conservation programs should include budget allowances for a monitoring program." | Ok. |
| 55) Watershed Monitoring, Page 66, Paragraph 1:<br>EPA has endorsed the concept of watershed based permitting. In the Boise, many NPDES permits were concurrently issued as drafts in 1999. Great efficiencies in monitoring are available if watershed based permitting were to occur and be coordinated with monitoring needed for the TMDLs. We suggest that some discussion be included in this section that contemplates the implementation of watershed based permitting and the benefits it might provide to the TMDL monitoring effort. | Ok |

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| 56) Table 17: The river miles identified for West Boise WWTF, South Channel Eagle Bridge, Eagle Bridge, Linder Bridge Meridian U/S, Meridian WWTF, and Meridian D/S should be listed consistent with the USGS stream identification method. Specifically, the south channel starts at River Mile 0.0 and the sites along it should be numbered accordingly.<br>Also, the sites identified as South Channel Eagle Bridge (42.8) and Eagle Bridge (40.8) are the same.<br>Linder Bridge (RM0.9 S. Chan)<br>Eagle Bridge (RM4.2 S Chan)<br>West Boise WWTF (RM5.4 S Chan)<br>Meridian Sites ??? | The river miles that appear in Table 17 are consistent with the 1996 sediment mass balance developed for the approved sediment TMDL. As such, any reference to river miles in the implementation plan should be consistent with the TMDL. |
| 57) Table 18: The Stormwater NPDES sites do not all drain to the Boise River. Only The Walnut St and Koppel's sites drain to the river. | Ok. A footnote has been added to clarify this point. |
| 58) USGS Activities, Page 69, Paragraph 3: We have some concerns with the characterization of the USGS program, particularly with regard to future monitoring activities and commitments. It is our understanding the eight year monitoring program is basically complete and USGS is working on the report that summarize this work. More discussion on this issue is warranted here. | We agree that the eight-year program is basically complete and the USGS is in the process of summarizing the work. However, the USGS has shown a commitment to continue monitoring the river; continuing and refining the monitoring program has been scheduled for FY2004 and is expected to occur into the future. |
| 59) NPDES Monitoring, Page 71, Paragraph 1:<br>We suggest the following minor changes:<br>1. Third sentence should read "Because all of these facilities operate under **current** NPDES permits".; and,<br>2. Include discussion of the role of watershed based permitting on monitoring. | Ok. |
| 60) Trend Analysis, Page 71, Title: We suggest that the title read "Five Year Data Analysis and Report". | The title has been changed to "Data Analysis and Report".. |
| 61) Trend Analysis, Page 71, Paragraph 1: We suggest that the first sentence should read "Consistent with EPA guidelines, based on the results of available monitoring data, DEQ will perform data analysis every 5 years…." | Ok. |
| 62) Trend Analysis, Page 71, Paragraph 2: We suggest that the second sentence should read "This type of monitoring <u>may</u> allow for trend analysis…." | Ok. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 63) Substrate Monitoring Plan, Page 72, Paragraph 1: We suggest that the second sentence should read "Although EPA initially took the lead in developing and implementing the project, with limited support roles coming from the remaining entities, DEQ agreed to limited participation…" | Ok. |
| 64) Other TMDL Data Gaps, Page 73, Seventh Bullet: We believe that a seventh bullet should be added to the list concerning stormwater. The proposed text is: "Stormwater data – sufficient data to estimate impacts of stormwater on the Boise River." | Ok. |
| 65) Point Source Pollution Control Efforts, Page 76, Paragraph 1: We suggest that the first paragraph should read:<br>"Because all of the municipal and industrial WWTP facilities operate under current NPDES permits, and are expected to do so into the indefinite future, no additional costs for these control actions associated exclusively with the lower Boise River TMDLs for sediment and bacteria are anticipated. However, significant additional costs will be incurred as a result of other watershed activities, such as complying with the Snake River-Hells Canyon TMDLs. (e.g. total phosphorus, temperature, mercury)" | Ok. |
| 66) Non-point Source Pollution Control Efforts, page 76, Paragraph 1: We note that really good cost and performance data for sediment, phosphorus, monitoring, and public outreach are available for from Rock Creek project near Twin Falls. | If the results from elsewhere in Idaho (for example, Rock Creek) are transferable, these data may be used to compare the cost and performance data obtained in the lower Boise River watershed over the implementation period. |
| 67) Non-point Source Pollution Control Efforts, Page 77, Paragraph 1: We suggest that time period be associated with costs, preferably with all units being consistent (e.g. annual…). When the Plan mentions the $28.8 million in agriculture implementation costs, what time period does this cover? | Clarifying language has been added.. |
| 68) Assessment of TMDL Progress, Page 78, Paragraph 1: We suggest that the financial relationship with DEQ be better defined and characterized. We need to tell the stakeholders and public what the budget needs and request from WAG to DEQ are to do the necessary work? If to develop a budget proposal for IDEQ, then we should get on that task quickly. | The FY2004 work plan for the LBRWQP includes developing a budget, which includes the WAG's role in the assessment of TMDL process, so that funding sources can be identified. This is expected to provide necessary information to better define and characterize the financial relationship between DEQ and the LBRWQP and various stakeholders. |

