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

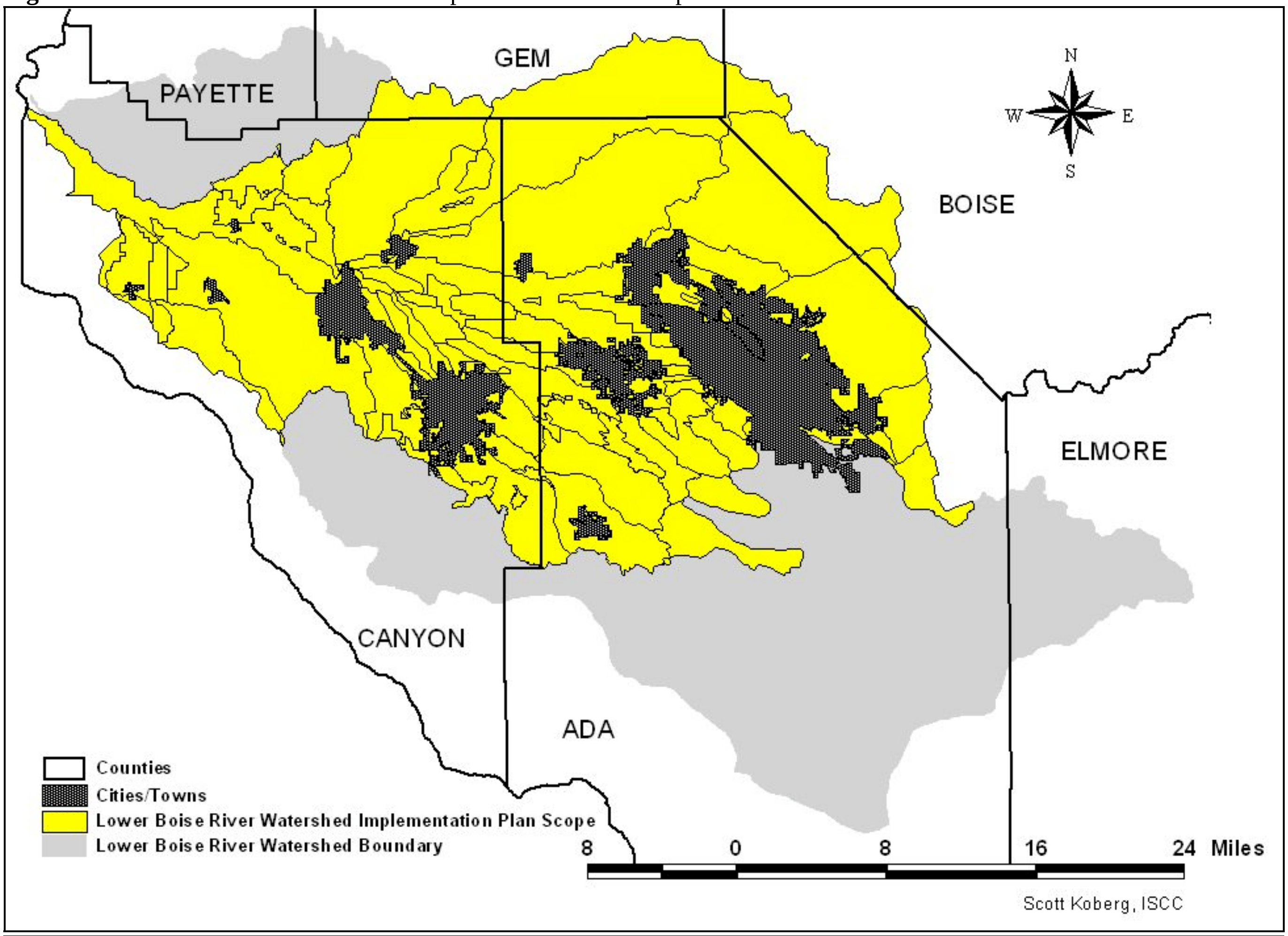
Subbasin Assessment

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.

