Lake Lowell Watershed (17050114SW004_06)

Total Maximum Daily Load

Implementation Plan for Agriculture

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Introduction

The Idaho Department of Environmental Quality (IDEQ) must develop a Total Maximum Daily Load (TMDL) for pollutants for impaired waters as described in Section 303(d) of the Clean Water Act. A final draft of the *Lake Lowell TMDL: Addendum to the Lower Boise River Subbasin Assessment (SBA) and Total Maximum Daily Load (TMDL)* was prepared by the IDEQ on September 2010 and approved by the Environmental Protection Agency (EPA) on December 2010 (IDEQ 2010). As the designated agency, the Soil & Water Conservation Commission (SWC) is responsible for preparing the implementation plan for agriculture.

PURPOSE

The Lake Lowell (TMDL) Implementation Plan for Agriculture outlines an adaptive management approach for implementation of best management practices (BMPs) and resource management systems (RMS) on agricultural lands to meet the requirements of the *Lake Lowell TMDL: Addendum to the Lower Boise River Subbasin Assessment (SBA) and Total Maximum Daily Load (TMDL). A*n adaptive management approach allows for modification of resource management decisions based on experimentation.

GOALS AND OBJECTIVES

The goal of this plan is to provide a strategy for agriculture to assist and/or complement other watershed efforts in restoring and protecting beneficial uses for water quality impaired waterbodies in the Lake Lowell watershed (Figure 1). The DEQ identifies impaired waterbodies in an integrated report compiled every two years and in Subbasin Assessments and TMDLs. Table 1 shows the listed pollutant for Lake Lowell taken from the Integrated Report (Table 1, Figure 2) (IDEQ 2011).

Table 1. Assessment Units in the Lake Lowell Watershed (IDEQ 2011).

Assessment Unit #	Listed Pollutants and Source of Use Impairment
ID17050114SW004_06	Phosphorus

The Lake Lowell watershed falls primarily within Canyon County. A smaller portion of the watershed is within Ada County. The reservoir is within Canyon County. These counties are served by the Ada Soil and Water Conservation District (SWCD) and the Canyon Soil Conservation District (SCD). The objective of this plan is to provide guidance to the districts, partnering agencies, such as the Natural Resource Conservation Service (NRCS), and agricultural producers on how to reduce pollutant loading to listed waterbodies. Agricultural pollutant reductions will be achieved by on-farm conservation planning with individual operators and application of BMPs in agricultural critical areas. This plan recommends BMPs to meet TMDL targets in the Lake Lowell watershed and suggests alternatives for reducing surface water and groundwater quality problems from agriculture-related activities. As such, this plan focuses on treatment of upland areas surrounding Lake Lowell.

Background

PROJECT SETTING

The Lake Lowell watershed is located within the Lower Boise River Subbasin in Ada and Canyon counties in southwestern Idaho (Figure 1). The Lake Lowell reservoir is about five miles south of Caldwell and less than five miles southwest of Nampa. The reservoir sits at approximately 2,400 feet elevation. Powers Butte and Kuna Butte, which are located southeast of the reservoir, reach 3,000 feet elevation. Pickles Butte is west of the reservoir and it also reaches 3,000 feet elevation. I-84 is located north of the reservoir. HWY 78 and the Snake River are beyond the southern edge of the watershed.

As stated in the Lake Lowell TMDL: Addendum to the Lower Boise SBA-TMDLs, "The watershed lies within a dry climate region. The summer months are hot and dry with cool nights. Winters are cold and wet, though generally not severe. Lake Lowell, like most of Idaho, receives relatively little precipitation in late summer. The Deer Flat Dam weather station reports an average rainfall of 0.23 inches in July and 0.33 inches in August (Figure 2). The summer dry season in southern Idaho usually ends by October. Mean snow depth in January is 1 inch. The average summer (June –August) temperature during the period of 1916-2008 was 70ºF at Lake Lowell (Deer Flat Dam), with an average daily maximum temperature of 85.4ºF" (IDEQ 2010).

For more information regarding the climate, hydrology, soils, vegetation, and other watershed characteristics; please consult the Lake Lowell TMDL: Addendum to the Lower Boise SBA-TMDLs (IDEQ 2010).

The entire watershed (75,157 acres) is in the Owyhee Uplands Section of Baileys Ecoregions. Native vegetation is sagebrush steppe, typical of southwestern Idaho (http://cloud.insideidaho.org), although most of the watershed is cultivated.

There is only one Common Resource Areas (CRAs) for the Lake Lowell watershed. General characteristics for this CRA are described below (ftp://ftpfc.sc.egov.usda.gov/ID/technical/pdffiles/IdahoCRAReport.pdf.).

CRA 11.1 Snake River Plains – Treasure Valley- mean annual temperature <8 °C or between 8 and 15 °C; moist winters and dry summers; natural plant community of sagebrush steppe shrubs and grasses, such as sagebrush, shadscale, Indian ricegrass, blue grass, and needle and thread grass; cultivated land includes irrigated cropland and pastureland; cities, suburbs, and industries; surface water alterations by canals, reservoirs, and diversions for irrigation, urban, and industrial uses; crops include wheat, barley, alfalfa, sugar beets, potatoes, and beans.

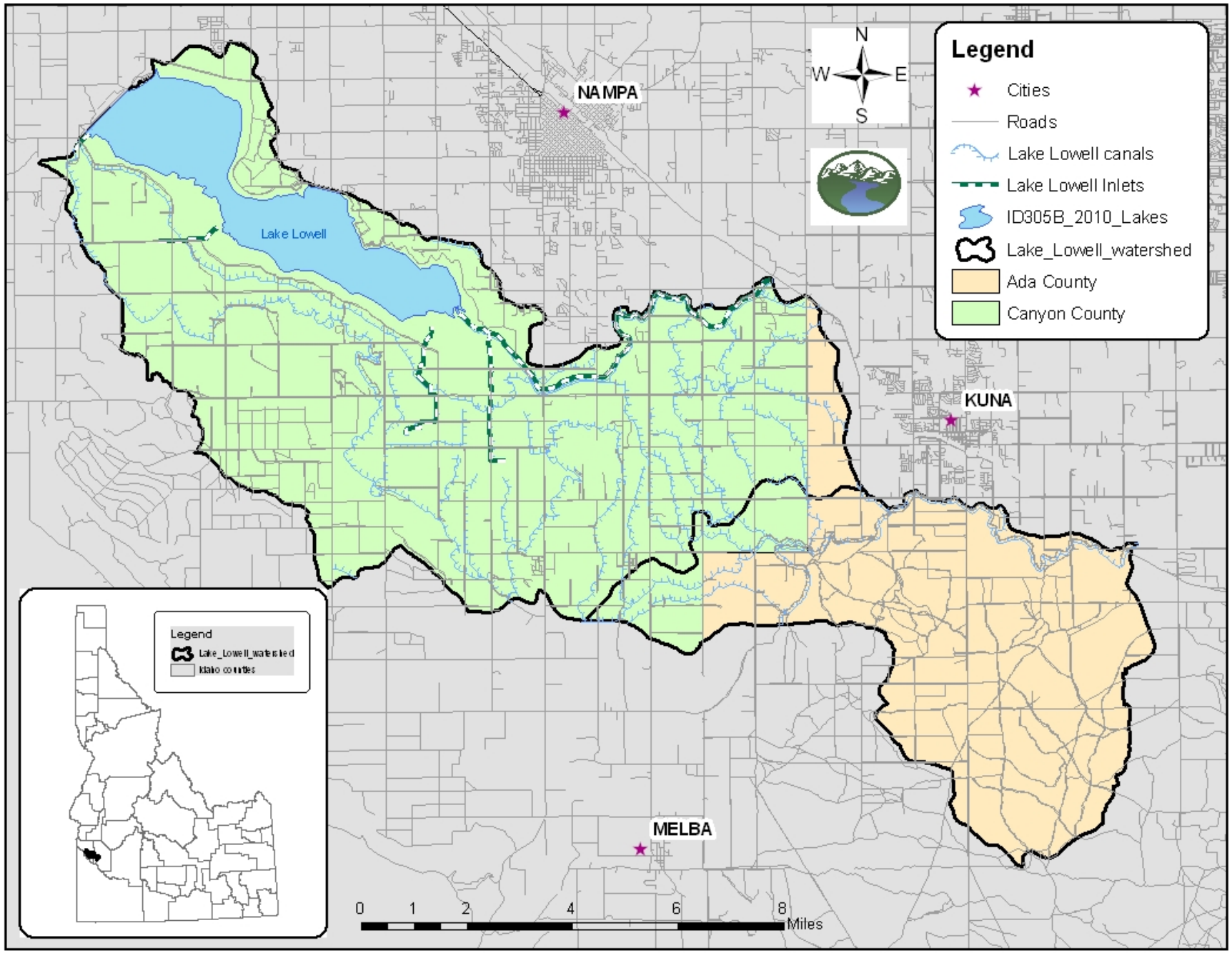


Figure 1. General Location of the Lake Lowell Watershed

LAND USE

Cropland is the predominant land use in the Lake Lowell watershed. Pasture and hayland are dispersed throughout the watershed. The southeastern portion of the watershed is rangeland. A series of canals, Bernard Drain, Coulee Drain, Deer Flat Highline, Farner Drain, and New York Canal are used to irrigate private land in the watershed and eventually drain into Lake Lowell. Roads are prevalent throughout the watershed. The city of Nampa, which has a population greater than 80,000, is about five miles northeast of Lake Lowell. The city of Kuna is east/southeast of Lake Lowell (Table 2, Figure 2). Land use data for Table 2 was taken from the National Land Cover Database developed and led by the United States Geological Survey (USGS 2006). 2006 USGS data was then compared to USGS data from 2001. Land use data was also taken from the Idaho Department of Water Resources Lower Boise River land use and land cover dataset for years 1994 and 2000 to evaluate land use change (IDWR 2011). The IDWR and USGS datasets have different land use categories. Therefore, 2001 USGS data and 2006 USGS data were compared to each other, but not to the IDWR land use coverages. There was no major change in land use over these time periods (Figures 3 & 4).

