Lower Boise River TMDL

2015 Sediment and Bacteria Addendum

Hydrologic Unit Code 17050114

State of Idaho
Department of Environmental Quality

June 2015

Printed on recycled paper, DEQ June 2015,
PID TM53, CA code 42102. Costs associated with
this publication are available from the State of Idaho
Department of Environmental Quality in accordance
with Section 60-202, Idaho Code.

Lower Boise River TMDL

2015 Sediment and Bacteria Addendum

June 2015

Prepared by
Hawk Stone
Idaho Department of Environmental Quality
Boise Regional Office
1445 N. Orchard Street
Boise, Idaho 83702

Table of Contents

Appendices

List of Tables

List of Figures

Abbreviations, Acronyms, and Symbols

§303(d)	refers to section 303 subsection (d) of the Clean Water Act, or a list of impaired water bodies required by this section
§	section (usually a section of federal or state rules or statutes)
ACHD	Ada County Highway District
AU	assessment unit
BMP	best management practice
BOR	United States Bureau of Reclamation
C	Celsius
CAFO	confined animal feeding operation
CFA	confined feeding areas
CFR	Code of Federal Regulations (refers to citations in the federal administrative rules)
cfs	cubic feet per second
CGP	construction general permit
CWAL	cold water aquatic life
cfu	colony-forming unit
DEQ	Idaho Department of Environmental Quality
DO	dissolved oxygen
EMAP	Environmental Monitoring and Assessment Program
EPA	United States Environmental Protection Agency
F	Fahrenheit
ft/s	feet per second
GIS	geographic information system
IDAPA	Refers to citations of Idaho administrative rules
IDFG	Idaho Department of Fish and Game
ISDA	Idaho State Department of Agriculture
kg	kilogram
LA	load allocation
lb	pound
LC	load capacity
mgd	million gallons per day
mg/L	milligrams per liter
mL	milliliter
mm	millimeter
MOS	margin of safety
MS4	municipal separate stormwater system
MSGP	multi-sector general permit
n/a	not applicable
NA	not assessed
NB	natural background

NFS not fully supporting

NPDES National Pollutant Discharge Elimination System

NTU nephelometric turbidity unit

PCR primary contact recreation

Q flow

SBA subbasin assessment

SCD soil conservation district

SCR secondary contact recreation

SEV severity level

SFI DEQ’s Stream Fish Index

SHI DEQ’s Stream Habitat Index

SMI DEQ’s Stream Macroinvertebrate Index

SSC suspended-sediment concentration

SWCD soil and water conservation district

SWPPP stormwater pollution prevention plan

TAC technical advisory committee

TMDL total maximum daily load

TSS total suspended solids

USC United States Code

USGS United States Geological Survey

WAG watershed advisory group

WLA wasteload allocation

WWTP wastewater treatment plant

Executive Summary

This document addresses the sediment and bacterial impairments of 15 assessment units in the Lower Boise River subbasin in southwest Idaho. The subbasin incorporates the Boise River and its tributaries between the outflow of Lucky Peak Dam and the Snake River.

The federal Clean Water Act requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. States and tribes, pursuant to §303 of the act, are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the nation's waters whenever possible. Section 303(d) establishes requirements for states and tribes to identify and prioritize water bodies that do not meet water quality standards. States and tribes must periodically publish a prioritized list (a "§303(d) list") of impaired waters. This list is currently published every 2 years as the list of Category 5 waters in the Integrated Report. For waters identified on this list, states and tribes must develop a total maximum daily load (TMDL) of pollutants, set at a level to achieve water quality standards.

The starting point for this assessment was Idaho's most recently federally approved §303(d) list of water quality limited water bodies (the 2012 Integrated Report). The subbasin assessment portion of this addendum examines the status of §303(d)-listed waters and defines the extent of impairment and causes of water quality limitation throughout the subbasin. The assessment describes the physical, biological, and cultural setting; water quality status; pollutant sources; and recent pollution control actions in the subbasin. The TMDL analysis quantifies pollutant sources and allocates responsibility for load reductions needed to return listed waters to a condition meeting water quality standards.

Rather than address the entire catalog of impaired streams in the subbasin, this document focuses on only the sediment and bacteria impairments. This approach allows the Idaho Department of Environmental Quality (DEQ) to address the waters listed in its TMDL settlement agreement in the most efficient manner. Sediment and *E. coli* TMDLs were previously established for the main stem of the Boise River. This document establishes 11 new *E. coli* and 12 new sediment TMDLs for the river's impaired tributaries (Table A).

The load capacities and allocations developed in this document take the form of flow-variable equations. Similar flow-variable equations are presented for wasteload allocations and reserve for growth.

Table A. Summary of TMDLs established in this addendum.

Water Body	Assessment Unit Number	Pollutant
Dixie Slough	ID17050114SW001_02	*E. coli*
Indian Creek— Sugar Avenue to Boise River	ID17050114SW002_04	Sediment, *E. coli*
Indian Creek—Indian Creek Reservoir to New York Canal	ID17050114SW003b_03	Sediment
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02	Sediment, *E. coli*
Indian Creek above Reservoir – 3rd order	ID17050114SW003d_03	Sediment
Mason Creek—entire watershed	ID17050114SW006_02	Sediment, *E. coli*
Fifteenmile Creek—4th order (Fivemile Creek to mouth)	ID17050114SW007_04	Sediment, *E. coli*
Tenmile Creek—3rd order below Blacks Creek Reservoir	ID17050114SW008_03	Sediment, *E. coli*
Fivemile, Eightmile, and Ninemile Creeks - 1st and 2nd order	ID17050114SW010_02	*E. coli*
Fivemile Creek—3rd-order section	ID17050114SW010_03	Sediment, *E. coli*
Sand Creek (part of Stewart Gulch, Cottonwood and Crane Creeks – 1st and 2nd order)	ID17050114SW012_02	*E. coli*
Willow Creek—3rd order	ID17050114SW015_03	Sediment
Sand Hollow Creek—C-line Canal to I-84	ID17050114SW016_03	Sediment
Sand Hollow Creek—I-84 to Sharp Road	ID17050114SW017_03	Sediment, *E. coli*
Sand Hollow Creek—Sharp Road to Snake River	ID17050114SW017_06	Sediment, *E. coli*

E. coli targets were based on the Idaho water quality standards. Existing *E. coli* levels (in the format of 30-day geometric means) were measured using data collected by several government agencies.

Sediment targets were established using a paper by Newcombe and Jensen (1996). Existing sediment levels were measured using data collected by several government agencies.

To fully implement this TMDL, nonpoint sources must reduce their sediment and *E. coli* pollution. Wastewater and industrial point sources are presently meeting the pollutant targets. The status of stormwater point sources is unknown.

A summary of assessment outcomes, including recommended changes to the next Integrated Report, is provided in Table B.

Table B. Summary of assessment outcomes for the Lower Boise River subbasin.

Assessment Unit Name	Assessment Unit Number	Pollutant	Recommended Changes to the next Integrated Report
Dixie Slough	ID17050114SW001_02	*E. coli*	Unlisted but impaired. Place in Category 4a—TMDL completed
Indian Creek— Sugar Avenue to Boise River	ID17050114SW002_04	*E. coli*	Move to Category 4a—TMDL completed
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02		
Mason Creek—entire watershed	ID17050114SW006_02		
Fifteenmile Creek—4th order (Fivemile Creek to mouth)	ID17050114SW007_04		
Tenmile Creek—3rd order below Blacks Creek Reservoir	ID17050114SW008_03		
Fivemile, Eightmile, and Ninemile Creeks - 1st and 2nd order	ID17050114SW010_02		
Fivemile Creek—3rd-order section	ID17050114SW010_03		
Sand Creek (part of Stewart Gulch, Cottonwood and Crane Creeks – 1st and 2nd order)	ID17050114SW012_02	*E. coli*	Unlisted but impaired. Place in Category 4a—TMDL completed
Sand Hollow Creek—I-84 to Sharp Road	ID17050114SW017_03	*E. coli*	Move to Category 4a—TMDL completed
Sand Hollow Creek—Sharp Road to Snake River	ID17050114SW017_06		
Indian Creek— Sugar Avenue to Boise River	ID17050114SW002_04	Sediment	Move to Category 4a—TMDL completed
Indian Creek—Indian Creek Reservoir to New York Canal	ID17050114SW003b_03		
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02		
Indian Creek above Reservoir – 3rd order	ID17050114SW003d_03		
Mason Creek—entire watershed	ID17050114SW006_02		
Fifteenmile Creek— 4th order (Fivemile Creek to mouth)	ID17050114SW007_04		
Tenmile Creek—3rd order below Blacks Creek Reservoir	ID17050114SW008_03		
Fivemile Creek—3rd-order section	ID17050114SW010_03		
Willow Creek—3rd order	ID17050114SW015_03		
Sand Hollow Creek—C-line Canal to I-84	ID17050114SW016_03		
Sand Hollow Creek—I-84 to Sharp Road	ID17050114SW017_03		
Sand Hollow Creek—Sharp Road to Snake River	ID17050114SW017_06		

Subbasin at a Glance

The Lower Boise River subbasin, represented by hydrologic unit code 17050114, is located in southwest Idaho (Figure A). The subbasin drains 1,290 square miles of rangeland, forests, agricultural lands, and urban areas. The lower Boise River itself is a 64-mile stretch that flows in a northwesterly direction through Ada and Canyon Counties and the cities of Boise and Caldwell, Idaho. The lower Boise River originates at Lucky Peak Dam and flows into the Snake River near Parma, Idaho.

Key Findings

The following summarize the water quality concerns addressed by this addendum:

- Impaired beneficial uses: cold water aquatic life, secondary contact recreation
- Pollutants addressed in this document: *E. coli*, sediment
- Pollutant sources: stormwater, municipal wastewater treatment, agriculture
- Impaired subwatersheds: Indian Creek, Mason Creek, Willow Creek, Sand Hollow Creek, Fivemile Creek, Tenmile Creek, Fifteenmile Creek (Figure B)
- Subwatersheds found to be impaired (but not listed on Idaho's 2012 §303(d) list): Dixie Slough, Sand Creek

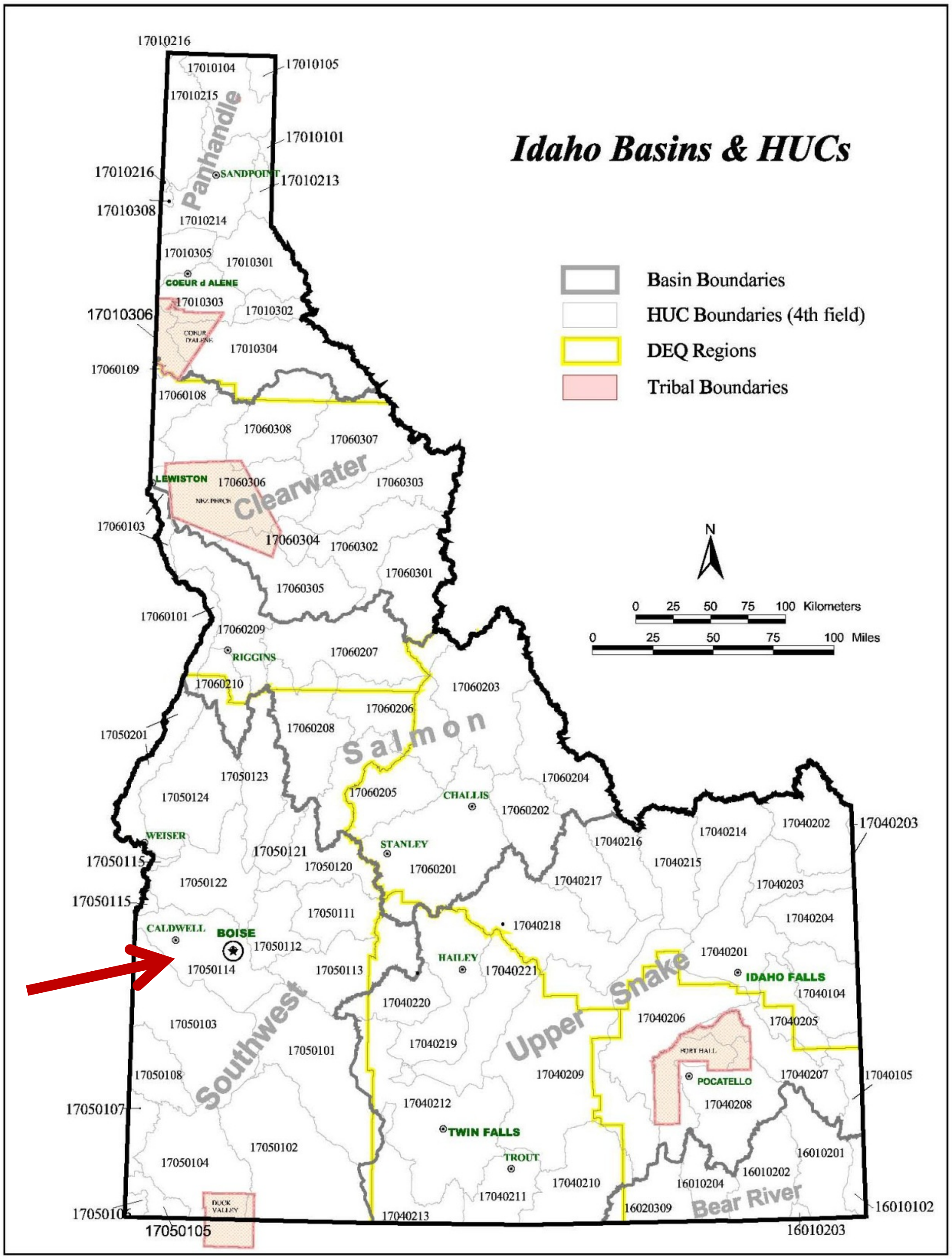


Figure A. Location of the Lower Boise River subbasin.

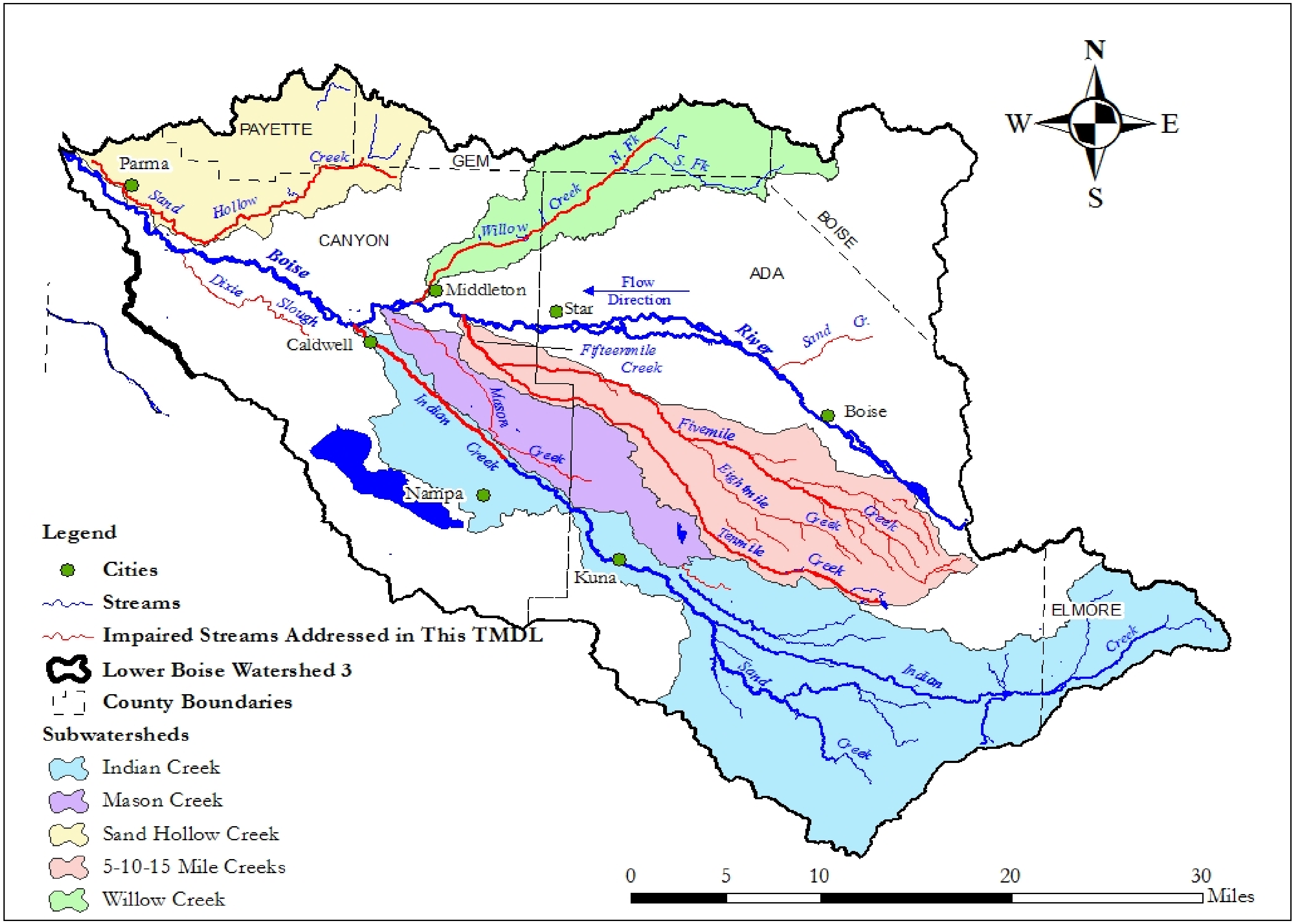


Figure B. Lower Boise River subbasin subwatersheds.

Several assessment units were listed on Idaho's 2012 §303(d) list, not all of which are addressed by this TMDL. Table C shows the assessment units addressed by this TMDL (DEQ 2012). Table D shows assessment units that are unlisted on the 2012 §303(d) list, but that were found to be impaired, and will be addressed in this TMDL.

Table C. Assessment units on Idaho's 2012 §303(d) list.

Assessment Unit Name	Assessment Unit Number	Pollutants
Indian Creek— Sugar Avenue to Boise River	ID17050114SW002_04	Sediment, *E. coli*
Indian Creek— Indian Creek Reservoir to New York Canal	ID17050114SW003b_03	Sediment
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02	Sediment, *E. coli*
Indian Creek—above reservoir	ID17050114SW003d_03	Sediment
Mason Creek—entire watershed	ID17050114SW006_02	Sediment. *E. coli*
Fifteenmile Creek—4th order (Fivemile Creek to mouth)	ID17050114SW007_04	Sediment, *E. coli*
Tenmile Creek—3rd order below Blacks Creek Reservoir	ID17050114SW008_03	Sediment, *E. coli*
Fivemile, Eightmile, and Ninemile Creeks - 1st and 2nd order	ID17050114SW010_02	E. coli
Fivemile Creek—3rd-order section	ID17050114SW010_03	Sediment, *E. coli*
Willow Creek—3rd order	ID17050114SW015_03	Sediment
Sand Hollow Creek—C-line Canal to I-84	ID17050114SW016_03	Sediment
Sand Hollow Creek—I-84 to Sharp Road	ID17050114SW017_03	Sediment, *E. coli*
Sand Hollow Creek—Sharp Road to Snake River	ID17050114SW017_06	Sediment, *E. coli*

Table D. Unlisted but impaired assessment units.

Assessment Unit Name	Assessment Unit Number	Pollutant
Dixie Slough	ID17050114SW001_02	*E. coli*
Sand Creek (part of Stewart Gulch, Cottonwood and Crane Creeks – 1^{st} and 2^{nd} order)	ID17050114SW012_02	*E. coli*

The TMDL load capacities and allocations are flow-dependent (Table E). The *E. coli* water quality targets are year-round. The sediment targets apply during any period when the appropriate stage of cold water aquatic life could be expected to exist. Monitoring points are generally at the downstream end of each assessment unit.

Table E. Summary of water quality targets and load capacities.

Water Body	Sediment Target	Sediment Target Concentration	Sediment Load Capacity	*E. coli* Target	*E. coli* Load Capacity
Fivemile Creek	Levels that will produce effects no worse than SEV 8 on salmonids[a]	33 mg/L (92 day average)	Q × 80.9 kg/day	126 cfu/100 mL, averaged over 30 days	$Q \times 3.08 \times 10^9$ cfu/day
Tenmile Creek					
Fifteenmile Creek		23 mg/L (84 day average)	Q × 56.4 kg/day		
Willow Creek					
Mason Creek		20 mg/L (4 month average)	Q × 49.0 kg/day		
Sand Hollow Creek					
Indian Creek					

Note: Flow (Q) measure in cubic feet per second (cfs); cfu = colony-forming units; mg/L = milligrams per liter; kg = kilograms; mL = milliliters
[a] From Newcombe and Jensen (1996).

Public Participation

This addendum was developed with extensive input by the public, including through involvement of a technical advisory committee and watershed advisory group. A total of 90 meetings were held with external stakeholders, including watershed and technical advisory groups, wastewater operators, and US Environmental Protection Agency staffers. The meetings were held between November 2012 and March 2015. The draft document was made available for public comment in April 2015, and the final document includes a summary of these comments and DEQ's responses.

Introduction

This document addresses numerous water bodies (15 assessments units [AUs]) in the Lower Boise River subbasin that have been placed in Category 5 of Idaho's most recent federally approved Integrated Report (DEQ 2014) for sediment and bacterial impairments. This document is an addendum to the *Lower Boise TMDL* (DEQ 1999). The purpose of this total maximum daily load (TMDL) addendum is to characterize and document pollutant loads within the Lower Boise River subbasin. The first portion of this document presents key characteristics or updated information for the subbasin assessment, which is divided into four major sections: subbasin characterization (section 1), water quality concerns and status (section 2), pollutant source inventory (section 3), and a summary of past and present pollution control efforts (section 4). While the subbasin assessment is not a requirement of the TMDL, the Idaho Department of Environmental Quality (DEQ) performs the assessment to ensure impairment listings are up-to-date and accurate.

The subbasin assessment is used to develop a TMDL for each pollutant of concern for the Lower Boise River subbasin. The TMDL (section 5) is a plan to improve water quality by limiting pollutant loads. Specifically, a TMDL is an estimation of the maximum pollutant amount that can be present in a water body and still allow that water body to meet water quality standards (40 CFR Part 130). Consequently, a TMDL is water body- and pollutant-specific. The TMDL also allocates allowable discharges of individual pollutants among the various sources discharging the pollutant. This addendum establishes 12 new sediment and 11 new *E. coli* TMDLs.

Regulatory Requirements

This document was prepared in compliance with both federal and state regulatory requirements. The federal government, through the United States Environmental Protection Agency (EPA), assumed the dominant role in defining and directing water pollution control programs across the country. DEQ implements the Clean Water Act in Idaho, while EPA oversees Idaho and certifies the fulfillment of Clean Water Act requirements and responsibilities.

Congress passed the Federal Water Pollution Control Act, more commonly called the Clean Water Act, in 1972. The goal of this act was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 USC §1251). The act and the programs it has generated have changed over the years as experience and perceptions of water quality have changed. The Clean Water Act has been amended 15 times, most significantly in 1977, 1981, and 1987. One of the goals of the 1977 amendment was protecting and managing waters to ensure "swimmable and fishable" conditions. These goals relate water quality to more than just chemistry.

The Clean Water Act requires that states and tribes restore and maintain the chemical, physical, and biological integrity of the nation's waters. States and tribes, pursuant to §303 of the Clean Water Act, are to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the nation's waters whenever possible. DEQ must review those standards every 3 years, and EPA must approve Idaho's water quality standards. Idaho adopts water quality standards to protect public health and welfare, enhance water quality, and protect biological integrity. A water quality standard defines the goals of a water body by designating the use or uses for the water, setting criteria necessary to protect those uses, and preventing degradation of water quality through antidegradation provisions.

Section 303(d) of the Clean Water Act establishes requirements for states and tribes to identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). States and tribes must periodically publish a priority list (a "§303(d) list") of impaired waters. Currently, this list is published every 2 years as the list of Category 5 waters in Idaho's Integrated Report. For waters identified on this list, states and tribes must develop a TMDL for the pollutants, set at a level to achieve water quality standards.

DEQ monitors waters, and for those not meeting water quality standards, DEQ must establish a TMDL for each pollutant impairing the waters. However, some conditions that impair water quality do not require TMDLs. EPA considers certain unnatural conditions—such as flow alteration, human-caused lack of flow, or habitat alteration—that are not the result of discharging a specific pollutant as "pollution." TMDLs are not required for water bodies impaired by pollution, rather than a specific pollutant. A TMDL is only required when a pollutant can be identified and in some way quantified.

1 Subbasin Assessment—Subbasin Characterization

A detailed discussion of the subbasin characteristics of the Lower Boise River subbasin is provided in the original TMDL (DEQ 1999, pages 3–19).

1.1 Physical and Biological Characteristics

A detailed discussion of the physical and biological characteristics of the Lower Boise River subbasin is provided in the original TMDL (DEQ 1999, pages 3–19), which was approved by EPA in January 2000.

1.1.1 Climate

A detailed discussion of the climate characteristics of the Lower Boise River subbasin is provided in the original TMDL (DEQ 1999, pages 3–19). The average maximum and minimum air temperatures and average annual precipitation have changed slightly since then. The most recent climate statistics are presented in Table 1 and originated from the Western Region Climate Center database.

Table 1. Air temperature and precipitation statistics.

Location (Period of Record)	Average Summer Maximum Air Temperature (ºF)	Average Winter Minimum Air Temperature (ºF)	Average Annual Precipitation (inches)
Boise Airport (1976–2005)	90.5	22.3	11.76
Nampa (1976–2005)	91.1	21.5	11.2
Caldwell (1976–2005)	91.1	21.5	10.6

1.1.2 Subwatershed Characteristics

Figure 1 provides a map of the subwatersheds addressed by this addendum.

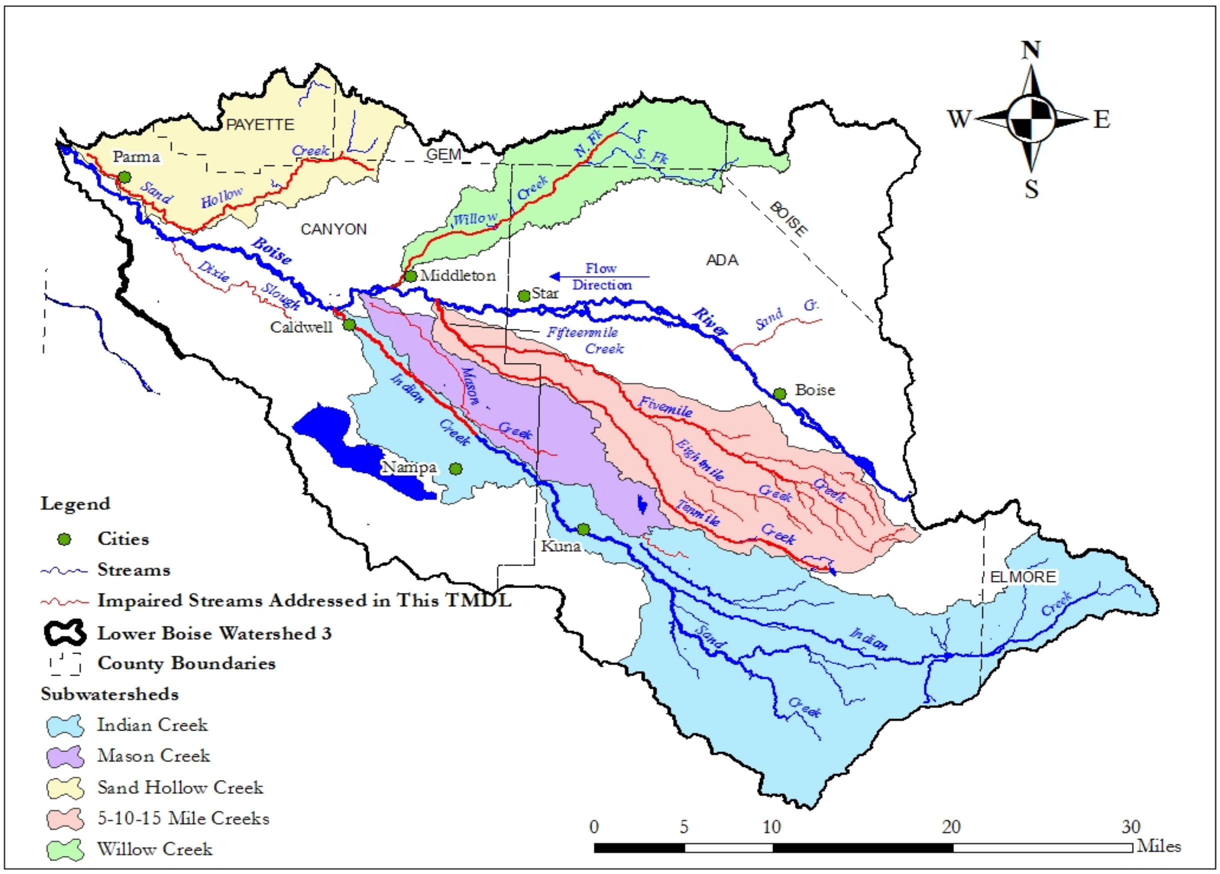


Figure 1. Lower Boise River subbasin subwatersheds.

The Fivemile and Tenmile Creek subwatersheds drain 83 and 74 square miles of rangeland, agricultural land, and urban areas, respectively. Both streams are located in the southeast portion of the subbasin. Fivemile and Tenmile Creeks flow in a northwesterly direction through Ada and Canyon Counties before they join together to form Fifteenmile Creek, which discharges to the lower Boise River 4 miles upstream of Middleton. Small tributaries to Fivemile Creek include

Eightmile and Ninemile Creeks. Much of the system is maintained as an agricultural drain by the Nampa & Meridian and Pioneer Irrigation Districts.

The Mason Creek subwatershed drains 62 square miles of rangeland, agricultural land, and urban areas. Mason Creek is located in the southern portion of the subbasin. Mason Creek largely flows through Canyon County, but the headwaters are in Ada County. The stream flows in a northwesterly direction from its origin at the New York Canal to its confluence with the lower Boise River in the city of Caldwell. Much of Mason Creek is maintained as an agricultural drain by the Pioneer Irrigation District.

The Indian Creek subwatershed drains 295 square miles of rangeland, agricultural land, and urban areas. Indian Creek is 55.68 miles long and is located in the southern portion of the subbasin. The headwaters of Indian Creek are in Elmore County, but most of the stream flows through Ada and Canyon Counties. The stream flows in a southwesterly direction from its origin to where it intersects Interstate 84. From Interstate 84 to its confluence with the lower Boise River, it flows in a northwesterly direction.

The Willow Creek subwatershed drains 84 square miles of rangeland, agricultural land, and mixed rural farmstead. Willow Creek is located in the northern portion of the subbasin. Willow Creek flows largely through Ada and Canyon Counties, with its headwaters in parts of Gem and Boise Counties. The stream flows in a southwesterly direction from its origin to its confluence with the Boise River near Middleton.

The Sand Hollow Creek subwatershed drains 93 square miles of rangeland, agricultural land, and mixed rural farmstead. Sand Hollow Creek is located in the northwest portion of the subbasin, although it ultimately drains to the Snake River. Sand Hollow Creek largely flows through Canyon County, but the headwaters are located in Gem and Payette Counties. The stream flows in a southwesterly direction from its origin to Interstate 84, then in a northwesterly direction from the interstate to its confluence with the Snake River downstream of Parma. Even though it sources most of its water from the Payette River system and drains into the Snake River, Sand Hollow Creek is included in this TMDL because it is within the same US Geologic Survey (USGS) fourth-field hydrologic unit code. It is also generally considered to be part of the lower Boise River system and is covered by the Lower Boise Watershed Advisory Group.

Detailed discussions of these subwatersheds within the subbasin are provided in the following documents:

- *Water in the Boise Valley: A History of the Nampa and Meridian Irrigation District* (Appendix A)
- *Estimates of Impacts on Lower Boise Valley Drain Discharge with Elimination of Gravity Irrigation* (Appendix B)
- *A History of the Pioneer Irrigation District, Idaho* (Appendix C)
- *Fivemile and Tenmile Creek Subbasin Assessment* (DEQ 2001a)
- *Mason Creek Subbasin Assessment* (DEQ 2001c)
- *Sand Hollow Creek Subbasin Assessment* (DEQ 2001d)
- *Indian Creek Subbasin Assessment* (DEQ 2001b)

1.1.3 Stream Characteristics

Detailed discussions of the streams within the subbasin are provided in the following documents:

- *Fivemile and Tenmile Creek Subbasin Assessment* (DEQ 2001a)
- *Mason Creek Subbasin Assessment* (DEQ 2001c)
- *Sand Hollow Creek Subbasin Assessment* (DEQ 2001d)
- *Indian Creek Subbasin Assessment* (DEQ 2001b)
- *Water in the Boise Valley: A History of the Nampa and Meridian Irrigation District* (Appendix A)
- *Estimates of Impacts on Lower Boise Valley Drain Discharge with Elimination of Gravity Irrigation* (Appendix B)
- *A History of the Pioneer Irrigation District, Idaho* (Appendix C)

In general, each stream slopes gently to its confluence with the Boise River (or the Snake River, in the case of Sand Hollow Creek). The stream channels have been classified as Rosgen F types, which are deeply entrenched, low-gradient (<0.02) streams with a high width/depth ratio and a riffle/pool morphology (Rosgen 1996). The entrenched aspect of each channel has been amplified by the extensive deepening and widening that occurred in the early part of the century.