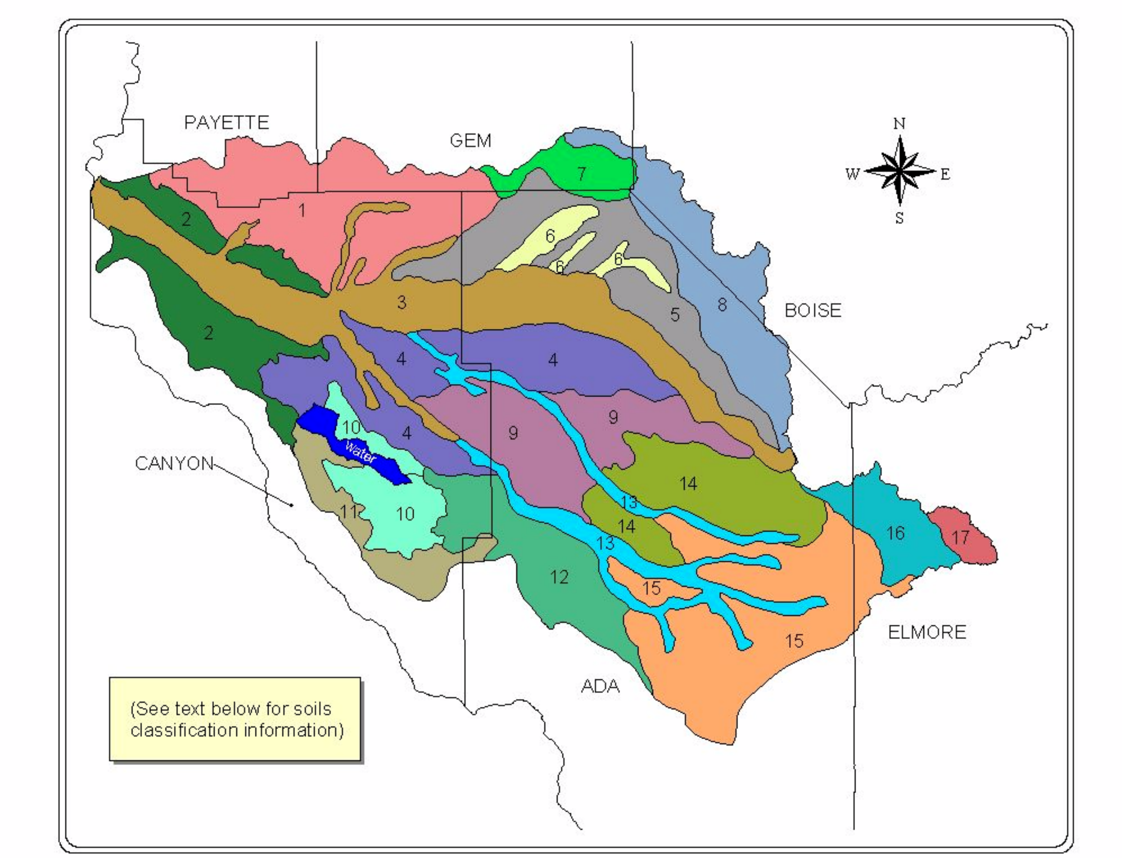
Figure 1. Lower Boise River Watershed Implementation Plan Scope



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)

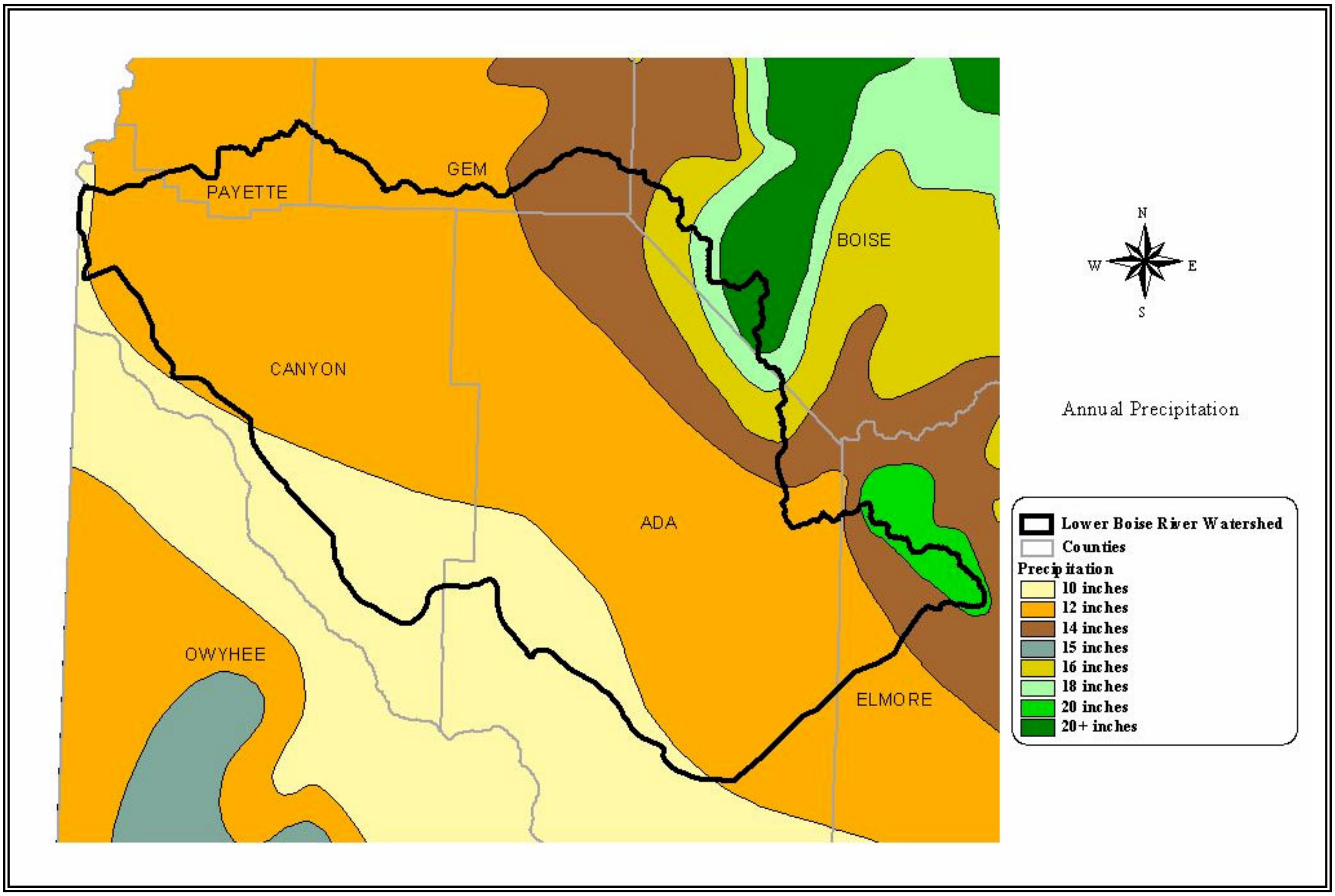
The following are the 17 predominant soil associations within the Lower Boise River watershed:

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

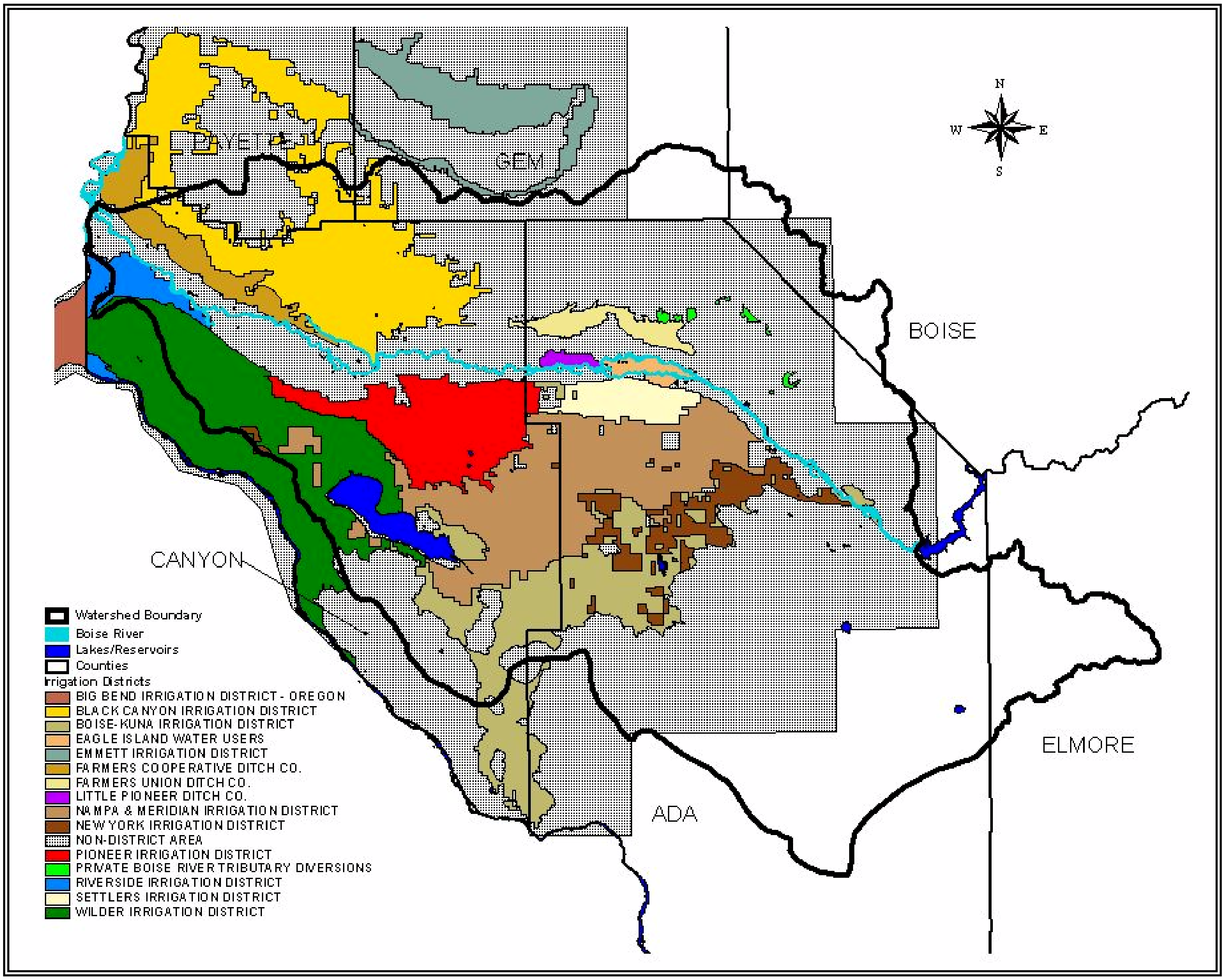
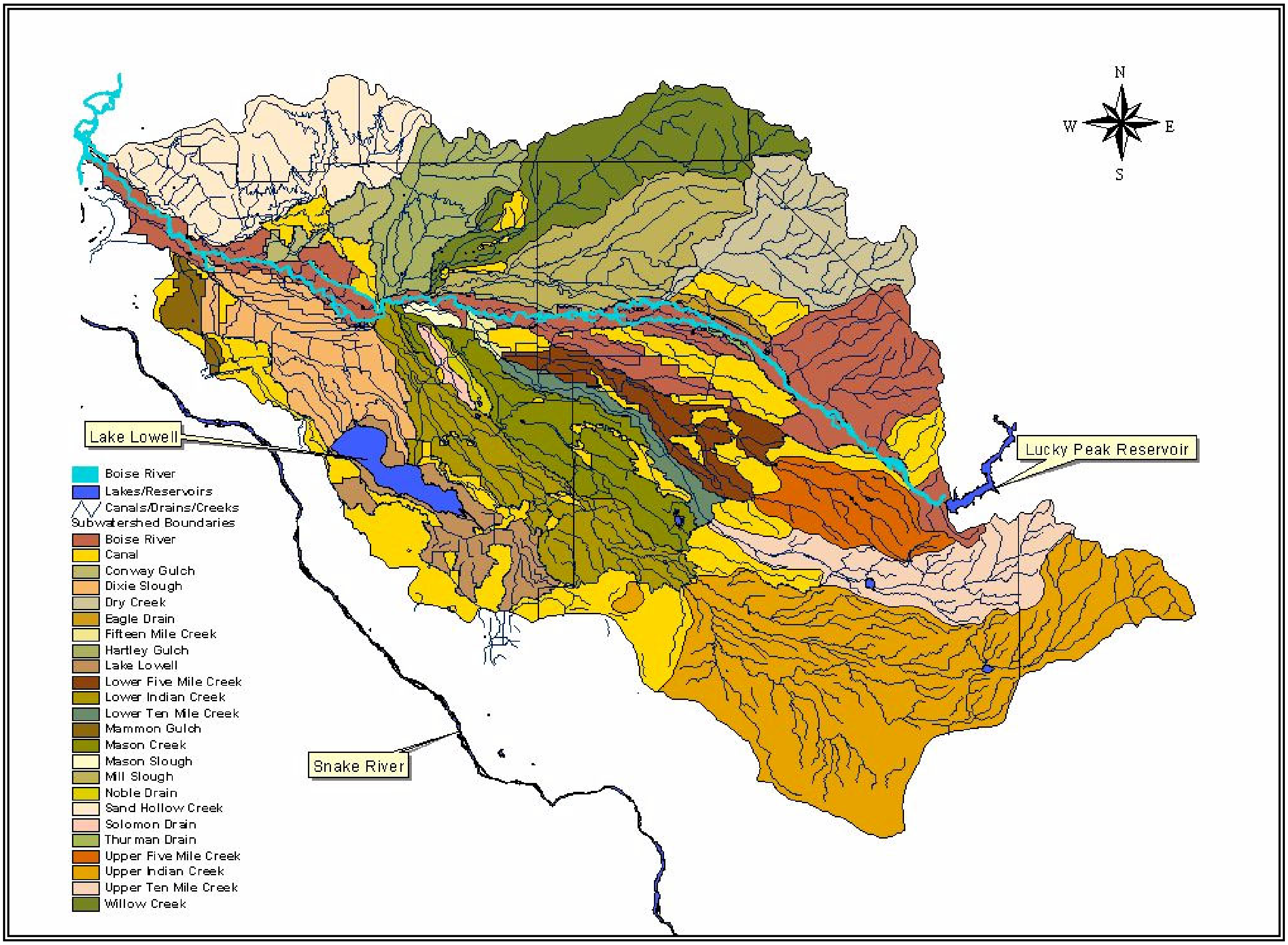