| **Comments From:**<br>Robbin Finch<br>Boise City Public Works<br>Received via e-mail August 8, 2003 | **Response:** |
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| 69) Revisions to NPDES Permits, Page 78, Paragraph 1: We suggest that the last sentence in paragraph 1 should read:<br>"However, significant nutrient reductions are required in the final Snake River-Hells Canyon TMDL, the process by which NDPES permits are or can be revised will be addressed." And,<br>Add paragraph for stormwater for Phase I and Phase II NPDES permits. | Ok. |
| 70) Appendix B, Urban/Suburban Implementation Plan Comments, Page 3, Paragraph 3, under Goals and Objectives: The final phosphorus and temperature allocations for the urban/suburban contributions within the Lower Boise River are to be established after final approval of the SRHC TMDL. Any suggested activities that reduce phosphorus in runoff and control temperature will need to be reviewed again in the future. | Ok. |

| **Comments From:**<br>Norman Semanko<br>Idaho Water Users Association, Inc.<br>Received via e-mail August 8, 2003 | **Response:** |
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| 1) Non-point Source TMDL Implementation is Voluntary. The Implementation Plan states that "local stakeholders", including "citizens and operators of facilities that generate point and non-point pollution sources", "are ultimately responsible for ensuring that beneficial uses in the lower Boise River are achieved." Implementation Plan, p. 1. In addition, while stating that "[t]he State of Idaho uses a non-regulatory approach to control agricultural non-point sources", the Implementation Plan claims that "regulatory authority" over non-point sources exists in DEQ's rules. Implementation Plan, p. 31. We strongly disagree that irrigators are responsible for "ensuring" water quality or that DEQ has broad regulatory authority over non-point sources.<br>Simply put, non-point source controls are voluntary under the Clean Water Act (CWA) and State law. With regard to irrigators, the Clean Water Act specifically excludes "return flows from irrigated agriculture" from the definition of "point source". 33 U.S.C. Sec. 1362(14); CWA Sec. 502(14). The CWA also exempts "return flows from irrigated agriculture" from the NPDES permit requirements. 33 U.S.C. Sec. 1342(l)(1); CWA Sec. 402(l)(1). Similarly, permits for dredged or fill material are not required "for the | Comment noted. The Implementation Plan and the Agricultural Implementation Plan clearly states the voluntary nature of non-point source controls that regulated under the NPDES stormwater program. For example, the plan clearly states that "it is expected that a voluntary approach will be able to achieve the necessary non-point load allocations". The agricultural community cooperation received to date, and expected in the future, demonstrates a willingness to implement BMPs and protect water quality.<br>In addition, reasonable and cost-effective BMP measures are encouraged under the CWA and the agricultural community, including irrigators, has demonstrated initiative by voluntarily investing in such BMPs throughout the watershed. |