The streambed substrate ranges from silt-size (<1 millimeter [mm]) material to large cobble (128.1–256 mm), although silt and sand material comprise most of the substrate. Larger substrate material is highly dispersed in cobble and gravel areas and typically embedded. The banks are typically stable with vegetation.

In general, the numerous human-modified portions of each stream, along with the regulated irrigation flow, have caused a narrowing and straightening of the stream channel. Braiding and sinuosity caused by divergent and out-of-bank flow events are largely absent.

Fivemile Creek is intermittent upstream from the Locust Grove/Franklin Road intersection. Tenmile Creek is intermittent upstream of McDermott Road (Figure 2). These transition locations were determined by DEQ field visits, aerial photograph interpretation, and consultation with the Nampa and Meridian Irrigation District superintendent. The target analysis used later in this TMDL applies only to the perennial portions of each stream.

Above their confluence, Five- and Tenmile Creeks are fast-moving, straightened channels. Both have fish barriers (such as the Fivemile feeder diversion) and are maintained as drainage facilities by the irrigation districts. Below the confluence, where the stream becomes known as Fifteenmile Creek, the water slows down. As the channel approaches the Boise river, it acquires several more natural features, including sporadic riparian vegetation.

1.1.4 Land Use

The past decade has seen increased conversion of farmland into other uses (Figure 3).

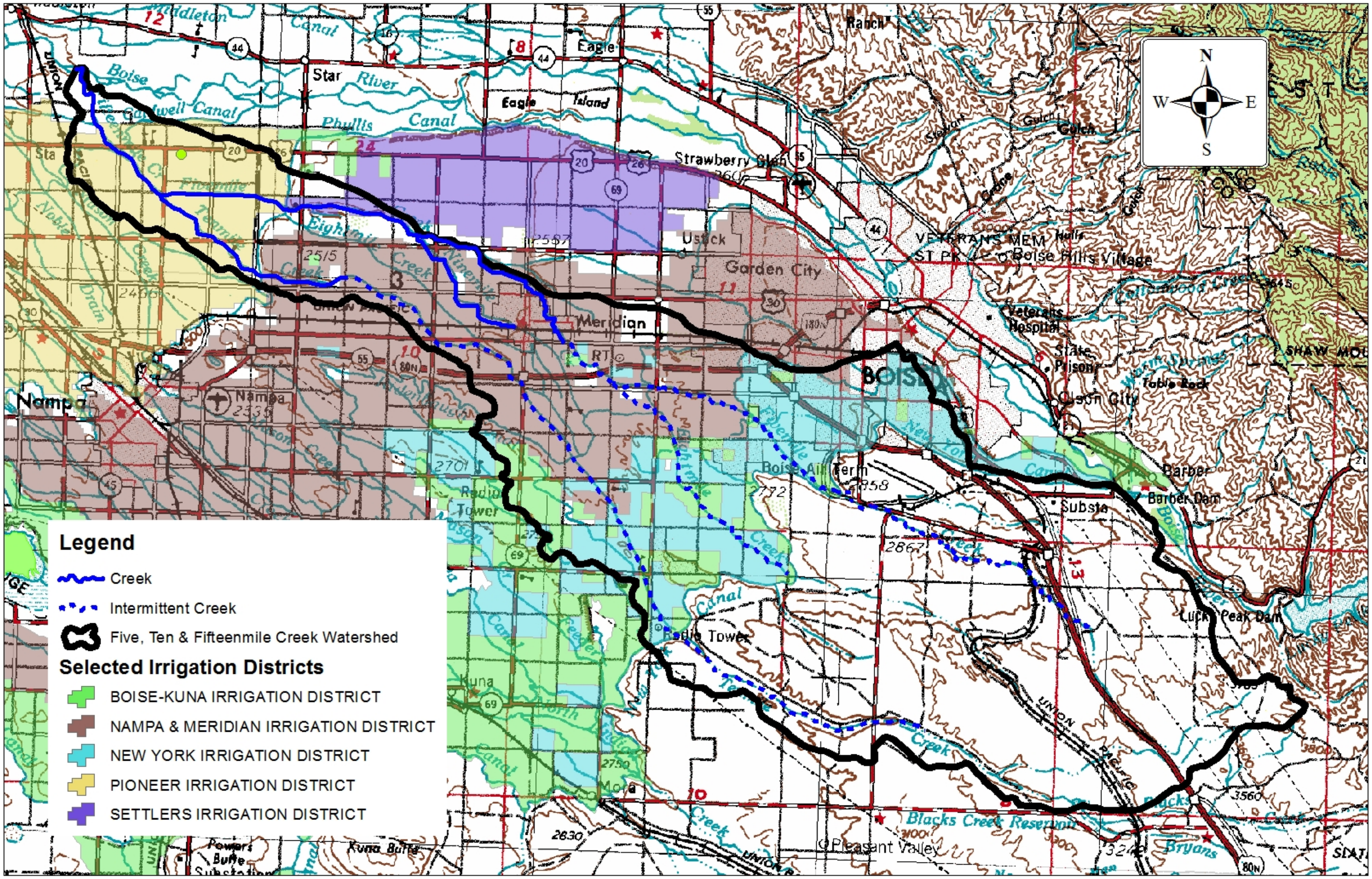


Figure 2. Intermittency in the Five-, Ten-, and Fifteenmile Creeks subwatershed.

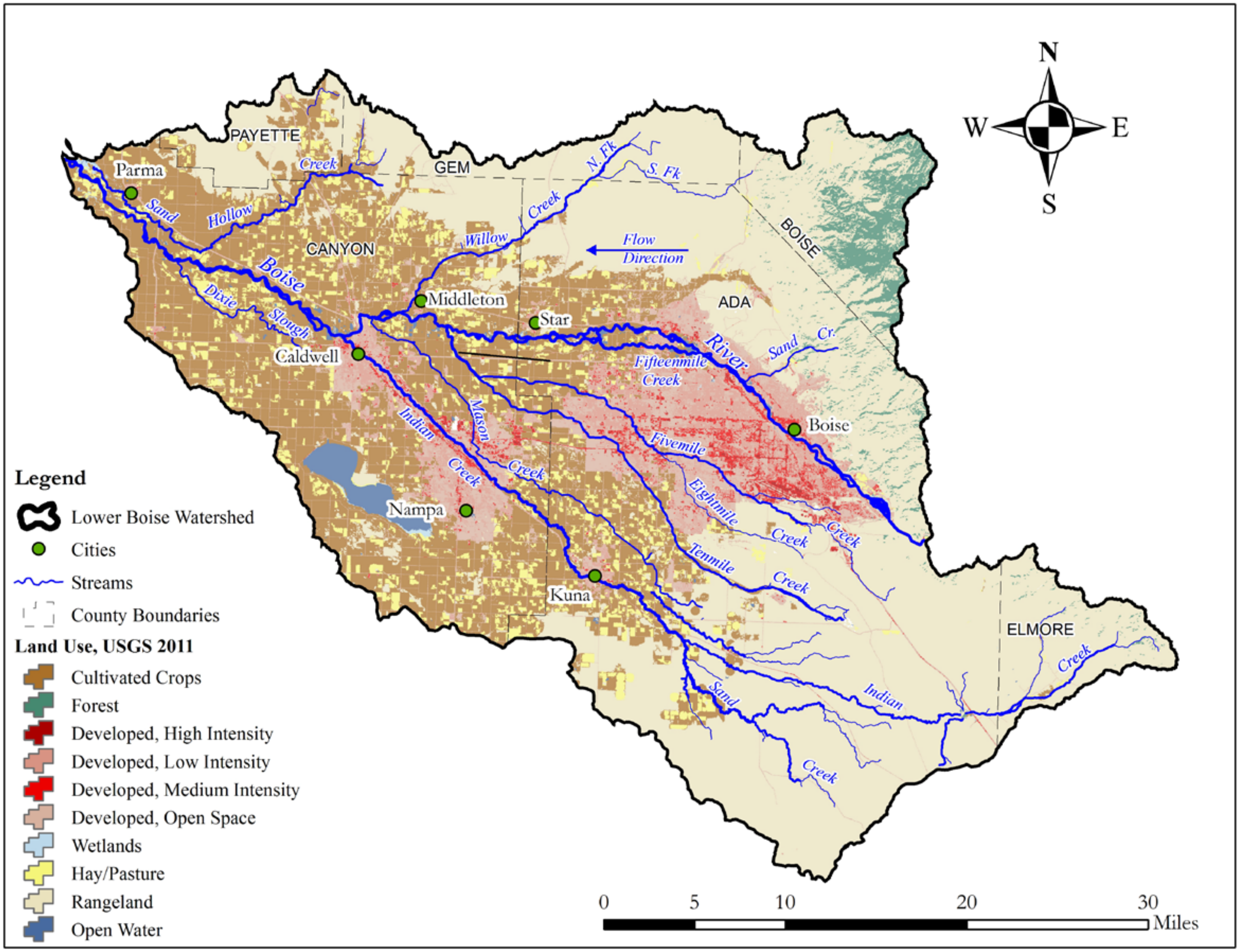


Figure 3. Land use in the Lower Boise River subbasin.

1.2 Cultural Characteristics

A detailed discussion of the cultural characteristics of the subbasin is provided in the original TMDL (DEQ 1999, pages 3–19).

Until the 2008 financial crisis, the cities in the subbasin continued to experience the types of urban expansion described in the 1999 TMDL (DEQ 1999). The slowdown in development provided opportunities for municipal and industrial point source dischargers to improve facilities and implement new technologies to prevent pollution. The City of Kuna recently began operating a wastewater treatment plant (WWTP) using membrane filtration technology that is capable of releasing Class A effluent expected to meet a total phosphorus target of 70 micrograms per liter. EPA has issued municipal separate stormwater system (MS4) National Pollutant Discharge Elimination System (NPDES) permits for several entities in the subbasin. The stormwater management activities required in the permits are consistent with the urban stormwater pollution controls identified in the lower Boise River TMDL implementation plan, which covered sediment and bacteria (LBRWQP 2003).

Caldwell is actively developing and implementing plans to restore Indian Creek to an open channel through the city center and in 2008 completed a 3-block section of a 7-block master plan. This project exemplifies changing community attitudes regarding Indian Creek over the past 100 years, from using the stream as a communal wasteway and open sewer to a philosophy that the creek is a valuable asset to be protected and appreciated as a socially and economically beneficial natural resource.

2 Subbasin Assessment—Water Quality Concerns and Status

This section provides an overview of the AUs addressed in this addendum, beneficial uses applicable to those AUs, and the water quality criteria in place to protect those uses. This section also summarizes existing water quality data and identifies any data gaps found during the TMDL analysis.

2.1 Water Quality Limited Assessment Units Occurring in the Subbasin

Section 303(d) of the Clean Water Act states that waters that are unable to support their beneficial uses and that do not meet water quality standards must be listed as water quality limited. Subsequently, these waters are required to have TMDLs developed to bring them into compliance with water quality standards.

2.1.1 Assessment Units

The listing history since the original TMDL is exceedingly complex because of Idaho's conversion from a named stream system to one using AUs. AUs are groups of similar streams that have similar land use practices, ownership, or land management. However, stream order is the main basis for determining AUs—even if ownership and land use change significantly, the AU usually remains the same for the same stream order.

Using AUs to describe water bodies offers many benefits, primarily that all waters of the state are defined consistently. AUs are a subset of water body identification numbers, which allows them to relate directly to the water quality standards.

2.1.2 Listed Waters

Table 2 identifies the stream segments on the 2012 §303(d) list that are addressed by this TMDL addendum.

Table 2. Lower Boise River subbasin §303(d)-listed assessment units addressed by this addendum.

Assessment Unit Name	Assessment Unit Number	Pollutants	Listing Reason
Indian Creek— Sugar Avenue to Boise River	ID17050114SW002_04	Sediment	1988 §303(d) list
		E. coli	2011 DEQ data
Indian Creek— Indian Creek Reservoir to New York Canal	ID17050114SW003b_03	Sediment	1988 evaluation
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02	*E. coli*	2012 DEQ data
		Sediment	1988 evaluation
Indian Creek—above reservoir	ID17050114SW003d_03	Sediment	1988 evaluation
Mason Creek—entire watershed	ID17050114SW006_02	*E. coli*	2008 ISDA data
		Sediment	1988 §303(d) list
Fifteenmile Creek—4th order (Fivemile Creek to mouth)	ID17050114SW007_04	Sediment	1988 §303(d) list
		E. coli	2011 DEQ data
Tenmile Creek—3rd order below Blacks Creek Reservoir	ID17050114SW008_03	Sediment	1988 §303(d) list
		E. coli	2011 DEQ data
Fivemile, Eightmile, and Ninemile Creeks - 1st and 2nd order	ID17050114SW010_02	*E. coli*	2011 DEQ data
Fivemile Creek—3rd-order section	ID17050114SW010_03	Sediment	1988 §303(d) list
		E. coli	2011 DEQ data
Willow Creek—south fork to mouth	ID17050114SW015_03	Sediment	2001 ISDA data
Sand Hollow Creek—C Line Canal to I-84	ID17050114SW016_03	Sediment	1988 §303(d) list
Sand Hollow Creek—I-84 to Sharp Road	ID17050114SW017_03	Sediment	1988 §303(d) list
		E. coli	2010 DEQ data
Sand Hollow Creek—Sharp Road to Snake River	ID17050114SW017_06	Sediment	1988 §303(d) list
		E. coli	2010 DEQ data

Notes: Idaho State Department of Agriculture (ISDA)

The remaining impaired streams and pollutants on the 2012 §303(d) list are not addressed by this TMDL addendum.

Table 3 shows two AUs that are unlisted but impaired and addressed by this TMDL.

Table 3. Unlisted but impaired assessment units addressed in this addendum.

Assessment Unit Name	Assessment Unit Number	Pollutants	Proposed Listing Reason
Dixie Slough	ID17050114SW001_02	*E. coli*	2013 DEQ data
Sand Creek (part of Stewart Gulch, Cottonwood and Crane Creeks – 1st and 2nd order)	ID17050114SW012_02	*E. coli*	2014 DEQ data

2.2 Applicable Water Quality Standards and Beneficial Uses

Idaho water quality standards (IDAPA 58.01.02) list beneficial uses and set water quality goals for waters of the state. Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02). These beneficial uses are interpreted as existing uses, designated uses, and presumed uses as described briefly in the following paragraphs. The *Water Body Assessment Guidance* (Grafe et al. 2002) provides a more detailed description of beneficial use identification for use assessment purposes.

Beneficial uses include the following:

- Aquatic life support—cold water, seasonal cold water, warm water, salmonid spawning, and modified
- Contact recreation—primary (swimming) or secondary (boating)
- Water supply—domestic, agricultural, and industrial
- Wildlife habitats
- Aesthetics

2.2.1 Existing Uses

Existing uses under the Clean Water Act are “those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards” (40 CFR 131.3). The existing instream water uses and the level of water quality necessary to protect the uses shall be maintained and protected (IDAPA 58.01.02.051.01). Existing uses need to be protected, whether or not the level of water quality to fully support the uses currently exists. A practical application of this concept would be to apply the existing use of salmonid spawning to a water that supported salmonid spawning since November 28, 1975, but does not now due to other factors, such as blockage of migration, channelization, sedimentation, or excess heat.

2.2.2 Designated Uses

Designated uses under the Clean Water Act are “those uses specified in water quality standards for each water body or segment, whether or not they are being attained” (40 CFR 131.3). Designated uses are simply uses officially recognized by the state. In Idaho, these include uses such as aquatic life support, recreation in and on the water, domestic water supply, and agricultural uses. Multiple uses often apply to the same water; in this case, water quality must be sufficiently maintained to meet the most sensitive use (designated or existing). Designated uses may be added or removed using specific procedures provided for in state law, but the effect must not be to preclude protection of an existing higher quality use such as cold water aquatic life or salmonid spawning. Designated uses are described in the Idaho water quality standards (IDAPA 58.01.02.100) and specifically listed by water body in sections 110–160.

2.2.3 Undesignated Surface Waters

In Idaho, due to a change in scale of cataloging waters in 2000, most water bodies listed in the tables of designated uses in the water quality standards do not yet have specific use designations (IDAPA 58.01.02.110–160). The water quality standards have three sections that address nondesignated waters. Section 101.02 and 101.03 specifically address nondesignated man-made waterways and private waters. All other undesignated waters are addressed by section 101.01. Under this section, absent information on existing uses, DEQ presumes that most Idaho waters will support cold water aquatic life and either primary or secondary contact recreation (IDAPA 58.01.02.101.01). To protect these so-called *presumed uses*, DEQ applies the numeric cold water aquatic life and recreation criteria to undesignated waters. If in addition to presumed uses, an additional existing use (e.g., salmonid spawning) exists, then the additional numeric criteria for salmonid spawning would also apply (e.g., intergravel dissolved oxygen, temperature) because of the requirement to protect water quality for that existing use. However, if some other use that requires less stringent criteria for protection (such as seasonal cold water aquatic life) is found to be an existing use, then a use designation (rulemaking) is needed before that use can be applied in lieu of cold water aquatic life criteria (IDAPA 58.01.02.101.01).

2.2.4 Beneficial Uses in the Subbasin

Designated uses must reflect existing uses but also may include uses that do not currently exist if the uses can be attained in the future (Idaho Code §39-3604). The Dixie Slough, Indian Creek, Tenmile Creek, and Fivemile Creek AUs are designated for cold water aquatic life and recreational uses. Mason, Fifteenmile, and Sand Hollow Creeks are designated for recreational uses but are undesignated for aquatic life. Willow Creek and Sand Creek are not designated for any uses. Under IDAPA 58.01.02.101.01 (discussed above), Mason, Fifteenmile, Sand Hollow, Willow, and Sand Creeks are presumed to support cold water aquatic life and are protected for this use by applying the applicable cold water aquatic life criteria. Part of the purpose of a subbasin assessment is to review whether the uses that are designated are attainable uses. For the Lower Boise River subbasin, this means looking at whether cold water aquatic life and recreational uses are attainable uses in the examined AUs (Table 4).

A designated use is attained if it actually occurs or exists, regardless of whether the use is currently fully supported (Idaho Code §§39-3602(2) and (13); Idaho Code §39-3604). DEQ's review of relevant information establishes that cold water aquatic life and recreational uses are existing or attained uses in the examined AUs (Table 4).

Table 4. Beneficial uses of §303(d)-listed streams addressed in this document.

Assessment Unit Name	Assessment Unit Number	Beneficial Uses[a]	Use Type[b]	Use Support[c]
Dixie Slough	ID17050114SW001_02	PCR	DESIG	NA[d]
Indian Creek—Sugar Avenue to Boise River	ID17050114SW002_04	CWAL SCR	DESIG DESIG	NFS NFS
Indian Creek— Indian Creek Reservoir to New York Canal	ID17050114SW003b_03	CWAL SCR	DESIG DESIG	NFS FS
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02	CWAL SCR	DESIG DESIG	FS NFS
Indian Creek—above reservoir	ID17050114SW003d_03	CWAL SCR	DESIG DESIG	NFS FS
Mason Creek—entire watershed	ID17050114SW006_02	CWAL SCR	PRES DESIG	NFS NFS
Fifteenmile Creek—Five/Ten Mile confluence to mouth	ID17050114SW007_04	CWAL SCR	PRES DESIG	NFS NFS
Tenmile Creek—3rd order below Blacks Creek Reservoir	ID17050114SW008_03	CWAL SCR	DESIG DESIG	NFS NFS
Fivemile, Eightmile, and Ninemile Creeks - 1st and 2nd order	ID17050114SW010_02	CWAL SCR	DESIG DESIG	NFS NFS
Fivemile Creek—3rd-order section	ID17050114SW010_03	CWAL SCR	DESIG DESIG	NFS NFS
Sand Creek (part of Stewart Gulch, Cottonwood and Crane Creeks – 1st and 2nd order)	ID17050114SW012_02	SCR	EX	NA[d]
Willow Creek—south fork to mouth	ID17050114SW015_03	CWAL	PRES	NFS
Sand Hollow Creek—C Line Canal to I-84	ID17050114SW016_03	CWAL SCR	EX DESIG	NFS FS
Sand Hollow Creek—I-84 to Sharp Road	ID17050114SW017_03	CWAL SCR	EX DESIG	NFS NFS
Sand Hollow Creek—Sharp Road to Snake River	ID17050114SW017_06	CWAL SCR	EX DESIG	NFS NFS

[a] PCR = primary contact recreation, CWAL = cold water aquatic life, SCR = secondary contact recreation
[b] DESIG = designated, EX = existing, PRES = presumed use protection
[c] NFS = not fully supporting, FS = fully supporting, NA = not assessed
[d] Dixie Slough and Sand Creek are impaired by *E. coli*, but were not assessed in time for the 2012 §303(d) list.

A further explanation of the uses for each AU is provided below:

Dixie Slough primary contact recreation (PCR)—To determine whether a recreational use is existing, DEQ looks at (1) whether there are designated recreational facilities; (2) the size of the water body; and (3) accessibility (Grafe et al. 2002, page 3-10). The slough is big enough for swimming, but it is fast and deep, which presents safety issues. The slough is almost entirely on private land, so accessibility is limited. Wetland bird hunting occurs on and near the creek. However, the slough is part of a Boise River AU, which is designated for PCR.

Indian Creek (lower) cold water aquatic life (CWAL)—Trout and sculpin populations are found upstream (above Sugar Avenue) and downstream (Boise River). There is no reason why they could not exist in between, if the creek were cleaner. According to their website, the Idaho

Department of Fish and Game (IDFG) stocks Indian Creek in Caldwell. Therefore, cold water aquatic life is an existing use in this creek.

Indian Creek (lower) secondary contact recreation (SCR)—A pathway in Caldwell provides access, which makes swimming likely. The creek was previously channeled underground but has been “daylighted” in places. This section is used for kayaking and swimming. Primary contact recreation may be a more appropriate designation.

Mason Creek CWAL—USGS found seven trout here in October 2011. The DEQ Beneficial Use Reconnaissance Program has collected fish and macroinvertebrate data on Mason Creek. The data identify the presence of aquatic macroinvertebrates and cool-water fishes such as redside shiner, smallmouth bass, and northern pikeminnow. These fish assemblages indicate that cold water aquatic life may be an existing use in Mason Creek. Other uses (seasonal cold or modified) may also be appropriate.

Mason Creek SCR—The creek passes through Lakeview Park in Nampa, where swimming is common. The subbasin assessment (DEQ 2001c) asserts that “many portions of Mason Creek are used for swimming and wading,” although the managing irrigation districts discourage such activities. The creek is certainly deep enough and accessible enough in Lakeview Park that it is highly likely that some recreation occurs. Therefore, contact recreation is an existing use.

Fifteenmile Creek CWAL—Native rainbow trout were found during an electrofishing survey in fall 2013. The creek is also directly connected to the Boise River, a reservoir of trout population. Other coolwater species were also found in this creek. These fish assemblages indicate that cold water aquatic life may be an existing use in Fifteenmile Creek. Other uses (seasonal cold or modified) may also be appropriate.

Fifteenmile Creek SCR—Fifteenmile Creek enters the Boise River on an IDFG access path, which provides access for recreational uses. Campers were observed washing their laundry in the creek on August 26, 2014. Anglers and hunters frequent this area too. Boise River boaters start their float in Fifteenmile Creek. The Boise River supports contact recreation, which is documented as an existing use via direct observation on float trips led by Idaho Mountain Recreation (2013) and Idaho Rivers United (2012–2014) and guides describing canoeing (Chelstrom 2002) and paddling (1999) of the lower Boise River.

Tenmile Creek CWAL—Native Rainbow Trout were found during an electrofishing survey in fall 2013. Cool water species were also found. These fish assemblages indicate that cold water aquatic life may be an existing use in Tenmile Creek. Other uses (seasonal cold or modified) may also be appropriate. The creek is tenuously connected to the Boise River—fish barriers and high water velocities prevent juvenile fish from persisting in this creek, but larger fish are likely able to swim up. The upper part of the creek is intermittent.

Tenmile Creek SCR—In several places, the creek is accessible to recreation (for example, at the Idaho Hostel on Ten Mile and Can-Ada Road). A resident reported that children sometimes fish there.

Fivemile Creek CWAL—Native Rainbow Trout and other cool water species were found in nearby Tenmile Creek during an electrofishing survey in fall 2013. The hydrology, geology, land use, and connectivity are the same between Fivemile and Tenmile Creeks, and if cold water aquatic life is present in Tenmile Creek, there is every reason to assume that the same biological community is present or at least attainable in Fivemile Creek. These fish assemblages indicate that cold water aquatic life may be an existing use in Fivemile Creek. Other uses (seasonal cold or modified) may also be appropriate. The creek is tenuously connected to the Boise River—fish barriers and high water velocities prevent juvenile fish from persisting in this creek, but larger fish are likely able to swim up. The upper part is intermittent.

Fivemile Creek SCR—The creek is accessible to recreation along the trail in Meridian and through a couple subdivisions. Recreational access is likely at low water.

Sand Creek SCR—This creek flows unfenced through one side of Catalpa Park in Boise. The author has observed small children playing in the creek on numerous occasions. Although not deep enough for fishing, children build dams, float sticks, and splash in the water.

Willow Creek CWAL—The creek is directly connected to the Boise River so is usable as a coldwater refuge for trout. Temperature data show that the creek generally varies from 13 C to 20 C, making it an attractive refuge from the warmer Boise River. However, no fish data are available so the existing use can’t be confirmed. The use is likely attainable based on temperature and connectivity.

Sand Hollow Creek CWAL—Trout have been found in Sand Hollow Creek. The upper part of the watershed is intermittent (DEQ 1999; Clark and Bauer. 1983). Rainbow Trout were documented in a report by the Idaho Department of Health and Welfare (1983) and through IDFG citizen reports. Beneficial Use Reconnaissance Program macroinvertebrate data were collected on Sand Hollow Creek in 1996. The data identify the presence of aquatic macroinvertebrates. The 2001 Sand Hollow Creek subbasin assessment identifies game, nongame, and trout fishes that have been collected in the creek (DEQ 2001d). These fish assemblages indicate that cold water aquatic life may be an existing use in Sand Hollow Creek. Other uses (seasonal cold or modified) may also be appropriate.

Sand Hollow Creek SCR—The IDFG preserve provides access at the lower end of the stream, where boating and wading occur. IDFG citizen reports document this access. The 2001 subbasin assessment (DEQ 2001d) mentions that during the summer, contact recreation occurs at several locations, although the managing irrigation districts discourage such activities.

Based on the above described information, the AUs addressed by this addendum are appropriately designated for aquatic life and recreational uses because these are existing or attained uses. The current fish data for some of the waters indicates the presence of both cold and cool water species, with a larger number of cool water species.

2.2.5 Water Quality Criteria to Support Beneficial Uses

Beneficial uses are protected by a set of water quality criteria, which include *numeric* criteria for pollutants such as *E. coli*, dissolved oxygen, pH, ammonia, temperature, and turbidity and *narrative* criteria for pollutants such as sediment and nutrients (IDAPA 58.01.02.250–251).

The *E. coli* criterion is numeric, and in this case, applies to the contact recreation beneficial use:

> **a**. Geometric Mean Criterion. Waters designated for primary or secondary contact recreation are not to contain E. coli bacteria in concentrations exceeding a geometric mean of one hundred twenty-six (126) E. coli organisms per one hundred (100) ml based on a minimum of five (5) samples taken every three (3) to seven (7) days over a thirty (30) day period. (IDAPA 58.01.02.251.01.a)

There is no instantaneous maximum value of *E. coli* that constitutes a violation of water quality criteria. Single sample values are used as "trigger values" for measuring the geometric mean:

> **b.** Use of Single Sample Values. A water sample exceeding the E. coli single sample maximums below indicates likely exceedance of the geometric mean criterion, but is not alone a violation of water quality standards. If a single sample exceeds the maximums set forth in Subsections 251.01.b.i., 251.01.b.ii., and 251.01.b.iii., then additional samples must be taken as specified in Subsection 251.01.c.:
>
> i. For waters designated as secondary contact recreation, a single sample maximum of five hundred seventy-six (576) E. coli organisms per one hundred (100) ml; or
>
> ii. For waters designated as primary contact recreation, a single sample maximum of four hundred six (406) E. coli organisms per one hundred (100) ml; or (IDAPA 58.01.02.251.01.b, parts b.iii and c not shown)

The sediment criterion is narrative, and in this case, applies to the cold water aquatic life beneficial use:

> Sediment shall not exceed quantities specified in Sections 250 and 252, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350. (IDAPA 58.01.02.200.08)

DEQ's procedure to determine whether a water body fully supports designated and existing beneficial uses is outlined in IDAPA 58.01.02.054. The procedure relies heavily on biological parameters and is presented in detail in the *Water Body Assessment Guidance* (Grafe et al. 2002). This guidance requires DEQ to use the most complete data available to make beneficial use support status determinations (Figure 4).

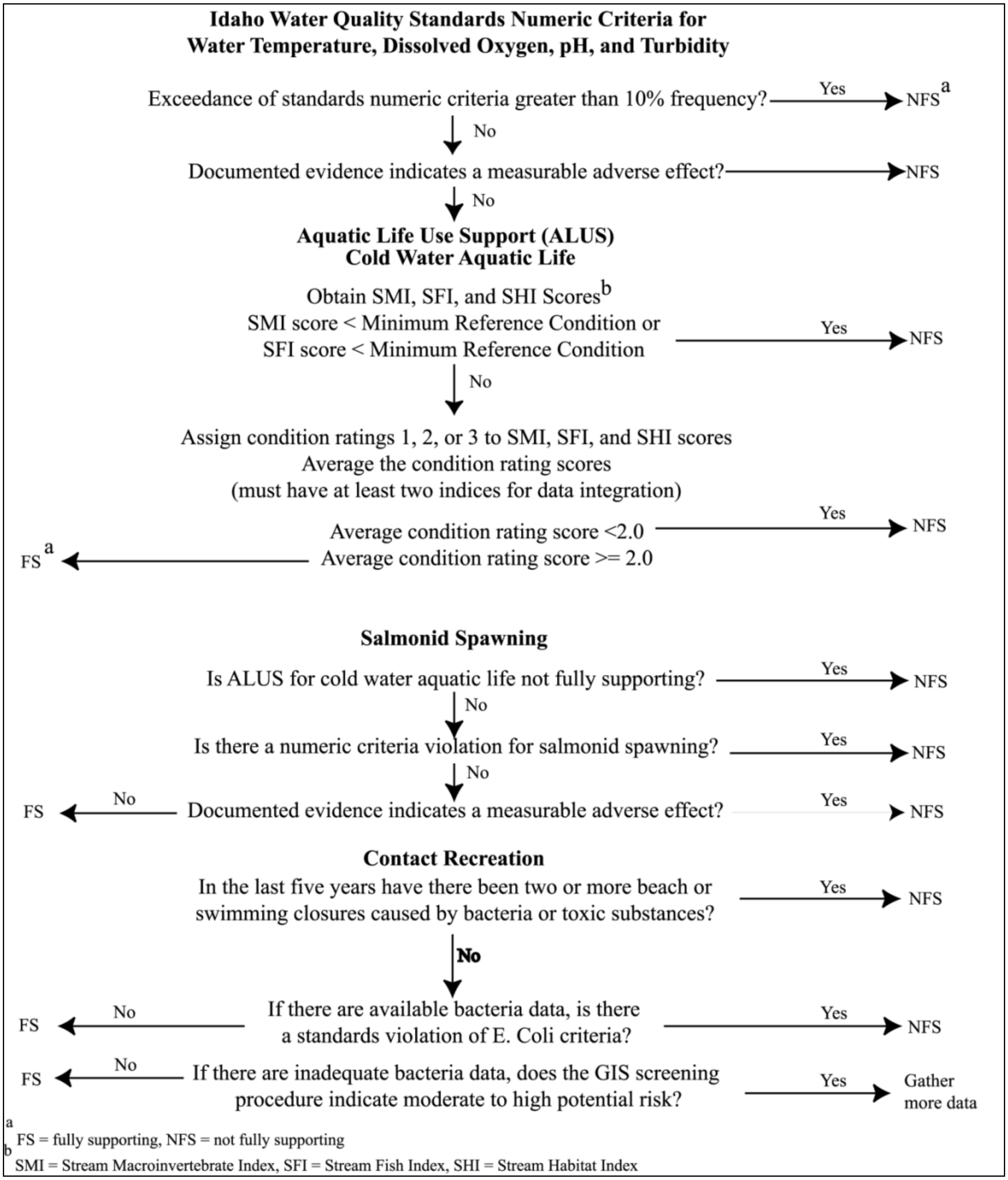


Figure 4. Steps and criteria for determining support status of beneficial uses in wadeable streams (Grafe et al. 2002).