Figure 5. Surface Hydrology of Lower Boise River Watershed



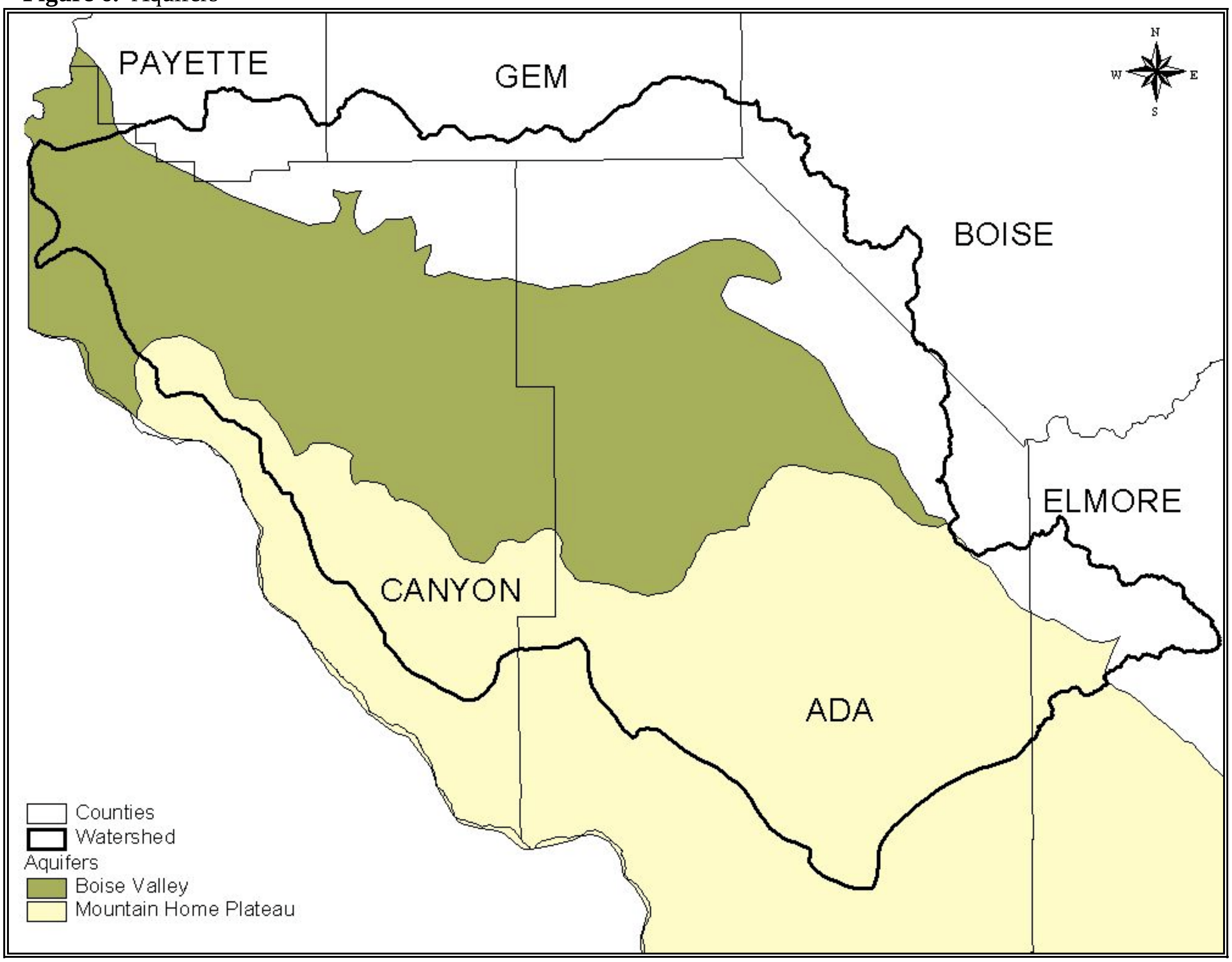
In Figure 5, the complicated hydrology of the watershed is evident in the yellow "islands" of land that represent canals. These isolated subwatersheds are a direct result of the significant modifications that have occurred within the Lower Boise River watershed to accommodate irrigated agriculture and 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