| **Comments From:**<br>Norman Semanko<br>Idaho Water Users Association, Inc.<br>Received via e-mail August 8, 2003 | **Response:** |
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| purpose of construction or maintenance of. . .irrigation ditches, or the maintenance of drainage ditches." 33 U.S.C. Sec. 1344(f)(1)(C); CWA Sec. 404(f)(1)(C).<br><br>Under State law, the TMDL provisions are not to be interpreted "as requiring best management practices for agricultural operations which are not adopted on a voluntary basis". I.C. Sec. 39-3610(1). This language was added to the Idaho Code during 1995, as part of the Idaho State Legislature's response to the U.S. District Court's ruling in *Idaho Sportsmen's Coalition v. Browner*, C93-943-WD (W.D. Wash.). While the court's decision required a "reasonable schedule for the development of TMDLs", there is no such requirement for the implementation of TMDLs under the CWA. State law also makes clear that DEQ has no authority to abrogate or injure water rights, including the right to divert and store water. I.C. Sec. 39-104.<br><br>The feedback loop process, as a mechanism to provide reasonable assurance to EPA, including monitoring and necessary modifications to BMPs, is a reasonable approach to TMDL implementation. Implementation Plan, p. 41. However, the Implementation Plan and the draft Implementation Plan for Agriculture, Appendix C, pp. 29-30, severely overstate the regulatory authority of the State regarding non-point sources. More importantly, this heavy-handed threat to use existing regulations, including injunctive relief actions for anything "that may be determined to be an imminent and substantial danger to public health or environment", sends the wrong message to the agricultural community. The Implementation Plan is correct in observing that the agricultural community, including irrigators, has demonstrated a willingness to implement BMPs and protect water quality. Implementation Plan, p. 31. However, this has been with the understanding that it is, and will continue to be, a voluntary, incentive-based program, not a heavy-handed regulatory program.<br><br>As a result, the Implementation Plan should be very clear that non-point source controls are voluntary under the CWA and State law. | |

| **Comments From:**<br>Norman Semanko<br>Idaho Water Users Association, Inc.<br>Received via e-mail August 8, 2003 | **Response:** |
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| 2) Flow Alteration is not a Pollutant. The Implementation Plan identifies "Flow Alteration" as a pollutant in the Lucky Peak to Barber Diversion stream segment. Implementation Plan, p. 3, Table 1. As you know, flow alteration is not a pollutant. It is not included in the statutory definition of "pollutant" in either the Clean Water Act or Idaho Code. 33 U.S.C. Sec. 1362(6); CWA Sec. 502(6); I.C. Sec. 39-3602(19). While we understand that Table 1 is a summary of the 1992 303(d) list, which erroneously listed flow alteration as a pollutant, DEQ should make clear that flow alteration is not a pollutant and that no TMDL is required to address flow alteration. This will avoid any confusion on the issue.<br><br>Additionally, the Implementation Plan states that flow alteration "is not an allocatable pollutant". Implementation Plan, p. 4. This should be corrected to state that flow alteration is not a pollutant, at all. Also, instead of saying that a TMDL for flow alteration "was not possible" (Implementation Plan, p. 4), the text should state that a TMDL is not required for flow alteration because it is not a pollutant. The position of DEQ that habitat modification and flow alteration are not pollutants is effectively stated within the draft Implementation Plan for Agriculture. Appendix C, p. 18. This position should also be reflected in the text of the Implementation Plan. Again, these clarifications will help avoid any confusion about DEQ's lack of authority over flow alteration, water rights and related water quantity issues. | Ok. |

| **Comments From:**<br>Norman Semanko<br>Idaho Water Users Association, Inc.<br>Received via e-mail August 8, 2003 | **Response:** |
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| 3) The Implementation Plan Must Reflect the New Bacteria Standards and Data. The Implementation Plan acknowledges that the *E. coli* load reductions needed to meet current water quality standards are not as stringent as those included in the approved TMDL, which were based on the old fecal coliform water quality criteria. Implementation Plan, p. 13. It also concludes that revised load reductions based on *E. coli* monitoring data are likely to be lower than the load reductions specified in the TMDL, as set forth in Table 4. Implementation Plan, pp. 16, 21.<br><br>The results of the Bacteria DNA Testing Project provide further, and even more compelling, evidence that the bacteria loads in the current TMDL are not accurate. Of the 1,079 isolated *E. coli* colonies for which a bacteria source was positively identified, more than 50 percent comes from avian, waterfowl and wildlife, while another 39 percent comes from humans and pets. Only 11 percent comes from livestock. Implementation Plan, pp. 18-19, Table 7.<br><br>Despite the new bacteria water quality standards, and the new data from the Bacteria DNA Testing Project, it was determined that the bacteria TMDL should not be revised. However, these load allocations may be revised as future bacteria TMDLS are developed for certain lower Boise River tributaries. Implementation Plan, p. 21. Whether the bacteria TMDL is formally revised or not, these factors must be taken into account when implementing the TMDL. Obviously, given that 89% of the bacteria identified in the sampling comes from sources like waterfowl, wildlife, people and pets, less focus should be put on agricultural sources than was contemplated when the TMDL was originally submitted and approved.<br><br>We agree with the need for an iterative process by which *E. coli* data will continue to be collected and bacteria levels will continue to be monitored. Implementation Plan, p. 21. As additional data becomes available, DEQ should continue to refine its approach to implementing the bacteria TMDL. For example, the data collected as part of the monitoring program conducted for local agriculture stakeholders, as discussed on p. 15 of the Implementation Plan, should be evaluated when it becomes final, in order to adjust the relative focus for load reductions. We also agree with the assessment that natural background conditions must be considered when implementing the bacteria TMDL. Implementation Plan, p. 22. | The bacteria loads in the current TMDL, which were based on available fecal coliform data and existing TMDL policies, were accurate at the time the TMDL was submitted and approved. Since then, the standards have been changed to incorporate *E. coli* and monitoring activities are underway to be able to revise bacteria loads for the bacteria TMDL. The hope is all that available and appropriate *E. coli* data can be incorporated into the process, including data collected as part of the monitoring program conducted for local agriculture stakeholders. This information has been repeatedly requested by DEQ and LBRWQP so that the relative targets for load reductions are appropriate.<br><br>The issue of "natural" background concentrations will also be addressed as part of the Adaptive Management strategy outlined in the Implementation Plan. In parallel, DEQ and LBRWQP expects that livestock sources will continue to be the focus of BMP activities because concentrations of bacteria (both fecal coliform and *E. coli*) are relatively higher in the agricultural portion of the watershed, particularly in tributaries and return drains. |