2.3 Summary and Analysis of Existing Water Quality Data

A detailed summary and analysis of existing water quality data prior to 1999 is contained within the original TMDL (DEQ 1999). An abundance of water quality data has been collected since 1999, so only data pertaining directly to one of the impaired AUs is identified here (Table 5).

Table 5. Sediment, discharge, and *E. coli* data collected since 1999.

Water Body	Assessment Unit Number	Start Date	End Date	Frequency	Collector[a]	TSS[b]	Q[c]	*E. coli*
Dixie Slough								
At Boise River Road	ID17050114SW001_02	Aug 2011	Sep 2011	Weekly	DEQ	N	N	Y
At Boise River Road	ID17050114SW001_02	May 1986	Sep 2011	Unknown	City of Boise	N	Y	N
At Boise River Road 13212890	ID17050114SW001_02	Mar 2013	Mar 2013	Once	USGS	N	Y	N
Indian Creek								
At Broadmore Street in Nampa	ID17050114SW002_04	May 2010	Nov 2010	Bimonthly	USGS	Y	Y	Y
At Sparrow Ave in Caldwell	ID17050114SW002_04	May 2010	Nov 2010	Bimonthly	USGS	Y	Y	Y
At 21st Avenue in Caldwell	ID17050114SW002_04	May 2010	Nov 2010	Bimonthly	USGS	Y	Y	Y
At Simplot Blvd 13211441	ID17050114SW002_04	May 2010	Nov 2010	Bimonthly	USGS	Y	Y	Y
At Simplot Blvd 13211441	ID17050114SW002_04	Aug 2012	Aug 2012	Once	USGS	Y	Y	Y
At Caldwell	ID17050114SW002_04	Nov 2011	Sep 2012	15 Minutes	City of Caldwell	N	Y	N
At mouth 13211445	ID17050114SW002_04	May 2010	Mar 2013	Bimonthly	USGS	Y	Y	Y
Upstream of WWTP	ID17050114SW002_04	Jan 2003	Jun 2009	Weekly	City of Nampa	Y	Y	N
Downstream of WWTP	ID17050114SW002_04	Jan 2003	Jun 2009	Weekly	City of Nampa	Y	Y	N
At mouth	ID17050114SW002_04	May 1998	Feb 1999	Biweekly	ISDA	Y	N	N
At mouth	ID17050114SW002_04	Mar 1999	Mar 2000	Biweekly	ISDA	Y	Y	N
At mouth	ID17050114SW002_04	Jan 2000	Sep 2001	Monthly	USGS	Y	Y	Y
At mouth	ID17050114SW002_04	May 2005	Aug 2005	Monthly	USGS	Y	Y	Y
At Kings Road	ID17050114SW003a_04	May 2008	Dec 2008	Monthly	DEQ	Y	Y	Y
At Robinson Road	ID17050114SW003a_04	Oct 2003	Oct 2003	Once	DEQ	N	Y	Y
At Robinson Road	ID17050114SW003a_04	May 2010	Nov 2010	Bimonthly	USGS	Y	Y	Y
At Stroebel Road	ID17050114SW003b_04	Feb 1999	Sep 1999	Monthly	BOR	Y	N	Y
Slater Creek—at Indian Creek Road	ID17050114SW003d_02	May 2012	May 2012	Weekly	DEQ	N	N	Y
At reservoir inlet	ID17050114SW003d_03	Mar 1999	Sep 1999	Monthly	BOR	Y	N	N
Mason Creek								
At Marble Front Road	ID17050114SW006_02	Apr 1998	Mar 2000	Biweekly	ISDA	Y	Y	Y
At Polk Road	ID17050114SW006_02	Apr 2008	Oct 2008	Biweekly	ISDA	Y	Y	Y
At Lakeview Park	ID17050114SW006_02	Oct 2003	Oct 2003	Once	DEQ	N	Y	Y
At Polk Road 13210983	ID17050114SW006_02	Apr 1999	Sep 2001	Monthly	USGS	N	N	Y
At Polk Road 13210983	ID17050114SW006_02	Mar 2011	Mar 2012	Monthly	USGS	N	N	Y
Fifteenmile Creek								
At Lincoln Road	ID17050114SW007_04	Apr 2008	Oct 2008	Biweekly	ISDA	Y	Y	Y
At mouth 13210815	ID17050114SW007_04	May 2005	Aug 2005	Monthly	USGS	Y	Y	Y
At mouth 13210815	ID17050114SW007_04	Jan 2000	May 2000	Monthly	USGS	Y	Y	Y
At mouth 13210815	ID17050114SW007_04	Aug 2012	Oct 2012	Bimonthly	USGS	Y	Y	Y
At mouth 13210983	ID17050114SW007_04	Mar 2013	Mar 2013	Once	USGS	Y	Y	Y
At mouth	ID17050114SW007_04	Jun 2011	Nov 2011	Biweekly	DEQ	Y	Y	N
At mouth	ID17050114SW007_04	Jul 2011	Jul 2011	Weekly	DEQ	N	N	Y

Water Body	Assessment Unit Number	Start Date	End Date	Frequency	Collector[a]	TSS[b]	Q[c]	*E. coli*
At mouth	ID17050114SW007_04	Nov 2011	Nov 2011	Weekly	DEQ	N	N	Y
At mouth (fish)	ID17050114SW007_04	Nov 2013	Nov 2013	Once	DEQ	N	N	N
Tenmile Creek								
At Franklin Road 13210660	ID17050114SW008_03	Apr 2000	Sep 2001	Monthly	USGS	Y	Y	Y
At Franklin Road 13210660	ID17050114SW008_03	May 2005	Aug 2005	Monthly	USGS	Y	Y	Y
At Franklin Road 13210660	ID17050114SW008_03	Nov 2008	Nov 2008	Once	USGS	Y	Y	Y
At Franklin Road 13210660	ID17050114SW008_03	Apr 2009	Apr 2009	Once	USGS	Y	Y	Y
At Franklin Road 13210660	ID17050114SW008_03	Aug 2012	Aug 2012	Once	USGS	Y	Y	Y
At Franklin Road 13210660	ID17050114SW008_03	Jul 2009	Jul 2009	Once	USGS	Y	Y	Y
At S Coverdale Road	ID17050114SW008_03	Nov 2008	Nov 2008	Once	USGS	Y	Y	Y
At S Coverdale Road	ID17050114SW008_03	Apr 2009	Apr 2009	Once	USGS	Y	Y	Y
At S Coverdale Road	ID17050114SW008_03	Jul 2009	Jul 2009	Once	USGS	Y	Y	Y
At Eagle Road	ID17050114SW008_03	Nov 2008	Nov 2008	Once	USGS	Y	Y	Y
At Eagle Road	ID17050114SW008_03	Apr 2009	Apr 2009	Once	USGS	Y	Y	Y
At Eagle Road	ID17050114SW008_03	Jul 2009	Jul 2009	Once	USGS	Y	Y	Y
Below Blacks Creek Reservoir	ID17050114SW008_03	Jun 1997	Jun 1997	Once	DEQ	N	Y	N
At Franklin Road	ID17050114SW008_03	Jun 2011	Nov 2011	Biweekly	DEQ	Y	Y	N
At Franklin Road	ID17050114SW008_03	Jul 2011	Jul 2011	Weekly	DEQ	N	N	Y
At Franklin Road	ID17050114SW008_03	Nov 2011	Nov 2011	Weekly	DEQ	N	N	Y
At Can-Ada Road (fish)	ID17050114SW008_03	Nov 2013	Nov 2013	Once	DEQ	N	N	N
Various	ID17050114SW008_03	Mar 2012	Oct 2014	Monthly, Mar–Oct	ACHD	Y	Y	Y
Various	ID17050114SW008_03	Mar 2012	Oct 2014	Quarterly, Oct–Mar	ACHD	Y	Y	Y
Ninemile Creek								
At Ustick Road	ID17050114SW010_02	Jun 2011	Nov 2011	Biweekly	DEQ	Y	Y	N
At Ustick Road	ID17050114SW010_02	Jul 2011	Jul 2011	Weekly	DEQ	N	N	Y
At Ustick Road	ID17050114SW010_02	Nov 2011	Nov 2011	Weekly	DEQ	N	N	Y
At mouth (fish)	D17050114SW010_02	Nov 2013	Nov 2013	Once	DEQ	N	N	N
Fivemile Creek								
At Franklin Road 13210795	ID17050114SW010_03	Apr 2000	Sep 2001	Monthly	USGS	Y	Y	Y
At Franklin Road 13210795	ID17050114SW010_03	May 2005	Aug 2005	Monthly	USGS	Y	Y	Y
At Franklin Road 13210795	ID17050114SW010_03	Nov 2008	Nov 2008	Once	USGS	Y	Y	Y
At Franklin Road 13210795	ID17050114SW010_03	Apr 2009	Apr 2009	Once	USGS	Y	Y	Y
At Franklin Road 13210795	ID17050114SW010_03	Aug 2012	Aug 2012	Once	USGS	Y	Y	Y
At Franklin Road 13210795	ID17050114SW010_03	Jul 2009	Jul 2009	Once	USGS	Y	Y	Y
At Eagle Road	ID17050114SW010_03	Apr 2009	Apr 2009	Once	USGS	Y	Y	Y
At Eagle Road	ID17050114SW010_03	Jul 2009	Jul 2009	Once	USGS	Y	Y	Y
At Victory Road	ID17050114SW010_03	Apr 2009	Apr 2009	Once	USGS	Y	Y	Y
At Victory Road	ID17050114SW010_03	Jul 2009	Jul 2009	Once	USGS	Y	Y	Y
Upstream of Meridian WWTP	ID17050114SW010_03	Jun 2009	Jun 2009	Daily	City of Meridian	N	Y	N

Water Body	Assessment Unit Number	Start Date	End Date	Frequency	Collector[a]	TSS[b]	Q[c]	*E. coli*
At Meridian Road	ID17050114SW010_03	Oct 2003	Oct 2003	Once	DEQ	N	Y	Y
At Franklin Road	ID17050114SW010_03	Jun 2011	Nov 2011	Biweekly	DEQ	Y	Y	N
At Franklin Road	ID17050114SW010_03	Jul 2011	Jul 2011	Weekly	DEQ	N	N	Y
At Franklin Road	ID17050114SW010_03	Nov 2011	Nov 2011	Weekly	DEQ	N	N	Y
At Meridian WWTP (fish)	ID17050114SW010_03	Nov 2013	Nov 2013	Once	DEQ	N	N	N
Various	ID17050114SW010_03	Mar 2011	Oct 2011	Storm events	ACHD	Y	Y	Y
Various	ID17050114SW010_03	Mar 2012	Oct 2014	Monthly, Mar–Oct	ACHD	Y	Y	Y
Various	ID17050114SW010_03	Mar 2012	Oct 2014	Quarterly, Oct–Mar	ACHD	Y	Y	Y
Sand Creek—at Catalpa Park	ID17050114SW012_02	Oct 2014	Oct 2014	Weekly	DEQ	N	N	Y
Willow Creek								
At mouth	ID17050114SW015_03	Apr 2008	Oct 2008	Biweekly	ISDA	Y	Y	Y
In Middleton	ID17050114SW015_03	Apr 2000	Mar 2001	Biweekly	ISDA	Y	Y	Y
At mouth	ID17050114SW015_03	Apr 2008	Oct 2008	Biweekly	ISDA	Y	Y	Y
In Middleton 13210835	ID17050114SW015_03	Apr 1999	Sep 1999	Biweekly	USGS	Y	Y	Y
In Middleton 13210835	ID17050114SW015_03	Oct 1999	May 2000	Monthly	USGS	Y	Y	Y
In Middleton 13210835	ID17050114SW015_03	Aug 2001	Aug 2001	Once	USGS	Y	Y	Y
In Middleton 13210835	ID17050114SW015_03	May 2005	Aug 2005	Once	USGS	Y	Y	Y
In Middleton 13210835	ID17050114SW015_03	Aug 2012	Oct 2012	Bimonthly	USGS	Y	Y	Y
In Middleton 13210835	ID17050114SW015_03	Mar 2013	Mar 2013	Once	USGS	Y	Y	Y
Sand Hollow Creek								
At Oasis Road	ID17050114SW016_03	May 2008	Dec 2008	Monthly	DEQ	Y	Y	Y
At Market Road	ID17050114SW017_03	Jun 2010	Jul 2010	Weekly	DEQ	N	Y	Y
At Market Road	ID17050114SW017_03	May 2008	Dec 2008	Monthly	DEQ	Y	Y	Y
At Old Fort Boise Road	ID17050114SW017_06	Apr 2008	Oct 2008	Biweekly	ISDA	Y	Y	Y
At Old Fort Boise Road	ID17050114SW017_06	Jun 2010	Jul 2010	Weekly	DEQ	N	Y	Y
At I-84 434821116444300	ID17050114SW017_03	Aug 2012	Oct 2012	Bimonthly	USGS	Y	Y	Y
Near Parma 13213072	ID17050114SW017_03	Aug 2012	Oct 2012	Bimonthly	USGS	Y	Y	Y
At mouth 13213080	ID17050114SW017_06	Aug 2012	Oct 2012	Bimonthly	USGS	Y	Y	Y
At I-84 434821116444300	ID17050114SW017_03	Mar 2013	Mar 2013	Once	USGS	Y	Y	Y
Near Parma 13213072	ID17050114SW017_03	Mar 2013	Mar 2013	Once	USGS	Y	Y	Y
At mouth 13213080	ID17050114SW017_06	Mar 2013	Mar 2013	Once	USGS	Y	Y	Y
Various—various	n/a	Jun 2008	Sep 2008	Many	EPA	Y	N	N

[a] US Geological Survey (USGS), Idaho State Department of Agriculture (ISDA), Ada County Highway District (ACHD), US Bureau of Reclamation (BOR), US Environmental Protection Agency (EPA)
[b] Total suspended solids (TSS)
[c] Q = flow

2.3.1 Flow Characteristics

Much of the year-round discharge data are quite dated. However, recent data points (for example, DEQ 2011 data in Fivemile and Tenmile Creeks) tend to confirm the general shape of each hydrograph. Existing discharge data are presented in Figure 5 through Figure 12.

Fivemile Creek is intermittent upstream of the Locust Grove/Franklin intersection, and Tenmile Creek is intermittent upstream of McDermott Road.

Instantaneous velocity measurements were taken by DEQ at the Franklin Road crossing in August 2014. Fivemile Creek varied between 2.5 and 2.8 feet per second (ft/s). Tenmile Creek varied between 2.0 and 4.6 ft/s.

DEQ discharge data from 2011 were not used because data were only collected between July and November (less than a full season).

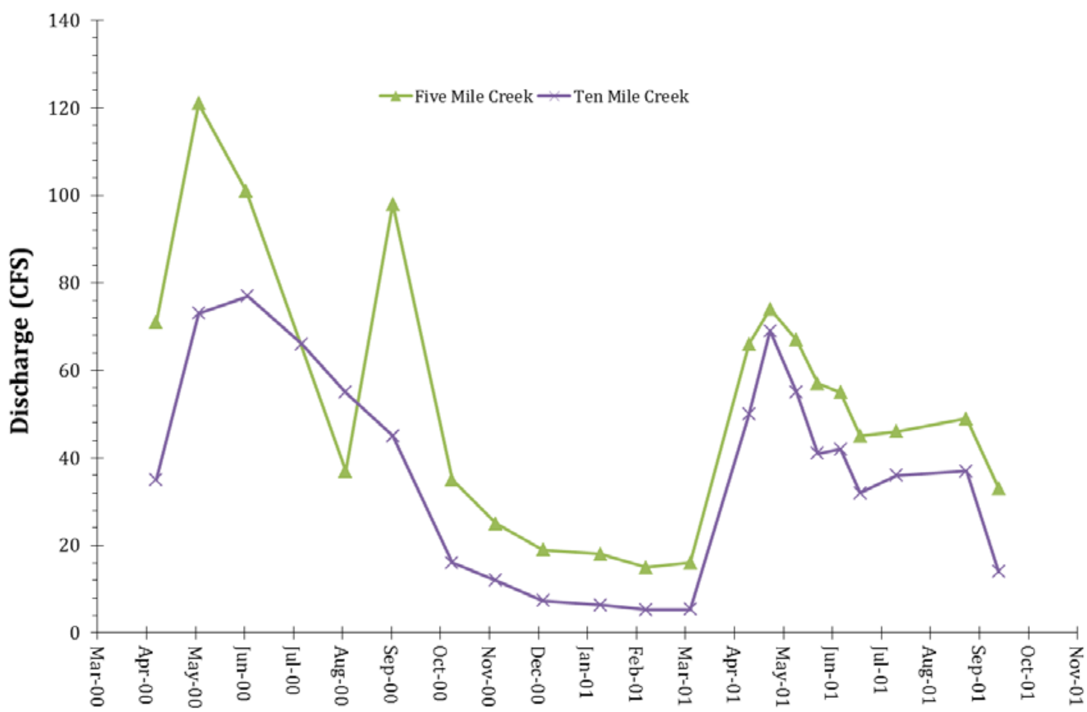


Figure 5. Discharge in Fivemile and Tenmile Creeks at Franklin Road (data from USGS, 2000–2001).

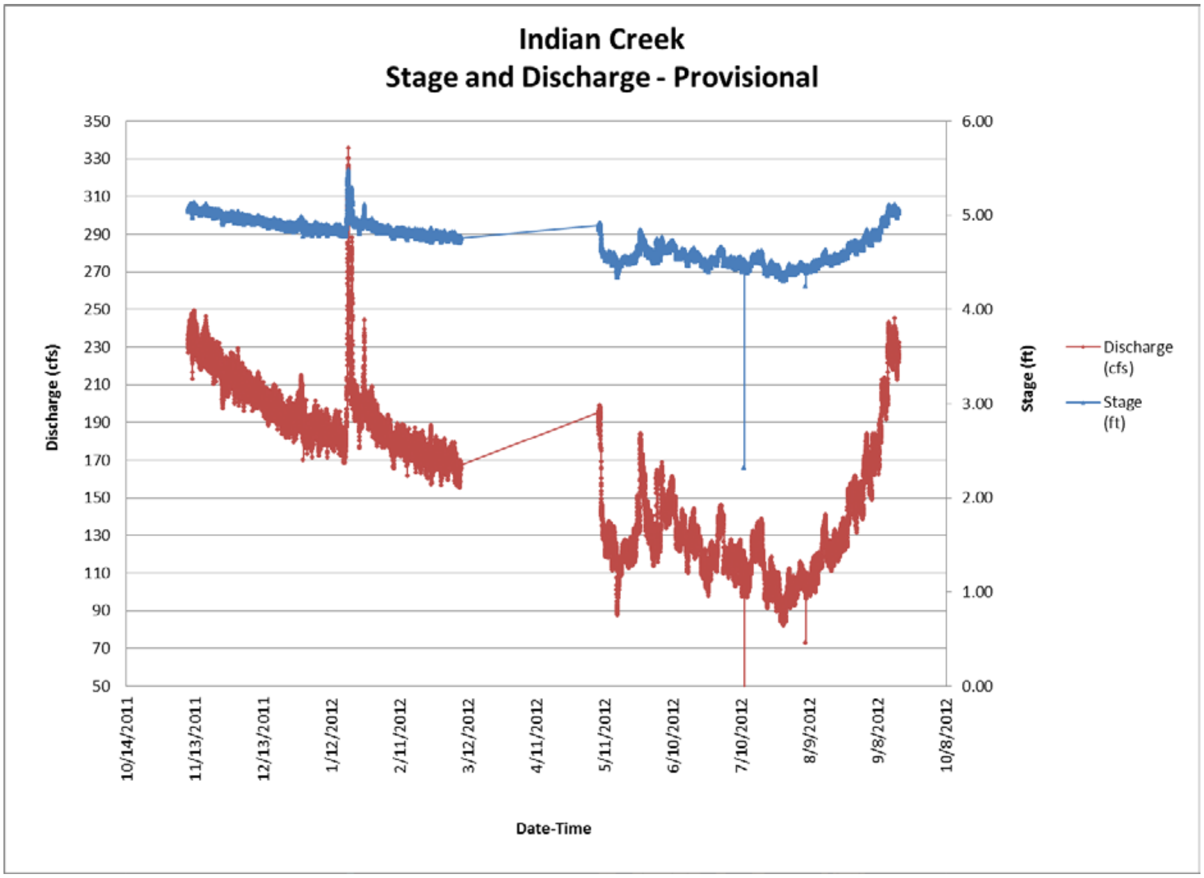


Figure 6. Discharge in Indian Creek at the mouth (data from City of Caldwell, 2011–2012).

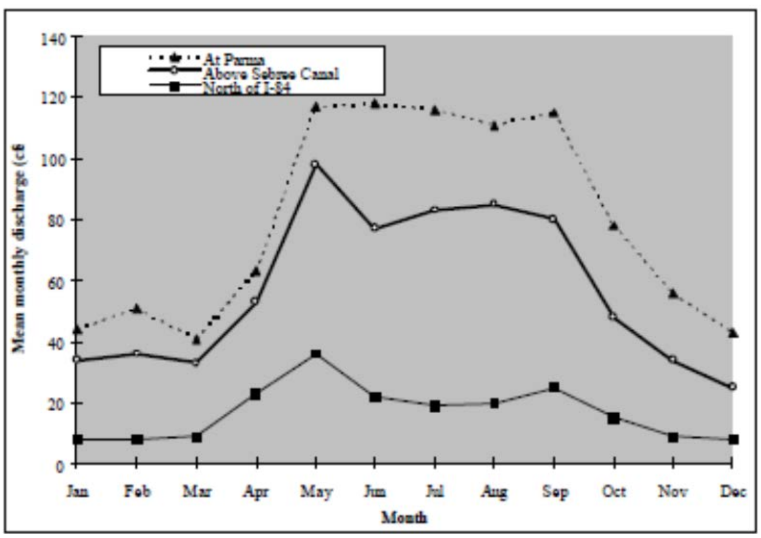


Figure 7. Discharge in Sand Hollow Creek (data from ISDA, 1998–2000).

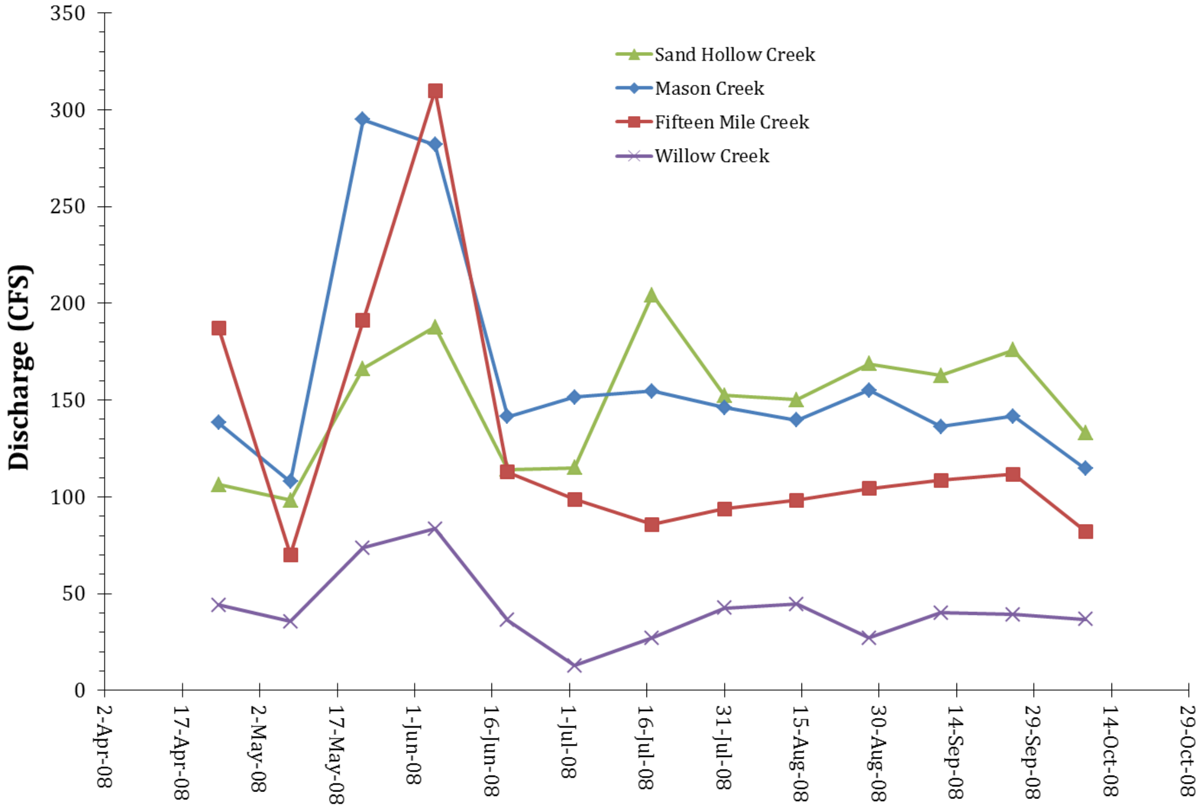


Figure 8. Discharge in Sand Hollow, Mason, Willow, and Fifteenmile Creeks (data from ISDA, 2008).

Instantaneous velocity measurements were taken by DEQ on Fifteenmile Creek at the Franklin Road crossing in August 2014 and varied between 1.1 and 4.1 cubic feet per second (cfs).

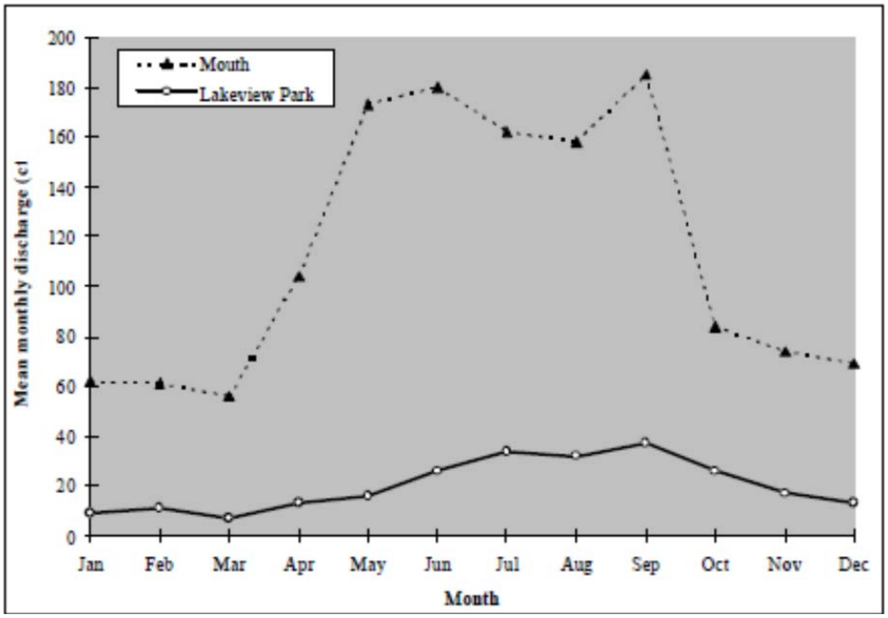


Figure 9. Discharge in Mason Creek (ISDA 1998–2000).

The most recent year-round discharge data for Fifteenmile Creek were collected by USGS in 1996 (Figure 10).

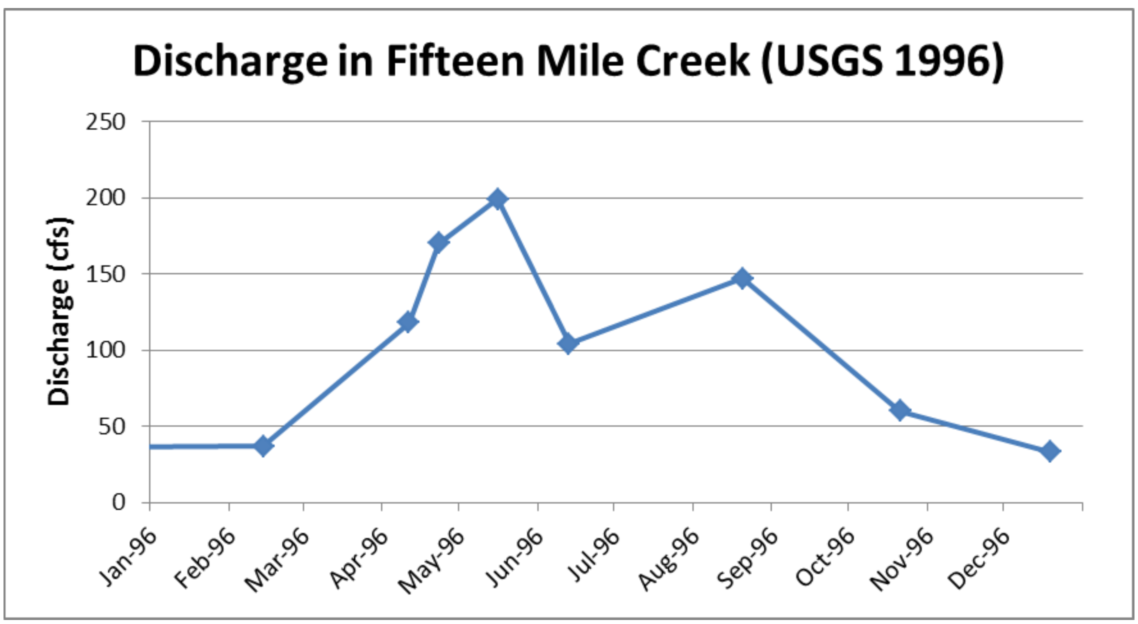


Figure 10. Discharge in Fifteenmile Creek (data from USGS, 1996).

The City of Boise provided discharge data from Dixie Slough between 1986 and 2011. The median flow was 200 cfs (Figure 11).

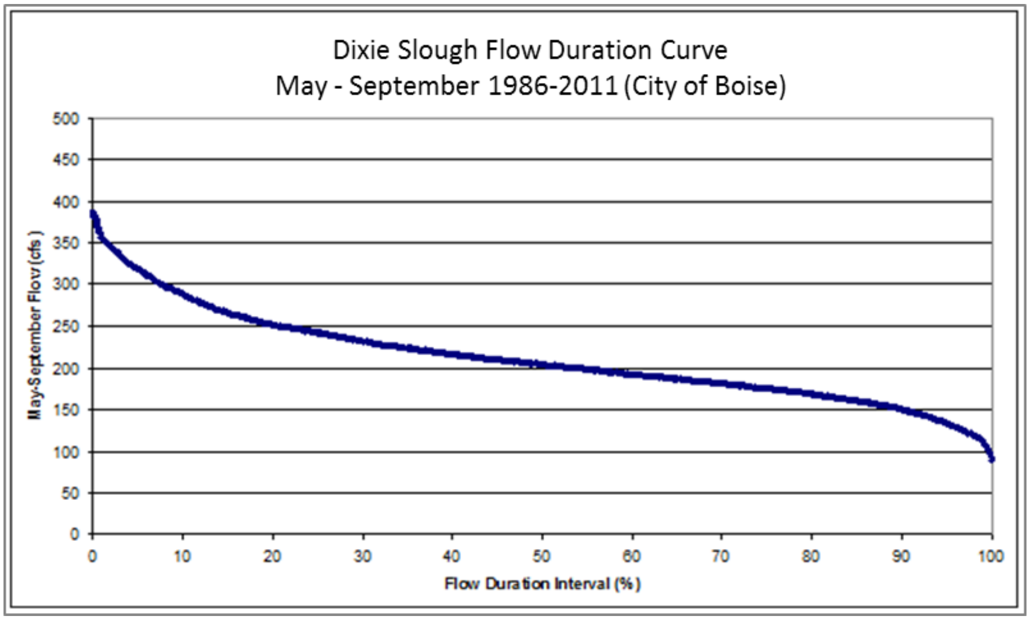


Figure 11. Flows in Dixie Slough between May and September (data from City of Boise, 1986–2011).

The USGS established a gaging station on upper Indian Creek, near Mayfield, in 2011. The gage report is in Appendix D, and the hydrograph is shown below (Figure 12).