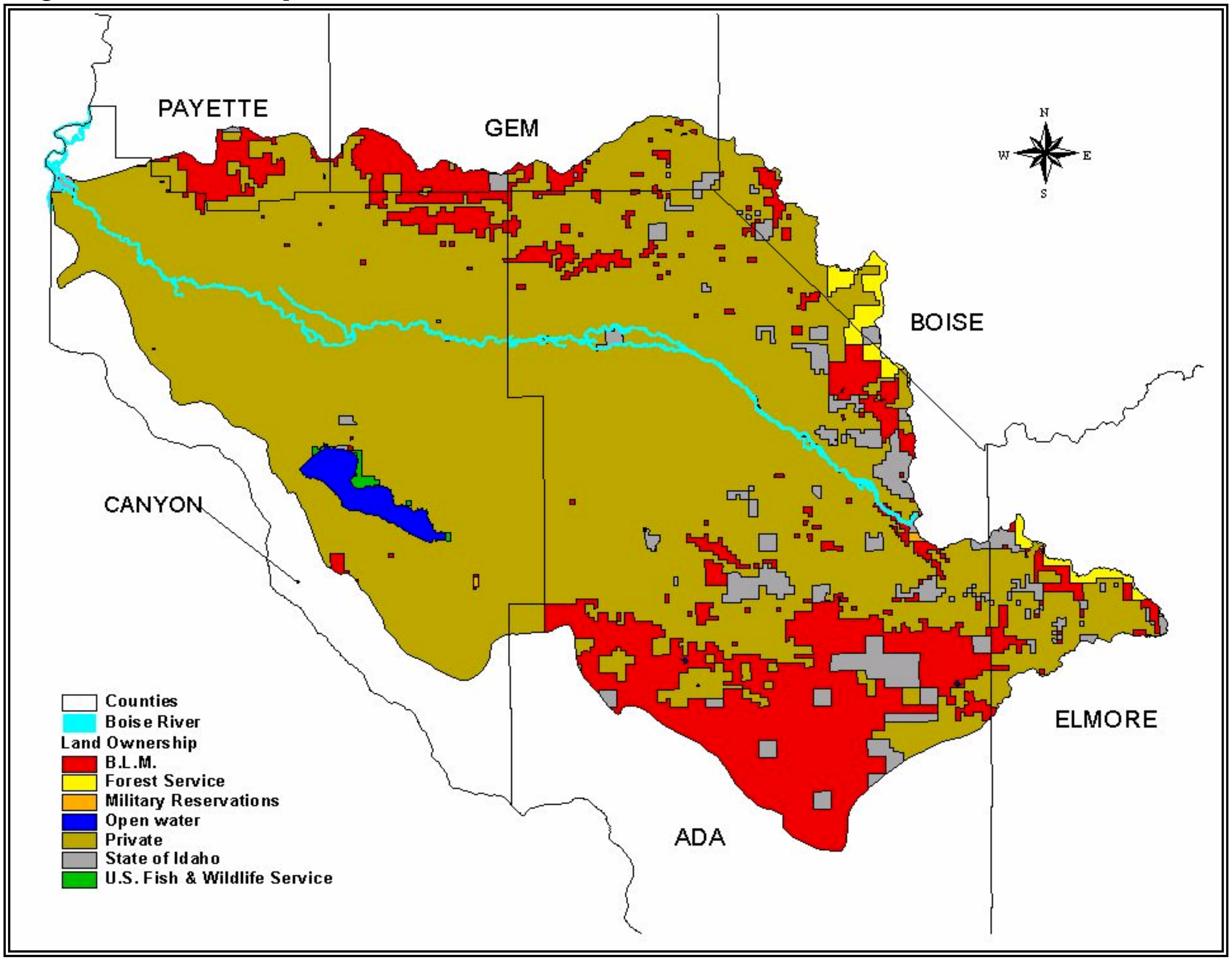


Table 1. 1997 Land Use

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.

Table 2. Development Patterns

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

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 Agricultural Water Supply Cold Water Biota Salmonid Spawning Primary Contact Recreation Secondary Contact Recreation
Boise River, River Mile 50 (Veteran's Parkway) to Caldwell	Agricultural Water Supply Cold Water Biota Salmonid Spawning Primary Contact Recreation
Boise River, Caldwell to Mouth	Agricultural Water Supply Cold Water Biota Primary Contact Recreation 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.