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| 4) The Agricultural Non-Point Source Implementation Timeframe is too Short. The Implementation Plan states that agricultural non-point source pollution control efforts "may take as many as 20 years or more to complete." Implementation Plan, p. 31. Indications are that this timeframe may be too short. The Snake River-Hells Canyon (SR-HC) Public Advisory Team (PAT) has developed a proposed load allocation method for total phosphorous within the SR-HC TMDL. Based upon the cost of BMPs, and the likely funding levels for these measures, the PAT concluded that it will take approximately 63 years to fully implement BMPs on Tier 1 lands, and another 63 years on Tier 2 lands, within the Lower Boise River Watershed. *Proposed Snake River-Hells Canyon TMDL-Appendix I, Stakeholders Proposal for Total Phosphorous Load Allocation Mechanism* (July 2003) (submitted by members of the SR-HC PAT). Given these timeframes, consideration should be given to lengthening the stated timeframe for implementation of the Lower Boise River TMDL in the Implementation Plan. | At the present level of funding ($708K per year), the high-end estimate would take over 100 years to implement. For the Tier 1 only estimate, the timeframe is over 40 years. Both of these funding estimates include treating sediment, bacteria, and phosphorus, but do not include maintenance costs. |

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| 5) Several Objectives of the Implementation Plan for Agriculture should be Deleted. Some of the objectives set forth for the Implementation Plan for Agriculture are highly questionable and should be removed from the document. For example, the objectives include: "Improve salmonid spawning habitat within the applicable reaches of the lower Boise River"; and "Preserve and enhance agricultural lands within the lower Boise River watershed". Implementation Plan, p. 32; Appendix C, p. 7. The draft Implementation Plan for Agriculture also cites the protection and enhancement of ground water as a goal. Appendix C, p.7.<br><br>None of these goals and objectives are part of the TMDL process. As stated in the Introduction to the document, "the goal of the CWA TMDL program is to correct water quality impairments and achieve beneficial uses of waterbodies through attainment of water quality standards". Implementation Plan, p. 1. It is not the purpose of a TMDL to improve spawning habitat or to preserve agricultural lands. We are unconvinced by the description of "habitat considerations" as an additional goal for the TMDL. Implementation Plan, pp. 43-44. While laudable goals, they are all outside the scope of the TMDL program. In addition, "water body" is specifically defined as meaning "accumulations of surface water", and does not include ground water. I.C. Sec. 39-3602(28). The declaration of policy and statement of legislative intent speaks only of "surface water". I.C. Sec. 39-3601.<br><br>As a result, these objectives and goals should be deleted from the document. | The original objectives have been somewhat modified and replaced with current objectives. The current objectives still include “Improve salmonid spawning habitat within the applicable reaches of the lower Boise River” and “Preserve and enhance agricultural lands within the lower Boise River watershed” because they are secondary benefits to water quality improvement. Ultimately the success of the TMDL is judged by restoration of beneficial uses, including salmonid spawning, and improvement of water quality conditions is an important step in this process. In addition, the enhancement of agricultural lands via the installation of long-term BMPs is a secondary outcome of the TMDL process. |