Table 2. Land Use in the Lake Lowell Watershed (USGS 2006).

LAND USE DESCRIPTION	ACRES	PERCENT OF WATERSHED
Open water	7,037	9.36
Developed, open space	3,002	3.99
Developed, low intensity	341	0.45
Developed, medium intensity	15	0.02
Shrub/Scrub	3,372	4.49
Grassland/Herbaceous	12,859	17.11
Pasture/Hayland	10,341	13.76
Cultivated crops	37,838	50.35
Woody wetlands	337	0.45
Emergent wetlands	9	0.01
TOTAL	75,150	100.00

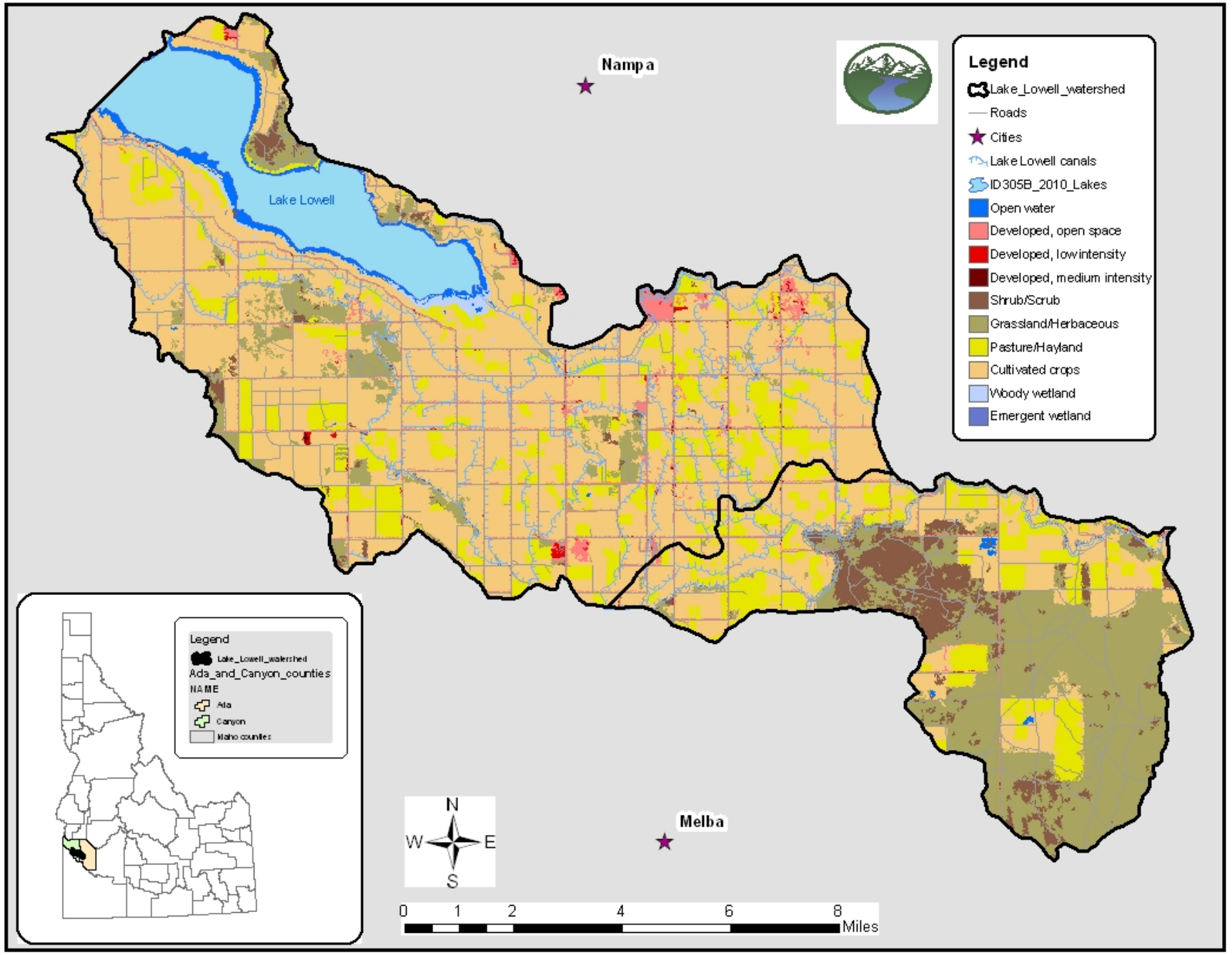
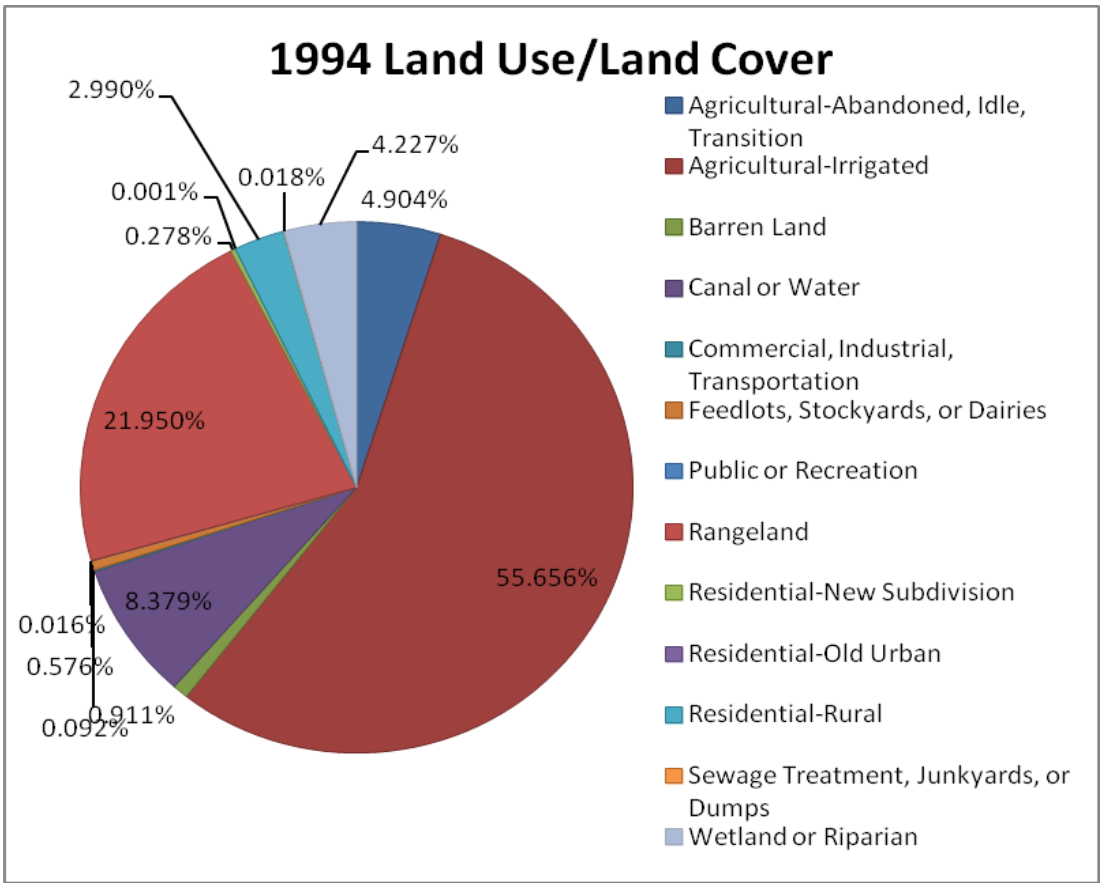


Figure 2. Land Use/Land Cover in the Lake Lowell Watershed (USGS 2006)