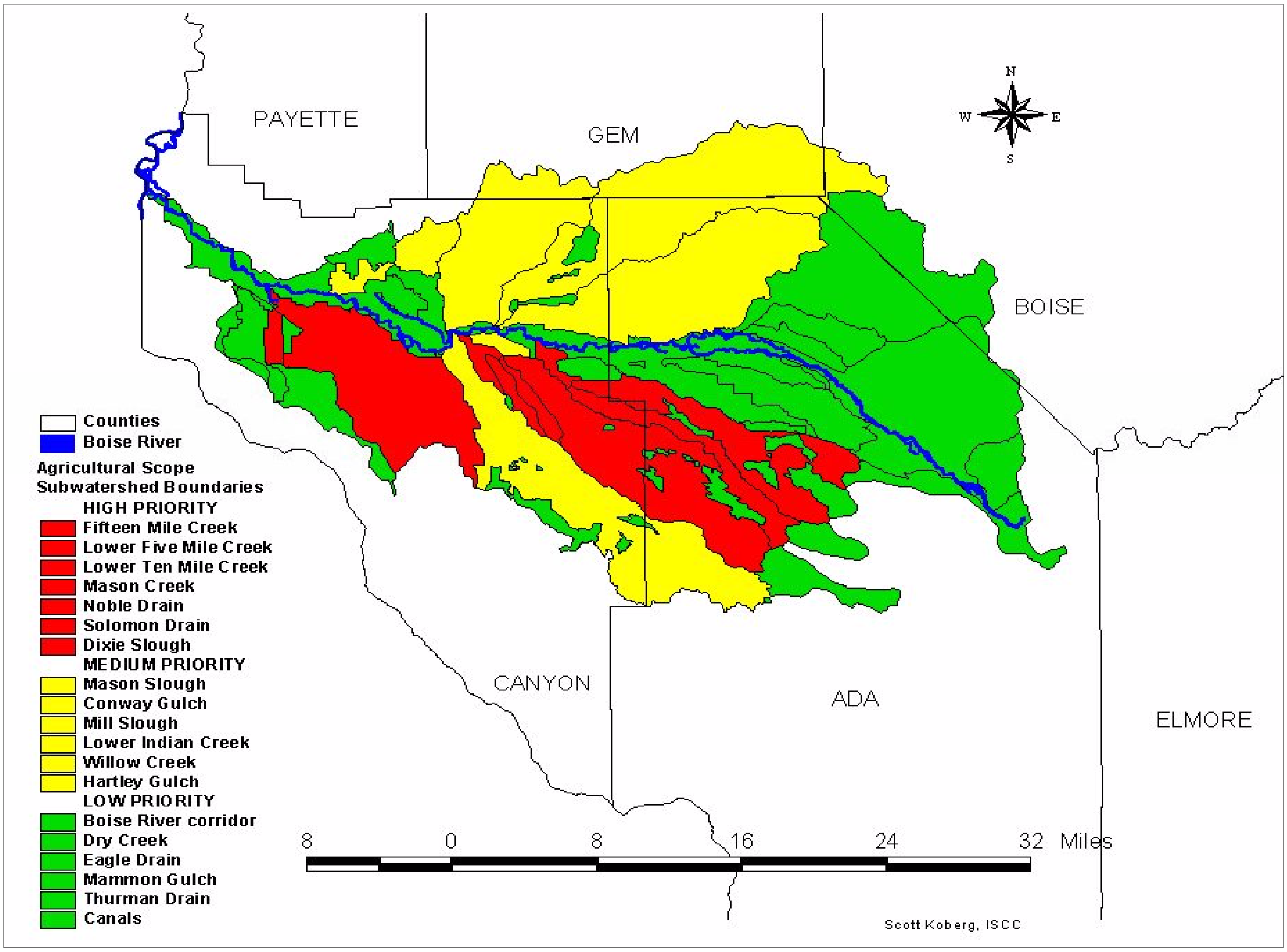
Sediment Priority Areas

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.