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| 6) The Plan Must Recognize that Some BMPs will not be Fully Implemented. It is important to recognize that there are financial and other practical barriers to full implementation of some BMPs. After all, it is estimated that agricultural BMP installation may cost as much as $73.7 million. Implementation Plan, p. 36.<br><br>As a further example, the Implementation Plan discusses the importance of reducing sediment from surface-irrigated farm fields. Implementation Plan, p. 33. Consequently, one of the major BMPs for irrigated agriculture is conversion to sprinkler irrigation. Implementation Plan, p. 34, Table 10; Appendix C, p. 6. However, onions and seed crops benefit from using surface-irrigation, as opposed to sprinkler irrigation. Growers in the Boise area have a competitive advantage directly related to low precipitation levels. Converting to sprinkler irrigation defeats this built-in advantage, resulting in fungal and bacterial diseases. Therefore, it is impractical to expect or rely upon full conversion to sprinkler irrigation in the Lower Boise River.<br><br>Other practical limitations include: (1) existing engineering of irrigation systems which are not compatible with various BMPs; (2) increased power costs for pumping and sprinkler irrigation; (3) availability of land or funding for sediment basins; (4) increased temperature and bacteria levels resulting from sediment basins; (5) low commodity prices and a corresponding lack of income to implement, operate and maintain BMPs; (6) the adverse hydrologic impacts of reducing return flows and ground water recharge; and (7) concerns about public disclosure of monitoring and evaluation data. This is not meant to be an exhaustive list.<br><br>All of these financial and other practical limitations must be recognized and accounted for in the Implementation Plan. | Clarifying language has been added that recognizes that the Implementation Plan for Agriculture is not intended to identify which specific BMPs are appropriate for specific farm fields, but rather it provides a watershed approach for addressing water quality problems attributed to runoff from agricultural lands. In addition, new language recognizes that from a water quality protection standpoint, sprinkler and drip irrigation methods have been shown to be very effective at controlling runoff. However, these methods may not be appropriate or feasible for every farm. In addition, conversion to sprinkler and drip irrigation methods may have consequences on water quantity and groundwater return flows. These are issues that will continue to be addressed as the water resources in the Treasure Valley are managed for future growth. |
| 7) Water Quality Trading Should Remain a Key Component of the Plan. IWUA has long been a partner in the development of the Lower Boise River Effluent Trading Demonstration Project, as described on pages 41-43 of the document. We fully support the inclusion of effluent trading, or water quality trading, in the Implementation Plan and look forward to continued involvement in the program. | Ok. |

| **Comments From:**<br>Norman Semanko<br>Idaho Water Users Association, Inc.<br>Received via e-mail August 8, 2003 | **Response:** |
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| 8) Ramifications of the Snake-River Hells Canyon TMDL. The Implementation Plan describes the potential impacts of the Snake River-Hells Canyon TMDL on the Lower Boise River watershed. Included is a discussion of forthcoming load allocations for nutrients, pesticides and temperature, as well as the need to take into consideration the water quality and standards of downstream waters. Implementation Plan, pp. 50-51. IWUA questions the legal authority for requiring upstream tributaries to meet downstream water quality standards and reserves the right to challenge that assumption in the future. Moreover, one TMDL cannot automatically amend another TMDL. Idaho's TMDL statutes require that WAGs be afforded the opportunity to provide recommendations to DEQ for the development of TMDLs. I.C. Secs. 39-3615 and 39-3616. This must necessarily include any TMDLs for nutrients, pesticides, or temperature, resulting from the downstream Snake River-Hells Canyon TMDL. As a result, the Lower Boise WAG must be afforded the opportunity to consider and act upon these potential issues at the appropriate time. | Comment noted. Members of the LBRWQP were involved in the Public Advisory Committee for the Snake River-Hells Canyon TMDL and it is expected that the group will continue to have an integral role in future TMDL issues in the lower Boise River. |