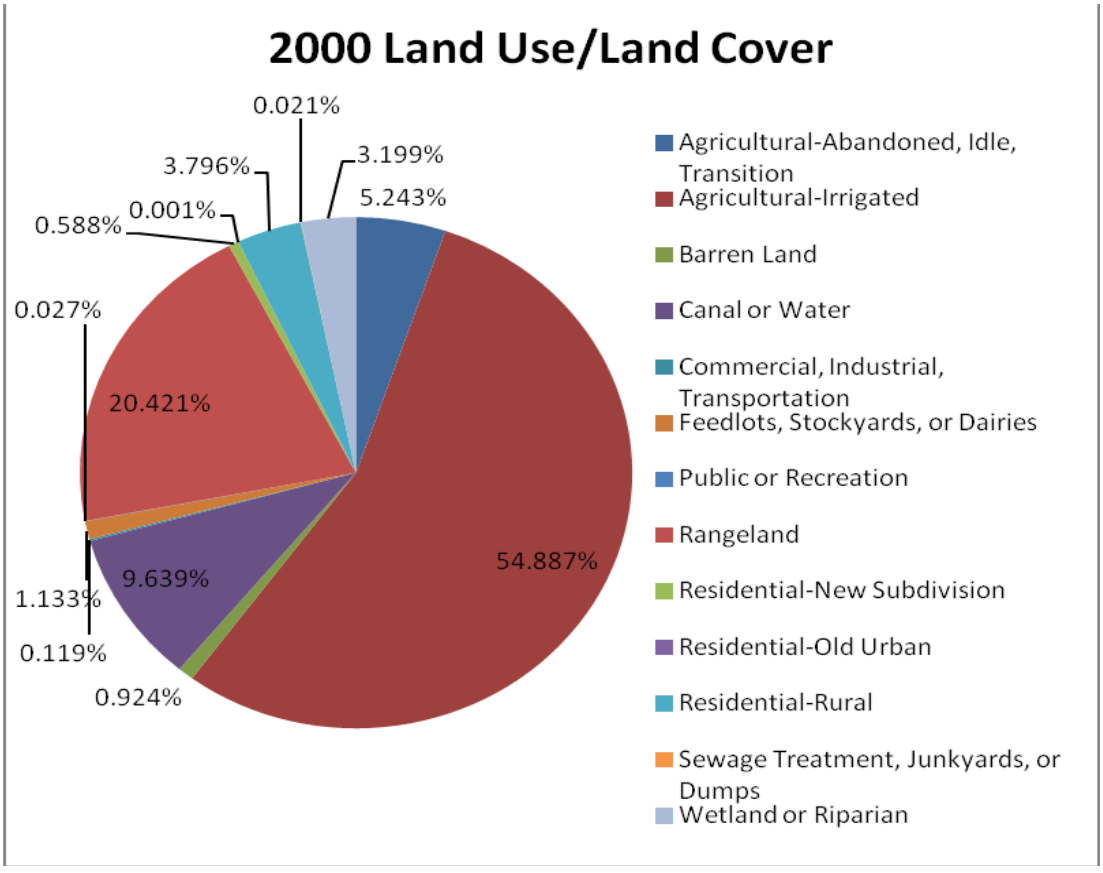
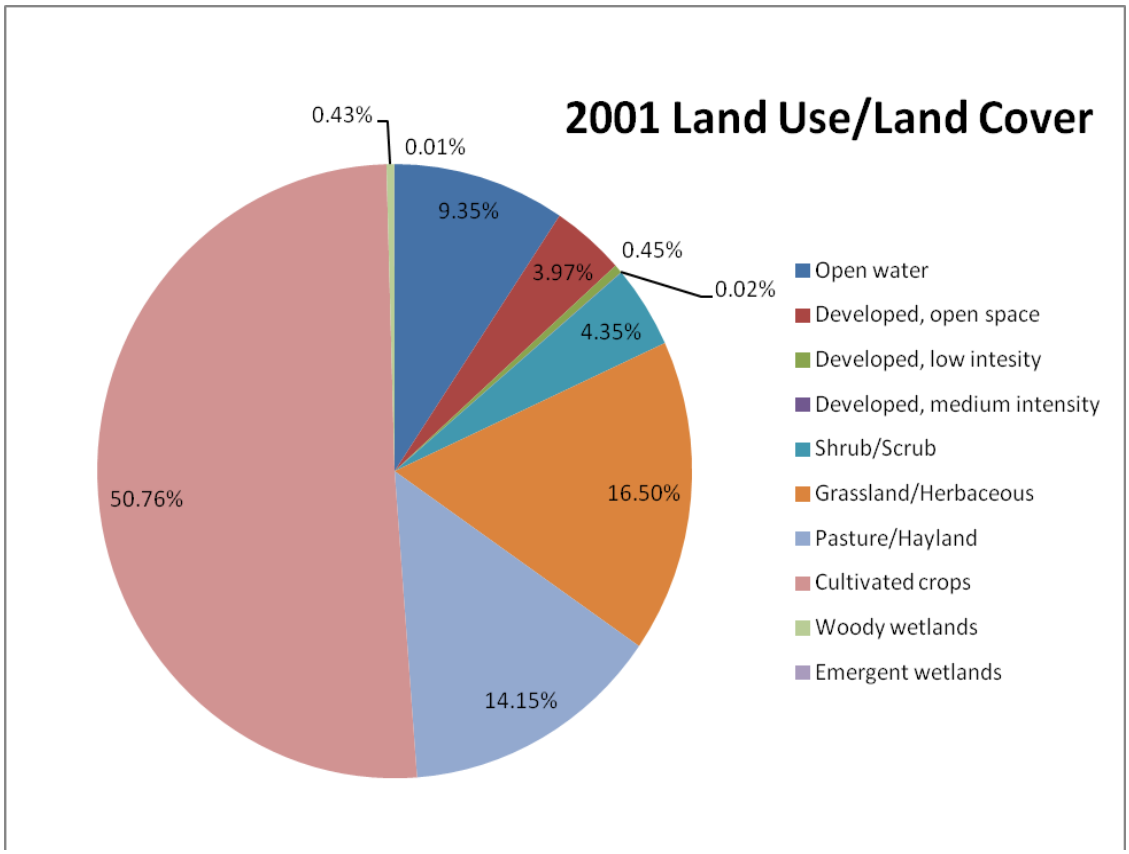


Figure 3. Land Use/Land Cover for years 1994 and 2000 (IDWR)



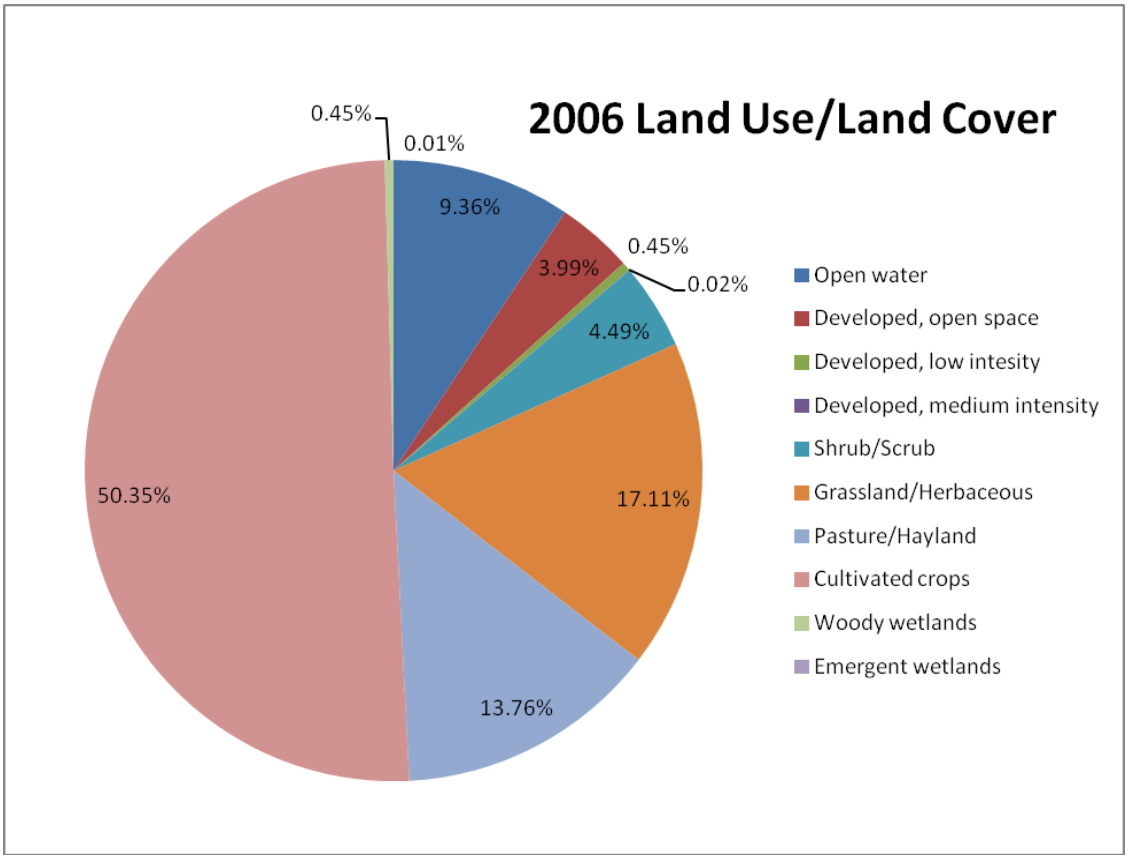


Figure 4. Land Use/Land Cover for years 2001 and 2006 (USGS)

LAND OWNERSHIP

Land ownership in the watershed is mostly private, accounting for seventy percent of the watershed. Bureau of Land Management (BLM) manages approximately fifteen percent of the watershed. The Deer Flat National Wildlife Refuge manages the land directly adjacent to Lake Lowell. Table 3 gives the name of the land owner or land manager, the total acres, and the percent of watershed in use by each of the land owners/managers. Figure 5 displays land ownership/management for the Lake Lowell watershed.

Table 3. Land Ownership in the Lake Lowell Watershed.