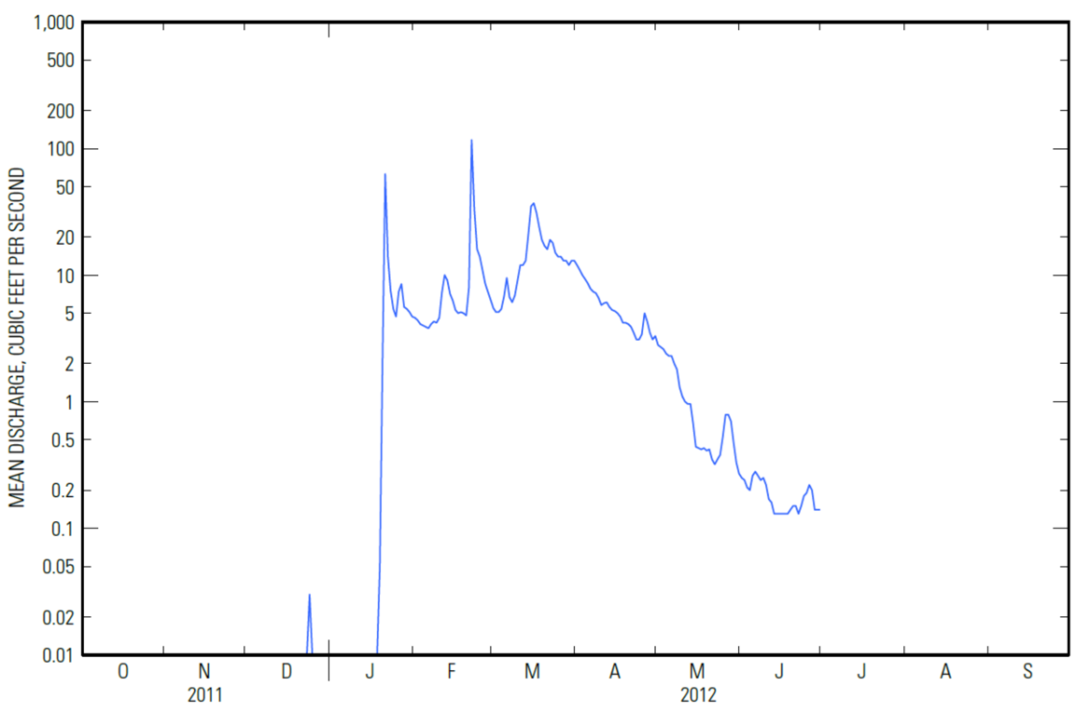


Figure 12. Gage report for Indian Creek at Mayfield (data from USGS, 2011).

No flow data were available for Ninemile Creek or either of the upper Indian Creek AUs, so the USGS StreamStats model was used to estimate the flow (Appendix A). This approximation is very coarse and may not be suitable for such small, modified basins. Ninemile Creek experiences its highest pollutant load in July, so the July D50 (i.e., average July flow) was used. Much of upper Indian Creek is dry in July, so the April D50 was used to approximate the effect of spring runoff. Sand Creek was only monitored in October, so the corresponding flow has been used (Table 6).

Table 6. Flow statistics used form Ninemile, upper Indian, and Sand Creeks.

Water Body	Assessment Unit	Estimated Flow (cubic feet per second)	Statistic
Indian Creek above Mora	ID17050114SW003b_03	15.5	April D50
Indian Creek at reservoir inlet	ID17050114SW003d_03	16.5	April D50
Ninemile Creek	ID17050114SW010_02	10.0	July D50
Sand Creek at Catalpa Park	ID17050114SW012_02	0.87	October D50

2.3.2 Water Column Data

2.3.2.1 *E. coli*

Since 2000, DEQ has collected *E. coli* samples from each of the impaired tributaries to the Boise River except Mason Creek. These samples were all collected according to the 5-sample, 30-day geometric mean format of the water quality standards (Table 7).

USGS and Idaho State Department of Agriculture (ISDA) both collected *E. coli* samples from the same location in Mason Creek in July 1999. Neither of these sample regimes alone met the frequency requirements for the water quality criterion, but together, a 5-sample, 30-day geometric mean was calculated.

Table 7. *E. coli* data and geometric mean.

Sampling Location	Assessment Unit Number	Date Sampled	*E. coli* Results (colony-forming units/100 milliliters)						Geometric Mean
Dixie Slough at River Road	ID17050114SW001_02	August 2011	650	308	738	201	875	—	**482**
Indian Creek at Simplot Boulevard	ID17050114SW002_04	July 2011	960	249	517	816	281	—	**490**
Upper Indian Creek at Indian Creek Road	ID17050114SW003d_02	May 2012	172	1,986	2,420	2,420	2,143	—	**1,338**
Mason Creek at Marble Front Road	ID17050114SW006_02	July 1999	700	340	1,000	580	1,300	—	**709**
Tenmile Creek at Franklin Road	ID17050114SW008_03	July 2011	988	345	1,046	669	703	—	**699**
		November 2011	75	75	34	25	40	—	**45**
Fifteenmile Creek at mouth	ID17050114SW008_04	July 2011	579	276	987	548	2,723	—	**748**
		November 2011	84	53	173	11	22	—	**45**
Ninemile Creek at Ustick Road	ID17050114SW010_02	July 2011	488	1,529	1,421	411	411	—	**709**
		November 2011	1,120	613	501	242	238	—	**457**
Fivemile Creek at Franklin Road	ID17050114SW010_03	July 2011	933	435	990	933	711	—	**768**
		November 2011	75	32	93	20	34	—	**43**
Sand Creek at Catalpa Park	ID17050114SW012_02	October 2014	548	461	238	365	488	—	**404**
Sand Hollow at Market Road	ID17050114SW017_03	July 2010	1,187	579	517	548	373	488	**573**
Sand Hollow at Old Fort Boise Road	ID17050114SW017_06	July 2010	717	411	549	1,187	459	1,017	**669**

2.3.2.2 *Sediment*

Total suspended solids (TSS) analysis is a method originally developed for wastewater. It relies on the sediment being relatively uniform and neutrally buoyant. It is measured by subsampling, which can introduce error when the heavier particles readily settle.

Suspended-sediment concentration (SSC) analysis uses a whole-volume sample, and so accounts for heavier particles. It is generally considered to be a more accurate measurement.

Analytical results used in this TMDL generally take the form of SSC but are occasionally analyzed using the TSS method. In a stream with fairly homogeneous, fine sediment particles, the methods yield similar results and are used interchangeably. For further information, please see USGS publication WRIR 00-4191, ‘Comparability of Suspended-Sediment Concentration and Total Suspended Solids Data’ (Gray 2000).

In 2008, ISDA collected sediment and discharge (Q) data from Willow, Mason, Sand Hollow, and Fifteenmile Creeks (Table 8).

Table 8. Sediment and discharge data (data from ISDA, 2008).

Date	Mason Creek ID17050114SW006_02		Fifteenmile Creek ID17050114SW007_04		Willow Creek ID17050114SW015_02		Sand Hollow Creek ID17050114SW017_06	
	Q (cfs)	SSC (mg/L)	Q (cfs)	SSC (mg/L)	Q (cfs)	SSC (mg/L)	Q (cfs)	SSC (mg/L)
04/24/2008	138.4	136	187.4	70.4	44.2	30.4	106.3	113
05/08/2008	108	71.2	70.1	56.5	35.7	25	98.3	76.3
05/22/2008	295	88.9	191.1	66	73.6	70.3	166.3	127
06/05/2008	282	71.5	309.8	37.1	83.5	22.2	187.7	66.5
06/19/2008	141.4	136	112.7	76.4	36.2	21.3	114.2	103
07/02/2008	151.6	106	98.7	91.4	12.9	14.4	115.1	112
07/17/2008	154.6	71.6	85.8	85	27.2	27.1	204.2	180
07/31/2008	146.2	87.4	93.7	80.7	42.5	27.4	152.5	117
08/14/2008	139.6	51.6	98.3	40.8	44.6	15	150.2	118
08/28/2008	155	39.2	104.2	29.7	27.1	15.3	168.8	62.1
09/11/2008	136.2	32.3	108.6	18.2	40	13.9	162.7	34
09/25/2008	141.6	26.1	111.8	27.8	39.2	30.9	176	30.9
10/09/2008	114.7	21.5	82.1	12.8	36.8	10.6	132.9	30.6

Note: Q = flow, cubic feet per second (cfs), suspended sediment concentration (SSC), milligrams per liter (mg/L)

ISDA also collected sediment data for Willow Creek between April 2000 and March 2001 (Table 9).

Table 9. Sediment data—Willow Creek near Highway 44 in Middleton (AU ID17050114SW015_03) (data from ISDA).

Date	Discharge (cfs)	Total Suspended Solids (mg/L)
04/04/2000	0	1
04/18/2000	36.5	49
05/03/2000	38.7	25
05/16/2000	54.5	27
05/31/2000	40.8	14
06/14/2000	48.6	27
06/27/2000	11.5	7
07/11/2000	17.2	10
07/25/2000	4.05	2
08/03/2000	27.6	15
08/22/2000	3.97	1
09/06/2000	38.5	7
09/19/2000	15.1	6
10/03/2000	4.88	6
10/18/2000	4.85	2
11/14/2000	1.1	4
12/14/2000	0.9	8
01/30/2001	0	0
02/21/2001	7.8	196
03/19/2001	0.66	4

Note: cubic feet per second (cfs), milligrams per liter (mg/L)

In 2011, DEQ collected sediment data from Five- and Tenmile Creeks (Table 10).

Table 10. Sediment data—Five- and Tenmile Creeks, 2011.

Date (2011)	Fivemile Creek at Franklin Road		Tenmile Creek at Franklin Road	
	TSS (mg/L)	Discharge (cfs)	TSS (mg/L)	Discharge (cfs)
June 16	46	n/a	36	n/a
July 1	49	n/a	90	n/a
July 18	70	43.2	160	75.0
July 29	62	69.3	230	65.6
August 10	98	71.5	69	66.2
August 25	50	71.9	82	84.5
September 8	18	65.3	64	61.5
September 19	24	67.3	18	61.4
October 5	38	107.8	47	82.5
November 2	5	26.0	5	11.8
November 16	5	28.5	5	10.1

Note: total suspended solids (TSS), milligrams per liter (mg/L), cubic feet per second (cfs)

USGS collected sediment data from Indian, Fivemile, and Tenmile Creeks between 2008 and 2010 (Table 11).

Table 11. Sediment data—Indian, Fivemile, and Tenmile Creeks, 2008–2010.

Water Body	Date	SSC (mg/L)	Flow (cfs)
Indian Creek at Robinson Rd	05/03/2010	47	8
Indian Creek at Robinson Rd	07/26/2010	64	14
Indian Creek at Robinson Rd	11/16/2010	6	10
Indian Creek at Broadmore St	05/03/2010	39	40
Indian Creek at Broadmore St	07/26/2010	90	23
Indian Creek at Broadmore St	11/16/2010	5	36
Indian Creek at Sparrow Ave	05/03/2010	87	94
Indian Creek at Sparrow Ave	07/26/2010	94	76
Indian Creek at Sparrow Ave	11/16/2010	14	61
Indian Creek at 21st St	05/04/2010	89	124
Indian Creek at 21st St	07/27/2010	93	135
Indian Creek at 21st St	11/17/2010	63	240
Indian Creek at Simplot Blvd	05/04/2010	85	142
Indian Creek at Simplot Blvd	07/27/2010	93	156
Indian Creek at Simplot Blvd	11/17/2010	61	255
Indian Creek at mouth	05/04/2010	89	78
Indian Creek at mouth	07/27/2010	94	65
Indian Creek at mouth	11/17/2010	42	340
Fivemile Creek at Victory Rd	04/28/2009	92	0.5
Fivemile Creek at Victory Rd	07/29/2009	98	1.1
Fivemile Creek at Eagle Rd	04/28/2009	98	1.2
Fivemile Creek at Eagle Rd	07/29/2009	93	1.1
Fivemile Creek at Franklin Rd	11/17/2008	93	22
Fivemile Creek at Franklin Rd	04/29/2009	86	45
Fivemile Creek at Franklin Rd	07/29/2009	98	54
Tenmile Creek at Cloverdale Rd	11/17/2008	73	0.07
Tenmile Creek at Cloverdale Rd	04/28/2009	86	3.1
Tenmile Creek at Cloverdale Rd	07/29/2009	89	1.8
Tenmile Creek at Eagle Rd	11/17/2008	76	0.05
Tenmile Creek at Eagle Rd	04/28/2009	45	1
Tenmile Creek at Eagle Rd	07/29/2009	91	3.5
Tenmile Creek at Franklin Rd	11/17/2008	85	9.2
Tenmile Creek at Franklin Rd	04/29/2009	81	57
Tenmile Creek at Franklin Rd	07/29/2009	89	55

Note: suspended sediment concentration (SSC), milligrams per liter (mg/L), cubic feet per second (cfs)

DEQ collected sediment data from Indian Creek (at Kings Road) and Sand Hollow Creek (two AUs) between May and December 2008 (Table 12).

Table 12. Sediment data—Sand Hollow and Indian Creeks, 2008.

Date	Sand Hollow Creek at Oasis Road ID17050114SW016_03		Sand Hollow Creek at Market Road ID17050114SW017_03		Indian Creek at Kings Road ID17050114SW003a_04	
	Q (cfs)	TSS (mg/L)	Q (cfs)	TSS (mg/L)	Q (cfs)	TSS (mg/L)
05/13/2008	2.4	9	n/a	300	10.3	7
06/24/2008	0.6 (e)	5.3	17 (e)	24	22 (e)	4.9
07/30/2008	0.45 (e)	4.9	45 (e)	460	15 (e)	5
09/04/2008	0.25 (e)	4.9	24 (e)	76	13 (e)	4.9
10/22/2008	n/a	n/a	9.89	53	38 (e)	4.9
12/01/2008	n/a	n/a	10	16	14 (e)	10.00

Note: (e) on the Q column means estimate; Q = flow; cubic feet per second (cfs); total suspended solids (TSS); milligrams per liter (mg/L)

The Bureau of Reclamation collected sediment data from Indian Creek at the reservoir inlet between March and September 1999 (Table 13).

Table 13. Sediment data—Indian Creek at reservoir inlet, 1999.

Date	Suspended Sediment Concentration (mg/L)
03/15/1999	2
04/06/1999	14
05/17/1999	5
06/15/1999	7
07/12/1999	7
08/17/1999	8
09/21/1999	10

Note: milligrams per liter (mg/L)

The City of Nampa collected frequent sediment data from upstream and downstream of its WWTP between January 2003 and June 2006. A summary graph is provided in Figure 13.

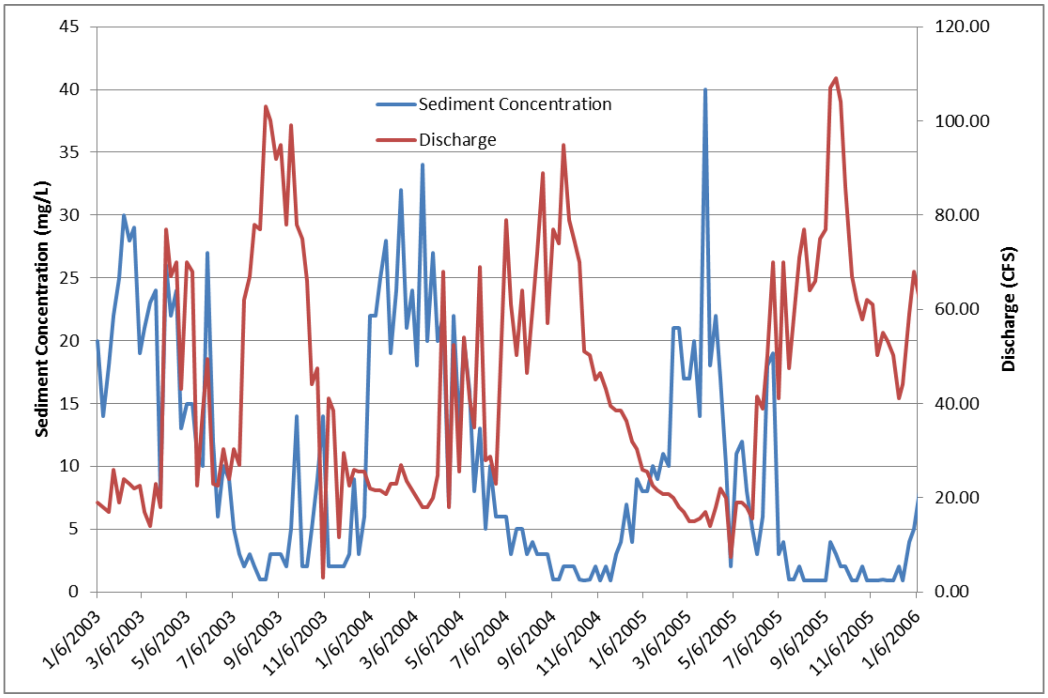


Figure 13. Indian Creek sediment and discharge upstream of Nampa Wastewater Treatment Plant (data from City of Nampa, 2003–2006).

The City of Caldwell collects discharge data from a weir upstream of the Riverside Canal every 15 minutes (see page 21, Figure 6).

The USGS collected sediment data for Willow Creek, site 13210835, in 2005, 2012 and 2013 (Table 14).

Table 14. Sediment data—Willow Creek at Middleton, Idaho (site 13210835), AU ID17050114SW015_03.

Date	Discharge (cfs)	SSC (mg/L)
05/04/2005	21	16
06/08/2005	29	22
07/07/2005	30	24
08/10/2005	24	12
08/21/2012	32	22
10/30/2012	1.5	2
03/05/2013	0.35	5

Notes: cubic feet per second (cfs), suspended sediment concentration (SSC), milligrams per liter (mg/L)

2.3.3 Biological and Other Data

DEQ and the USGS collected biological data at eight sites (Table 15).

Table 15. Biological data.

Sampling Location	Assessment Unit Number	Site ID	SMI	SFI	SHI	Determination
Indian Creek near Karcher Mall	ID17050114SW002_04	2011SBOIA036 (DEQ)	0	0	1	Not supporting cold water aquatic life use
Mason Creek at Lakeview Park	ID17050114SW006_02	2003SBOIA050 (DEQ)	0	0	1	Not supporting cold water aquatic life use
Mason Creek near Wells Road	ID17050114SW006_02	13210976 (USGS)	Electrofishing only: trout found			
Fifteenmile Creek near mouth	ID17050114SW007_04	2013LOWBOI01 (DEQ)	Electrofishing only: trout found			
Tenmile Creek at Can-Ada Road	ID17050114SW008_03	2013LOWBOI04 (DEQ)	Electrofishing only: trout found			
Ninemile Creek at mouth	ID17050114SW010_02	2013LOWBOI03 (DEQ)	Electrofishing only: no trout found			
Fivemile Creek at Meridian Road	ID17050114SW010_03	2003SBOIA052 (DEQ)	0	1	1	Not supporting cold water aquatic life use
Fivemile Creek at Meridian WWTP	ID17050114SW010_03	2013LOWBOI02 (DEQ)	Electrofishing only: no trout found			

Notes: stream macroinvertebrate index (SMI), stream fish index (SFI), stream habitat index (SHI), wastewater treatment plant (WWTP)

2.4 Data Gaps

Most data for Indian Creek were collected either at the Nampa WWTP or at the mouth. Neither location is ideal:

- The Nampa WWTP is situated about midway through the AU. A major tributary, Wilson Drain, enters Indian Creek downstream of this point, so the data do not reflect all sediment sources.
- During the irrigation season, the water at the mouth of Indian Creek is largely spillover water from the Riverside Canal, which intercepts Indian Creek downstream of Simplot Boulevard. The data collected at the mouth of Indian Creek therefore do not represent the rest of the AU. They reflect an uncertain mixture of Riverside Canal and Indian Creek water. The incoming water in the Riverside Canal is diverted from the Boise River, which is itself heavily influenced by the nearby confluence with Mason Creek.

This data gap means that we cannot estimate the existing sediment load of Indian Creek in Caldwell (above the Riverside Canal). However, we do have very detailed flow data at this location, so load allocations can be set using a concentration target.

The recommended location for future monitoring would be upstream of the Riverside Canal, probably at Simplot Boulevard in Caldwell.

Other data gaps include the following:

- Upper Indian Creek, particularly the section between Mora and the reservoir, has no data available.
- Data about the origin and composition of dry-weather flows are largely absent.

3 Subbasin Assessment—Pollutant Source Inventory

Detailed discussions of the pollutants within the Lower Boise River subbasin are provided in the following documents:

- *Fivemile and Tenmile Creek Subbasin Assessment* (DEQ 2001a)
- *Mason Creek Subbasin Assessment* (DEQ 2001c)
- *Sand Hollow Creek Subbasin Assessment* (DEQ 2001d)
- *Indian Creek Subbasin Assessment* (DEQ 2001b)

3.1 Point Sources

The following point sources discharge to the impaired AUs. Stormwater sources typically discharge through multiple outfalls, and WWTPs typically discharge through a single pipe (Table 16).

Table 16. Point source discharges to impaired water bodies.

Name	Permit Number	Receiving Water	Type	Numeric Permit Limits			
				Monthly Avg (lb/day)	**Weekly Avg (lb/day)**	**Monthly Avg TSS (mg/L)**	**Weekly Max TSS (mg/L)**
ACHD Phase II[a]	ID-028185	Fivemile, Tenmile, Ninemile Creeks	Stormwater	No numeric limits. Stormwater BMPs required.			
ACHD Phase I, Boise City, Garden City, Ada Co. Drainage #3, ITD #3, Boise State University	IDS-027561						
City of Caldwell	IDS-028118	Indian and Mason Creeks					
Canyon Highway District #4	IDS-028134						
ITD #3	IDS-028177	Fivemile, Tenmile, Indian, Mason Creeks					
City of Meridian	ID-002019-2	Fivemile Creek	WWTP	2550	3820	30	45
City of Middleton	IDS-028100	Willow Creek	Stormwater	No numeric limits. Stormwater BMPs required.			
City of Nampa	ID-002206-3	Indian Creek	WWTP	4503	6755	30	45
Nampa Highway District #1	IDS-028142	Mason and Indian Creeks	Stormwater	No numeric limits. Stormwater BMPs required.			
City of Nampa	IDS-028126						
City of Parma	ID-002177-6	Sand Hollow Creek	WWTP	255	369	45	65
Simplot Meat Products	ID-002696-4	Indian Creek	Industrial	No permitted sediment discharge—temperature only.			
Sorrento-Lactalis	ID-002803-7	Mason Creek (via Purdum)	Industrial	53	106	13	25
City of Greenleaf	ID-0028304	Dixie Slough	WWTP	60	90	30	45

Notes: pound (lb), total suspended solids (TSS), milligrams per liter (mg/L), Ada County Highway District (ACHD), best management practices (BMPs), Idaho Transportation Department (ITD), wastewater treatment plant (WWTP),
[a] Includes areas of Meridian, Eagle, and urbanized unincorporated Ada County

3.2 Nonpoint Sources

Detailed discussions of the nonpoint source pollutants within the subbasin are provided in the following documents:

- *Fivemile and Tenmile Creek Subbasin Assessment* (DEQ 2001a)
- *Mason Creek Subbasin Assessment* (DEQ 2001c)
- *Sand Hollow Creek Subbasin Assessment* (DEQ 2001d)
- *Indian Creek Subbasin Assessment* (DEQ 2001b)

The following text is adapted from the original TMDL (DEQ 1999):

Sediment enters the Boise River tributaries from point and nonpoint sources. Nonpoint sources of sediment include agricultural activities, unpermitted stormwater runoff, runoff from construction activities, and bank erosion. The most significant sources of sediment from agricultural practices are likely surface irrigated land and streambank trampling due to unrestricted use of streamside areas by livestock. Construction activities on sites that exceed 1 acre are subject to a general NPDES permit that requires best management practices (BMPs) to limit sediment releases (see section 5.4.7). Construction in the river channel is subject to stream alteration permits issued by the Idaho Department of Water Resources. These permits generally include requirements for BMPs to reduce sediment releases to the river. Agricultural activities are exempt from stream alteration permits. Agricultural activities that generate sediment include surface-irrigated row crops and surface-irrigated pastures. A substantial amount of the sediment that erodes from agricultural lands is deposited in drains and canals and may be removed or liberated during maintenance activities.

Most bacteria comes from nonpoint sources. WWTPs are subject to effluent limits for bacteria. Nonpoint sources of bacteria include agricultural operations (primarily livestock), failed septic systems, and wildfowl populating the stream corridor. Generally, septic systems are designed to prevent any bacteria from reaching either ground water or surface water. However, there may be some failed septic systems in the valley.

Most large confined animal feeding operations (CAFOs), confined feeding areas (CFAs), and dairies are subject to discharge limits under general NPDES permits. To be regulated under a general NPDES permit, CAFOs and CFAs must meet size criteria and be considered significant contributors of pollutants. EPA issued the general CAFO permit in 2012, but to date, only one facility is covered under it. All dairies that have a permit to sell milk are subject to the Idaho State Department of Agriculture (ISDA) dairy inspection program. Dairies are required to have adequate waste management practices subject to the “Rules Governing Dairy Waste,” (IDAPA 02.04.14). Smaller CAFOs and pasture grazing are not regulated. Animal waste that is removed from dairies, CAFOs, and CFAs in liquid or solid form may be applied to agricultural lands as a soil amendment. Operators subject to an NPDES permit are required to land apply waste at agronomic rates and maintain adequate recordkeeping of waste management. The ISDA has proposed draft rules to ensure proper management of land applied animal waste at other facilities, but these activities are currently unregulated. The extent to which land application of animal waste is a source of bacteria is unknown.

In 2003, CH2M HILL performed DNA analysis on approximately 120 *E. coli* samples from 8 sites throughout the Lower Boise River subbasin (CH2M HILL 2003; Table 17). DNA analysis can help determine the source of the bacteria.

Table 17. *E. coli* DNA testing (CH2M HILL 2003).

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

The report offered several conclusions:

1. The total human and pet contribution to bacteria levels appears to decrease as the river and tributaries flow from predominantly urban areas to more rural areas in the downstream direction.
2. In rural areas associated with agricultural sources, livestock waste contributes the highest percentages.
3. Avian, waterfowl, and wildlife contributions are consistently large, sometimes accounting for more than 50% of the total bacteria identified.
4. Concentrations of “natural” bacteria (avian, waterfowl, and wildlife) are higher than typically found in pristine environments.

3.3 Pollutant Transport

Virtually all of the monitoring data on each tributary stream have been collected at the mouth, which makes it difficult to evaluate how pollutants are transported through each system. One exception is Indian Creek, where USGS conducted three synoptic sampling visits in May, July, and November 2010 (Table 18). These data show that sediment loads increase significantly between Robinson Road and Simplot Boulevard. During the irrigation season, the site at the mouth is comprised of spillover from the Riverside Canal and is more representative of Boise River (and entrained Mason Creek) water.

Table 18. Sediment loads—Indian Creek, 2010.

Sampling Location	Date	SSC (mg/L)	Flow (cfs)	Load (kg/day)
Indian Creek at Robinson Rd	5/3/2010	47	8	921
Indian Creek at Broadmore St	5/3/2010	39	40	3,822
Indian Creek at Sparrow Ave	5/3/2010	87	94	20,036
Indian Creek at 21st St	5/4/2010	89	124	27,038
Indian Creek at Simplot Blvd	5/4/2010	85	142	29,572
Indian Creek at Mouth	5/4/2010	89	78	17,008
Indian Creek at Robinson Rd	7/26/2010	64	14	2,195
Indian Creek at Broadmore St	7/26/2010	90	23	5,072
Indian Creek at Sparrow Ave	7/26/2010	94	76	17,503
Indian Creek at 21st St	7/27/2010	93	135	30,760
Indian Creek at Simplot Blvd	7/27/2010	93	156	35,545
Indian Creek at Mouth	7/27/2010	94	65	14,970
Indian Creek at Robinson Rd	11/16/2010	6	10	147
Indian Creek at Broadmore St	11/16/2010	5	36	441
Indian Creek at Sparrow Ave	11/16/2010	14	61	2,092
Indian Creek at 21st St	11/17/2010	63	240	37,044
Indian Creek at Simplot Blvd	11/17/2010	61	255	38,110
Indian Creek at Mouth	11/17/2010	42	340	34,986

Notes: suspended sediment concentration (SSC), milligrams per liter (mg/L), cubic feet per second (cfs), kilograms (kg)

Wilson Drain terminates in Indian Creek a short distance upstream of 21st Street in Caldwell and is the largest irrigation tributary to Indian Creek. Quantitative data have not been collected from the irrigation system, although it likely contributes sediment and *E. coli* pollution to Indian Creek.

4 Subbasin Assessment—Summary of Past and Present Pollution Control Efforts

Watershed improvement projects in the subbasin have been directed at improving the water quality in the main stem Boise River. Without sediment TMDLs in place, the tributaries were assigned reductions based solely on improving water quality in the river itself. Nevertheless, many of the projects may have had beneficial effects on the tributaries themselves. It is worth noting how bad water quality used to be. The quote below is excerpted from a 1959 report on Indian Creek:

> At stations 2 and 3, paunch manure and meat scraps were noted floating in the stream. At times, the stream was even reddish in color from the blood wastes. The bottom and sides of the creek were coated with black sludge deposits. A great deal of rat activity also was noted along the banks. (Idaho Department of Health 1959)

4.1 Wastewater Treatment Plants

The Boise River TMDL states that "...changes in loads from treatment plants have negligible effects on the Boise River …. Since most of the treatment plants in the valley already remove 85 percent or more of suspended solids, further treatment at this time would result in high costs with little tangible benefit to the river" (DEQ 1999).

Discharge monitoring reports (DMRs) from each of the NPDES-permitted point sources listed in section 3.1 were examined. While most of the permits allow for a daily maximum of 45 milligrams per liter (mg/L) suspended sediment, typical discharge concentrations were less than 5 mg/L.

4.2 Stormwater

The following text was excerpted from the Boise River TMDL 5-year review:

> The lower Boise River subbasin uses watershed-based permitting for stormwater NPDES permits. This allows for an integrated approach to a watershed-wide program. Based on the information provided by permitted point sources within the subbasin, permit holders are in compliance with permit conditions. Based on the information provided by the responsible agencies, stormwater and point source compliance monitoring in the Boise urban area is taking place as anticipated by the TMDL implementation plan. (DEQ 2009)

Stormwater is regulated at the federal level, and the implementation plan recognizes that when required BMPs are implemented through the federal permit system, stormwater contributions of pollutants to impaired waters in the subbasin will diminish. At the time of the TMDL 5-year review, stormwater dischargers anticipated meeting TMDL targets within 10 years of implementation.

In the Boise and Garden City area, the Ada County Highway District (ACHD), the Cities of Boise and Garden City, Idaho Transportation Department, Ada County Drainage District 3, and Boise State University share permittee responsibilities for implementing the NPDES MS4 permit. Information on meetings, responsibilities, budgets, stormwater management plans, and annual reports is available from the partnership internet site *www.partnersforcleanwater.org*. ACHD's annual report for the area that includes the Cities of Eagle and Meridian and urbanized Ada County is published and made available through ACHD's web site at *www.achd.ada.id.us/Departments/TechServices/Drainage*.

Nampa, Middleton, Caldwell, the Idaho Transportation Department (ITD), and several highway districts in the subbasin received MS4 permits in 2009. A multi-agency effort produced the *BMP Handbook: Best Management Practices for Idaho Rural Road Maintenance* (Smith et al. 2005), and highway district personnel were trained in the methods through a training program funded with public funds through various agencies. For more information about MS4s, see section 5.4.7.

4.3 NPDES General Permits

Since the TMDL was approved, EPA has issued general stormwater permits for CAFOs, construction sites larger than 1 acre, and other industrial sectors. These permits intend to reduce, or eliminate, sediment discharges (see section 3.2 for more information about CAFOs and section 5.4.7 for more about NPDES permits).

4.4 Nonpoint Source Implementation Efforts

Nonpoint sources of pollution in the subbasin are primarily from agricultural operations. In Idaho, irrigated agriculture pollution control is voluntary, and return flows from irrigated agriculture are specifically excluded from the definition of "point source" in the Clean Water Act. Idaho addresses nonpoint source pollution through industry/activity-specific BMP development. Watershed stakeholders developed the TMDL implementation plan to provide guidance and support to members of the agricultural community who choose to voluntarily reduce or prevent pollution from agricultural activities entering subbasin waters (LBRWQP 2003).

The TMDL implementation plan for agricultural lands identifies critical acres and prioritizes land for BMPs by identifying acres with the greatest effect on pollutant delivery to the Boise River. For sediment pollutant reduction, priority acres are surface-irrigated croplands with the steepest slopes or closest to the Boise River and riparian acres grazed by livestock. The highest priority subwatersheds for agricultural BMP implementation to reduce sediment pollution are Dixie Slough and Fifteenmile, Fivemile, Tenmile, and Mason Creeks.

Table 19 includes TMDL implementation details for agricultural lands in the subbasin. The percent of producers implementing and maintaining BMPs is unknown.

Table 19. Implementation activities in progress and planned for the Lower Boise River subbasin as of May 2008.