| **Comments From:**<br>Norman Semanko<br>Idaho Water Users Association, Inc.<br>Received via e-mail August 8, 2003 | **Response:** |
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| 9) The Plan Should Adopt a Phased Approach to TMDL Implementation. Directly related to many of the issues discussed above is the need to adopt a phased approach to TMDL implementation. This approach has previously been suggested by the SR-HC PAT, as well as IWUA, in the context of the SR-HC TMDL, and may have ramifications on the Lower Boise TMDL through that process, as well. Implementation Plan, pp. 50-51. The Implementation Plan includes a discussion of Adaptive Management, beginning on page 53 of the document.<br><br>We encourage DEQ to incorporate the following elements of the adaptive management, or phased, approach into its document: (1) Providing a process for modifying TMDL objectives, targets and load allocations when water quality standards change; (2) long-term, scientifically justified water quality based goals; (3) interim, attainable water quality goals based on implementation of feasible control strategies and an equitable distribution of load reduction; (4) pollutant trading which enables stakeholders to commit limited financial resources to implement the most cost-effective control strategies; (5) monitoring to periodically review and determine progress in attaining TMDL objectives; and (6) periodic review and modification of these goals, cost-benefit analysis, and progress in achieving them through a phased approach.<br><br>Each of these elements is necessary to ensure widespread support for the TMDL and broad participation in its implementation. Therefore, they should be incorporated into the Implementation Plan. | The Adaptive Management approach outlined in the document specifically relies on a phased approach. We agree that the mentioned elements are important components of the plan and believe that they are already incorporated. |

| **Comments From:**<br>Dan Steenson<br>Ringert-Clark Chartered<br>Received via e-mail August 8, 2003 | **Response:** |
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| 1) As you know, I worked on the Implementation Plan For Agriculture with Scott Koberg and Keith Griswold over many months. As you will understand after reading the email, I assumed that the text of the Agricultural Implementation Plan submitted to the WAG and ultimately to you, was the same as the text attached to the email. Unfortunately it is not. | Ok. Thank you for working with Scott to make sure your comments were incorporated into the final version. |
| 2) The discussion of and approach to implementation described in Appendix I (of the SR-HC TMDL) was widely accepted by the SR-HC TMDL PAT. I believe we should incorporate the discussion and approach into the implementation plan for the Lower Boise River TMDL. | Appropriate portions of the implementation approach discussed in the Snake River-Hells Canyon TMDL have been incorporated into this plan. |
| 3) I have one passing comment regarding bacteria. I think it is important for the discussion of bacteria to state that, based on present information, it is not feasible to meet the reduction goals set by the TMDL. | While it is recognized that the reduction goals set by the TMDL for reduction of fecal coliform are high, it is likely that those goals will be reduced as *E. coli* data are collected and analyzed as part of the Adaptive Management process. The feasibility of meeting the current or future reduction goals remains speculative until a more complete *E. coli* dataset is developed. |

| **Comment From:**<br>Erica Anderson Maguire<br>Stormwater Quality Coordinator<br>Received via mail August 8, 2003 | **Response:** |
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| **Implementation Plan** | |
| 1) Pg. 26, last sentence: Boise City and Garden City are part of Phase I and therefore are not considered part of Phase II. Delete Boise City and Garden City from list or clarify text. | Ok. |
| 2) Pg. 39, 4th paragraph: Properly cite DEQ document *Technical Guidance Manual for Individual and Subsurface Sewage Disposal Systems* (DEQ, 2001). | Ok. |
| 3) Pg. 39, 5th paragraph: Properly cite DEQ document *Nutrient-Pathogen Evaluation Program for*…(DEQ, ). | Ok. |