LAND OWNER/MANAGER	ACRES	PERCENT OF WATERSHED
BLM	11,460	15.26
MIL	100	0.13
USFWS, NWR	10,405	13.86
PRIVATE	52,721	70.22
STATE	388	0.52
STATEFG	6	0.01
Total	75,081	100.0

BLM=Bureau of Land Management, MIL=Military, USFWS, NWR=United States Fish and Wildlife Service, National Wildlife Refuge, STATEFG=State Fish and Game

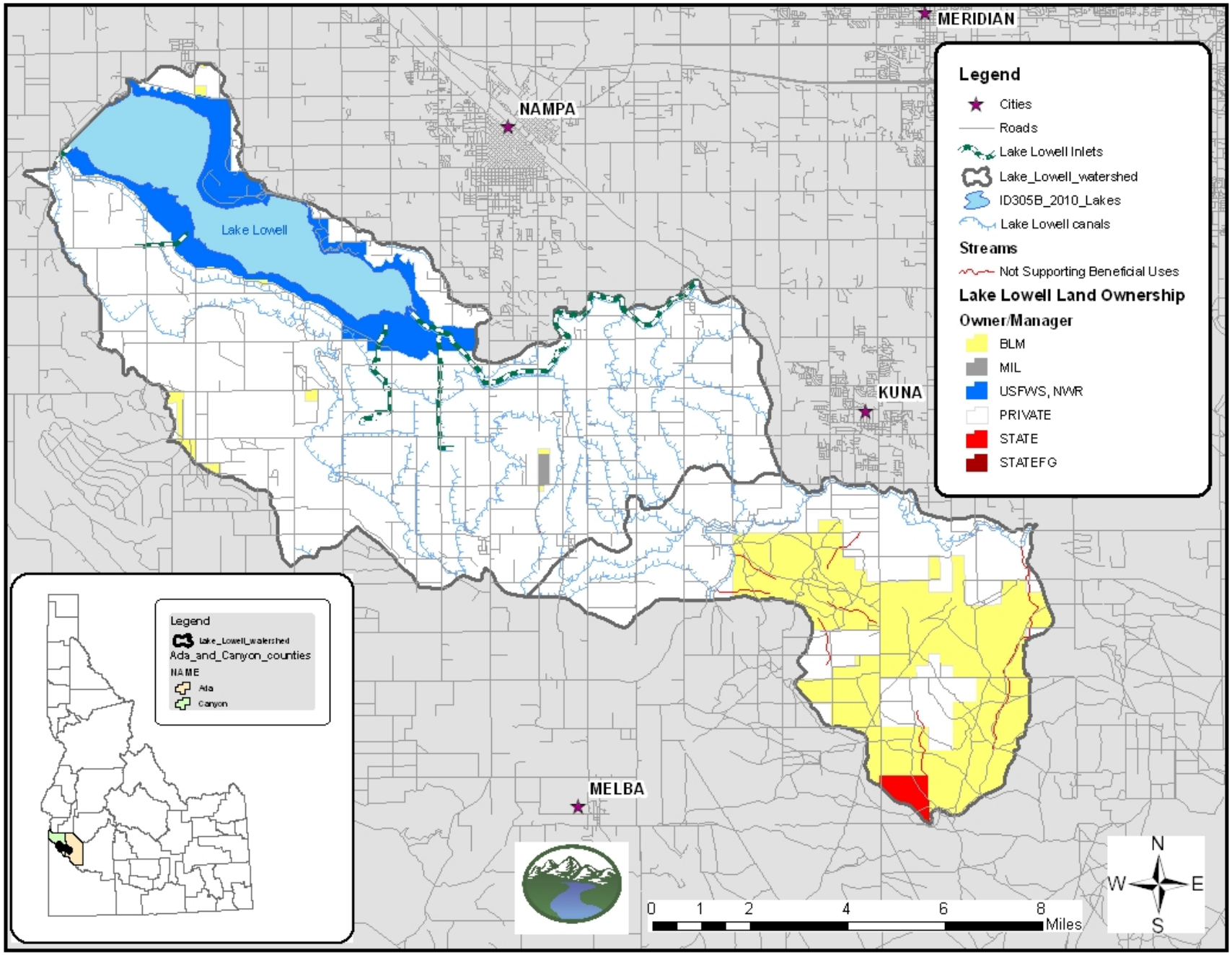


Figure 5. Land Ownership/Management in the Lake Lowell Watershed

CONSERVATION ACCOMPLISHMENTS

Most of the past best management practices (BMPs) installed on cropland and pasture/hayland focused on improving water use efficiency on irrigated agricultural land through crop rotations, irrigation system conversions or improvements as well as management practices such as irrigation water, nutrient, and pest management.

Other practices were aimed at reduction of runoff containing sediment and nutrients. Still others were geared toward improvement of plant condition and productivity.

Landowners have used polyacrylamide (PAM) on head ditches for the last 10 years. They have also converted to center pivots without the aid of Farm Bill programs (pers. comm. Mike Somervilie, Canyon County Supervisor).

A majority of the BMPs were installed in the middle and southeastern portion of the watershed. A summary of the BMPs installed throughout the watershed through federal programs from fiscal years 2007 through 2011 can be found in Table 4 (http://ias.sc.egov.usda.gov/PRSHOME).

One of the goals of applying these BMPs is to reduce impacts to water quality from agricultural lands. In the Lake Lowell watershed BMPs have typically been funded through local SWCD/SCDs and NRCS Farm Bill Programs such as the Environmental Quality Incentives Program (EQIP), Conservation Technical Assistance (CTA-General), and Ground and Surface Water Conservation (GSWC). For more detailed information regarding these programs please refer to the funding section of this plan or to the USDA Natural Resources Conservation Service (http://www.id.nrcs.usda.gov/).

Table 4. BMPs installed in the Lake Lowell Watershed, by federal fiscal year.

PRACTICE NAME	PRACTICE NUMBER	2011	2010	2009	2008	2007	UNIT
Comprehensive Nutrient Management Plan	100					2	no
Conservation Crop Rotation	328	57			371	290	ac
Diversion	362				770		ft
Fence	382				2,056		ft
Irrigation Pipeline	516	3,945			520		ft
Irrigation System, Sprinkler	442	47	53		122	217	ac
Irrigation System, Surface and Subsurface	443				11		ac
Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic	430DD		8,506		1,170	984	ft
Irrigation Water Management	449			7	125	165	ac
Nutrient Management	590	37		7	125	172	ac
Pasture and Hay Planting	512				7		ac
Pest Management	595				125	160	ac
Prescribed Grazing	528			7			ac
Pumping Plant	533	2	1		1		no
Residue Management, Seasonal	344					5	ac
Roof Runoff Structure	558				1	1	no
Structure for Water Control	587	3	3				no
Surface Roughening	609					5	ac
Waste Storage Facility	313					1	no
Watering Facility	614				3	3	no
Windbreak/Shelterbelt Establishment	380					600	ft

Water Quality Problems

BENEFICIAL USE STATUS

Idaho water quality standards require that beneficial uses of all water bodies be protected (IDAPA 58.01.02.051.02). Beneficial uses can include existing uses, designated uses, and presumed existing uses. Designated uses are uses officially recognized by the state. Agricultural water supply, industrial water supply, wildlife habitat, and aesthetics are designated uses for all waterbodies within the state of Idaho. In cases where designated uses have not been established by the state for a given water body, DEQ has established the presumed existing uses of supporting cold water aquatic life and either primary or secondary contact recreation. Designated beneficial uses specific to the Lake Lowell watershed are listed below in Table 5 (IDEQ 2010). The canals and drains entering Lake Lowell are man-made water bodies which must support the uses for which they were developed, in this case agricultural water supply. In order for beneficial uses to be supported, water quality criteria must not be exceeded. Some of these criteria are:

Warm water aquatic life (WARM)

- Temperature is 33 °C or less daily maximum; 29 °C or less daily average.
- DO must exceed 5.0 mg/L. (This does not apply to the bottom 20% of water depth in lakes or reservoirs 35 meters or less and waters of the hypolimnion in stratified lakes and reservoirs.)

Primary Contact Recreation (PCR)

- Bacteria counts are less than 126 *E. coli*/100 ml (geometric mean) of 5 samples over 30 days or less than 406 *E. coli*/100 ml (instantaneous).
- Waters shall be free from visible slime growths or other nuisance aquatic growths.

Temperature and dissolved oxygen were measured to determine beneficial use support status for WARM. Temperature data collected by IDEQ and the Bureau of Reclamation (BOR) indicates support of warm water aquatic life as a beneficial use for Lake Lowell. However, dissolved oxygen concentrations exceed the criterion for the months sampled during 2003, 2004, and 2005 at the Upper Embankment site and a site near Highline Wasteway #1. Dissolved oxygen concentrations do not support WARM.

E. coli bacteria measurements and observations of aquatic growth were made to determine beneficial use support status for PCR. Bacteria concentrations were below criteria. However, nutrient narrative criteria were not met because the water in Lake Lowell has visible slime growths, algal blooms, and/or other nuisance aquatic growths.

Table 5. Beneficial Uses by AU in the Lake Lowell Watershed (IDEQ 2010).

Assessment Unit (AU)#	Beneficial Use	Type of Use	Support Status
ID17050114SW004_06 Lake Lowell	 WARM PCR	 Designated Designated	 Not Supported Not Supported

WARM=Warm Water Aquatic Life, PCR=Primary Contact Recreation, SRW=Special Resource Water

POLLUTANTS

DEQ collected water quality data (total phosphorus, ammonia, Kjeldahl nitrogen, and nitrate/nitrite) to determine beneficial use support status and to clarify the 303 (d) listing of Lake Lowell as impaired by unknown pollutant(s), which was based on observations of nutrient enrichment and measurements of low dissolved oxygen levels.

Nutrient data collected by DEQ, BOR, and ISDA from canals and drains entering into Lake Lowell exceeded the total phosphorus (TP) target (0.07 mg/L) for tributaries to Brownlee Reservoir. Phosphorus is thought to enter into Lake Lowell bound to sediment because it is predominantly found in the particulate form in the lake (IDEQ 2010).