Assessment Unit Number	Year	Target Pollutant	Activity	Completion Status
Undetermined	2004	Sediment	Jerry Glen wetland construction	Completed
Undetermined	n/a	Sediment, bacteria	Canyon County Soil Conservation District (SCD), 19 BMPs including 13,666 feet of streambank protected and 35 acres treated	Completed
ID17050114SW001_02	n/a	Sediment, bacteria	Canyon SCD, Conway Gulch, 141 BMPs including 99,138 linear feet of streambank protected and 29,462 acres treated	Completed
ID17050114SW001_02	n/a	Sediment, bacteria	Canyon SCD, Dixie Slough, 75 BMPs including 41,219 linear feet of streambank protected and 1,352 acres treated	Completed
ID17050114SW002_04	2004	Sediment	Indian Creek, Caldwell low impact development demonstration	Completed
ID17050114SW007_04	n/a	Sediment, bacteria	Ada Soil and Water Conservation District (SWCD), Fifteenmile Creek, 34 BMPs including 14,125 linear feet of streambank protected and 983 acres treated	Completed
ID17050114SW011a_06	2004	Sediment, bacteria	Downtown Boise gray water recycling demonstration	Completed
ID17050114SW011a_06	2004	Sediment	Barber Park living roof demonstration	Removed
ID17050114SW011b_02	2005	Sediment, habitat and flow alteration	Boise River side channel reconstruction	Completed

5 Total Maximum Daily Load(s)

A TMDL prescribes an upper limit (i.e., load capacity) on discharge of a pollutant from all sources to ensure water quality standards are met. It further allocates this load capacity among the various sources of the pollutant. Pollutant sources fall into two broad classes: point sources, each of which receives a wasteload allocation, and nonpoint sources, each of which receives a load allocation. Natural background contributions, when present, are considered part of the load allocation but are often treated separately because they represent a part of the load not subject to control. Because of uncertainties about quantifying loads and the relation of specific loads to attaining water quality standards, the rules regarding TMDLs (40 CFR Part 130) require a margin of safety be included in the TMDL. Practically, the margin of safety and natural background are both reductions in the load capacity available for allocation to pollutant sources.

Load capacity can be summarized by the following equation:

$$LC = MOS + NB + LA + WLA = TMDL$$

Where:

LC = load capacity
MOS = margin of safety
NB = natural background
LA = load allocation
WLA = wasteload allocation

The equation is written in this order because it represents the logical order in which a load analysis is conducted. First, the load capacity is determined. Then the load capacity is broken down into its components. After the necessary margin of safety and natural background, if relevant, are quantified, the remainder is allocated among pollutant sources (i.e., the load allocation and wasteload allocation). When the breakdown and allocation are complete, the result is a TMDL, which must equal the load capacity.

The load capacity must be based on critical conditions—the conditions when water quality standards are most likely to be violated. If protective under critical conditions, a TMDL will be more than protective under other conditions. Because both load capacity and pollutant source loads vary, and not necessarily in concert, determining critical conditions can be more complicated than it may initially appear.

Another step in a load analysis is quantifying current pollutant loads by source. This step allows for the specification of load reductions as percentages from current conditions, considers equities in load reduction responsibility, and is necessary for pollutant trading to occur. A load is fundamentally a quantity of pollutant discharged over some period of time and is the product of concentration and flow. Due to the diverse nature of various pollutants, and the difficulty of strictly dealing with loads, the federal rules allow for “other appropriate measures” to be used when necessary (40 CFR 130.2). These other measures must still be quantifiable and relate to water quality standards, but they allow flexibility to deal with pollutant loading in more practical and tangible ways. The rules also recognize the particular difficulty of quantifying nonpoint loads and allow “gross allotment” as a load allocation where available data or appropriate predictive techniques limit more accurate estimates. For certain pollutants whose effects are long term, such as sediment and nutrients, EPA allows for seasonal or annual loads, but they must also be expressed as daily loads.

5.1 In-stream Water Quality Targets

5.1.1 Target Selection

5.1.1.1 *E. coli*

The target for *E. coli* applies in each stream and is simply the Idaho water quality criterion: 126 colony-forming units per 100 milliliter (cfu/100 mL), calculated as a geometric mean of 5 samples, collected 3 to 7 days apart, over 30 days (IDAPA 58.01.02.251.01).

There is *no instantaneous maximum* target concentration of *E. coli*. If it is not possible to collect 5 samples (for example, the stream runs dry), the criterion is not violated.

5.1.1.2 *Sediment*

Idaho's narrative sediment criterion appears in IDAPA 58.01.02.200.08 and states that "Sediment shall not exceed quantities … which impair designated beneficial uses."

In this addendum, every sediment-impaired AU has cold water aquatic life as its most stringent designated or existing beneficial use. TMDL sediment targets must be based on attaining this use.

The sediment targets are based on a paper by Newcombe and Jensen (1996). This paper makes the link between sediment levels and beneficial uses. It assigns a "severity index" (SEV) of impacts to trout associated with a given concentration and duration of sediment.

A SEV of 8 has been chosen as the target for protection of cold water aquatic life. SEV 8 is the level of impact where the beneficial use is still fully supported and is congruent with the targets chosen for the lower Boise River. It was supported by the watershed advisory group (WAG) on January 10, 2013.

To translate this target into a concrete sediment concentration, Newcombe and Jensen have two independent variables: duration of sediment and biological assemblage (1996). Each creek has a slightly different duration of sediment, which may result in a different sediment target. Some of the more heavily modified streams have such high current velocities that the biological assemblage is restricted at certain times. Newcombe and Jensen provide several durations in their matrices. For intermediate durations, they also provide an equation. Assemblages used in this analysis include model 1 (juvenile trout) and model 2 (adult trout only).

These combinations of factors yield the following sediment concentration targets (Table 20). These are all manifestations of the *same target* of SEV 8, customized for each creek's unique combination of flow and sediment. See Appendix A for further explanation.

Table 20. Sediment targets.

Water Body	Target	Newcombe and Jensen Model	Duration	Concentration	Method
Fivemile Creek Tenmile Creek	SEV 8	2	92 days	33 mg/L	Equation
Fifteenmile Creek Willow Creek	SEV 8	1	84 days	23 mg/L	Equation
Sand Hollow Creek Mason Creek Indian Creek	SEV 8	1	4 months	20 mg/L	Matrix
All streams	SEV 8	1	Short (<6 days)	Various	Matrix

The short-duration target is intended to protect against short, high-intensity sediment concentrations. These streams naturally experience periods of high sediment during spring runoff, but these events are infrequent and brief. Except for a single exceedance of the 6-day target on Tenmile Creek (DEQ 2011), there is no evidence that the short-term targets are exceeded. The sediment pollution of concern is the long-duration kind. Only pollutant sources that discharge sediment for a period of 84 days or longer will be subject to this TMDL and its loading allocations. Short-duration sediment sources, such as stormwater systems, will be addressed through the NPDES permitting system. Stormwater NPDES permits do not presently contain numeric targets, but if the permitting authority desired a target, it should use a short-duration target commensurate with the length of a severe storm event (e.g., one day), and not the 4-month target.

The TMDL will be based on the long-duration targets, because the data indicate they are consistently exceeded. The targets are expressed as an *average* of measurements over the time period. The TMDL applies at the downstream end of the perennial portion of each AU.

5.1.2 Monitoring Points

The ideal monitoring point for each AU is typically the most downstream road crossing (Table 21). This point integrates all the effects of the watershed and provides a convenient place to collect samples. It also enables the sample to be used to assess the creek’s impact on the downstream receiving water. A bridge enables samples to be taken even during periods of very high flow.

Table 21. Existing sampling locations and ideal monitoring points.

Water Body	Assessment Unit Number	Data Location	Ideal Location
Dixie Slough	ID17050114SW001_02	River Road	River Road
Indian Creek below Sugar Ave.	ID17050114SW002_04	Nampa WWTP, Simplot, Mouth	Simplot Boulevard
Indian Creek above Mora	ID17050114SW003b_03	None	Upstream of Sand Creek
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02	Slater Creek at Indian Creek Road	Slater Creek at Indian Creek Road
Indian Creek above reservoir	ID17050114SW003d_03	Reservoir inlet	Reservoir inlet
Mason Creek	ID17050114SW006_02	Polk Road	Polk Road
Fifteenmile Creek	ID17050114SW007_04	Lincoln Road and mouth	Lincoln Road
Tenmile Creek	ID17050114SW008_03	Franklin Road	Franklin Road
Fivemile Creek	ID17050114SW010_03	Franklin Road	Franklin Road
Sand Creek	ID17050114SW012_02	Catalpa Park	Catalpa Park
Willow Creek	ID17050114SW015_03	Highway 44	Highway 44
Sand Hollow Creek	ID17050114SW016_03	Oasis Road	Old Hwy 30
	ID17050114SW017_03	Market Road	Sharp Road
	ID17050114SW017_06	Old Fort Boise Road	Old Fort Boise Road

Note: wastewater treatment plant (WWTP)

5.2 Load Capacity

The load capacities for *E. coli* and sediment are based on meeting target concentrations. For *E. coli*, the load capacity is the load that would be present when a **concentration of 126 cfu/100 mL** is achieved. For sediment, the load capacity is the load that would be present when **the target concentration** is achieved. Table 22 provides some example load capacities. The targets apply at any time during which the beneficial use can occur.

The load capacities (LC) can also be expressed as equations, with flow (and in the case of sediment, concentration) as the variable:

$$E.\ coli\ \text{LC (in } 10^9 \text{ cfu/day)} = Q \times 3.08$$

$$\text{Sediment LC (in kg/day)} = Q \times C \times 2.45$$

Where Q is the flow of the creek **measured in cfs** and C is the sediment target concentration measured in mg/L.

The coefficients are simply a collection of conversion constants:

$$E.\ coli\text{: } 126\ cfu/100\ mL \times \frac{86400\ s/day \times 28.3\ L/cf}{0.1\ L/100\ mL \times 10^9} = \mathbf{3.08} \times 10^9\ cfu/day/cfs$$

$$\text{Sediment: } \frac{86400\ s/day \times 28.3\ L/cf}{10^6\ mg/kg} = \mathbf{2.45}\ \frac{kg.L}{day.cfs.mg}$$

Table 22. Example load capacities.

Example Discharge (cfs)	Target Concentration		Load Capacity		
	Sediment (mg/L)	*E. coli* (cfu/100 mL)	Sediment (kg/day)	Sediment (lb/day)	*E. coli* (10^9 cfu/day)
25	20	126	1,225	2,701	77
	23	126	1,409	3,106	
	33	126	2,021	4,456	
50	20	126	2,450	5,401	154
	23	126	2,818	6,213	
	33	126	4,043	8,913	
75	20	126	3,675	8,102	231
	23	126	4,226	9,317	
	33	126	6,064	13,369	
100	20	126	4,900	10,803	308
	23	126	5,635	12,423	
	33	126	8,085	17,824	
150	20	126	7,350	16,204	462
	23	126	8,453	18,636	
	33	126	12,128	26,738	
200	20	126	9,800	21,605	616
	23	126	11,270	24,846	
	33	126	16,170	35,649	
300	20	126	14,700	32,408	924
	23	126	16,905	37,269	
	33	126	24,255	53,473	

Notes: cubic feet per second (cfs), milligrams per liter (mg/L), colony-forming units (cfu), milliliters (mL), kilograms (kg)

5.3 Estimates of Existing Pollutant Loads

Data have generally been collected from a single point at the lower end of each AU and by each point source. There are insufficient data to identify categories of nonpoint source pollution, and so a single load is presented for each AU and point source discharger (Table 23, Table 24, and Table 25).

Table 23. Current *E. coli* loads from all sources in the impaired assessment units.

Stream Name	Assessment Unit Number	Existing *E. coli* Concentration[a] (cfu/100 mL)	Average Discharge[b] (cfs)	Existing *E. coli* Load (10^9 cfu/day)	Required Reduction to Meet Target
Dixie Slough	ID17050114SW001_02	482[c]	200[d]	2,362	74%
Indian Creek below Sugar Ave.	ID17050114SW002_04	490[e]	156[f]	1,870	79%
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02	1,338[g]	1.06[h]	35	91%
Mason Creek	ID17050114SW006_02	709[i]	87.7[j]	1,521	67%
Fifteenmile Creek	ID17050114SW007_04	748[e]	92.7[k]	1,696	78%
Tenmile Creek	ID17050114SW008_03	700[e]	70.3[e]	1,204	82%
Eightmile and Ninemile Creeks	ID17050114SW010_02	709[e]	10[l]	173	82%
Fivemile Creek	ID17050114SW010_03	768[e]	56.3[e]	1,058	81%
Sand Creek	ID17050114SW012_02	404[f]	0.87[l]	9	69%
Sand Hollow Creek	ID17050114SW017_03	573[e]	45[m]	631	87%
Sand Hollow Creek	ID17050114SW017_06	669[e]	157[k]	2,570	83%

[a] Maximum concentration, collected per IDAPA 58.01.02.251.01
[b] During the same period as *E. coli* sample collection
[c] Data from DEQ and HyQual, 2012
[d] Data from City of Boise, 1996–2011
[e] Data from DEQ, July 2011
[f] Data from DEQ, 2014
[g] Data from DEQ, May 2012
[h] USGS gage at Mayfield May 2012
[i] Data from USGS and ISDA, July 1999
[j] Data from ISDA, July 1999
[k] Data from ISDA, July 2008
[l] USGS StreamStats website
[m] Data from DEQ, July 2008

In most cases, the highest *E. coli* values occurred in July. Sand Hollow Creek was highest in August, and upper Indian Creek was highest in May. Five-, Nine-, Ten-, and Fifteenmile Creeks were also monitored in November 2011. In November, Five-, Ten-, and Fifteenmile Creeks met the water quality criterion, but Ninemile Creek remained above the water quality criterion, albeit at a lower level (365 cfu/100 mL).

Current sediment loads are presented in Table 24. These loads are based on the maximum 4-month average of sediment concentrations. The associated discharge is the average discharge over the same 4-month period.

Table 24. Current sediment loads from all sources in the impaired assessment units.

Stream Name	Assessment Unit Number	Existing Sediment Concentration[a] (mg/L)	Average Discharge[b] (cfs)	Existing Sediment Load		Required Reduction to Meet Target
				(kg/day)	(lb/day)	
Indian Creek below Sugar Ave.[c]	ID17050114SW002_04	22.6[d]	126.0[e]	6,977	15,382	23%
Indian Creek above New York Canal	ID17050114SW003b_03	Unknown	15.5	Unknown		Unknown
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02	Unknown	1.1	Unknown		Unknown
Indian Creek above reservoir	ID17050114SW003d_03	8[f]	16.5	311	686	0%
Mason Creek	ID17050114SW006_02	80.4[g]	162.7[g]	32,049	70,656	78%
Fifteenmile Creek	ID17050114SW007_04	67.9[g]	120.6[g]	20,062	44,229	70%
Tenmile Creek	ID17050114SW008_03	75.1[h]	70.4[h]	12,953	28,556	59%
Fivemile Creek	ID17050114SW010_03	46.2[h]	63.8[h]	7,222	15,922	34%
Willow Creek	ID17050114SW015_03	25.2[g]	39.5[g]	2,439	5,377	19%
Sand Hollow Creek	ID17050114SW016_03	5.8[i]	0.6[i]	9	20	0%
	ID17050114SW017_03	126.0[i]	26.4[i]	8,150	17,968	86%
	ID17050114SW017_06	102.6[g]	142.2[g]	35,745	78,804	83%

[a] Maximum recorded 4-month average concentration
[b] During the same period as sediment data collection
[c] Note that this site is midway through the assessment unit. There were no sufficiently large sediment datasets available for the preferred location, Simplot Boulevard. The data collected at the mouth is not representative.
[d] Data from City of Nampa, 2003–2009
[e] Discharge data were collected at Caldwell at the preferred location, Simplot Boulevard.
[f] Data from Bureau of Reclamation, 2009
[g] Data from ISDA, 2008
[h] Data from DEQ, 2011
[i] Data from DEQ, 2008

5.3.1 Point Sources

Wasteloads from point sources are presented in Table 25. The City of Kuna and XL Four Star Beef discharge to an unimpaired section of Indian Creek that is not addressed in this TMDL. They already receive load allocations from the Boise River TMDL (DEQ 1999) and will not be assigned further loads by this TMDL. The City of Greenleaf has only recently received its NPDES permit and only has 2 months of data available.

Table 25. Current wasteloads from point sources in the impaired assessment units.

Facility	Permit #	Affected AU (ID17050114 SW)	Existing Flow[a] (mgd)	Existing Concentration[a]		Existing Wasteload		
				Sediment (mg/L)	*E. coli* (cfu/day)	Sediment (kg/day)	Sediment (lb/day)	*E. coli* (10^9 cfu/day)
City of Greenleaf	ID-0028304	001_02 Dixie Slough	0.7	n/a	1	n/a	n/a	0.013
City of Nampa	ID-002206-3	002_04 Indian Creek	9.7	6.8	21.3	251	553	7.826
Sorrento-Lactalis	ID-002803-7	006_02 Mason Creek	0.7	4.3	2.3	10	22	0.057
City of Meridian	ID-002019-2	010_03 Fivemile	5.6	2.4	1	50	110	0.211
City of Parma	ID-002177-6	017_06 Sand Hollow	0.1	4.5	1	2	4	0.005

Notes: million gallons per day (mgd), milligrams per liter (mg/L), colony-forming units (cfu), kilograms (kg)
[a] Annual averages of reported values

5.4 Load and Wasteload Allocations

Aside from contributions from point sources, the existing instream loads are generated by the land uses occurring in each watershed. Load allocations are established for compliance points near the bottom of each AU, and all land uses upstream of the compliance point that contribute pollutants should make combined reductions to meet the load allocation.

To improve beneficial uses, water quality managers should focus on the target *concentrations*, rather than absolute loads. However, to meet the requirements of the Clean Water Act, flow-variable loads are assigned to each tributary. Loads apply year-round and are calculated as averages: 30 days for *E. coli* and either 84 days, 92 days, or 4 months for sediment.

5.4.1 Point Sources—Wasteload Allocations

The *E. coli* wasteload allocations are based on a bacteria concentration of 126 cfu/100 mL, collected as a 5-sample geometric mean over 30 days. The sediment wasteload allocations are based on 20 mg/L, less 2.5 mg/L for natural background (section 5.4.6).

The same target concentrations apply to every NPDES-permitted facility, a strategy that provides a clear regulatory system for permitting. Therefore, the sediment wasteload allocations are all expressed as 4-month averages. In every case, the current discharge concentration is substantially below the target concentration.

This TMDL is concentration based, so the wasteload allocations (WLA) are based on the design flow.

$$E.\ coli \text{ WLA (in } 10^9 \text{ cfu/day)} = Q \times 4.76$$

$$\text{Sediment WLA (in kg/day)} = Q \times 66.2$$

Where Q is the design flow of the facility **in million gallons per day** (mgd).

The coefficients are simply a collection of conversion constants:

$$E.\ coli\text{: } 126\ cfu/100\ mL \times \frac{3.785\ L/gal \times 10^6\ gal/million\ gal}{0.1L/100mL \times 10^9} = \mathbf{4.76} \times 10^9 cfu/\ day/mgd$$

$$\text{Sediment: } \frac{(20-2.5)mg}{L} \times \frac{3.785\ L/gal \times 10^6\ \ gal/million\ gal}{10^6\ mg/kg} = \mathbf{66.2}\ \ kg/day/mgd$$

If the design flow were to increase, then the wasteload allocation would correspondingly increase, according to the equations above. The present design flows and wasteload allocations are shown in Table 26.

Table 26. Point source wasteload allocations for tributaries in the Lower Boise River subbasin.

Facility	NPDES Permit Number	Affected Assessment Unit (ID17050114SW)	Present Design Flow (mgd)	Wasteload Allocation at Present Design Flow		
				Sediment [a]		*E. coli* (10^9 cfu/day)[b]
				(kg/day)	(lb/day)	
City of Greenleaf	ID-0028304	001_02 Dixie Slough	0.24	n/a[c]	n/a[c]	1
City of Nampa	ID-002206-3	002_04 Indian Creek	18.00	1192.3	2,628.6	86
Sorrento-Lactalis	ID-002803-7	006_02 Mason Creek	1.52	100.7	222.0	7
City of Meridian	ID-002019-2	010_03 Fivemile	10.20	675.6	1,489.4	49
City of Parma	ID-002177-6	017_06 Sand Hollow	0.68	45.0	99.2	3

Notes: National Pollutant Discharge Elimination System (NPDES), million gallons per day (mgd), kilograms (kg), colony-forming units (cfu)

[a] 4-month average

[b] 30-day geometric mean

[c] Dixie Slough is not §303(d) listed for sediment but was found to be impaired by *E. coli*.

All point sources in Table 26 presently meet these wasteload allocations, therefore no reduction are necessary.

5.4.2 Nonpoint Sources—Load Allocations

The *E. coli* loads are based on a bacteria concentration of 126 cfu/100 mL, collected as a 5-sample geometric mean over 30 days. The sediment loads are based on the targets and durations stated in 5.1.1, less 2.5 mg/L for natural background (section 5.4.6).

The load allocations (LA) calculated here are based on the flow of water from nonpoint sources. These flows are highly variable, so flow-variable equations are used. *Water quality managers should focus on the concentration targets.*

$E.\ coli$ LA (in 10^9 cfu/day) = $Q \times 3.08$

Sediment LA (in kg/day) = $Q \times (C - 2.5) \times 2.45$

Where *Q* is the flow of the creek **measured in cfs** and *C* is the sediment target concentration measured in mg/L. Again, the coefficients are simply a collection of conversion constants, identical to those explained in section 5.2.

If the flows increase, the load allocations correspondingly increase, according to the equations above. The present nonpoint source flows and corresponding load allocations are shown in Table 27. These values are merely examples at current flows.

Table 27. Example nonpoint source load allocations for tributaries in the Lower Boise River subbasin.

Water Body	Assessment Unit Number	Sediment Target (mg/L)	Present Flow (cfs)	Load Allocation at Present Flow		
				Sediment		*E. coli*
				(kg/day)	(lb/day)	(10^9 cfu/day)
Dixie Slough	ID17050114SW001_02	n/a	200.0	n/a	n/a	616
Indian Creek below Sugar Ave.	ID17050114SW002_04	20	126.0[a]	5,402	11,909	388
Indian Creek - Indian Creek Reservoir to New York Canal	ID17050114SW003b_03	20	15.5[b]	665	1,466	n/a
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02	20	1.1	45	99	3
Indian Creek above reservoir	ID17050114SW003d_03	20	16.5[b]	707	1,559	n/a
Mason Creek	ID17050114SW006_02	20	162.7	6,976	15,379	501
Fifteenmile Creek	ID17050114SW007_04	23	120.6	6,057	13,353	371
Tenmile Creek	ID17050114SW008_03	33	70.4	5,261	11,599	217
Eightmile and Ninemile Creeks	ID17050114SW010_02	n/a	10.0[b]	n/a	n/a	31
Fivemile Creek	ID17050114SW010_03	33	63.8	4,767	10,509	197
Sand Creek	ID17050114SW012_02	n/a	0.9[b]	n/a	n/a	3
Willow Creek	ID17050114SW015_03	23	39.5	1,984	4,374	n/a
Sand Hollow Creek	ID17050114SW016_03	20	0.6	26	57	n/a
	ID17050114SW017_03	20	26.4	1,132	2,496	81
	ID17050114SW017_06	20	142.2	6,097	13,442	438

Notes: milligrams per liter (mg/L), cubic feet per second (cfs), kilograms (kg), colony-forming units (cfu), n/a indicates that loads are not applicable because the assessment unit is not impaired by that pollutant.

[a] This flow was measured at Caldwell, where it has significantly increased from the flow listed in Table 6.

[b] There were no flow data available for Ninemile, Sand, or upper Indian Creeks, so USGS StreamStats values were used as approximations.

5.4.3 Margin of Safety

An implicit margin of safety is built into the TMDL for four reasons:

- Each of the impaired creeks is heavily influenced by ground water infiltration. This ground water likely contains very little sediment or *E. coli.* As such, if all surface water sources discharged at the target, dilution would become available as a result of ground water infiltration into the stream.

- The WWTPs are discharging at extremely low concentrations (<20 cfu/100 mL *E. coli* and <7 mg/L sediment), thereby providing further dilution.
- The water quality target was based on not causing lethal or paralethal effects on juvenile salmonids: a severity rating of 8. In their paper, Newcombe and Jensen (1996) define the threshold as *between* levels 8 and 9 (equivalent to perhaps level 8.5). Therefore, level 8 is a slightly more conservative level of protection that would still support the beneficial use.
- The natural background concentration assumes all the water in the creek is exposed to the streambanks (the source of background sediment) for the creek's entire length. In fact, these streams have no headwater inflow, and their water comes mainly from agricultural return flows, which means that water enters the creeks throughout their length. Water entering at the bottom end of the creek has no streambanks to erode and therefore is potentially cleaner than water entering at the top of the creek, which has far more opportunity to collect sediment from the banks.

5.4.4 Seasonal Variation

Water quality standards apply year-round, so the *E. coli* target of 126 cfu/100 mL must be met all year.

The sediment targets are based on supporting cold water aquatic life. The targets apply during any period when the appropriate stage of cold water aquatic biota could be expected to exist. The data from each creek indicate the highest sediment levels are typically seen between April and mid-September.

5.4.5 Reasonable Assurance

Although the impaired watersheds have several WWTP point sources of *E. coli* and sediment pollution, all of these sources discharge at a concentration lower than the water quality criteria. In other words, the WWTP point sources are reducing the *E. coli* and sediment concentrations with their discharge. The only way to reduce *E. coli* and sediment levels to the water quality target is to reduce the pollution from nonpoint sources. There must be reasonable assurance that these reductions will be implemented and effective in achieving the water quality target.

Under Section 319 of the Clean Water Act, each state is required to develop and submit a nonpoint source management plan. Idaho's most recent *Nonpoint Source Management Plan* was approved in March 2015. The plan was submitted to and approved by the EPA. Among other things, the plan identifies programs to achieve implementation of nonpoint source BMPs, includes a schedule for program milestones, outlines key agencies and agency roles, is certified by the state attorney general to ensure that adequate authorities exist to implement the plan, and identifies available funding sources.

Idaho's nonpoint source management program describes many of the voluntary and regulatory approaches the state will take to abate nonpoint pollution sources. One of the prominent programs described in the plan is the provision for public involvement, such as the formation of basin advisory groups and WAGs. The Lower Boise Watershed Council is the designated WAG for the Lower Boise River subbasin.

The Idaho water quality standards refer to existing authorities to control nonpoint pollution sources in Idaho. Some of these authorities and responsible agencies are listed in Table 28.

Table 28. State of Idaho's regulatory authority for nonpoint pollution sources.

Authority	IDAPA Citation	Responsible Agency
"Solid Waste Management Rules and Standards" (IDAPA 58.01.06)	58.01.02.350.03(b)	Idaho Department of Environmental Quality
"Individual/Subsurface Sewage Disposal Rules" (IDAPA 58.01.03)	58.01.02.350.03(c)	Idaho Department of Environmental Quality
"Stream-channel Alteration Rules" (IDAPA 37.03.07)	58.01.02.350.03(d)	Idaho Department of Water Resources
"Rules Governing Exploration, Surface Mining, and Closure of Cyanidation Facilities" (IDAPA 20.03.02)	58.01.02.350.03(f)	Idaho Department of Lands
"Dredge and Placer Mining Operations in Idaho" (IDAPA 20.03.01)	58.01.02.350.03(g)	Idaho Department of Lands
"Rules Governing Dairy Waste" (IDAPA 02.04.14)	58.01.02.350.03.(h)	Idaho State Department of Agriculture

The state of Idaho uses a voluntary approach to address agricultural nonpoint sources. However, regulatory authority can be found in the water quality standards (IDAPA 58.01.02.350.01–03). IDAPA 58.01.02.055.07 refers to the *Idaho Agricultural Pollution Abatement Plan* (Ag Plan) (SCC and DEQ 2003), which provides direction to the agricultural community regarding approved BMPs. A portion of the Ag Plan outlines responsible agencies or elected groups (soil conservation districts) that will take the lead if nonpoint source pollution problems need to be addressed. For agricultural activity, the Ag Plan assigns the local soil conservation districts to assist the landowner/operator with developing and implementing BMPs to abate nonpoint source pollution associated with the land use. If a voluntary approach does not succeed in abating the pollutant problem, the state may seek injunctive relief for those situations determined to be an imminent and substantial danger to public health or the environment (IDAPA 58.01.02.350.02(a)).

The Idaho water quality standards and wastewater treatment requirements specify that if water quality monitoring indicates that water quality standards are not being met, even with the use of BMPs or knowledgeable and reasonable practices, the state may request that the designated agency evaluate and/or modify the BMPs to protect beneficial uses. If necessary, the state may seek injunctive or other judicial relief against the operator of a nonpoint source activity in accordance with the DEQ director's authority provided in Idaho Code §39-108 (IDAPA 58.01.02.350). The water quality standards list designated agencies responsible for reviewing and revising nonpoint source BMPs: the Idaho Soil and Water Conservation Commission for grazing and agricultural activities, the Idaho Transportation Department for public road construction, the Idaho State Department of Agriculture for aquaculture, and DEQ for all other activities (IDAPA 58.01.02.010).

5.4.6 Natural Background

Even unimpaired streams have natural levels of sediment and bacteria. To quantify the natural background level of sediment, sample results from EMAP (Environmental Monitoring and

Assessment Program) were examined. EMAP was a research program run by EPA to develop the tools necessary to monitor and assess the status and trends of national ecological resources.

DEQ examined 153 sample sites in the xeric west; 25 of these were judged to be in "least impacted" condition, as evidenced by a ranking of good in both their macroinvertebrate and fish populations. The average SSC in these least-impacted sites was **2.5 mg/L**, which therefore is a reasonable estimate for the natural background concentration of sediment in a stream in the xeric west during the summer months.

The natural background level of sediment must be subtracted from all anthropogenic sources, and therefore represents a reduction in the available load capacity. Said another way, even perfectly pure water would naturally be expected to gain up to 2.5 mg/L of sediment as it travelled down the stream, through processes such as bank erosion.

The water quality standards do not make a distinction between anthropogenic and background sources of *E. coli*. "Natural" *E. coli* (from sources such as birds and deer) is also now more likely to enter the streams because of irrigation and storm conveyances. For this reason, the background levels of *E. coli* will be incorporated in the load allocation.

5.4.7 Stormwater Runoff Load and Wasteload Allocations

Stormwater runoff is water from rain or snowmelt that does not immediately infiltrate into the ground and flows over or through natural or man-made storage or conveyance systems. When undeveloped areas are converted to land uses with impervious surfaces—such as buildings, parking lots, and roads—the natural hydrology of the land is altered and can result in increased surface runoff rates, volumes, and pollutant loads. Certain types of stormwater runoff are considered point source discharges for Clean Water Act purposes, including stormwater that is associated with municipal separate storm sewer systems (MS4s), industrial stormwater covered under the Multi-Sector General Permit (MSGP), and construction stormwater covered under the Construction General Permit (CGP).

5.4.7.1 *Point Source versus Nonpoint Source*

Stormwater is produced by runoff from storms. When it is discharged by an MS4, this discharge is regulated as a point source. Stormwater runoff is commonly transported through MS4s, from which it is often discharged untreated into local water bodies. An MS4, according to 40 CFR 122.26(b)(8), is a conveyance or system of conveyances that meets the following criteria:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the US
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.)
- Not a combined sewer
- Not part of a publicly owned treatment works (sewage treatment plant)

To prevent harmful pollutants from being washed or dumped into a water of the US, operators must obtain an NPDES permit from EPA, implement a comprehensive municipal stormwater management program, and use BMPs to control pollutants in stormwater discharges to the maximum extent practicable.

In addition to stormwater, stormwater systems in the Treasure Valley accept other inputs of water (Table 29). In some cases, this is voluntary and regulated by the NPDES permit (e.g., an MS4 permittee might agree to accept water pumped from a construction site).

However, in some cases the stormwater system is intertwined with the valley's agricultural drainage system. This situation is more common in the western end of the subbasin. This follows patterns of development in the valley, when for example, traditional drainage ditches were incorporated into a storm drain. The ditches still function to drain agricultural lands, and yet are now part of a permitted MS4. The combined nature of the plumbing gives the MS4 entity no choice but to accept the drainage water. Separating the systems would be expensive and the agricultural drainage water would still be routed to the nearest stream or river. In effect, in these situations, MS4s share a pipe with nonpoint source discharges.

Table 29. Types of authorized non-stormwater (from ACHD).

Type of MS4 Authorized Non-Stormwater Discharge	Point Source	Nonpoint Source
	Authorized Non-stormwater	Agricultural Exempt Non-stormwater
Uncontaminated water line flushing	X	
Potable water sources	X	
Landscape irrigation	X	
Lawn watering	X	
Irrigation water		X
Flows from riparian habitats and wetlands	X	
Diverted stream flows	X	
Springs	X	
Rising ground waters	X	
Uncontaminated ground water infiltration	X	
Uncontaminated pumped ground water or spring water	X	
Foundation and footing drains	X	
Uncontaminated air conditioning or compressor condensate	X	
Water from crawlspace pumps	X	
Individual residential car washing	X	
Dechlorinated swimming pool discharges	X	
Routine external building wash down	X	
Street and pavement wash waters	X	
Fire hydrant flushing	X	
Flows from emergency firefighting activities	X	

Note: The following terms originate from the NPDES stormwater permit:

- Stormwater—authorized, permitted, wet-weather, point source
- Authorized Non-Stormwater—authorized, dry weather, point source
- Agricultural Exempt Non-Stormwater—irrigation water, pass through, non-point source
- Illicit Discharge—unauthorized non-stormwater

To the extent that their discharge originates from nonpoint sources, it is DEQ's intent to assign *load* allocations to the MS4 outfalls. The remainder of the discharge will be regulated as a point source and be assigned a *wasteload* allocation.