| **Comment From:**<br>Erica Anderson Maguire<br>Stormwater Quality Coordinator<br>Received via mail August 8, 2003 | **Response:** |
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| **Suburban/Urban Implementation Plan** | |
| 1) Pg. 3, 1st sentence: Title of plan in text is different than title page, table of contents, etc. One title should be used consistently throughout the document. | Ok. |
| 2) Pg. 6, 3rd paragraph: Sediment allocation discussion is different than in the Implementation Plan. These should be consistent throughout the document. Statement is incorrect about allocation. Since discussion involving stakeholders agreed to language in Implementation Plan ACHD recommends using same language in Suburban/Urban Plan. | Ok. |
| 3) Pg. 6, 5th paragraph: Bacteria allocation discussion is different than in the Implementation Plan (pg. 13). These should be consistent throughout the document. | Ok. |
| 4) Pg. 7, 3rd/4th paragraph: Typos – include quotations around term "site potential", o.25 °F should be changed to 0.25°F | Ok. |
| 5) Pg. 7, 5th paragraph: Text is correct however it needs to be stated that high temperatures in storm water runoff are not considered a problem in the lower Boise River valley because during the hot months of the year little rainfall occurs. ACHD recommends adding the following or similar text at the end of this paragraph "However, due to the nature of the Lower Boise River Valley climate, storm events resulting in rainfall runoff in hot summer months are infrequent." | High temperatures in storm water runoff are considered a problem in the lower Boise River valley, even during the hot months of the year when little rainfall occurs. Stormwater monitoring data are largely absent during this time period, but temperature is expected to be an issue when there are storms (e.g., thermal heating from hot pavement causes warmer runoff during summer storms). Clarifying language has been added. |
| 6) Pg. 8, 3rd paragraph: Change text to read "The Boise Area is regulated under Phase I of the storm water requirements. An NPDES Storm Water Permit was issued in November 2000 to Boise area MS4 owners and operators. The copermittees of this permit include…" | Ok. |
| 7) Pg. 9, 1st sentence: This sentence doesn't fit with context of paragraph. Delete the sentence or move to area in text where it fits in better with the context of the paragraph. | Ok. |
| 8) Pg. 12, 1st paragraph: Sediment allocation discussion is different than in the Implementation Plan. These should be consistent throughout the document. Statement is incorrect about allocation. Allocation based on 1995 loads was given. Since discussion involving stakeholders agreed to language in Implementation Plan ACHD recommends using same language in Suburban/Urban Plan. | Ok. |
| 9) Pg. 12, 1st paragraph: Bacteria allocation discussion is different than in the Implementation Plan (pg. 13). These should be consistent throughout the document. | Ok. |

| **Comment From:**<br>Erica Anderson Maguire<br>Stormwater Quality Coordinator<br>Received via mail August 8, 2003 | **Response:** |
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| 10) Pg. 12, 2nd paragraph: Change text to read "Boise ~~City~~ area copermittees ~~was~~ were issued an NPDES…~~Coapplicants~~ Copermittees include…"; Ada County Drainage District 3 | Ok. |
| 11) Pg 12, last sentence: What "Plan" is this sentence referring to? This statement should be clarified. | Ok. |
| 12) Pg.13, 3rd paragraph: Change text to read "Boise ~~City~~ area MS4 owners and operators ~~has~~ have …" | Ok. |
| 13) Pg. 27, Table 7: Insert 4.40 in 1995 load column | Ok. |
| 14) Pg. 27, Table 7: Delete "no net increase" in load allocation column or add to discussion in text on pages 6 and 12 and to Implementation Plan, page 7 (see comments #2 and #8). | Ok. |
| 15) Pg. 27, 3rd paragraph: Table number is incorrect. "Table 8" should be listed as "Table 7". | Ok. |
| 16) Pg. 28, Table 8: See comments #3 and #9. | Ok. |
| 17) Pg. 33, last paragraph "The NPDES storm water permit issued for the ~~City of~~ Boise area is based …" | Ok. |
| 18) Pg. 33 last paragraph: "Boise City, Garden City …and Ada County Drainage District 3…" | Ok. |
| 19) Pg. 34, VIII.: VIII. Plan Implementation Schedule – Not sure what plan this is. Is it the Suburban/Urban Plan or an Phase II community plan? Clarify. | Ok. |
| 20) Pg.34, 5th paragraph: Table number is incorrect. "Table 8" should be listed as "Table 10". | Ok. |
| 21) Pg.34, 7th paragraph: Table number is incorrect. "Table 8" should be listed as "Table 10". | Ok. |
| 22) Pg. 35, 2nd paragraph: "It should be recognized that the Boise ~~City~~ area storm water …" | Ok. |
| 23) Pg. 35, 3rd paragraph: Table number is incorrect. "Table 9" should be listed as "Table 11". | Ok. |
| 24) Pg. 35, 5th paragraph: Table number is incorrect. "Table 10" should be listed as "Table 12". | Ok. |
| 25) Pg. 37, 1st paragraph: Table numbers are incorrect. "Table 9" should be listed as "Table 11" and "Table 10" should be listed as "Table 12". | Ok. |
| 26) Pg. 38, Table 13: Table 13 is not referenced in the text. | Ok. |
| 27) Pg. 40 and 41 bullets: Bullet items referring to "measurable goals" refer to Phase II permittees. Phase I permittees are not bound to measurable goals however, pages 24 and 29 of the Boise area NPDES permit addresses requirements of Phase I permittees. | Ok. |