Mercury in fish tissue was sampled in 1998 by BOR and the United States Fish and Wildlife Service (USFWS) in 2006 and 2007. Methylmercury concentrations did not exceed the WQS of 0.3 mg/kg; however, a fish consumption advisory was posted due to potential health risks for young children and pregnant women who may eat fish.

Nonpoint source pollution is attributed to erosion of sediment and nutrients from irrigated cropland and pastureland as stated below in the Lake Lowell TMDL: Addendum to the Lower Boise River SBA and TMDL (IDEQ 2010). Table 6 is the TMDL load reduction.

> Land use in the watershed is dominated by irrigated crops and pasture. While the locations of agricultural diversions and drains can be identified as specific points on the landscape, the CWA designates these as nonpoint sources due to the impact that widespread land use activities have on the water channeled through these systems. The data from a 2003 ISDA study indicate that agricultural acres currently under furrow or flood irrigation practices, rather than sprinkler, contribute the largest concentration of sediment, phosphorus, and nitrogen.
>
> Nutrients from agricultural lands are transported primarily during the irrigation season while agricultural canals and drains are flowing. The majority of the precipitation in the basin is received during the non-irrigation season. Precipitation events can transport nutrient-laden sediment to the dry ditches or canals. The nutrients will be mobilized in spring when water is returned to the irrigation system, causing a large pulse of available nutrients.

Table 6. 2010 303(d) Listed Waterbody and Pollutant for the Lake Lowell Watershed (IDEQ 2010)

Assessment Unit #	Pollutant	Load Allocation (g/ac/day)	Percent Reduction Required to meet TMDL	Agricultural Concerns
ID17050114SW004_06 Lake Lowell	Total Phosphorus	2.70	56%	Agricultural runoff from irrigated lands

WATER QUALITY MONITORING

The Lake Lowell TMDL: Addendum to the Lower Boise River Subbasin Assessment (SBA) and Total Maximum Daily Load (TMDL) includes information on most of the water quality monitoring that has taken place in the watershed. Conclusions from the Lake Lowell Irrigation Return Drains (presented in the TMDL) stated that heavy sediment and nutrient loading entered Lake Lowell from the three drains sampled (Campbell 2003). An additional study conducted by the ISDA was not presented in the TMDL, but it is summarized here. Four drains (Bernard, Coulee, Garland, and Highland Wasteway #3) that deliver sediment loads into Lake Lowell were sampled for pesticides. Most of the detected pesticides were herbicides rather than insecticides. There were five pesticides, chlorpyrifos, chorvus, methomyl, metolachor, and linuron that exceeded 50% of the acute or chronic level for fish or aquatic invertebrates for one or more detections. This level was established by EPA (http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.htm). Chlorpyrifos is of the greatest concern because it is the most toxic of the pesticides detected (Campbell 2010).

AGRICULTURAL WATER QUALITY INVENTORY AND EVALUATION

The following information is based on the Soil Survey of Canyon Area, Idaho, field surveys conducted by SWC staff, personal communication with Randy Aulbach (Deer Flat NWR) and personal communication with board members of the Canyon Soil Conservation District (Priest et al 1976). SWC field staff inventoried drains entering into Lake Lowell in 2010. SWC field staff also inventoried fields for irrigation type in 2012.

Cropland

Cropland is the predominant land use in the Lake Lowell watershed. Conventionally tilled, cultivated cropland is found on 0-12% slopes. Elevation ranges from 2,200 to 3,080 feet at Pickle Butte. Precipitation is 8 to11 inches per year. Frost free season is 140 to 165 days. Irrigated crops are grown on Bram silt loam, Minidoka silt loam, Power silt loam, and Scism silt loam soils to name a few. Soils are typically sandy loams or silt loams. Sprinkler and surface (flood) irrigation are used to grow crops. Flood irrigation is most common and is via earthen and concrete ditches. There are some hand-lines, wheel-lines, and pivots used to irrigate crops. Runoff potential can be moderate to severe and

erosion from irrigated lands is a serious concern. The irrigation water source is surface water from the Boise River which is delivered through a series of canals. The principal crops are alfalfa and clover for seed and hay, winter and spring wheat, field corn, sweet corn, hybrid sweet corn seed, sugar beets, potatoes, hops, onions, beans, and barley. Some land leveling may have occurred. Fertilizers and pesticides are typically applied.

Grass/Pasture/Hayland

Irrigated pastureland is the second most common agricultural land use in the watershed. Elevation ranges from 2,200 feet in the bottomlands along streams to 3,080 feet in the uplands. Precipitation is 8 to 11 inches per year with a growing season ranging from 140 to 165 days. Typical soils are silt loams or sandy loams. Bram silt loam, Power-Purdam silt loam, Power silt loam, Purdam silt loam, and Scism silt loam are some of the soil types upon which pasture grasses are grown. Irrigated pastures are often surface irrigated by earthen or concrete ditches or hand or wheel lines. Flood irrigation efficiency is 20-35%, but this may be increased to 70% or greater with conversion to hand line, wheel line, or pivot sprinkler systems. Canals supply water used to irrigate pastures.

Practices such as land leveling and land smoothing have been applied to pasture and hay fields. Pastureland consists of introduced forage species and native perennials whereas hayland consists of a small grains and an alfalfa rotation. Fertilizers and pesticides may be applied.

ANIMAL FEEDING OPERATIONS AND DAIRIES

There are seventeen dairies located within the watershed based on data compiled by IDEQ and ISDA from 1999 (www.idwr.state.id/gisdata/gisdata-new.htm). These dairies lie on the eastern edge of the watershed. All licensed dairies are required to have a nutrient management plan according to Idaho law, *I.C. §37-401, Title 37, Chapter 4, Sanitary Inspections of Dairy Products* (http://www.agri.state.id.us/Categories/Animals/Dairy).

There are eight approved cattle feeding operation in Ada and Canyon counties (ISDA 2009). Cattle feedlots are governed by IDAPA 02.04.15, Rules Governing Beef Cattle Animal Feeding Operations. CAFOs must have wastewater storage and confinement facilities to control runoff. ISDA is responsible for regulation of beef and dairy CAFOs.

GROUNDWATER CONCERNS

Ada/Canyon is the 2nd highest ranking nitrate priority area (NPA) in the State of Idaho. NPAs have elevated nitrate levels in the groundwater that pose human health concerns for infants and elderly consuming drinking water. A portion of the Ada/Canyon Nitrate Priority Area is located in the middle of the Lake Lowell watershed (Figure 6). This area covers about 31,250 acres within the watershed.

The trend in nitrate levels is increasing according to the 2008 Final Nitrate Priority Area Ranking (http://www.deq.state.id.us/water/data_reports/ground_water/reports.cfm). A

Lower Boise/Canyon County Water Quality Groundwater Management Plan was developed to address groundwater contamination (IDEQ 2005).

Groundwater concern areas also lie within the Lake Lowell watershed. Groundwater concern areas are areas where groundwater use is a concern because there may be limited supply of this resource (www.idwr.idaho.gov/GeographicInfo/GISdata/gis_data.htm).

Groundwater quality monitoring of nutrients and pesticides occurred from 2003 to 2006. Groundwater quality monitoring conducted by the ISDA demonstrated that nitrate concentrations were greatest northwest of Lake Lowell. Pesticides, such as atrazine, bromacil, dacthal, and simazine were detected on the eastern edge of the watershed, but were below levels that would pose a human health risk (Carlson and Atlakson 2007).