The plumbing of the combined stormwater/agricultural irrigation distribution/drainage system is intricate, and the exact quantity of the non-stormwater inputs is presently unknown. However, some of the MS4 permittees have recommended initial estimates for the percentage of their non-stormwater discharge that originates from nonpoint sources (Table 30). These estimates are based on professional judgement, rather than hard data. They should be refined by monitoring and mapping in future permit cycles.

Table 30. Estimates of dry-weather stormwater discharge attributable to nonpoint sources.

Facility	NPDES Number	Dry-Weather Discharge Attributable to Nonpoint-Sources
ACHD Phase II	ID-028185	50%
ACHD Phase I	IDS-027561	50%
Boise City	IDS-027561	0%
Garden City	IDS-027561	0%
Ada County Drainage #3	IDS-027561	[a]
ITD #3	IDS-027561	100%
Boise State University	IDS-027561	0%
City of Caldwell	IDS-028118	98%
Canyon Highway District #4	IDS-028134	100%
ITD #3	IDS-028177	100%
Nampa Highway District #1	IDS-028142	0%
City of Nampa	IDS-028126	99%
City of Middleton	IDS-028100	[a]
Industrial facilities	Multi-Sector General Permit	0%
Construction activities	Construction General Permit	0%
Confined animal feeding operations	IDG010000	0%

Notes: National Pollutant Discharge Elimination System (NPDES), Ada County Highway District (ACHD), Idaho Transportation Department (ITD)
[a] Estimates not received by 5/21/15.

5.4.7.2 *Stormwater Targets*

Stormwater discharge typically lasts a few hours or days and so is usually a short-duration pollutant. This TMDL is concerned mainly with pollutants of long-duration and has found no evidence that the short-duration sediment targets in Newcombe and Jensen (1996) are exceeded (see Table F.3 in Appendix A).

The *E. coli* wasteloads are based on attaining a concentration of 126 cfu/100 mL. The sediment wasteloads are based on 20 mg/L, less 2.5 mg/L for natural background. *These targets are averages* (4 months for sediment and 30 days for *E. coli*) and only apply to outfalls that discharge for the entire averaging period. They must not be construed as instantaneous, end-of-pipe limits.

The same target concentrations apply to every stormwater facility and therefore provide a clear regulatory system for permitting. In many cases, permitted entities may discharge into multiple streams.

5.4.7.3 *Stormwater Allocations*

The volume of stormwater discharge is presently unknown, so flow-based equations are used for the load and wasteload allocations (Table 31). A table of examples is also provided (Table 32).

For short-term discharges, a narrative wasteload allocation is assigned:

1. Stormwater entities must continue management practices that reduce sediment and *E. coli*
2. Stormwater entities must continue to identify and characterize inputs to their systems

NPDES permit writers may also consider using the short-duration sediment targets (Appendix A), although DEQ has no data that suggest these targets are exceeded.

For long-term discharges (i.e., at least 30 days for *E. coli* and 4 months for sediment), the loads and wasteloads are allocated in Table 31. The wasteload allocation is per AU. For example, Idaho Transportation Department #3 might have separate wasteload allocations for Sand Hollow and Indian Creeks.

Table 31. Load and wasteload allocations for long-term stormwater discharges.[a]

Facility	NPDES Permit Number	Load or Wasteload Allocation[b]	
		4-month Average Sediment (kg/day)	30-day geometric mean *E. coli* (10^9 cfu/day)
ACHD Phase II[c]	ID-028185	Q × 42.9	Q x 3.08
ACHD Phase I Boise City Garden City Ada County Drainage #3 Idaho Transportation Department #3 Boise State University	IDS-027561		
City of Caldwell	IDS-028118		
Canyon Highway District #4	IDS-028134		
Idaho Transportation Department #3	IDS-028177		
Nampa Highway District #1	IDS-028142		
City of Nampa	IDS-028126		
City of Middleton	IDS-028100		
Industrial facilities	Multi-Sector General Permit		
Construction activities	Construction General Permit		
Confined animal feeding operations	IDG010000		

Notes: National Pollutant Discharge Elimination System (NPDES), kilograms (kg), colony-forming unit (cfu); Ada County Highway District (ACHD); Q = flow in **cubic feet per second** and represents the entire flow from each stormwater entity into a given assessment unit, rather than any specific outfall.

[a] "Long-term" is part of the nature of the pollutants and is explained further in Appendix A.

[b] The division of the allocation between load and wasteload is found by multiplying the allocation by the percentage in Table 30. For example, Caldwell's sediment *load* allocation is 98% × Q × 42.9. Its sediment *wasteload* allocation is 2% × Q × 42.9.

[c] Includes areas of Meridian, Eagle, and urbanized unincorporated Ada County

Table 32. Example allocations based on discharge.

Example Discharge (cfs)	Target Concentration		Load or Wasteload Allocation	
	Sediment (mg/L)	*E. coli* (cfu/100 mL)	Sediment (kg/day)	*E. coli* (10^9 cfu/day)
0.5	17.5	126	21	2
1	17.5	126	43	3
2	17.5	126	86	6
5	17.5	126	215	15
10	17.5	126	429	31
20	17.5	126	858	62
50	17.5	126	2,145	154
100	17.5	126	4,290	308

The wasteload allocations in Table 32 only apply to long-term discharges (at least 30 days for *E. coli* and 4 months for sediment).

5.4.7.4 *Industrial Stormwater Requirements*

Stormwater runoff picks up industrial pollutants and typically discharges them into nearby water bodies directly or indirectly via storm sewer systems. When facility practices allow exposure of industrial materials to stormwater, runoff from industrial areas can contain toxic pollutants (e.g., heavy metals and organic chemicals) and other pollutants such as trash, debris, and oil and grease. This increased flow and pollutant load can impair water bodies, degrade biological habitats, pollute drinking water sources, and cause flooding and hydrologic changes, such as channel erosion, to the receiving water body.

Multi-Sector General Permit and Stormwater Pollution Prevention Plans

In Idaho, if an industrial facility discharges industrial stormwater into waters of the US, the facility must be permitted under EPA's most recent MSGP. To obtain an MSGP, the facility must prepare a stormwater pollution prevention plan (SWPPP) before submitting a notice of intent for permit coverage. The SWPPP must document the site description, design, and installation of control measures; describe monitoring procedures; and summarize potential pollutant sources. A copy of the SWPPP must be kept on site in a format that is accessible to workers and inspectors and be updated to reflect changes in site conditions, personnel, and stormwater infrastructure. For a list of notices of intent filed under the MSGP, see Appendix A.

Industrial Facilities Discharging to Impaired Water Bodies

Any facility that discharges to an impaired water body must monitor all pollutants for which the water body is impaired and for which a standard analytical method exists (see 40 CFR Part 136).

Also, because different industrial activities have sector-specific types of material that may be exposed to stormwater, EPA grouped the different regulated industries into 29 sectors, based on their typical activities. Part 8 of EPA's MSGP details the stormwater management practices and monitoring that are required for the different industrial sectors. EPA is in the process of issuing a new MSGP. DEQ anticipates including specific requirements for impaired waters as a condition of the 401 certification. The new MSGP will detail the specific monitoring requirements.

TMDL Industrial Stormwater Requirements

When a stream is on Idaho's §303(d) list and has a TMDL developed, DEQ may incorporate a wasteload allocation for industrial stormwater activities under the MSGP. However, most load analyses developed in the past have not identified sector-specific numeric wasteload allocations for industrial stormwater activities. Industrial stormwater activities are considered in compliance with provisions of the TMDL if operators obtain an MSGP under the NPDES program and implement the appropriate BMPs. Typically, operators must also follow specific requirements to be consistent with any local pollutant allocations. The next MSGP will have specific monitoring requirements that must be followed.

5.4.7.5 *Construction Stormwater*

The CWA requires operators of construction sites to obtain permit coverage to discharge stormwater to a water body or municipal storm sewer. In Idaho, EPA has issued a general permit for stormwater discharges from construction sites.

Construction General Permit and Stormwater Pollution Prevention Plans

If a construction project disturbs more than 1 acre of land (or is part of a larger common development that will disturb more than 1 acre), the operator is required to apply for a CGP from EPA after developing a site-specific SWPPP. The SWPPP must provide for the erosion, sediment, and pollution controls they intend to use; inspection of the controls periodically; and maintenance of BMPs throughout the life of the project. Operators are required to keep a current copy of their SWPPP on site or at an easily accessible location.

TMDL Construction Stormwater Requirements

When a stream is on Idaho's §303(d) list and has a TMDL developed, DEQ may incorporate a gross wasteload allocation for anticipated construction stormwater activities. Most loads developed in the past did not have a numeric wasteload allocation for construction stormwater activities. Construction stormwater activities are considered in compliance with provisions of the TMDL if operators obtain a CGP under the NPDES program and implement the appropriate BMPs. Typically, operators must also follow specific requirements to be consistent with any local pollutant allocations. The CGP has monitoring requirements that must be followed.

Construction Stormwater Management

Many communities throughout Idaho are currently developing rules for postconstruction stormwater management. Sediment is usually the main pollutant of concern in construction site stormwater. DEQ's *Catalog of Stormwater Best Management Practices for Idaho Cities and Counties* (DEQ 2005) should be used to select the proper suite of BMPs for the specific site, soils, climate, and project phasing in order to sufficiently meet the standards and requirements of the CGP to protect water quality. Where local ordinances have more stringent and site-specific standards, those are applicable.

5.4.8 Reserve for Growth

The TMDLs are based on a target *concentration*. Therefore, growth can occur provided the following are true:

- The receiving stream channel can transport the extra effluent.
- The effluent contains an *E. coli* concentration less than 126 cfu/100 mL (30-day geometric mean)
- The effluent contains a suspended sediment concentration less than 17.5 mg/L (4-month average)

If these conditions were met, the effluent would actually dilute the impaired streams and reduce the pollutant concentrations. This acknowledges the fact that WWTP and industrial point sources almost always discharge their pollutants *in solution*, and whether the water were "new" (from wells or sewers) or "old" (taken from the creek itself), as long as it met the above criteria, it would contribute to improving the beneficial uses.

DEQ and this addendum make no statement about water rights or availability.

This TMDL is concentration-based, so the reserve allocations are based on the design flow of the future WWTP or industrial point-source (*Q*), less 2.5 mg/L for natural background (for sediment). The equations are the same as for the wasteload allocations. See section 5.4 for an explanation of the constants in the equations below.

E. coli reserve (in 10^9 cfu/day) = $Q \times 4.76$

Sediment reserve (in kg/day) = $Q \times 66.2$

Where Q is the design flow **(in million gallons per day)** of the future facility.

Examples of reserves for growth are shown in Table 33.

Table 33. Examples of reserves for growth based on design flow.

Future Facility Design Flow (mgd)	Maximum Concentration		Reserve For Growth	
	Sediment (mg/L)	*E. coli* (cfu/100 mL)	Sediment (kg/day)	*E. coli* (10^9 cfu/day)
0.5	17.5	126	33	2
1	17.5	126	66	5
2	17.5	126	132	10
5	17.5	126	331	24
10	17.5	126	662	48
15	17.5	126	993	71
20	17.5	126	1,324	95
25	17.5	126	1,655	119
30	17.5	126	1,986	143

Notes: million gallons per day (mgd), milligrams per liter (mg/L), colony-forming units (cfu), kilograms (kg)

5.5 Public Participation

House Bill 145 has brought about changes in how WAGs are involved in TMDL development and review. The basic process for developing TMDLs and implementation plans is as follows:

- Basin advisory group members are appointed by DEQ's director for each of Idaho's basins.
- An "Integrated Report" is developed by DEQ every two years that highlights which water bodies in Idaho appear to be degraded.
- DEQ prepares to begin the subbasin assessment (SBA) and TMDL process for individual degraded watersheds.
- A WAG is formed by DEQ (with help from the basin advisory group) for a specific watershed/TMDL.
- With the assistance of the WAG, DEQ develops an SBA and any necessary TMDLs for the watershed.
- The WAG comments on the SBA/TMDL.
- WAG comments are considered and incorporated, as appropriate, by DEQ into the SBA/TMDL.
- The public comments on the SBA/TMDL.
- Public comments are considered and incorporated, as appropriate, by DEQ into the SBA/TMDL.

- DEQ sends the document to EPAfor approval.
- DEQ and the WAG develop, then implement, a plan to reach the goals of the TMDL.

DEQ will provide the WAG with all available information pertinent to the SBA/TMDL, when requested, such as monitoring data, water quality assessments, and relevant reports. The WAG will also have the opportunity to actively participate in preparing the SBA/TMDL documents.

Once a draft SBA/TMDL is complete, it is reviewed first by the WAG, then by the public. If, after WAG comments have been considered and incorporated, a WAG is not in agreement with an SBA/TMDL, the WAG's position and the basis for it will be documented in the public notice of public availability of the SBA/TMDL for review. If the WAG still disagrees with the SBA/TMDL after public comments have been considered and incorporated, DEQ must incorporate the WAG's dissenting opinion

5.6 Implementation Strategies

Implementation should focus on reducing nonpoint source pollution. Although small-scale projects may, collectively, produce water quality improvements, large-scale projects may be required to achieve the large reductions necessary.

DEQ recognizes that implementation strategies for TMDLs may need to be modified if monitoring shows that the TMDL goals are not being met or significant progress is not being made toward achieving the goals.

5.6.1 Time Frame

The WWTP point sources already meet their wasteload allocations. The stormwater point sources require more data to know whether they meet their wasteload allocations. These data should be forthcoming in future permit cycles (5–10 years). The nonpoint sources will attempt to meet their load allocations as soon as possible, but this may be dependent on funding availability.

5.6.2 Approach

Funding provided under Clean Water Act §319 and other funds will be used to encourage voluntary projects to reduce nonpoint source pollution.

A survey of the hydrology of each stream should be attempted, with the goal of identifying the major inflows. These inflows could then be prioritized for projects to eliminate sediment and *E. coli* discharge to the tributary.

5.6.3 Responsible Parties

In addition to the designated management agencies, the public-through the WAG and other equivalent organizations or processes-will have opportunities to be involved in developing the implementation plan to the maximum extent practical. The following Idaho designated management agencies are responsible for management in the subbasin:

- Idaho Soil and Water Conservation Commission for grazing and agricultural activities

- Idaho Transportation Department for public road construction
- Idaho State Department of Agriculture for aquaculture
- DEQ for all other activities

5.6.4 Implementation Monitoring Strategy

A repeat survey of sediment and *E. coli* concentrations should occur 10 years after this TMDL is approved. Measurements should be taken at the ideal locations identified in section 5.1.2. Sediment measurements should be collected every 2 weeks between April and November, and 5-sample, 30-day *E. coli* geometric means should be collected in July.

5.6.5 Pollutant Trading

Pollutant trading (also known as water quality trading) is a contractual agreement to exchange pollution reductions between two parties. Pollutant trading is a business-like way of helping to solve water quality problems by focusing on cost-effective, local solutions to problems caused by pollutant discharges to surface waters. Pollutant trading is one of the tools available to meet reductions called for in a TMDL where point and nonpoint sources both exist in a watershed.

The appeal of trading emerges when pollutant sources face substantially different pollutant reduction costs. Typically, a party facing relatively high pollutant reduction costs compensates another party to achieve an equivalent, though less costly, pollutant reduction.

Pollutant trading is voluntary. Parties trade only if both are better off because of the trade, and trading allows parties to decide how to best reduce pollutant loadings within the limits of certain requirements.

Pollutant trading is recognized in Idaho's water quality standards at IDAPA 58.01.02.055.06. DEQ allows for pollutant trading as a means to meet TMDLs, thus restoring water quality limited water bodies to compliance with water quality standards. DEQ's *Water Quality Pollutant Trading Guidance* sets forth the procedures to be followed for pollutant trading (DEQ 2010).

5.6.5.1 *Trading Components*

The major components of pollutant trading are trading parties (buyers and sellers) and credits (the commodity being bought and sold). Ratios are used to ensure environmental equivalency of trades on water bodies covered by a TMDL. All trading activity must be recorded in the trading database by DEQ or its designated party.

Both point and nonpoint sources may create marketable credits, which are a reduction of a pollutant beyond a level set by a TMDL:

- Point sources create credits by reducing pollutant discharges below NPDES effluent limits set initially by the wasteload allocation.
- Nonpoint sources create credits by implementing approved BMPs that reduce the amount of pollutant runoff. Nonpoint sources must follow specific design, maintenance, and monitoring requirements for that BMP; apply discounts to credits generated, if required; and provide a water quality contribution to ensure a net environmental benefit. The water quality contribution also ensures the reduction (the marketable credit) is surplus to the

reductions the TMDL assumes the nonpoint source is achieving to meet the water quality goals of the TMDL.

5.6.5.2 *Watershed-Specific Environmental Protection*

Trades must be implemented so that the overall water quality of the water bodies covered by the TMDL is protected. To do this, hydrologically based ratios are developed to ensure trades between sources distributed throughout TMDL water bodies result in environmentally equivalent or better outcomes at the point of environmental concern. Moreover, localized adverse impacts to water quality are not allowed.

5.6.5.3 *Trading Framework*

For pollutant trading to be authorized, it must be specifically mentioned within a TMDL document. After adoption of an EPA-approved TMDL, DEQ, in concert with the WAG, must develop a pollutant trading framework document. The framework would mesh with the implementation plan for the watershed that is the subject of the TMDL. The elements of a trading document are described in DEQ’s pollutant trading guidance (DEQ 2010).

6 Conclusions

This addendum established concentration-based TMDLs for sediment and *E. coli* for the impaired streams in the Lower Boise River subbasin (Table 34). Point sources all currently meet the pollutant targets. Implementation should focus on nonpoint sources, as funds allow.

Table 34. Summary of assessment outcomes.

Assessment Unit Name	Assessment Unit Number	Pollutant	Recommended Changes to the next Integrated Report
Dixie Slough	ID17050114SW001_02	*E. coli*	Place in Category 4a—TMDL completed
Indian Creek— Sugar Avenue to Boise River	ID17050114SW002_04	*E. coli*	Move to Category 4a—TMDL completed
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02		
Mason Creek—entire watershed	ID17050114SW006_02		
Fifteenmile Creek—4th order (Fivemile Creek to mouth)	ID17050114SW007_04		
Tenmile Creek—3rd order below Blacks Creek Reservoir	ID17050114SW008_03		
Fivemile, Eightmile, and Ninemile Creeks - 1st and 2nd order	ID17050114SW010_02		
Fivemile Creek—3rd-order section	ID17050114SW010_03		
Sand Creek (part of Stewart Gulch, Cottonwood and Crane Creeks – 1st and 2nd order)	ID17050114SW012_02	*E. coli*	Place in Category 4a—TMDL completed
Sand Hollow Creek—I-84 to Sharp Road	ID17050114SW017_03	*E. coli*	Move to Category 4a—TMDL completed
Sand Hollow Creek—Sharp Road to Snake River	ID17050114SW017_06		
Indian Creek— Sugar Avenue to Boise River	ID17050114SW002_04	Sediment	Move to Category 4a—TMDL completed
Indian Creek—Indian Creek Reservoir to New York Canal	ID17050114SW003b_03		
Indian Creek above Reservoir – 1st and 2nd order	ID17050114SW003d_02		
Indian Creek above Reservoir – 3rd order	ID17050114SW003d_03		
Mason Creek—entire watershed	ID17050114SW006_02		
Fifteenmile Creek— 4th order (Fivemile Creek to mouth)	ID17050114SW007_04		
Tenmile Creek—3rd order below Blacks Creek Reservoir	ID17050114SW008_03		
Fivemile Creek—3rd-order section	ID17050114SW010_03		
Willow Creek—3rd order	ID17050114SW015_03		
Sand Hollow Creek—C-line Canal to I-84	ID17050114SW016_03		
Sand Hollow Creek—I-84 to Sharp Road	ID17050114SW017_03		
Sand Hollow Creek—Sharp Road to Snake River	ID17050114SW017_06		

The development of this document included the following public participation:

- September 2012: The technical advisory committee (TAC) was invited to submit papers addressing the effect of elevated sediments on cold water aquatic life.
- October 2012: The TAC debated *E. coli* targets and recommended they be sent to the WAG. The WAG subsequently voted to approve the *E. coli* targets.

- November 2012: The TAC debated sediment targets and recommended another meeting. The WAG members were individually consulted about the strategy and direction of the TMDL and about the pollutant targets.
- December 2012: The TAC debated sediment targets and recommended another meeting.
- January 2013: The WAG voted to approve the sediment targets.
- April 2013: The WAG members were individually consulted about the method for allocating the load capacity amongst the various sources.
- June 2013: The TAC was provided a draft copy of the TMDL to review.
- July 2013: Individual consultations took place with all WAG members regarding specific concerns or comments about the TMDL.
- August 2013–November 2014: Extended WAG comment and suggestion period.
- December 2014: Stormwater TAC meetings were held.
- January 2015: TAC voted to recommend TMDL for passage by WAG.
- February 2015: WAG voted to recommend TMDL be released for public comment

This document was prepared with input from the public, as described in Appendix A. Public comments and DEQ responses are also included in this appendix, and a distribution list is included in Appendix A.

References Cited

CFR (Code of Federal Regulation). 1977. "Guidelines Establishing Test Procedures for the Analysis of Pollutants." 40 CFR 136.

CFR (Code of Federal Regulation). 1983. "Water Quality Standards." 40 CFR 131.

CFR (Code of Federal Regulation). 1995. "Water Quality Planning and Management." 40 CFR 130.

CH2M HILL. 2003. *Lower Boise River Coliform Bacteria DNA Testing.* Boise, ID: CH2M HILL.

Chelstrom. 2002. *Canoeing the Boise River*. Boise, ID: REI

Clark and Bauer. 1983. *Water Quality Status Report: Lower Boise River Drains, Canyon County, Idaho.* Boise, ID: Idaho Department of Health and Welfare, Division of Environment.

DEQ (Idaho Department of Environmental Quality). 1999. *Lower Boise River TMDL: Subbasin Assessment, Total Maximum Daily Loads.* Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2001a. *Fivemile and Tenmile Creek Subbasin Assessment*. Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2001b. *Indian Creek Subbasin Assessment*. Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2001c. *Mason Creek Subbasin Assessment*. Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2001d. *Sand Hollow Creek Subbasin Assessment*. Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2005. *Catalog of Stormwater Best Management Practices for Idaho Cities and Counties*. Boise, ID: DEQ. Available at: *http://www.deq.idaho.gov/water-quality/wastewater/stormwater.aspx*.

DEQ (Idaho Department of Environmental Quality). 2009. *Lower Boise River: TMDL Five-Year Review*. Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2010. *Water Quality Pollutant Trading Guidance.* Boise, ID: DEQ. Available at: *http://www.deq.idaho.gov/water-quality/surface-water/pollutant-trading.aspx*.

DEQ (Idaho Department of Environmental Quality). 2011. *Fivemile, Ninemile, Tenmile and Fifteenmile Creeks. Results and Field Summary.* Boise, ID: DEQ.

DEQ (Idaho Department of Environmental Quality). 2014. *Idaho's 2012 Integrated Report*. Boise, ID: DEQ.

Grafe, C.S., C.A. Mebane, M.J. McIntyre, D.A. Essig, D.H. Brandt, and D.T. Mosier. 2002. *Water Body Assessment Guidance,* 2nd ed. Boise, ID: Department of Environmental Quality.

Gray, J. R., Glysson, G. D., Turcios, L. M, Schwarz, G. E. 2000. *Comparability of Suspended-Sediment Concentration and Total Suspended Solids Data*, Water-Resources Investigations Report 00-4191. U.S. Geological Survey, Reston, VA.

Idaho Code. 2014. “Definitions.” Idaho Code §39-3602.

Idaho Code. 2014. “Designation of Instream Beneficial Uses.” Idaho Code §39-3602.

Idaho Department of Health. 1959. “Report on Pollution Problems in Indian Creek: Ada and Canyon Counties, Idaho, 1958–1959. Boise, ID: Department of Health, Engineering and Sanitation Section. Water quality status report no. 3.

IDAPA. 2014. “Idaho Water Quality Standards.” Idaho Administrative Code. IDAPA 58.01.02.

IDAPA. 2014. “Rules Governing Dairy Waste.” Idaho Administrative Code. IDAPA 02.04.14.

IDHW (Idaho Department of Health and Welfare). 1983. Water Quality Status Report: Lower Boise River Drains, Canyon County, Idaho. Boise, ID: Idaho Department of Health and Welfare, Division of Environment. Water Quality Series #50.

LBRWQP (Lower Boise River Water Quality Plan). 2003. *Implementation Plan for the Lower Boise River Total Maximum Daily Load*. Boise, ID: DEQ.

Newcombe, C.P., and J.O.T. Jensen. 1996. “Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact.” *North American Journal of Fisheries Management* 16:693–727.

Rosgen, D. 1996. *Applied River Morphology*. Pagosa Springs, CO.

SCC and DEQ (Soil Conservation Commission and Idaho Department of Environmental Quality). 2003. *Agriculture Pollution Abatement Plan*. Boise, ID: SCC.

Smith, S., Idaho Technology Transfer Center, Federal Highway Administration, Idaho Department of Environmental Quality. 2005. *BMP Handbook: Best Management Practices for Idaho Rural Road Maintenance.* Moscow, ID: University of Idaho, Idaho Technology Transfer Center.

Strahler, A.N. 1957. “Quantitative Analysis of Watershed Geomorphology.” *Transactions American Geophysical Union* 38:913–920.

US Congress. 1972. Clean Water Act (Federal Water Pollution Control Act). 33 USC §1251–1387.

GIS Coverages

Restriction of liability: Neither the state of Idaho nor the Department of Environmental Quality, nor any of their employees make any warranty, express or implied, or assume any legal liability or responsibility for the accuracy, completeness or usefulness of any information or data provided. Metadata is provided for all data sets, and no data should be used without first reading and understanding its limitations. The data could include technical inaccuracies or typographical errors. The Department of Environmental Quality may update, modify, or revise the data used at any time, without notice.

Glossary

§303(d)

Refers to section 303 subsection "d" of the Clean Water Act. Section 303(d) requires states to develop a list of water bodies that do not meet water quality standards. This section also requires total maximum daily loads (TMDLs) be prepared for listed waters. Both the list and the TMDLs are subject to United States Environmental Protection Agency approval.

Assessment Unit (AU)

A group of similar streams that have similar land use practices, ownership, or land management. However, stream order is the main basis for determining AUs. All the waters of the state are defined using AUs, and because AUs are a subset of water body identification numbers, they tie directly to the water quality standards so that beneficial uses defined in the water quality standards are clearly tied to streams on the landscape.

Beneficial Use

Any of the various uses of water that are recognized in water quality standards, including, but not limited to, aquatic life, recreation, water supply, wildlife habitat, and aesthetics.

Beneficial Use Reconnaissance Program (BURP)

A program for conducting systematic biological and physical habitat surveys of water bodies in Idaho. BURP protocols address lakes, reservoirs, and wadeable streams and rivers.

Exceedance

A violation (according to DEQ policy) of the pollutant levels permitted by water quality criteria.

Fully Supporting

In compliance with water quality standards and within the range of biological reference conditions for all designated and existing beneficial uses as determined through the *Water Body Assessment Guidance* (Grafe et al. 2002).

Load Allocation (LA)

A portion of a water body's load capacity for a given pollutant that is given to a particular nonpoint source (by class, type, or geographic area).

Load(ing)

The quantity of a substance entering a receiving stream, usually expressed in pounds or kilograms per day or tons per year. Loading is the product of flow (discharge) and concentration.

Load Capacity (LC)

How much pollutant a water body can receive over a given period without causing violations of state water quality standards. Upon allocation to various sources, a margin of safety, and natural background contributions, it becomes a total maximum daily load.

Margin of Safety (MOS)

An implicit or explicit portion of a water body's load capacity set aside to allow for uncertainly about the relationship between the pollutant loads and the quality of the receiving water body. The margin of safety is a required component of a total maximum daily load (TMDL) and is often incorporated into conservative assumptions used to develop the TMDL (generally within the calculations and/or models). The margin of safety is not allocated to any sources of pollution.

Nonpoint Source

A dispersed source of pollutants generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and nonirrigated lands used for grazing, crop production, and silviculture; rural roads; construction and mining sites; log storage or rafting; and recreation sites.

Not Assessed (NA)

A concept and an assessment category describing water bodies that have been studied but are missing critical information needed to complete an assessment.

Not Fully Supporting

Not in compliance with water quality standards or not within the range of biological reference conditions for any beneficial use as determined through the *Water Body Assessment Guidance* (Grafe et al. 2002).

Point Source

A source of pollutants characterized by having a discrete conveyance, such as a pipe, ditch, or other identifiable "point" of discharge into a receiving water. Common point sources of pollution are industrial and municipal wastewater plants.

Pollutant

Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Pollution

A very broad concept that encompasses human-caused changes in the environment that alter the functioning of natural processes and produce undesirable environmental and health effects. Pollution includes human-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.

Stream Order

Hierarchical ordering of streams based on the degree of branching. A 1st-order stream is an unforked or unbranched stream. Under Strahler's (1957) system, higher-order streams result from the joining of two streams of the same order.

Total Maximum Daily Load (TMDL)

A TMDL is a water body's load capacity after it has been allocated among pollutant sources. It can be expressed on a time basis other than daily if appropriate. Sediment loads, for example, are often calculated on an annual basis. A TMDL is equal to the load capacity, such that load capacity = margin of safety + natural background + load allocation + wasteload allocation = TMDL. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several water bodies and/or pollutants within a given watershed.

Wasteload Allocation (WLA)

The portion of receiving water's load capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations specify how much pollutant each point source may release to a water body.

Water Body

A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.

Water Quality Criteria

Levels of water quality expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, aquatic habitat, or industrial processes.

Water Quality Standards

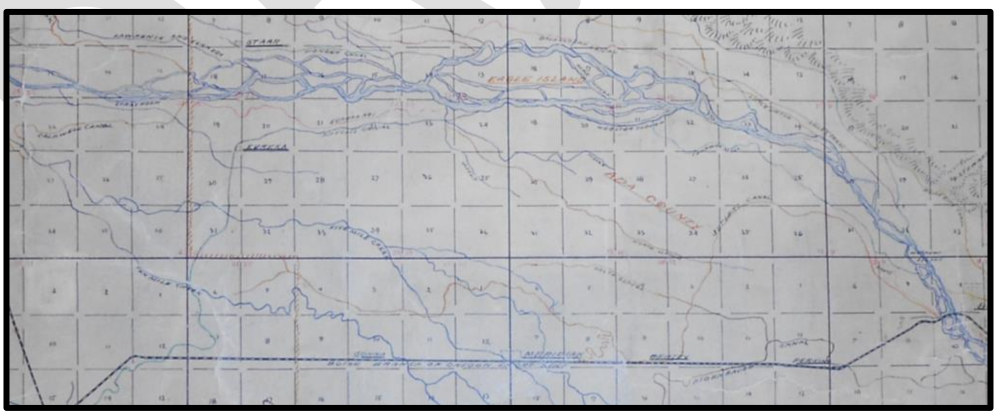
State-adopted and United States Environmental Protection Agency-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.

Appendix A. Nampa Meridian Historical Report

This page intentionally left blank for correct double-sided printing.

WATER IN THE BOISE VALLEY:

A HISTORY OF THE NAMPA & MERIDIAN IRRIGATION DISTRICT



By Jennifer A. Stevens, Ph.D.

SHRA StevensHistoricalResearchAssociates

TABLE OF CONTENTS

LIST OF FIGURES FOUND IN APPENDIX 1

ABSTRACT

This history was prepared for Nampa & Meridian Irrigation District for the purpose of documenting the historical development of its facilities, and particularly its drainage system.

Today's landscape might lead an untrained observer to believe that the Boise River has always been a relatively neat and tidy channel, or that the many waterways snaking across the landscape have always fed and enhanced the Boise River's flows from the south as well as the north. But the modern landscape and hydrology of the Boise River Valley bear little resemblance to the landscape and hydrology encountered by the earliest pioneers. Settlers who arrived in the Boise River Valley in the 1860s encountered an unpredictable river surrounded by a dry and forbidding sagebrush landscape. The Boise River rises in the high mountains of central Idaho, and courses south and west to its confluence with the Snake River near the Oregon border. Its final 50 miles flow west through a valley of rich agricultural lands in the southwest corner of Idaho that have been cultivated to support the increasing human population since the late 19th century. But before the advent of irrigation systems, the river consisted of multiple braided channels flowing through the valley, regularly changing course and overflowing their banks each spring.