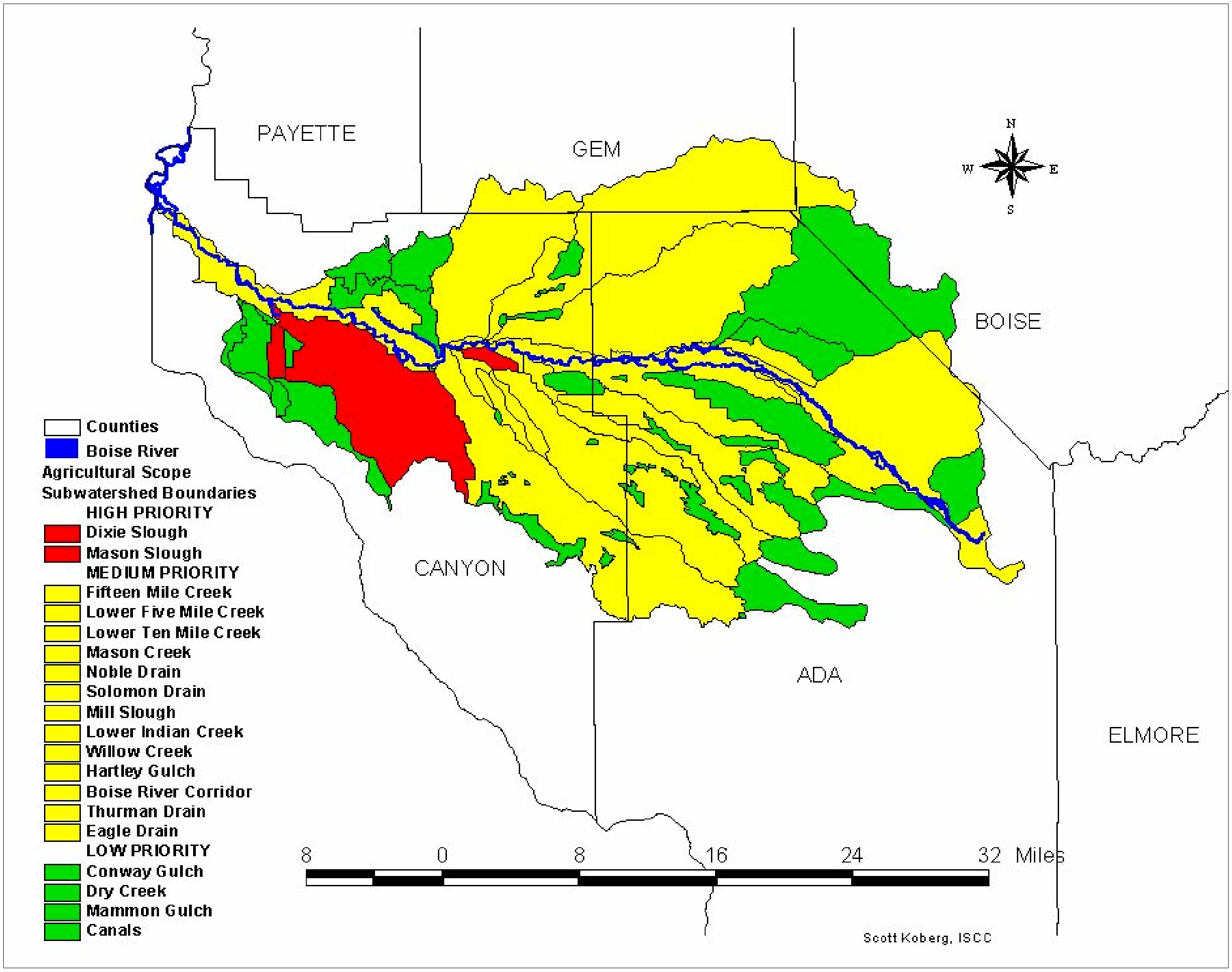
Bacteria Priority Areas

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.

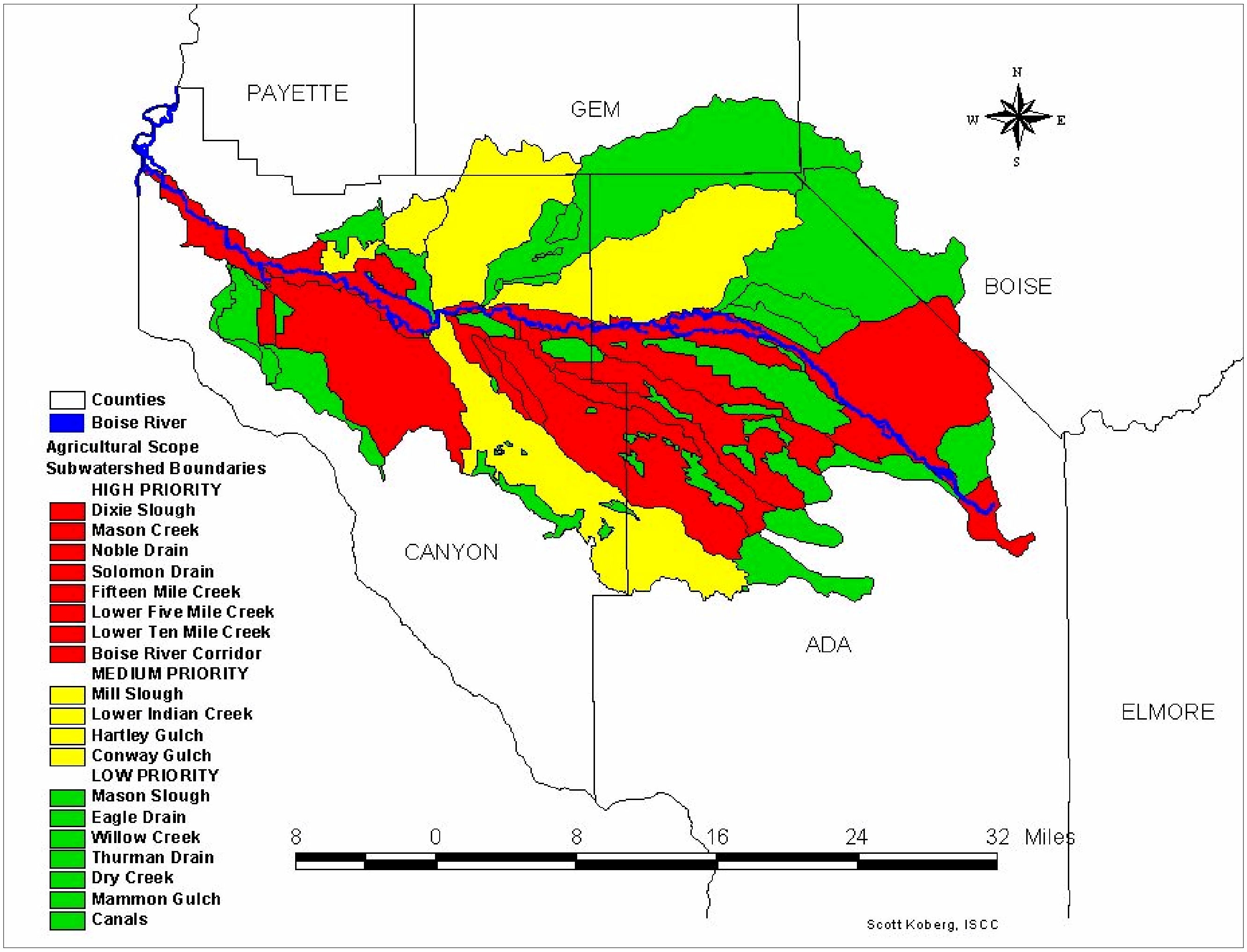
Phosphorus Priority Areas

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