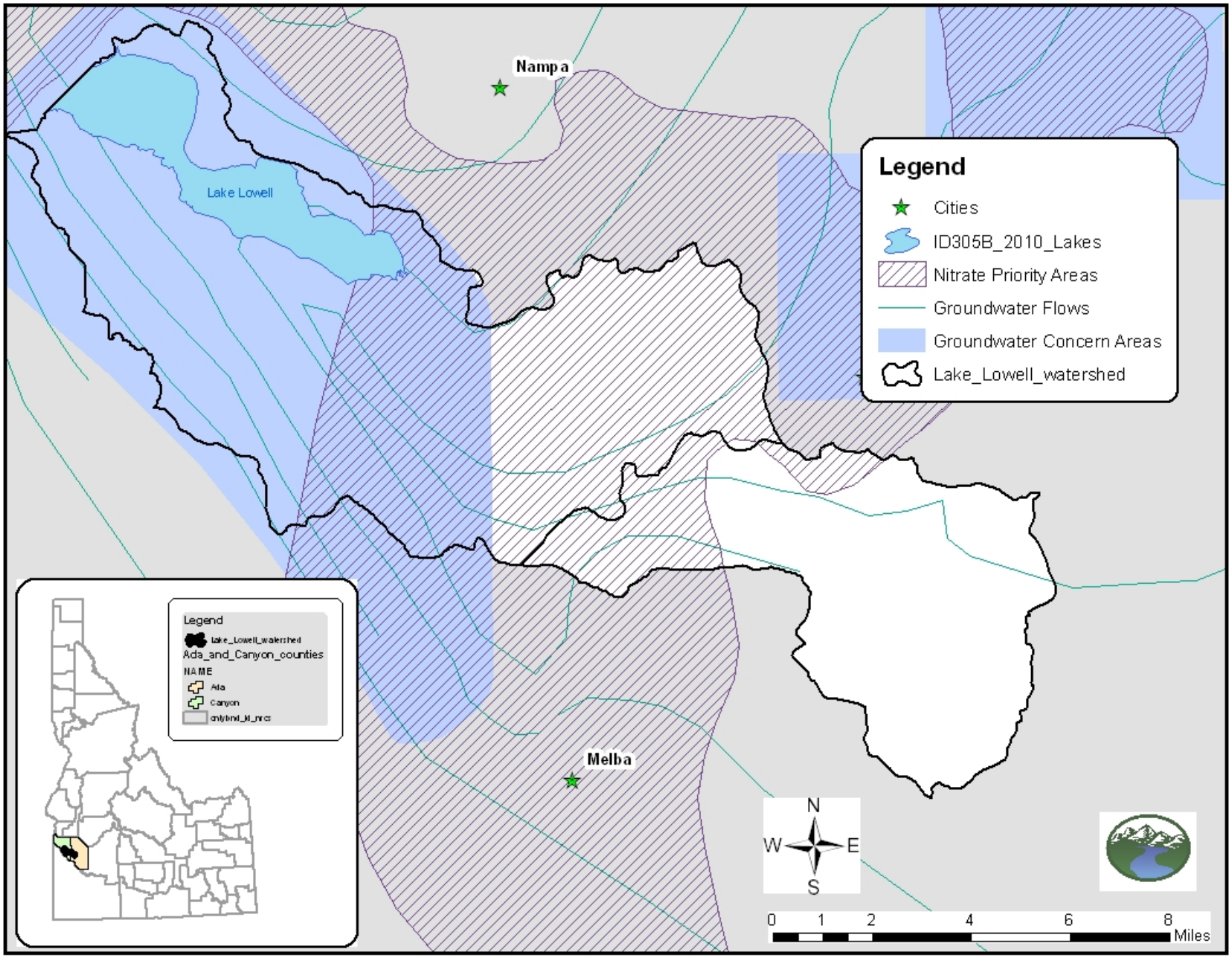


Figure 6. Nitrate Priority and Groundwater Concern Areas in the Lake Lowell Watershed

INVASIVE SPECIES

Invasive species are plants, animals, fish, and invertebrates that are not native to Idaho. Listed below are invasive fish, invertebrate, and plant species that are documented to exist in the Lake Lowell watershed, a subunit of the Lower Boise River subbasin.

There are no native populations of trout in Lake Lowell (http://map.streamnet.org/website/bluesnetmapper/viewer.htm). However, introduced game fish, such as largemouth bass, smallmouth bass, perch, crappie, bluegill, rainbow trout, channel catfish, and brown bullhead are stocked by Idaho Department of Fish and Game. Stocking rates and type of fish stocked can change yearly. There are three know barriers to fish movement, Deer Flat Middle, Deer Flat Lower, and Deer Flat Upper Dams (http://ecos.fws.gov/geofin/).

New Zealand mudsnails exist in Wilson Spring in Nampa (http://nas.er.usgs.gov/queries/).

Aquatic and terrestrial noxious weeds that are documented to exist in Canyon County are listed below (University of Idaho 2010). Noxious weeds include curly leaf pondweed, dalmation toadflax, Eurasion watermilfoil, field bindweed, perennial pepperweed, poison hemlock, puncturevine, purple loosestrife, rush skeletonweed, Russian knapweed, Scotch thistle, whitetop, and yellow flag iris.

THREATENED AND ENDANGERED SPECIES

The following species are listed as candidate, endangered, or threatened by the USFWS for Canyon County (http://www.fws.gov/idaho/Species.htm).

Table 7. Listed Species for the Lake Lowell Watershed

Scientific Name	Common Name	Listing
Coccyzus americanus	Yellow-billed cuckoo	Candidate
Gulo gulo	Wolverine	Candidate
Haitia (Physa) natricinia	Snake River physa snail	Endangered
Haliaeetus leucocephalus	Bald eagle	Endangered
Lepidium papilliferum	Slickspot peppergrass	Threatened Proposed Critical Habitat

Agricultural conservation planning will be coordinated with other species recovery and protection efforts in the watershed to consider listed species' habitats and address any potential impacts from BMP implementation. Improvements in water quality, achieved from BMPs installed on agricultural lands, are not expected to adversely affect these listed species and should improve or enhance their habitat. Any BMP implementation that will affect T&E species or habitat will follow Endangered Species Act (ESA) consultation requirements.

WETLANDS

Wetlands are lands that are inundated by water or have saturated soil for significant periods of time. Wetlands are important because they contain a wide variety of plant and animal species and they function as natural filters (http://www.epa.gov/owow/wetlands). The area surrounding Lake Lowell contains freshwater forested scrub and freshwater emergent wetlands. (http://www.fws.gov/wetlands/Data/Mapper.html). The perimeter of Lake Lowell is surrounded by wetlands that are used by shorebirds and other wildlife (http://www.fws.gov/deerflat/wildlife.html).

Treatment

For the purposes of this implementation plan, surface irrigated fields, sprinkler irrigated fields, and animal feeding operations were identified for treatment. Fields previously treated with best management practices (BMPs) were excluded from further treatment. Irrigation canals themselves were not listed and were excluded from treatment.

CRITICAL AREAS

Areas of agricultural lands that contribute excessive pollutants to water bodies are defined as critical areas for implementation. Critical areas are those areas in which treatment is considered necessary to address resource concerns affecting water quality. Critical areas are prioritized for treatment based on their location to a water body of concern and the potential for pollutant transport and delivery to the receiving water body. Critical areas in this plan are surface irrigated cropland and surface irrigated pastureland/hayland that may contribute sediment and nutrients to Lake Lowell via irrigation canals and drains to the lake. Drain entry points are located in Figure 7. Entry points were marked for drains that had no flowing water, intermittent flows, and had flowing water throughout the irrigation season. Tiers for surface irrigated cropland are shown in Figure 8. Orthoimagery, topographic maps, land use, cropland units, canals/drains, and field investigations were used to sort critical areas into tiers.

TIERS

Tier 1: Surface irrigated fields that drain directly into Lake Lowell, or into one of the five tributary waterways which deliver the greatest phosphorus loads into the lake (New York Canal, Deer Flat Wasteway #3, Farner Drain, Bernard Drain, and Coulee Drain).

Tier 2: Surface irrigated fields where the wastewater has the potential to be reused by Tier 1 acreage before entering the lake or one of the five major tributary waterways.

Tier 3: Surface irrigated fields in the uplands the wastewater from which has the potential to be used multiple times by Tier 2 and Tier 1 acreage before entering the lake or one of the five major tributary waterways.