The General Land Office sent surveyors out to Idaho territory in the 1870s to take inventory of the land and prepare it for settlement by setting corners and boundaries, utilizing the rectangular survey system adopted by the United States to survey the Northwest Territory in 1796. The records they left of the Boise River's meanderings provide evidence of a very different hydrological system than the one we see in the 21st century. Walking the township and section lines throughout the Boise Valley, surveyors found that very few streams fed the river from either north or south. The 19th-century surveys clearly demonstrate that only three creeks existed south of the Boise River before the 1890s: Five Mile, Ten Mile, and Indian Creeks, and that these were ephemeral, flowing only for a month or two in the springtime when snowmelt found its way through drainages to the Boise River. An unknown deep aquifer lay beneath these lands. It was fed from higher elevation precipitation, but was not visible to the human eye nor accessible until later in the 20th century when technology was developed to allow its use. Thus, the surface waters of the Boise River were the only water source for growing food in the Boise Valley, presenting challenging conditions for Americans who came to settle in the valley.

The arrival of European Americans provoked conflicts over use of natural resources and especially water, the results of which subjected the Boise River to major changes during the 19th century. The first European Americans to pass through the area were the fur trappers who traveled and stayed temporarily during the early part of the century; none created permanent settlements, however. The earliest whites to actually settle in the Boise Valley began to arrive in the 1860s, brought by the promise of gold over the hills to the north in Idaho City. Those who settled in the valley near the river grew crops to feed the miners and meet other business demands. Their most obvious need was water. During the ensuing decades, they undertook the challenge of utilizing the Boise River to build communities from the fertile desert lands that spread for miles north and south of the river.

Pioneers who came to Idaho from many points east left records that help historians reconstruct the historic landscape and fragile hydrological balance that existed before irrigation. Many were lured by the promise of free land and the dream of owning their own farm. But when they arrived, they found that the land was vastly different from their homes of origin; it needed clearing and

preparation, and the lack of precipitation was a surprise to many. Homesteaders who staked ground in the Boise area soon found that securing land too far from the river could render their already dry land distant from an adequate water supply; but conversely a decision to settle too close could result in potentially devastating flooding. And, other than the hot artesian flows that pioneers used for hot springs, homesteaders knew nothing about the ground water that lay beneath them and its potential to provide water for their crops. The homesteaders' records reveal the aridity not just of the land, but of the stream beds and natural depressions that cross the desert south of the river. The detailed statements that the government required pioneers to file about their land provide a window into the challenges of being a homesteader on dry earth with such a limited water supply.

Thus, the unpredictability of the river and the need to develop the means to use the available water supply were key characteristics of early settlement in the Boise Valley. The Boise River was the only source of reliable water that could be diverted onto the desert lands for farms, and as this report will demonstrate, the construction of facilities to deliver irrigation water was fraught with difficulties. Settlers came nonetheless, but pioneering here was challenging, and only the hardiest survived and persisted through the years before larger and more reliable irrigation arrived in the 1890s.

The lack of federal funding before 1902 meant that irrigation development in the 19th century was subject to the volatility of capital markets. Engineers with big dreams designed canals to stretch 20-40 miles across dry desert lands, but the costs to build them were staggering. All too often a lack of funding halted work before it was complete, resulting in partially dug ditches and unfinished irrigation systems. The construction of the Ridenbaugh Canal was no different as it became one of the first irrigation systems to serve the lands south of the Boise River. Although its construction began in 1873, it was not until 1891 – through much trial and error – that the Ridenbaugh's lengthy extension west was finally completed, totaling approximately 52 miles.[1]

As irrigation systems grew in the latter third of the 19th century and sagebrush was plowed under to create productive agricultural lands, the hydrology of the Boise River Valley began to evolve. A portion of the water diverted from the Boise River seeped through canals and the soils of irrigated fields to form a shallow aquifer that rose to the surface in many places as the years proceeded. The rising shallow aquifer and return flows from the newly irrigated lands naturally sought outlets back to the Boise River, causing the ephemeral creeks to run with water more regularly and new waterways to be formed in the land's natural depressions.[2]

These developments and alterations to the hydrology of the Boise River Valley accelerated after the United States Congress created the U.S. Reclamation Service in 1902 (now known as the Bureau of Reclamation). Reclamation Service engineers arrived in the Boise Valley in 1904, bringing with them plans for the Boise Project, consisting of storage reservoirs and funding to expand and finish incomplete canals and irrigation systems. Simultaneously, farmers across the Valley organized

---

[1] Lynne MacDonald, U.S. Bureau of Reclamation, *Historic American Engineering Record Nampa & Meridian Irrigation District*, Sept. 2002, Updated April, 2008, Draft, citing from *Biennial Report of the State Engineer to the Governor of Idaho for the years 1899-1900* (Boise, ID: 1900) (hereafter HAER report).(NMID5) Note: MacDonald's report does not contain page numbers. Note: All NMID source numbers reference the SHRA Archives table unless otherwise noted.

[2] "Idaho State News: Water for Caldwell," *Idaho Daily Statesman*, June 9, 1891. (NMID News85)

irrigation districts under recently-enacted state laws to manage their water delivery. Users under the Ridenbaugh canal formed the Nampa & Meridian Irrigation District in 1904 and purchased the canal and its associated infrastructure on December 23, 1905.[3] By 1915, the Reclamation Service had completed and expanded the New York and Ridenbaugh Canal systems, and constructed Arrowrock Reservoir for irrigation purposes, despite ongoing engineering work. The ownership patterns in the district had changed by this time, and only a few pioneering souls remained on their original homesteads. Families farming larger plots had ascended to prominence, and could now depend on reliably delivered irrigation water through canals that stretched for miles across the Treasure Valley's south desert lands.

The rapidly rising shallow aquifer beneath the irrigated lands was an unexpected consequence of expanding irrigation in the Boise Valley near the turn of the century. By 1910, the shallow depressions in the desert could no longer accommodate the volume of irrigation water being applied to homesteads, and the waterways that had begun to run like streams in the late 19th century were dotted with stagnant pools of swamp water teeming with reeds. The volume of water continually being applied to farmlands had inundated thousands of acres; orchards and farms were ruined, and alkali invaded the seeped lands. Farmers were devastated and sought the assistance of the Reclamation Service as well as their irrigation district boards to engineer a solution to this unforeseen problem.

By 1913, Reclamation Service engineers began working together with local engineers to design a drainage system that would dig deeper into the land's natural depressions to relieve these excess flows and direct them back to the Boise River. West valley lands lying in Pioneer Irrigation District were the first to be relieved under a contract signed with Reclamation in 1913. Two short years later, Nampa & Meridian Irrigation District's Board also voted to enter a contract with the Reclamation Service to engineer, finance, and construct a system of 11 deep surface drains, utilizing the ephemeral creeks as well as additional natural depressions to reclaim the seeped lands. Five Mile, Ten Mile, and Indian Creeks were all deepened, straightened, and engineered so that any resemblance they bore to their former ephemeral existence was all but lost. New place names such as "Mason Creek" and "Nine Mile Creek" appeared on maps and the landscape, and together with the mushrooming number of canals and laterals, led any untrained eye to rapidly forget that the land had been desert not long before. Ultimately, completion of the primary drainage systems in 1918 laid the groundwork for the functional balance and equilibrium between surface and ground water that persists to this day.

To rectify the drainage challenges that were increasing throughout the valley, the Idaho Legislature got involved. In 1913, they recognized the need for drainage construction and passed legislation enabling the creation of county drainage districts. The first of these was created by at least 1917.

However, drainage needs continued to spread across the valley floor. The legislature passed another bill in 1917 conferring upon irrigation districts "the same power and authority as is now conferred or may hereafter be conferred respecting irrigation…shall now be construed to include drainage."[4] The law became codified as Idaho Code Section 43-305. That year, Nampa & Meridian Irrigation District completed its system and apportioned drainage benefits and assessed its

---

[3] Boise City Irrigation and Land Co. to Nampa & Meridian Irrigation District, Instrument Numbered 9582, Dec. 23, 1905, Special Projects, 1900-1925, Nampa & Meridian Irrigation District Office, Nampa, Idaho. (NMID277)
[4] Idaho House Bill No. 254, 14th session of the Idaho Legislature, 1917. (NMID356)

landowners throughout the District accordingly, per their 1915 contract with the Reclamation Service. Additional drainage – constructed after 1918 outside the District's boundaries but upon Boise Project lands – also required the Nampa & Meridian District to assess their landowners to recoup the annual $1/acre maintenance and operation charge the Reclamation Service began to assess to the District in 1920, a charge that the District unsuccessfully fought all the way to the U.S. Supreme Court.[5] Finally, supplementary drainage for lands within the boundaries of the Nampa & Meridian Irrigation District were handled by the District, which assessed its landowners a separate charge for drainage that went into a special drainage fund beginning in 1926.[6]

The District today manages water delivery and drainage for thousands of acres of land, stretching from eastern portions of the Boise River Valley west into lands surrounding the towns of Nampa and Meridian. The continuous evolution of man-made reservoirs, canals, laterals, and drains designed to meet the needs of water users has dramatically shaped the area's hydrology, economy, culture, landscape, and overall appearance since the time of settlement. The Valley's development led to the demand for yet a greater water supply, which resulted in the addition of Anderson Ranch and Lucky Peak Reservoirs in the 1950s. These dams also provided flood control benefits, recreational uses, and hydropower for Valley residents. Together, the Boise River irrigation delivery, drainage and storage developments that began in the 1870s continue to meet the needs of Boise Valley communities while maintaining the hydrologic balance between surface and ground water. Storage reservoirs supplement natural Boise River water flows to supply water for irrigation throughout the valley. Water diverted from the Boise River for irrigation feeds the shallow aquifer, creating a ground water supply that meets multiple needs. The shallow aquifer and irrigation return flows feed the drainage systems that replenish the Boise River where they meet the river downstream from the City of Middleton. This hydrologic balance, developed and maintained since the early 1900s, has truly transformed the pre-irrigation desert landscape to sustain the communities of the Boise Valley.

[5] *Nampa & Meridian Irrigation District v. Bond*, 268 U.S. 50 (1925). (NMID378)
[6] NMID Board Meeting Minutes, March 2, 1926. (NMID377)

INTRODUCTION

This report will trace the evolution of land and water south of the Boise River within the bounds of the Nampa & Meridian Irrigation District from European American settlement in the 1860s through the 1920s. The report will detail the history of these facilities, which now comprise the largest system in the Boise River Valley, as they transitioned over 50 years from being privately financed, to irrigation district facilities.

The first section of this report will discuss the era of private development, and trace the land's evolution from arid desert settled by European Americans in the 1860s to the accelerated application of widespread artificial irrigation on these lands into the 1890s. It will detail the impact of the artificial irrigation infrastructure on the creeks flowing into the Boise River from the south, including Five Mile, Ten Mile, and Indian Creek. It will demonstrate that the rise of artificial irrigation modified the hydrology of the area, creating new waterways and dramatically altering the nature of preexisting ones.

The second section of this report will discuss the consequential rise of the water table across these same lands, the acquisition of privately-owned irrigation facilities by a newly formed irrigation district in 1904, and the increasing need for the drainage of farmlands through the first two decades of the 20th century. It was during this period when water users, suffering from seeped and unproductive lands due to the altered hydrology, worked with the Bureau of Reclamation to deepen and realign preexisting ephemeral drainages and construct new drains to reclaim waterlogged lands south of the river. It will describe the uses of these drains, how they were constructed and financed, how the engineering altered their flows, and how they have been maintained. By the 1920s, the Boise River Valley hardly resembled the lands encountered by early pioneers. Where the lands south of the River had once been dry and unproductive, offering water only in a small number of ephemeral streams, they now flowed with man-made drains that served productive farms.

The final section of the report will provide a summary of the Nampa & Meridian Irrigation District following the construction of the drainage system, detailing the continued need for drainage on the lands and the engineering that achieved it, and the operation and maintenance of the district through the modern era.

SECTION 1: SETTLING THE BOISE RIVER VALLEY: 1860-1900

The Boise Valley's earliest white settlers left behind many records of their lives and impressions of the land. In some cases, they did so through written diaries or letters, while others left behind business records that have survived. But the majority of recorded information about the character of the land and landscape that survived originated with the pioneers' interactions with the government.

The United States was still a young country in 1865. The federal government was keen to expand its land mass and prove its independence and power. Verbal skirmishes with Great Britain over claims to the Pacific Northwest ultimately resulted in the United States marking its territory up to the 49th parallel (location of the modern international boundary with Canada) through negotiation of the Oregon Treaty in 1846. But it was not until almost 20 years later that President Abraham Lincoln signed legislation in 1863 which carved the Idaho Territory out of the land that had been annexed from Britain in 1846. Soon after, the U.S. General Land Office (GLO) posted a General Surveyor in the new territory to inventory the land, and the settlers began to arrive in greater numbers.

The GLO inventory allowed for the subdivision, privatization, and ultimate settlement of the area by United States citizens. The surveys in the Boise River Valley began in 1867 with the land closest to the Boise River and the most concentrated area of settlement. The records left behind serve as important documentation demonstrating the character of the land before the physical alterations of the late 19th century. Entrepreneurs hoping to capitalize on the land rush and the need for water also left records of their enterprises. These records, together with newspaper accounts, allow us to piece together an accurate picture of the Boise River Valley's features in the period before large-scale irrigation was firmly established in the 1890s.

The available records reveal that water development south of the Boise River has a distinct timeline and history. In the years before the 1890s, that is, the era preceding large-scale artificial irrigation, the land south of the Boise River was consistently dry, and there were no streams that flowed with any reliability. It was a high desert environment absent any abundant water. The only streams mentioned by contemporaries – Five Mile, Ten Mile, and Indian Creeks – were consistently described as containing water in the spring and running dry the remainder of the year. Often they were mentioned in the paper only because of flooding during the months of snowmelt. Regardless of the context, they were unfailingly and repeatedly characterized as ephemeral.

Starting in the 1860s and 1870s, pioneering settlers began to engineer ditches to divert the waters of the Boise River to these dry lands. As the newly constructed canals – including the Ridenbaugh, the New York, and the Settlers, all located on the south side of the Boise River – began to carry and deliver more water into and throughout the 1890s, the noted creeks began to flow with more regularity and volume. This became increasingly true over time as the canals extended their systems further and further west, stretching into Nampa, Meridian, and Caldwell and irrigating an increasing number of acres each year. In fact the records demonstrate intentional engineering and manipulation of the creek beds of Five Mile, Ten Mile, and Indian Creeks as a means of delivering water to farmers and avoiding the expense of additional canal construction. As the decade progressed, another interesting phenomenon occurred. The increasing flows in these creeks encouraged settlers to file on rights to the waste water flowing in them, creating new sources of reliable water. Outside of the spring snowmelts, however, the records demonstrate that increased flow in these streams in the 1890s was entirely a result of and dependent upon the irrigation of nearby lands and the return flows from them. Eventually, the re-capture of these flows became the right of the irrigation districts that owned the original diversions.

SURVEYING THE BOISE VALLEY: 1867-1875

The U.S. GLO (predecessor to the Bureau of Land Management) began the survey of townships south of the Boise River in 1867 and continued until all of the land within the modern boundaries of the Nampa & Meridian Irrigation District was surveyed in 1875. These survey records provide a consistent and telling story about the arid character of land in the Boise River Valley during the eight years they were performed.

The method for surveying these public lands followed the government's established pattern in other territorial lands. In preparation for each survey, the GLO signed contracts with the survey team and directed them to follow a particular set of instructions issued by the agency. Some of the surveys completed in the area of study were done pursuant to the instructions issued by the GLO in 1855 and a supplemental circular issued in 1864, while the remainder of them were completed using instructions issued in 1871. Both the 1855 and 1871 instruction manuals provided surveyors with directions regarding the objects and data they were to record in their field notes. The instructions explained that the purpose of the field notebooks was to provide information about:

> the elements from which the plats and calculations in relation to the public surveys are made. They are the source wherefrom the description and evidence of locations and boundaries are officially delineated and set forth. They therefore must be a faithful, distinct, and minute record of everything officially done and observed by the surveyor and his assistants, pursuant to instructions, in relation to running, measuring, and making lines, establishing boundary corners, and c&; and present, as far as possible, a full and complete *topographical description* of the country surveyed, as to every matter of useful information, or likely to gratify public curiosity.[7] [Emphasis in original.]

This instruction was intended to convey to surveyors the importance of their notes being precise and accurate. The surveyors often referenced the instructions in their field notebooks, underscoring the significance of the instructions to doing the job correctly.

In addition to providing justification for the work, the manuals also instructed the survey teams on the *specific items* they were to record in their notebooks. The directions left little to question, and although the language in other parts of the document changed slightly over time, the manuals from 1855 and 1871 were identical with regard to their requirements for recording land and water objects. The instructions directed that surveyors record the following land objects: settlers' claims, the nearby rivers, creeks, swamps, and bottom lands, and whether the bottom lands were wet or

[7] The "&c" is an early form of "etc.," meaning "and other things." *Instructions to the Surveyors General of Public Lands of the United States for Those Districts Established In and Since the Year 1850: Containing, Also, A Manual of Instructions to Regulate the Field Operations of Deputy Surveyors* (Washington, D.C.: A.O.P. Nicholson, 1855), 15; *Instructions to the Surveyors General of Public Lands of the United States for Those Districts Established in and Since the Year 1850: Containing, Also, A Manual of Instructions to Regulate the Field Operations of Deputy Surveyors* (Washington, D.C.: Government Printing Office, 1871), 17.

dry. *Water* objects were also to be recorded, including the presence of "all rivers, creeks, and smaller streams of water which the [survey] line crosses," and the width of the water body at the point of intersection.[8] The manuals also required that surveyors record lakes, springs, roads and trails, and timber, among other items. This section of the instructions concluded by requiring surveyors to note at the end of the field note book "such further description or information touching any matter or thing connected with the township (or other survey) which he may be able to afford, and may deem useful in the *aggregate*, as respects the face of the country, its soil and geological features, timber, mineral, waters, &c."[9] Such specific directions directed the surveyors to note all of the items deemed significant by the Land Office, and led the surveyors who examined the lands in this Valley to provide multiple descriptions of the land and water during their inventories.

The earliest surveys of the valley were performed only on the exterior lines of the valley's townships in order to determine potential for settlement and cultivation and to record the features of the land. Peter Bell and Allen Thompson were the first surveyors to obtain contracts with the GLO. In 1867, Bell signed up to survey the exterior boundaries of Township 1 North, Range 3 East; 2 North, 2 East; 2 North, 1 East; 1 North, 4 East; and 1 North, 5 East. He was also contracted to survey the subdivision (interior) lines of Township 3 North, Range 2 East, just upstream from the new town site of Boise. The same year, Thompson was contracted to survey lands to the west of Bell's, including Townships 2 North, Range 1 West; 3 North, 1 West; 3 North, 2 West; 3 North, 3 West. Their records provide a detailed look at the landscape and hydrology of the area for this period of early settlement.

My examination of hundreds of such public land surveys for studies similar to this one indicates that these surveys are extremely useful for understanding the physical features present on lands in their pre-settlement state. In this case, a great deal of irrigation development had taken place in these townships by the mid-20th century, and modern maps note the presence of many "creeks" in the region. However, the 19th-century surveys clearly demonstrate that only three creeks existed south of the Boise River before the 1890s: Five Mile, Ten Mile, and Indian Creeks. Furthermore, the surveys and their corresponding field notes reveal that even these named streams were not dependable sources of water, flowing only during a small part of each year. In addition to seasonal variations, the stream flows also were affected by the underlying lava formations, which caused them to disappear entirely in certain areas as their flows sunk into the porous ground beneath them. While surveyors recorded the presence of water in some reaches of each of these creeks, the bulk of evidence establishes that all three were ephemeral, dependable more for their aridity than for any reliable water flow. Furthermore, an examination of records for these townships – through which Three Mile, Eight Mile, Nine Mile, and Mason Creeks flow today – show that these additional four creeks are modern water objects created by the application of artificial irrigation on surrounding lands, and that they did not exist by 1875 when the surveys were completed.

FIVE MILE CREEK

Five Mile Creek is one of the three creeks that did in fact exist before large-scale irrigation practices began. It rises on the sagebrush plains of southeastern Idaho to the southwest of Boise in the

[8] *Instructions,* 1855, 17; and *Instructions*, 1871, 18. The 1864 circular did not contradict these instructions.
[9] *Instructions*, 1855, 18. The wording in the 1871 Instructions differ slightly after the word "useful" in that they specifically require surveyors to provide a "*general description* of the township in the *aggregate,*" with the soil and geological features specified, as well. *Instructions*, 1871, 19.

southeast portion of Township 3 North, Range 1 East, near or in Section 25. Before its man-made alterations, the original bed continued to the northwest through Townships 3 and 4 North, Range 1 West before turning south at the eastern boundary of Township 4 North, Range 2 West and joining Ten Mile Creek on its journey to the Boise River.[10] (See Figure 1 for an example of one of these township plats.) The earliest written impressions of Five Mile Creek by European Americans were done in the 1860s by General Land Office surveyors, but other observations were recorded throughout the latter part of the 20th century, as well, by settlers and in newspaper reports.

The first GLO surveyor to record the presence of Five Mile Creek was Allen Thompson in the spring of 1867, just one mile west (downstream) of the creek's heading.[11] At the time of the survey, Boise and its surrounding area were sparsely settled. Thompson did not note the presence of any settlers whatsoever. His survey of the north and east boundaries of Township 3 North, Range 1 West (see Figure 1) began in April, when he encountered Five Mile Creek on the township's eastern boundary and recorded that it was 20 links wide[12] (just under 13 feet), and coursed west.[13] Just a few months later, but into the dry part of the year, Thompson was contracted to survey the remaining exterior boundaries of the same township. Thompson conducted this survey in August, and simply referred to his encounter with Five Mile Creek on the north boundary of the township as a "creek bed," likely reflecting the lack of water in the creek by that time of the year. Interestingly, he refers to Indian Creek in another portion of this survey as a "creek," so the contrast in terminology and language is significant, as Thompson referred to both Five and Ten Mile Creeks as "creek beds," implying their lack of water. The accompanying plat, accepted by the General Surveyor, labeled the water object on the north boundary as Five Mile Creek.[14] Thompson continued to survey the land along the stream that summer as he walked downstream into Township 4 North, Range 1 West and consistently referred to the "bed of 5 Mile Creek" instead of a flowing creek.[15]

A number of years passed before the GLO contracted with Thompson again for townships relevant to a study of Five Mile Creek, but field notes from his next survey are consistent with Five Mile Creek's ephemeral nature. In 1875, he was hired to survey the interior (subdivision) lines of Township 3 North, Range 1 East, where Five Mile Creek heads, and upstream from his 1867 surveys. Thompson performed the survey of Township 3 North, Range 1 East in April 1875, and his route resulted in him crossing the water object many times. In contrast to his August survey in the 1860s when he referred to Five Mile as a "creek bed," in April 1875, he referred to it consistently as a "creek." April is often the time of heaviest flows for ephemeral creeks, as they receive the greatest

[10] Allen M. Thompson, Original Survey Plat, Township 4 North, Range 2 West, accepted March 1868. (NMID215) Note: All General Land Office Survey Records (field notes and plats) can be found online at www.glorecords.blm.gov, unless otherwise mentioned. Note: All surveys referenced in this report are from the Boise Meridian.
[11] Allen M. Thompson, Exterior Line Field Notes for Township 3 North, Range 1 West, under Contract 2, approved May 1867. (NMID68)
[12] A surveyor's link is just less than eight inches long; a surveyor's chain is comprised of 100 links. There are 80 chains (or 8,000 links) in one mile, which is equal to the length of one section in a township.
[13] Thompson, Exterior Line Field notes for Township 3 North Range 1 West, under Contract 2, approved May 1867. (NMID68)
[14] Allen M. Thompson, Exterior Line Field Notes and Plat for Township 3 North, Range 1 West, under Contract 5, approved December 1867. (NMID12, NMID16)
[15] Allen M. Thompson, Subdivision Line Field Notes for Township 4 North, Range 1 West, under Contract 5, approved January 1868, 10, 19, 27. (NMID166)

snowmelt when the warmer temperatures arrive, so it is not surprising that Five Mile Creek appeared to have water at the time. His recordings of the creek's width in this township varied between five (5) and ten (10) links (between three and six feet) and actually narrowed as it headed downstream.[16]

The presence of water in April – both in 1867 and 1875 – and the apparent dryness of the bed in August (1867) is consistent with other sources which describe Five Mile Creek in this way. (See below.)

TEN MILE CREEK

The impressions of and records related to Ten Mile Creek follow a pattern similar to Five Mile Creek. Ten Mile Creek runs parallel to Five Mile Creek but rises far above the city of Boise. Its official head today is at the Black Creek Reservoir (known today as "Blacks Creek") in Township 2 North, Range 4 East. Before that reservoir was constructed, Black Creek became Ten Mile Creek in Township 1 North, Range 3 East. The first official recordings of Ten Mile Creek during the period of settlement came from surveyors hired by the GLO to inventory and subdivide the land. Like the land along Five Mile Creek, much of the land adjacent to Ten Mile Creek was also surveyed beginning in 1867, with surveys of the land along the entirety of the creek eventually being completed in 1875 by the same two surveyors, Thompson and Bell.

As with Five Mile Creek, surveys of land along Ten Mile that were conducted in the spring resulted in references to the "creek," while surveys that took place in drier months referred to the creek "bed." Some of the 1867 surveys were done in spring while others were completed in summer, providing a good sample of the stream's character. For example, Allen Thompson surveyed the eastern boundary of Township 3 North, Range 1 West in April 1867, and noted his encounter with Ten Mile this way: "Creek 50 links wide course N40W," suggesting the presence of water.[17] (See Figure 1.) Surveys were performed upstream from that point later in the year. The most upstream parts of the stream were located in Township 1 North, Range 3 East, a township surveyed by Peter Bell in July, where he recorded his encounter with Ten Mile as a "creek."[18] Just downstream, Bell was also in charge of surveying Township 2 North, Range 2 East, which he also did in July, recording Ten Mile as a "creek."[19] But as the stream flowed downstream to the northwest, the next survey (also executed by Peter Bell and also during the summer months of 1867) in Township 2 North, Range 1 East noted just how ephemeral the stream was along its course even within the span of just a few days and a few miles. (See Figure 2.) Bell, who was contracted to survey this township's exterior boundaries, first marked the stream's presence on his northern traverse along the township's east boundary, where he wrote in his field notes: "creek 18 links wide course NW," suggesting again the presence of water. Yet just a few miles downstream, as Bell walked along the

[16] Allen M. Thompson, Subdivision Line Field Notes for Township 3 North, Range 1 East, under Contract 58, approved July 1875, 230, 231, 242, 254, 266, 280, 282, 285. (NMID14)
[17] Thompson, Exterior Line Field notes for Township 3 North Range 1 West, under Contract 2, approved May 1867, 109. (NMID68)
[18] Again, Bell erroneously named this creek "16-Mile Creek" in his field notes, although the associated plat correctly called it "Ten Mile Creek." Peter W. Bell, Exterior Line Field Notes for Township 1 North, Range 3 East, under Contract 4, approved December 1867, 101-102. (NMID 60)
[19] Peter W. Bell, Exterior Line Field Notes for Township 2 North, Range 2 East, under Contract 4, approved December 1867, 31. (NMID53) Interestingly, Bell mistook his encounter with Ten Mile Creek in this location for Indian Creek. The associated plat, however, labeled it correctly as Ten Mile Creek.

north boundary of this same township, he recorded his downstream encounter with Ten Mile Creek this way: "Creek 'dry bed' course N40W 10 links."[20]

Further downstream yet, Allen Thompson surveyed the exterior boundaries of Township 3 North, Ranges 1 and 2 West, also performing them during summer of that same year. He, too, appeared to have found a dry creek bed in these two townships, since he recorded his encounter with Ten Mile Creek in Township 3 North, Range 1 West as "creek bed 50 links wide course N40W,"[21] and along the north edge of Section 1 in Township 3 North, Range 2 West, as "creek bed 50 links wide course NW," referring to Ten Mile Creek.[22] In the more upstream sections of these two townships, it is important to note that Thompson also encountered and recorded Indian Creek, which he called a "creek" rather than a "creek bed," in contrast to his recording of Ten Mile.[23]

In 1875, the GLO contracted with Allen Thompson to survey subdivision lines for the townships for which only exterior boundary surveys had been completed. Between April and June 1875, Thompson surveyed all of the land inside the Nampa & Meridian Irrigation District, including lands lying adjacent to Ten Mile Creek. The townships included 1 North, Range 3 East, 2 North, Ranges 1-3 East, 3 North, Range 1 East, and 3 North, Range 1 West. Although Thompson did not survey them in a downstream manner, all of the townships were surveyed during the spring months, when it would have been customary to see water flowing in Ten Mile Creek.[24] Thompson recorded crossing Ten Mile Creek at many points during his survey. He recorded the water object as a "creek," and taken together, it is clear that the creek widened as it flowed downstream, at one point (in May) even being recorded as 50 links wide, or more than 30 feet.[25] It is not surprising to find such descriptions for a survey done during the spring snowmelt.[26]

[20] Peter W. Bell, Exterior Line Field Notes for Township 2 North, Range 1 East, under Contract 4, approved December 1867, 14, 19. (NMID51)
[21] Thompson, Exterior Line Field Notes for Township 3 North, Range 1 West, under Contract 5, approved December 1867, 234. (NMID12)
[22] Allen M. Thompson, Exterior Line Field Notes for Township 3 North, Range 2 West, under Contract 5, approved December 1867, 285(4). (NMID48)
[23] In the downstream township of 3 North, Range 2 West, Indian Creek is also referred to as a creek bed. See Indian Creek section of this report for details.
[24] 1875 was also a good water year in which 13.83 inches of rain fell on Boise City. A.D. Foote, *Feasibility of Irrigating and Reclaiming Certain Desert Lands Between the Snake and Boise Rivers, in Ada County, Idaho, and of other projects connected therewith*, 1883, 13. (NMID41)
[25] Allen M. Thompson, Subdivision Line Field Notes for Township 2 North, Range 1 East, under Contract 58, approved June 1875, 98, 110, 111, 123, 124, and 43. (NMID44)
[26] Allen M. Thompson, Subdivision Line Field Notes for Township 1 North, Range 3 East, under Contract 58, approved July 1875. (NMID35); Allen M. Thompson, Subdivision Line Field Notes for Township 2 North, Range 3 East, under Contract 58, approved July 1875. (NMID34); Allen M. Thompson, Subdivision Line Field Notes for Township 2 North, Range 2 East, under Contract 58, approved July 1875, mentions of Ten Mile Creek at 159D, 168, 169, 180, 191, 203. (NMID46); Thompson, Subdivision Line Field Notes for Township 2 North, Range 1 East, under Contract 58, approved June 1875, 98, 110, 111, 123, 124, and 43. (NMID44); Thompson, Subdivision Line Field Notes for Township 3 North, Range 1 East, under Contract 58, approved July 1875, mentions of Ten Mile Creek at 260, 274, 276, 279. (NMID14); Allen M. Thompson, Subdivision Line Field Notes for Township 3 North, Range 1 West, under Contract 58, approved December 1874, mentions of Ten Mile Creek at 71, 83, 84, 95, 107, 108, 124. (NMID15).

Taken together, the various surveys done for the townships through which Ten Mile Creek flowed in the middle of the 19th century demonstrate a creek that carried water in the spring, but which dried up as the year progressed, running entirely dry by the summer months.

INDIAN CREEK

Indian Creek, which also rises in the desert lands southeast of Boise, was historically grouped together and discussed with Five and Ten Mile Creeks, since it shared many of the same characteristics and flowed nearby. In 1867, for instance, Peter Bell's survey of Township 1 North, Range 3 East (which also included encounters with both Ten Mile and Indian Creeks) in 1867 included a general description in which he wrote: "This township contains some 1st rate land – especially along the valleys of the small water courses the most of which are dry in the summer."[27] Like Five and Ten Mile Creeks, Indian Creek coursed northwest through the southern desert, emptying into the Boise River in Township 4 North, Range 3 West, not far downstream of the confluence of Ten Mile Creek and the Boise River.[28] While there is evidence that Indian Creek may have carried water more regularly than either Five or Ten Mile Creek, it still was an ephemeral stream through its lower reaches, flowing only for a short time in the spring.

Surveys done on the lands adjacent to Indian Creek were part of the surveys done in 1867. The Indian Creek surveys were all done during summer months, a time when the creek would, in fact, be expected to run dry. It appears from the field notes of these surveys that the creek contained water close to its origin in Township 1 North, Range 5 East, but that it dried up further downstream. The presence of water in the upper reaches could possibly be attributed to a particularly wet year, since the surveyors that summer recorded some parts of Indian Creek as being as wide as 150 links – or 100 feet wide – (in Township 2 North, Range 1 West), while later recordings (1875) of stream width near the same location were significantly narrower (50 links).[29] Nevertheless, Bell and Thompson's notes from the 1867 surveys between Township 1 North, Range 3 East downstream through Township 2 North, Range 1 West recorded Indian Creek as an actual creek, and not a creek bed. In fact, Bell noted in Township 2 North, Range 1 West that Indian Creek was "stream of pure good water… but in Section 22 it begins to form a canyon and is too low for any practible [sic] purpose as the water sinks in all Basaltic regions."[30]

In addition to it being summer and therefore typically dry, the sinking water might explain Allen Thompson's 1867 field notes in some of the downstream reaches of Indian Creek through Townships 3 North, Range 2 West and Township 3 North, Range 3 West. In those two surveys,

---

[27] Peter W. Bell, Exterior Line Field Notes for Township 1 North, Range 3 East, under Contract 4, approved December 1867, 104. (NMID60)

[28] Indian Creek has also been known historically as Fifteen Mile Creek, as noted on the Survey Plat for Township 4 North, Range 3 West. Allen M. Thompson, Original Survey Plat, Township 4 North, Range 3 West, accepted March 1868. (NMID216)

[29] Allen M. Thompson, Subdivision Line Field Notes for Township 2 North, Range 1 West, under Contract 58, approved June 1875, 33. (NMID25). In the southwest corner of Township 3 North, Range 1 West, similar disparities were uncovered between the surveys of 1867 and 1875, in one case measuring Indian Creek in the southwestern region of this Township at 100 links wide while the 1875 survey for the northwestern part of Indian Creek measured it at 50 links wide. (See NMID12 and NMID15.)