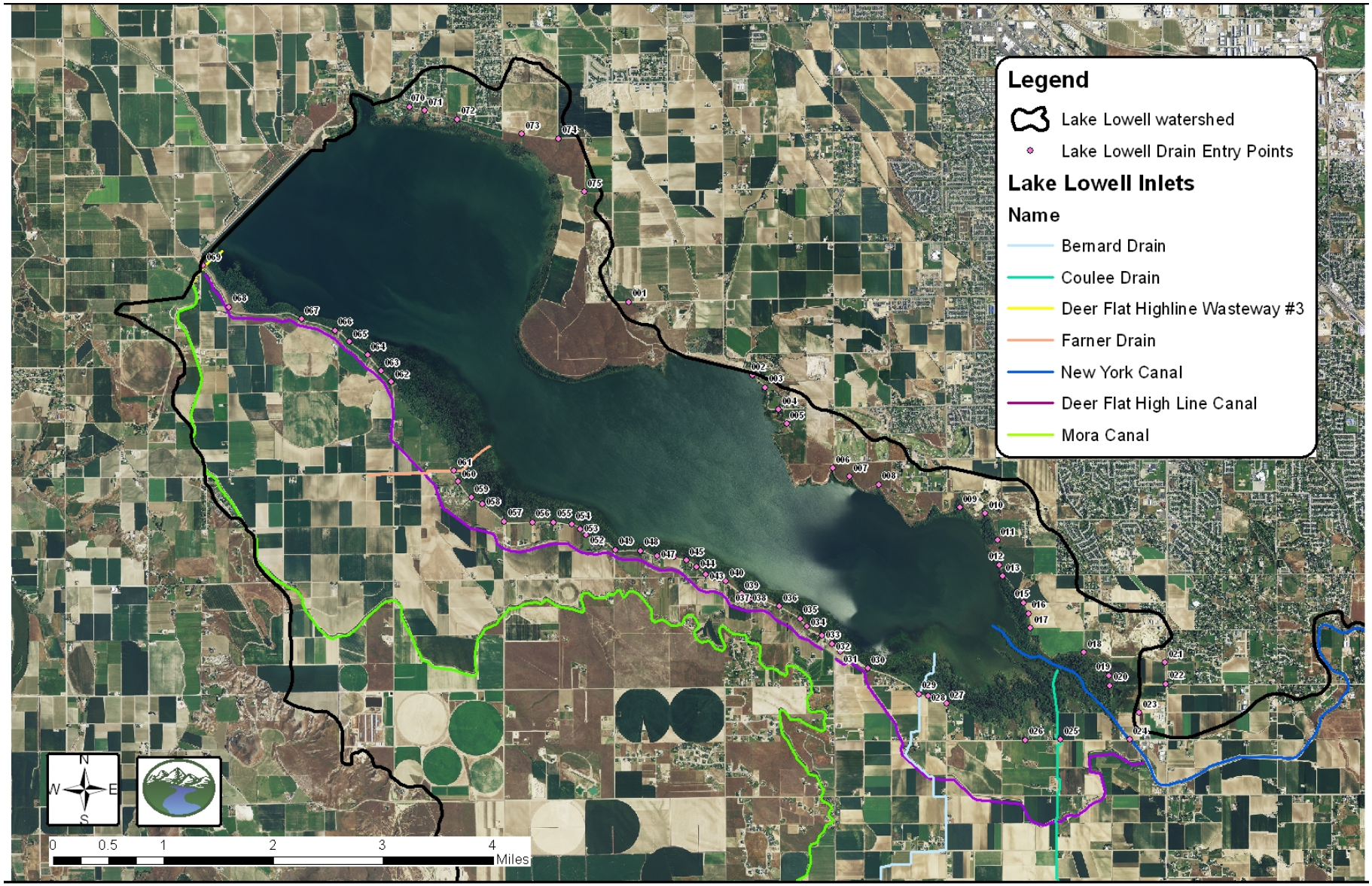


Figure 7. Drain Entry Points in the Lake Lowell Watershed

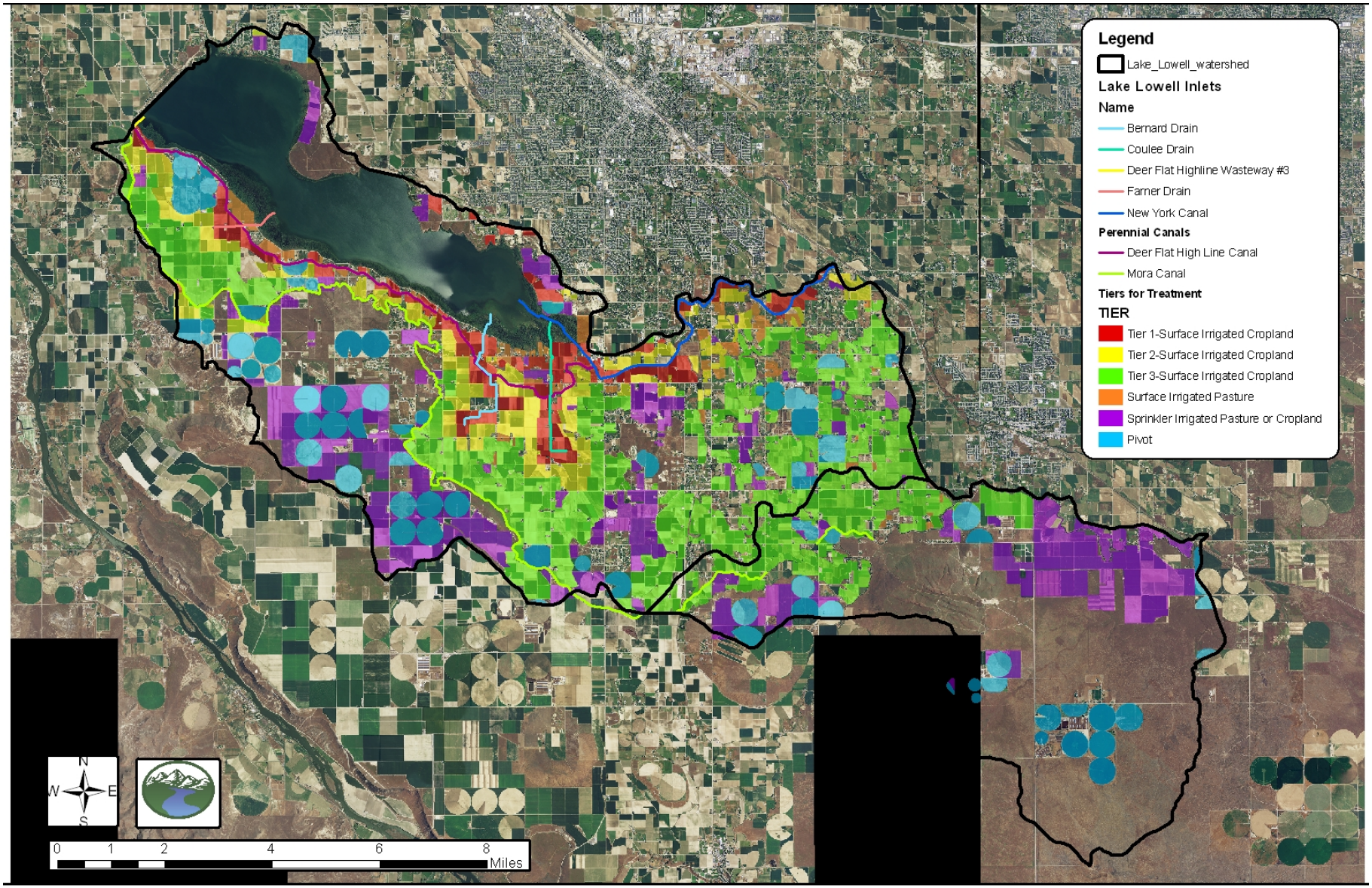


Figure 8. Tiers for Treatment in the Lake Lowell Watershed

TREATMENT UNITS (TU)

The following treatment units (TUs) describe areas in the Lake Lowell watershed with similar land uses, irrigation practices, soil type, resource concerns, and treatment needs. These TUs provide a method for evaluating land use impacts to water quality and for formulating alternatives for solving water quality problems. Treatment units for private agricultural lands in the Lake Lowell watershed include surface irrigated cropland, surface irrigated pasture/hayland, sprinkler irrigated cropland/pastureland/hayland, and animal feeding operations. BMPs are suggested for each treatment unit in Table 8.

Treatment Unit #1- Surface Irrigated Cropland

Acres	Description	Resource Problems	Critical Acres
18,869	-Sandy or silt loam soils -Moderately drained soils -Slope 0 to 12% -Highly erodible by wind	Irrigation induced erosion as well as natural water and wind erosion, sediment and nutrient (fertilizer) transport from cropland during runoff, sediment and nutrient transport into the lake from canals and inlets, nutrient and pesticide leaching into groundwater	**6,292**

Treatment Unit #2- Surface Irrigated Pastureland/Hayland

Acres	Description	Resource Problems	Critical Acres
769	-Sandy or silt loam soils -Moderately drained soils -Slope 0 to 7% - Highly erodible by wind	Irrigation induced erosion as well as natural water and wind erosion, sediment and nutrient (fertilizer) transport from pasture during runoff, sediment and nutrient transport into the lake from canals and inlets, nutrient and pesticide leaching into groundwater	**769**

Treatment Unit #3 Sprinkler Irrigated Cropland/Pastureland/Hayland

Acres	Description	Resource Problems	Critical Acres
7,468	-Sandy or silt loam soils -Moderately drained soils -Slope 0 to 12%	Soil condition, inefficient water use on irrigated land, sheet and rill erosion, ephemeral gully erosion, irrigation-induced erosion (sprinkler), surface water quality (pesticides, nutrients and organics, suspended sediment), ground water quality (pesticides, nutrients and organics), and wind erosion	**1,184**

Treatment Unit #4 Animal Feeding Operations

No.	Description	Resource Problems
8	Domestic animal facilities located along irrigation canals	Bacteria, sediment, and nutrient transport into Lake Lowell via irrigation canals and inlets

RECOMMENDED BMPS AND ESTIMATED COSTS

Table 8 is a list of suggested BMPs for the above described treatment units in the Lake Lowell watershed. These BMPs and their estimated costs are based on treatment unit acres and the most recent NRCS cost-share list (Table 8) (NRCS, 2012). A more accurate cost for implementation of BMPs may be made on a case by case basis with interested landowners.

The NRCS, SWC, and Canyon SCD provide technical and other assistance for the development of conservation plans for landowners who participate in State or Federal cost-share programs. Each plan consists of an evaluation of resource concerns as well as an assessment of crop rotation, tillage operations, irrigation water management, nutrient management, waste storage, and other site specific considerations.

Table 8. Recommended BMPs by treatment unit and estimated total costs.

Lake Lowell Watershed Practice#	Practice Name	Amount	Cost /Unit	Unit	Total Cost
Treatment Unit #1- Surface Irrigated Cropland (6,292 ac)					
328	Conservation Crop Rotation	6,292			
441	Irrigation System Sprinkler, Micro-irrigation	150	$715.00	ac	$107,250
442	Irrigation System Sprinkler, Center Pivot	25,500	$33.10	ft	$844,050
430DD	Irrigation Water Conveyance, Pipeline	17,000	$2.75	ft	$46,750
449	Irrigation Water Management	6,292	$25.05	ac	$157,615
590	Nutrient Management	6,292	$4.90	ac	$30,831
595	Pest Management	6,292	$21.95	ac	$138,109
450	PAM (Anionic Polyacrylamide)				
533	Pumping plant	3	$2,325.00	hp	$6,975
350	Sediment Basin	171,000	$2.00	yd^3	$342,000
587	Structure for Water Control	12	$325.00	ft	$3,900
Treatment Unit #2- Surface Irrigated Pastureland/Hayland (769 ac)					
382	Fence (wire-4 strand)	12,300	$1.15	ft	$14,145
442	Irrigation System Sprinkler, Wheel line	25,080	$965.00	ft	$24,202,200
430DD	Irrigation Water Conveyance, Pipeline	70,000	$2.75	ft	$192,500
449	Irrigation Water Management	769	$25.05	ac	$19,263
590	Nutrient Management	769	$4.90	ac	$3,768
512	Forage and Biomass Planting	769	$42.60	ac	$32,759
595	Pest Management	769	$21.95	ac	$16,880
516	Pipeline	1,500	$1.80	ft	$2,700
528	Prescribed Grazing (pasture site)	769	$4.35	ac	$3,345
533	Pumping plant	3	$2,325.00	hp	$6,975
587	Structure for Water Control	4	$325.00	ft	$1,300
645	Upland Wildlife Habitat Management	769	$0.65	ac	$500
313	Waste Storage Facility	3	$25,000.00	no	$75,000
614	Watering Facility	4,500	$1.05	gal	$4,725

Table 8 cont.

Recommended BMPs by treatment unit and estimated total costs.

Lake Lowell Watershed Practice#	Practice Name	Amount	Cost /Unit	Unit	Total Cost
Treatment Unit #3- Sprinkler Irrigated Cropland/Pastureland/Hayland (1,184 ac)					
328	Conservation Crop Rotation				
442	Irrigation System Sprinkler, Center Pivot	10,500	$33.10	ft	$347,550
430DD	Irrigation Water Conveyance, Pipeline	7,000	$2.75	ft	$19,250
449	Irrigation Water Management	1,184	$25.05	ac	$29,659
590	Nutrient Management	1,184	$4.90	ac	$5,802
595	Integrated Pest Management	1,184	$21.95	ac	$25,989
533	Pumping plant	1	$2,440.00	no	$2,440
345	Residue Management (mulch till)	1,184	$21.85	ac	$25,870
587	Structure for Water Control	12	$325.00	ft	$3,900
Treatment Unit #4- Animal Feeding Operations (8)					
100	Comprehensive Nutrient Management Plan	8	$1,500.00	no	$12,000
380	Windbreak/Shelterbelt Establishment	6,600	$0.85	ft	$5,610
614	Watering Facility	40,000	$1.05	gal	$42,000
					$26,773,610

Implementation

The TMDL implementation planning process included assessing impacts to water quality in the Lake Lowell watershed from agricultural lands and recommending BMPs to meet water quality objectives stated in the Lake Lowell SBA-TMDL. Data from office and field inventory and evaluations were used to identify critical areas affecting water quality and to set priorities for treatment. Conversion from surface to sprinkler irrigation along with facilitating practices such as nutrient management, irrigation water management, pest management, and residue management is the #1 recommended conservation alternative.

RECOMMENDED STRATEGY FOR BMP IMPLEMENTATION

Implementation of BMPs will involve ongoing cooperation with the Canyon SCD to carry out implementation. The strategy is to implement BMPs based on available funding and landowner interest.

As funding for projects and landowner participation is available, the Canyon SCD aims to convert agricultural lands from flood irrigation to sprinkler or drip irrigation systems, use sediment basins to trap sediments and nutrients before they enter into Lake Lowell, and seek partnerships and opportunities to construct wetlands to filter sediment and nutrients before they enter into the lake, and to add wildlife and aesthetic appeal to the watershed.

TIMELINE

Task	Output	Milestone
Evaluate treatment needs for the Lake Lowell watershed	Lake Lowell TMDL Implementation Plan for Agriculture	2012
Develop conservation plans and contracts	Completed plans and contracts	2015
Finalize BMP designs	Completed BMP plans and designs	2020
Design and install approved BMPs	Certify BMP installations	2023
Track BMP installations	Implementation progress reports	2027
Evaluate BMP & project effectiveness	Complete project effectiveness reports	2030

Funding

Financial and technical assistance for installation of BMPs is needed to ensure success of this implementation plan. The Canyon Soil and Water Conservation District with the technical assistance from IASCD, SWC, and NRCS, will actively pursue multiple potential funding sources to implement water quality improvements on private agricultural and grazing lands. Many of these programs can be used in combination with each other to implement BMPs. These sources include (but are not limited to):

CWA 319 –These are Environmental Protection Agency funds allocated to the Nez Perce Tribe and the State of Idaho. The Idaho Department of Environmental Quality (DEQ) administers the Clean Water Act §319 Non-point Source Management Program for areas outside the Nez Perce Reservation. Funds focus on projects to improve water quality and are usually related to the TMDL process. The Nez Perce tribe has CWA 319 funds available for projects on Tribal lands on a competitive basis. http://www.deq.idaho.gov/water/prog_issues/surface_water/nonpoint.cfm#management

Water Quality Program for Agriculture (WQPA) –The WQPA is administered by the Idaho State Soil and Water Conservation Commission (SWC). This program is also coordinated with the TMDL process. http://www.scc.state.id.us/programs.htm

Resource Conservation and Rangeland Development Program (RCRDP) –The RCRDP is a loan program administered by the SWC for implementation of agricultural and rangeland best management practices or loans to purchase equipment to increase conservation. http://www.scc.state.id.us/programs.htm

Conservation Improvement Grants – These grants are administered by the SWC. http://www.scc.state.id.us/programs.htm

PL-566 –This is the small watershed program administered by the USDA Natural Resources Conservation Service (NRCS).

Agricultural Management Assistance (AMA) –The AMA provides cost-share assistance to agricultural producers for constructing or improving water management structures or irrigation structures; planting trees for windbreaks or to improve water quality; and mitigating risk through production diversification or resource conservation practices, including soil erosion control, integrated pest management, or transition to organic farming. http://www.nrcs.usda.gov/programs/ama/

Conservation Reserve Program (CRP) –The CRP is a land retirement program for blocks of land or strips of land that protect the soil and water resources, such as buffers and grassed waterways. http://www.nrcs.usda.gov/programs/crp/

Conservation Technical Assistance (CTA) –The CTA provides free technical assistance to help farmers and ranchers identify and solve natural resource problems on their farms and ranches. This might come as advice and counsel, through the design and implementation of a practice or treatment, or as part of an active conservation plan. http://www.nrcs.usda.gov/programs/cta/

Environmental Quality Incentives Program (EQIP): EQIP offers cost-share and incentive payments and technical help to assist eligible participants in installing or implementing structural and management practices on eligible agricultural land. http://www.nrcs.usda.gov/programs/eqip/

Wetlands Reserve Program (WRP) –The WRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. Easements and restoration payments are offered as part of the program. http://www.nrcs.usda.gov/programs/wrp/

Wildlife Habitat Incentives Program (WHIP) –WHIP is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Cost-share payments for construction or re-establishment of wetlands may be included. http://www.nrcs.usda.gov/programs/whip/

State Revolving Loan Funds (**SRF) –**These funds are administered through the SWC. http://www.scc.state.id.us/programs.htm

Grassland Reserve Program (GRP) –The GRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance grasslands on their property. http://www.nrcs.usda.gov/programs/GRP/

Conservation Security Program (**CSP) –**CSP is a voluntary program that rewards the Nation's premier farm and ranch land conservationists who meet the highest standards of conservation environmental management. http://www.nrcs.usda.gov

Grazing Land Conservation Initiative (**GLCI) –**The GLCI's mission is to provide high quality technical assistance on privately owned grazing lands on a voluntary basis and to increase the awareness of the importance of grazing land resources. http://www.glci.org/

Habitat Improvement Program (HIP) – This is an Idaho Department of Fish and Game program to provide technical and financial assistance to private landowners and public land managers who want to enhance upland game bird and waterfowl habitat. Funds are available for cost sharing on habitat projects in partnership with private landowners, non-profit organizations, and state and federal agencies.
http://fishandgame.idaho.gov/cms/wildlife/hip/default.cfm

Partners for Fish and Wildlife Program in Idaho – This is a U.S. Fish and Wildlife program providing funds for the restoration of degraded riparian areas along streams, and shallow wetland restoration. http://www.fws.gov/partners/pdfs/ID-needs.pdf

Outreach

Conservation partners in the Lake Lowell watershed will use their combined resources to provide information about BMPs to agricultural landowners and operators within the watershed. A local outreach plan may be developed. Newspaper articles, district newsletters, watershed and project tours, landowner meetings and one-on-one personal contact may be used as outreach tools.

Outreach efforts may:

- Build rapport among agencies and local landowners
- Provide information about the TMDL planning and implementation process
- Inform the public about water quality projects and monitoring results
- Accelerate the development of conservation plans and program participation
- Distribute progress reports
- Enhance technology transfer related to BMP implementation
- Increase public understanding of agriculture's contribution to conserve and enhance natural resources
- Improve public appreciation of agriculture's commitment to meeting the TMDL challenge
- Organize an informational tour bringing together irrigation districts' Board of Directors and Soil Conservation Districts' Board of Supervisors.
- Identify and encourage the adoption of BMPs for land uses in the watershed

Monitoring and Evaluation

FIELD LEVEL

At the field level, annual status reviews should be conducted to insure that the contracts are on schedule and that BMPs are being installed according to standards and specifications. BMP effectiveness monitoring should be conducted on installed projects to determine installation adequacy, operation consistency and maintenance, and the relative effectiveness of implemented BMPs in reducing water quality impacts. This monitoring should also measure the effectiveness of BMPs in controlling agricultural nonpoint-source pollution. These BMP effectiveness evaluations can be conducted according to the protocols outlined in the Agriculture Pollution Abatement Plan and the SWC Field Guide for Evaluating BMP Effectiveness.

WATERSHED LEVEL

At the watershed level, there are many governmental and private groups involved with water quality monitoring. The Idaho Department of Environmental Quality has used the Beneficial Use Reconnaissance Protocol (BURP) to collect and measure key water quality variables that aid in determining the beneficial use support status of Idaho's water bodies. Their determination reports if a water body is in compliance with water quality standards and criteria. In addition, DEQ conducts five-year TMDL reviews.

Annual reviews for funded projects should be conducted to insure the project is kept on schedule. With many projects being implemented across the state, SWC developed a software program to track the costs and other details of each BMP installed. This program can show what has been installed by project, by watershed level, by sub-basin level, and by state level. These project and program reviews will insure that TMDL implementation remains on schedule and on target. Monitoring BMPs and projects will be the key to a successful application of the adaptive watershed planning and implementation process.

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