[30] Peter W. Bell, Subdivision Line Field Notes for Township 2 North, Range 1 West, under Contract 9, approved August 1868, 17. (NMID24)

Thompson noted several encounters with the "creek bed,"[31] and further stated that the region was "not susceptible of cultivation without artificial irrigation," indicating an overall lack of water.[32]

Like land along the other creeks, the subdivision surveys of the lands adjacent to Indian Creek were done in 1875 and reflect findings similar to the descriptions of those streams. Near the creek's head in Township 1 North, Range 3 East, Allen Thompson recorded in his general description that the township offered rich bottom land near Indian Creek, identifying it as a "fine stream of good clear water."[33] Its width generally was recorded to be between 25 and 50 links for the remainder of its length before emptying into the Boise River in Township 4 North, Range 3 West.[34] There is no mention of a dry creek bed, even in the stream's lower reaches, which is explained by the fact that the survey was performed in April and May, the typical period of flow for Indian Creek as well as Five and Ten Mile Creeks. But, as will be seen from other sources discussed below, Indian Creek was as unreliable as Five and Ten Mile Creeks, flowing only during the spring.

The GLO surveys are useful for providing a snapshot of the land's characteristics preceding the era of increased settlement and large-scale artificial irrigation. They offer a starkly contrasting picture to the land's character just a few decades hence, illustrating the ephemeral nature of the three creeks, as well as the complete absence of any others. This picture of the south Boise desert changed dramatically over the next few decades.

ENTREPRENEURS AND SETTLERS SOUTH OF THE BOISE RIVER

In addition to the surveyors who came to the Boise region, many entrepreneurs and pioneers came to settle permanently or to make a quick fortune through the exploitation of the vast resources of the area. Entrepreneurs arrived soon after the discovery of gold in the early 1860s, some flush with eastern capital and ready to make deals and develop the area. For those not predisposed to try their luck in the mines, land and water were an alternate way to strike it rich, and investors poured thousands of dollars into efforts across the valley to dig canals that would divert river water to lands being speculated on by many of the same men.

[31] Thompson, Exterior Line Field Notes for Township 3 North, Range 2 West, under Contract 5, approved December 1867, 284 (NMID48); Allen M. Thompson, Exterior Line Field Notes for Township 3 North, Range 3 West, under Contract 5, approved December 1867, 332. (NMID50)
[32] Thompson, Exterior Line Field Notes for Township 3 North, Range 3 West, under Contract 5, approved December 1867, 335. (NMID50)
[33] Thompson, Subdivision Line Field Notes for Township 1 North, Range 3 East, under Contract 58, approved July 1875, 61. (NMID35)
[34] The approved survey plat for Township 4 North, Range 3 West labeled Indian Creek "Fifteen Mile Creek." Thompson, Original Survey Plat, Township 4 North, Range 3 West, accepted March 1868. (NMID216) Indian Creek also mentioned in the following survey field notes: Thompson, Subdivision Line Field Notes for Township 2 North, Range 1 East, under Contract 58, approved June 1875, 127, 139, 141. (NMID44); Thompson, Subdivision Line Field Notes for Township 2 North, Range 1 West, under Contract 58, approved June 1875, 11, 12, 13, 19, 20. (NMID25); Thompson, Subdivision Line Field Notes for Township 3 North, Range 1 West, under Contract 58, approved December 1874, 45. (NMID15); Thompson, Subdivision Line Field Notes for Township 3 North, Range 2 West of the Boise Meridian, under Contract 58, approved July 1875, 2, 3, 15, 16, 28, 29, 40, 55, 58, 60. (NMID29)

Those settlers might have been driven to the West by a conviction that God had pre-ordained their country's destiny to spread across the continent. A reflection of that belief came in the form of multiple laws enacted by Congress, whose members hoped to encourage permanent settlement of the country's far-flung western lands. By 1880, Congress had passed two key pieces of legislation to encourage settlement on public lands. First was the 1863 Homestead Act, a law providing free land to settlers who could prove residence on the land and the cultivation and improvement of at least a portion of it. The promise of free land was expected to lure people to the western territories, and it worked. However, the 1863 law limited acquisition by any individual to 160 acres, a relatively small plot for the amount of capital and labor it took to actually make the land productive. It became clear to policy makers within a few years that settlement west of the 100th meridian was unique and challenging. Water was a major problem, and Congress tried to facilitate successful settlement by passing another law that increased the total acreage (to 640 acres) that could be acquired by an individual but which also required proof that water rights had been secured through existing or planned systems. The Desert Land Act encouraged even more people to migrate west. The citizens who took advantage of these offers of free land left behind a treasure of documents generated by the paperwork that the government required them to file before obtaining title to their land. Among the information the settlers were obliged to provide was a description of the land, and, depending on which law they used to apply for their land and what year they did it, a description of how they would water their lands.

ENTREPRENEURS

THE RIDENBAUGH CANAL

Two years after Allen Thompson completed his 1875 General Land Office surveys, William B. Morris began construction on the Ridenbaugh Canal. Morris hoped that the canal would serve to develop irrigation on the lands south of the Boise River. In this early period, the canal was little more than a small ditch. Over the years, multiple companies and numerous construction efforts provided the foundation for the intricate irrigation system that serpentines today's landscape and waters the lands in what we now know as the Nampa & Meridian Irrigation District. In 1877, the *Tri-Weekly Statesman* explained that the canal stretched for seven miles and employed 45 sub-graders or shovelers and 20 teams of scrapers and plows. In addition to the main ditch, the *Statesman* article explained that "two miles of smaller ditches have been constructed for distributing the water over the land."[35] Together, the system would form the earliest working portion of the vast and intricate system of irrigation.

In addition to constructing what would become the Ridenbaugh Canal, Morris also purchased land to the south of Boise. Construction continued on these lands, where Morris commissioned the construction of smaller ditches which enabled the distribution of water from the canal.[36] By the close of 1878, the seven-mile long ditch was complete, irrigating approximately 1,200 acres of land south of Boise.[37] That same year, Morris passed away and ownership of the ditch reverted to his

[35] "Completed," *Idaho Tri-Weekly Statesman*, May 4, 1878. (NMID283)
[36] "The South Boise Canal and Land—A Magnificent Property," *Idaho Tri-Weekly Statesman*, Oct. 12, 1878. (NMID284)
[37] MacDonald, HAER report, Sept. 2002, updated April 2008, Draft. (NMID5)

widow, Lavinia T. Morris, and his nephew, William H. Ridenbaugh. Despite lacking investment funds, Ridenbaugh followed in his uncle's entrepreneurial footsteps and filed a notice for an additional 30,000 inches of water. However, his aspirations were short lived. Ridenbaugh was unable to obtain the capital needed to extend the canal and eventually sold it in 1883. Over the course of the next twenty years, approximately eight investment companies owned and tried to extend and make a success of the Ridenbaugh Canal.[38]

The first group to own the canal after Ridenbaugh sold it was a group of men named Ogilvy, Settle, and Dunn. Soon after their purchase was complete, the men proclaimed that "as soon as the irrigating season is over, the upper portion of the Morris canal will be enlarged to the same width as that of the extension."[39] But from 1884-1886, a lack of newspaper reporting on construction plans suggests that prevailing economic conditions severely hampered irrigation development.[40]

Though Ogilvy, Settle, and Dunn had great plans for the canal, it appears that the economic conditions proved too difficult an obstacle to overcome, a problem that plagued subsequent owners, as well. By November 1887 the Boise and Nampa Canal Company had obtained control of the canal and verbalized plans to extend it to the city of Nampa.[41] But by autumn 1888 the canal was once again sold and remained just seven miles long.[42]

In September 1888, the Idaho Central Canal and Land Company became the newest owner of the Ridenbaugh. Like its predecessors, the company immediately began making plans to extend the canal.[43] But in contrast to them, the Central Canal and Land Company was able to execute on its plans and began work immediately. On May 10, 1889 the *Idaho Daily Statesman* published an article detailing the work and reporting that the company began construction with "the needed enlargement and improvements at the headgate or initial point of the enterprise," and that the canal had also been widened."[44] According to the article the canal was 20 feet wide at its base and 30 feet wide at its surface, with a water depth of six feet, and a capacity of 300 cubic feet per second.[45] Work on the canal's extension continued into the winter of 1889, when the *Idaho Daily Statesman* reported that,

> "the extension of the Ridenbaugh Irrigation Canal is progressing rapidly. Some twelve miles of the extension are already completed, taking the canal to a point beyond Ten Mile Creek. Within another week a point on the bench will be reached from which the town of Nampa can be seen. Should the winter prove as favorable for outdoor work…the Canal will be completed to Nampa and beyond, long before the water will be needed for irrigation next season."[46]

---

[38]MacDonald, HAER report, Sept. 2002, updated April 2008, Draft. (NMID5); Idaho State Historical Society Reference Series, Ridenbaugh-Rossi Mill Ditch, Number 151, 1974, 1-2. (NMID237)
[39] "Irrigation," *Idaho Tri-Weekly Statesman*, May 10, 1883. (NMID285)
[40] MacDonald, HAER report, Sept. 2002, updated April 2008, Draft. (NMID5)
[41] "Local Intelligence," *Idaho Tri-Weekly Statesman*, Nov. 8, 1887. (NMID286)
[42] MacDonald, HAER report, Sept. 2002, updated April 2008, Draft. (NMID5)
[43] "South Side of the River," *Idaho Daily Statesman*, Sept. 22, 1888. (NMID287); MacDonald, HAER report, Sept. 2002, updated April 2008, Draft. (NMID5)
[44] "The Ridenbaugh Ditch," *Idaho Daily Statesman*, May 10, 1889. (NMID288)
[45] "The Ridenbaugh Ditch," *Idaho Daily Statesman*, May 10, 1889. (NMID288)
[46] "Ridenbaugh Irrigation Canal," *Idaho Daily Statesman*, Dec. 7, 1889. (NMID289)

In spite of the capital expended on improving and extending the Ridenbaugh Canal, the Central Canal and Land Company sold the Ridenbaugh to the newly incorporated Boise City and Nampa Irrigation, Land and Lumber Company on April 25, 1890, deeming it a "poor investment."[47]

Work on the canal continued to move rapidly under the new ownership. Determined to have the canal reach Nampa by January 1, 1891, the Boise City and Nampa Irrigation, Land and Lumber Company contracted one company to complete three (3) miles of the canal extension and commissioned another company to construct 11 additional miles.[48] The *Idaho Daily Statesman* reported that the work was "to be completed to Nampa by January 1, 1891, or the contractors are to forfeit $25 a day until the work is completed."[49] As canal construction continued, the Boise City and Nampa Irrigation, Land and Lumber Company set out to diversify its holdings. Several company officials purchased land south of the Ridenbaugh, close to Nampa.[50] In the meantime, the officers of the new company traveled east to obtain additional investments for the work, and convinced Buffalo capitalists H.L. Taylor and J. Satterfield to invest heavily in the enterprise.[51]

Thus, by the end of 1891 the Boise City and Nampa Irrigation, Land and Lumber Company possessed an impressive enterprise and the capital to do still more. The *Idaho Daily Statesman* noted that "one hundred and five miles of the Boise & Nampa canal, including the main canal and the laterals have been completed and are carrying water."[52] In addition, an electric light reservoir was filled on the Boise bench, with the 80-foot water fall providing power for the growing manufacturing industry in the Boise valley.[53] Other parts of the enterprise's grand scheme included surveys for multiple lakes and reservoirs along the Ridenbaugh's path, including Lake Ethel, Lake Marie, Lake Nampa, and Lake Paradox, among others. By 1893, the ditch was constructed all the way to within a few miles of Nampa with a bottom width of 22 feet, a top width of 32 feet, and a water capacity at its headgate of 66,000 inches.[54] Plans to double the capacity of the lengthened ditch were soon hatched and implemented by the purchase of a steam dredge to work atop a boat

---

[47] MacDonald, HAER report, Sept. 2002, updated April 2008, Draft (NMID5); Richard J. Hinton, *A Report on Irrigation and the Cultivation of the Soil Nearby…for 1891, Part I*, 52 Cong., 1st sess., Senate Ex. Doc. 41, Part 1, under direction of the Secretary of Agriculture, 175. (NMID292)
[48] "The B.C.&N.I.L.&L. Co," *Idaho Daily Statesman*, Nov. 9, 1890. (NMID290)
[49] "The B.C.&N.I.L.&L. Co," *Idaho Daily Statesman*, Nov. 9, 1890. (NMID290)
[50] MacDonald, HAER report, Sept. 2002, updated April 2008, Draft. (NMID5)
[51] *Idaho Daily Statesman*, Sept. 15, 1892. (NMID309)
[52] "Local Brevities," *Idaho Daily Statesman*, Aug. 18, 1891. (NMID291)
[53] "Boise City, Idaho," *Idaho Daily Statesman,* Dec. 12, 1892. (NMID310)
[54] "Ridenbaugh Ditch," *Idaho Daily Statesman,* March 29, 1893. (NMID298) Although a 1942 University of California Master's thesis in history by Paul Murphy suggests that the company had constructed multiple lakes along the Boise Bench at the conclusion of 1891, it is clear from the majority of other sources that only one lake – Lake Ethel – was ever constructed as part of the company's plans. In his 1942 Master's thesis in history for the University of California Paul Murphy wrote that the company's holdings in 1891 included "a chain of ten lakes and reservoirs for storage," for which he cites the 1891 Congressional Irrigation Report by Richard Hinton. It is clear when examining the Congressional report that the lakes were planned but not constructed, therefore Murphy's assertion is incorrect. Paul Lloyd Murphy, "Irrigation in the Boise Valley. 1863-1903: A Study in Pre-Federal Irrigation" (master's thesis, University of California, 1948), 62-63. (NMID263)

constructed for the purpose.[55] Over the ensuing years, the canal and its associated infrastructure continued to serve the lands under it as its owners contemplated additional expansion.

ENTREPRENEURS

A.D. FOOTE AND THE IDAHO MINING AND IRRIGATION COMPANY

Morris and his successors were not the only entrepreneurs in the valley. In 1883, the same year Ridenbaugh first sold the canal, eastern capitalists sent engineer A.D. Foote to Idaho to inspect the land between the Boise and Snake Rivers for the purposes of potential investment in a system of reclamation and irrigation. Foote's observations are useful again for offering a glimpse onto a landscape that had not yet been fully manipulated. Foote's examinations – undertaken between 1883 and 1887 – reflect an era that immediately preceded major changes to the landscape and especially to the area south of the Boise River, when the previously dry creek beds began to run more regularly due to the return flows and waste water from the newly constructed canals. His notations regarding the landscape closely match those of the GLO surveyors ten years earlier, and are perhaps more significant because he observed the landscape and hydrology with an eye toward irrigation development. Thus, any encounter with water would no doubt have figured into his analysis.

Upon examination and survey, Foote reported back to his employers in March of 1883 with a description of his proposed canal line. Discussing what would become the New York Canal, he noted:

> A branch from this point [at the top of the mesa], running down the highest part of the divide, will cover all of the land lying between Boise River and Five-mile Creek, amounting to about thirty thousand acres. Thence, with an irregular line following the contour of the land, the canal continues southward toward Snake River, putting off branches at the highest points between Five-mile and Ten-mile, and Ten-mile and Indian Creeks. *These creeks have an existence only for a few days in the winter or spring, as they are called into life by melting snows or rains.*"[56] [Emphasis added.]

The map accompanying the report, presumably drawn either by Foote or at his direction, showed Five Mile, Ten Mile and Indian Creeks, and all three were depicted with the words "dry channel" written next to their names.[57] (See Figure 3.)

Encouraged by Foote's report, the capitalists organized the Idaho Mining and Irrigation Company in 1884 and filed upon a large volume of water in the Boise River that year. They intended to apply to purchase or homestead thousands of acres of land upon which the water would be applied.

---

[55] "Ridenbaugh Ditch," *Idaho Daily Statesman*, March 29, 1893. (NMID298) It was not long before the company's big plans went awry. A lawsuit by Taylor and Satterfield against the company's operators soon resulted in an ownership change through a fire sale, and then another series of owners before the Nampa & Meridian Irrigation District was formed. Only Lake Ethel was ever constructed. See below for additional details. "Attachment Suit Filed," *Idaho Daily Statesman*, Aug. 24, 1893 (NMID311)

[56] Foote, *Feasibility of Irrigating…*, 17. (NMID41)

[57] Foote, *Feasibility of Irrigating…*, 23. (NMID41)

Foote revised his report that year, and added detail to it. The second version of Foote's report described the Boise area in general terms before moving on to the specifics of the land being marketed by the company. Foote prefaced the subject by deeming irrigated land drainage as "nearly" as important as the irrigation itself, and then continued:

> The lands controlled by this company have...the immense advantage of local slopes and drainage channels. For instance: Indian Creek has a regular fall of twenty-six and one half feet to the mile…The line of the company's canal runs on the south side of it at a distance of from six to ten miles away. The land between the two is permeated by hundreds of slight, natural drainage channels, or draws, each with its branches, leading from the canal to the creek. Channels is not quite the word for them, as they are seldom strongly marked enough to have a channel. Slight depressions between slight knolls would perhaps describe them better. It is precisely the same way between the other creeks, altogether making as perfect a system of drainage as could be desired. *It might be well to mention that the creeks spoken of are simply dry channels, which the melting snows, when there are any, fill in the spring, until the frost comes out of the ground. After that the dry soil takes every drop of moisture there is and the creeks vanish*. [Emphasis added.][58]

Foote also described the duty of water in the area, the availability of timber, and the placer mining opportunities before launching into another description of the canal he proposed to build. He explained that the canal would take out of the river in a canyon about ten miles above Boise. At a point at the top of the mesa, he had designed the canal to make a sharp turn south so as to avoid the grading. Because of the savings in grade, the canal reached the next cut at a higher place and therefore saved more grade at the cut between what he called Seven and a Half and Ten Mile Creeks. He explained that there was "almost no natural drainage across this line," and that the creeks were so small and short that they made perfect locations for waste gates, allowing for a much less expensive canal than in other places where they needed to place flumes to get across drainages.[59] Foote urged the use of waste gates, explaining that while some people might deem them unnecessary, they were actually good for the increased safety of the canal. If the canal were ever to break, he explained, the waste gates "render it much more harmless, as the water above any break can quickly be taken away. The natural channels are there, and it is better to use them." He opined that it might be "advisable also to use the valley of Five and Seven and a Half Mile Creek as reservoirs."[60] It is not clear precisely which creek Foote intended with use of the term "Seven and a Half Mile Creek," but the creek was insignificant enough to be left off the sketches that accompanied all three versions of Foote's reports between 1883 and 1887.

Based on the progress of the Ridenbaugh and the reports issued by Foote, it is clear that by 1890, the rush to irrigation had begun in earnest. Foote's company ultimately was responsible for the partial construction of both the New York and the Phyllis Canals, two of the biggest in the valley. Enthusiastic construction of the canal recommended in Foote's reports – the New York – began in 1890 but stopped soon after it started. The financial panic that occurred in 1893 and the resulting financial circumstances of the capitalists, together with mismanagement of the project, resulted in

---

[58] A.D. Foote, *The Idaho Mining and Irrigation Company* (New York: Theo. L. Devinne Printers, 1884), 14. NMID40

[59] Foote, *The Idaho Mining and Irrigation Company*, 32. NMID40

[60] Foote, *The Idaho Mining and Irrigation Company*, 33. NMID40

only partially completed work. Consequently, the canal was not put into service until 1900 and even then was not complete. The Ridenbaugh, however, was in good shape by March 1891, as described above, and was watering many thousands of acres. According to the company secretary, Freemont Wood, the main line of the Ridenbaugh Canal had been "constructed, completed and conveying water past the head of…Mason Creek extension since the spring of 1891."[61] (Details on this construction and the creation of Mason Creek will be provided in the next section of this report.) Other canals in the valley, including the Settlers and Phyllis Canals, gradually began delivering additional water throughout the 1890s, putting increasing acreage into production across the desert lands south of the Boise River.

SETTLERS

Despite the speculative nature of land development and the unreliability of canals constructed in this part of the Boise River Valley in the late 19th century, settlers were determined to obtain the government-offered free lands. The process of doing so was complex, requiring a good deal of paperwork and the effort to get witnesses to testify in support of the application. Applicants for lands under the Homestead and Desert Land Acts were required to file a series of documents during the three to five years it took to "prove up" their claims. The forms asked many questions, including improvements made on the land, length of residence, citizenship, crops grown, and (for Desert Land applications) the source of water for irrigation.

Settlers began to apply for lands in the Boise area in the 1860s, but the real influx to the valley began in the 1880s. The first to apply to the federal government for a land patent near Five Mile Creek was James Daley in Section 7, Township 3 North, Range 1 East, the same township where that creek heads. By 1885, Daley was working on filing the necessary paperwork to perfect his patent under the Homestead Act. Daley was one of many citizens who filed on land along Five Mile Creek, but not a single one of the settlers who homesteaded adjacent to the creek named it as a natural body of water on their property that could be used for irrigation.[62] Many of them described the land instead as "sage-brush land" or "sagebrush plains,"[63] and even detailed the means by which they were receiving Boise River water (as opposed to creek water) for irrigation.

---

[61] Boise City and Nampa Irrigation, Land, and Lumber Company, a corporation, Right of Way Filing for Extension of Canal and for Reservoir Locations in the Boise City Land District, April 24, 1895, Entry UD 569 Old Canal & Reservoir Files, Boise City and Nampa Irrigation & Lumber Co., Box 2, Record Group 49, Records of the Bureau of Land Management,, U.S. National Archives, Washington D.C.. (NMID275)

[62] As one patent file example, see the following primary source. Homestead Proof-Testimony of Witnesses, David Howry and H. Young, Oct. 31, 1885, and Homestead Proof-Testimony of Claimant, John Daley, Oct. 31, 1885, Homestead Entry Patent File 457, Township 3 North, Range 1 East, James Daley, Box 312, Land Entry Files, Boise City, Record Group 49, Records of the Bureau of Land Management, U.S. National Archives, Washington D.C. (NMID173) Note: All Homestead and Desert Land patent files can be found in Record Group 49, Records of the Bureau of Land Management, U.S. National Archives, Washington D.C., unless otherwise stated.

[63] Homestead, Pre-Emption, and Commutation Proof, Testimony of Witness, Solomon Pettit and Milton Burns, Jan. 15, 1889, and Homestead, Pre-Emption, and Commutation Proof, Testimony of Claimant, Lucy Fox, widow of Charles Fox, Jan. 15, 1889, Homestead Entry Patent File 646,Township 3 North, Range 1 West, Charles and Lucy Fox, Box 315, Land Entry Files, Boise City. (NMID192); and Final Proof under the Desert-Land Act of March 3, 1877, James Nelson, June 18, 1890, Desert Land Patent File Entry 123, Township 3 North, Range 1 West, Fremont Wood, Box 397, Land Entry Files, Boise City. (NMID191)

One settler went so far as to provide a description of Five Mile Creek in her paperwork. Cascinda Sanders filed a Desert Land Entry application for land in Section 2 of Township 3 North, Range 1 West. As such, she was required to describe how water was going to be applied to her lands. On January 8, 1890 George Field appeared before the Boise Land Office to testify on Sanders's behalf. He noted that "no living streams or other body of water" existed on Sanders's land. However, he also explained that the corner of Five Mile creek ran through Sanders's property but only ran "during the rains of the early spring and fall of the year for a short time." On the same day, William Sanders also testified for Cascinda Sanders. He also testified that Five Mile Creek only ran during the early spring and fall, and noted further that Sanders's water was obtained from the Boise River via a ditch. Finally, Cascinda Sanders's own testimony underscored the ephemeral nature of the stream, stating that while the corner of Five Mile Creek coursed through her land, it only contained water during the rains of early spring and fall and only for short times.[64]

Ten years after Sanders filed her Desert Land Entry application, the characteristics of Five Mile Creek were further explored in a 1900 lawsuit between Luther and Susan Snyder and the Boise City Irrigation and Land Company (owner of the Ridenbaugh Canal prior to the Nampa & Meridian Irrigation District). The case revolved around whether the Five Mile "slough" or "drain" was natural or man-made. The company's complaint in the case accused the couple of tapping, diverting and selling water which belonged in the company's ditches and laterals, specifically what they referred to as the Five Mile Drain. The company asserted that the waterway was a man-made ditch and that they had claimed rights to the water that was discharged via construction of the drain. Luther Snyder, however, asserted that "the five mile slough mentioned in plaintiff's complaint is a natural channel for the running and carrying of melted snow and waters that fall on the lands in the vicinity of the said slough."[65]

As the case progressed, the Boise City Irrigation and Land Company filed into evidence several documents, including a May 17, 1899 Notice of Water Right belonging to R.E. Green, the manager of the company, that predated the filing of the lawsuit. The document noted that the company (by way of Green) "hereby claims the use of the waters of the herein described drain ditch now constructed or in process of construction." The document further explained that the purpose of the constructed drain ditch was to "divert water or begin said drain ditch at or near the point where a copy of this notice is and more definitely described as follows." Appended to the document was a detailed description of the area in which the company had initiated and completed construction of the drain on Five Mile Slough. The description maintained that the waterway from the NW 1/4 of the SW 1/4 of Section 24 in Township 3 North, Range 1 East (or the intersection of the Farmer's Lateral and Five Mile Slough) moving in a northwesterly direction all the way to the NE 1/4 of Section 2 in Township 3 North, Range 1 West (to the South Slough Lateral) had been under or was in the process of construction when the water right was issued. Additionally, the description explained that the south branch of Five Mile Slough, starting in the NE 1/4 of the NE 1/4 of Section 27 in

---

[64] Desert Land Act of March 3, 1877, Affidavit of Witness, George Field, Jan. 8, 1890 and William Sanders, Jan. 8, 1890, and Desert Land Act of March 3, 1877, Declaration of Applicant, Cascinda Sanders, Jan. 8, 1890, Desert Land Entry Patent File 158, Township 3 North, Range 1 West, Cascinda Sanders, Box 398, Land Entry Files, Boise City. (NMID207)

[65] *The Boise City Irrigation and Land Co., a corporation, Plaintiff, vs. Luther Snyder and Susan S. Snyder, Defendants*, Separate Answering of Deft. Luther Snyder, Feb. 2, 1901, Ada County District Court Civil Cases, 1890-1908, Cases 46-83 AR 202, Records of Ada County, at the Idaho State Archives and Record Center (hereafter: SARA). (NMID269)

Township 3 North, Range 1 East (where Five Mile intersected with the Farmer's Lateral) and moving northwesterly to the S 1/2 of the NW 1/4 of Section 16 in Township 3 North, Range 1 East, also was artificially constructed.[66] (See Figure 4.)

Although the historical record does not provide the answers as to how the case was settled, the documentation is nonetheless significant in its details regarding the intentional alteration and use of Five Mile Creek for water delivery in the years predating the turn of the century. While Green's Notice of Water Right does not indicate precisely *how* the Boise City Irrigation and Land Company altered or constructed segments of Five Mile Slough Drain, it does indicate that humans manipulated the seasonal waterway; his water right application describes the so-called "creek" as a "drain ditch now constructed or in the process of construction." Green's water right application likewise reveals that by at least 1899, irrigation companies, specifically the Boise City Irrigation and Land Company, altered and engineered depressions in the natural landscape for the use of irrigating land. Thus, private companies were actively constructing ditches for drainage and to develop an additional water supply even before the federal government created the Bureau of Reclamation in 1902. Five Mile Slough was not a reliable source of water for settlers seeking to reclaim land before Green's employer (Boise City Irrigation and Land Company) deepened it, but once the drain ditch was constructed to collect excess flows, a new water supply was developed. These creeks – in this case, Five Mile – did not become a reliable source of water under they were deepened and constructed to collect the excess flow.[67]

Ten Mile Creek was equally absent as a noted source of irrigation water on these lands before the 1890s, but patent documents show that this creek was used for *water delivery* purposes as early as 1887. For instance, the neighbors who testified on behalf of settler Freemont Wood's patent application provided useful testimony in 1887 about the nature of both these creeks.[68] Wood had filed for 280 acres of land in Sections five (5) and six (6) of Township 3 North, Range 1 West under the Desert Land Entry act. This was a piece of land through which Ten Mile Creek flowed when it carried water. However, his witnesses explained that Wood obtained water through an intricate system of ditches and laterals and indicated that Ten Mile Creek was not a reliable source of water to irrigate Wood's land. One affiant, Charles Stewart, explained that Wood's property was situated on "sage brush plain between Five and Ten Mile Creeks" and that "no natural streams or bodies of water [are] upon or pass through or adjoin" Wood's land. He explained that the only exception was "Ten Mile Creek which has water it its bed very seldom, being dry most of the year. Last year it had no water in it at all."[69]

---

[66] In the District Court of the Third Judicial District of the State of Idaho, In and For the County of Ada, *The Boise City Irrigation and Land Co., a corporation, Plaintiff, vs. Luther Snyder and Susan S. Snyder*, Defendants, Complaint, Oct. 3, 1900; and In the District Court of the Third Judicial District of the State of Idaho, In and For the County of Ada, *The Boise City Irrigation and Land Co., a corporation, Plaintiff, vs. Luther Snyder and Susan S. Snyder, Defendants*, Separate Answering of Deft. Luther Snyder, Feb. 2, 1901 and Notice of Water Right, R.E. Green, Manager of The Boise City Irrigation and Land Co., May 17, 1899, Civil No. 66 in the District Court, *Boise City Irrigation and Land Company, a corporation vs. Luther Snyder and Sarah Snyder*, Action for Injunction, Ada County District Court Civil Cases, 1890-1908, Cases 46-83, AR 202 Records of Ada County, SARA. (NMID269)

[67] Notice of Water Right, R.E. Green, 1899 (NMID269)

[68] Wood is the same man affiliated with the company that owned the Ridenbaugh canal at the time.

[69] Desert Land Entry Patent File 123, Township 3 North, Range 1 West, Fremont Wood, Box 397, Land Entry Files, Boise City. (NMID191) For some additional examples, see: Homestead Proof-Testimony of Witnesses, Lewis Corcoran and

While Ten Mile might have been dry most of the time, A.D. Foote's examination and survey of the land from the 1880s had urged both his own investors and other competing canal companies to use this and the other creeks to convey water to farms. Additional paperwork from Wood's patent application shows that the creeks were in fact subject to such human engineering as early as 1887. Testifying on behalf of Wood, James Nelson explained how Wood intended to obtain water to irrigate his land. Noting that the natural character of the property was "sage brush plains between Five and Ten Mile Creeks," and that "no natural streams or bodies of water are upon or pass through or adjoin" Wood's land, he then explained how Five Mile Creek was used to direct water to his land: "water was brought from the Boise River through the Settlers Ditch and was then turned into south slough between 6 and 7 miles from the [Boise] river." After running through the south slough, the water entered into Five Mile Creek and was again taken out and carried through a ditch with a capacity of 300-400 inches of water having a width of three feet and depth of two feet at the head gate.[70] Figure 5 (a 1901 map) depicts the Settlers Irrigation District and shows the configuration of this scheme.

By at least the 1890s, Ten Mile Creek was utilized in this manner as well. A Desert Land Entry application by W. Scott Neal for 160 acres in Section 19 of Township 3 North, Range 1 East was approved and granted in 1901 by President William McKinley. Paperwork for the application noted that "Ten Mile Creek sometimes furnishes small water supply before irrigation season commences," but that the channel was "usually dry." The maps submitted with the application shows that the Ridenbaugh Canal, however, used Ten Mile Creek to deliver water to the land in question. (See Figure 6.)

In addition to Wood's and Neal's patent applications, other sources show that these creeks were gradually being subjected to engineering and manipulation, and that they were carrying more water than they had naturally carried before irrigation. The *Idaho Daily Statesman* reported in February 1896 that farmers in Meridian also planned to convey water to Five Mile Creek at "a point about three miles from the end of the New York canal and thence to the farms in the vicinity of Meridian."[71] By 1901, so much water was flowing in the creek that residents had begun filing for water rights on it, noting that the "water in question is the waste water from the New York canal and smaller ditches."[72] Five Mile Creek was even used to divert water out of canals during dangerous flood periods in order to avoid damaging the canals.[73]

Indian Creek was no different than Five Mile and Ten Mile. Indian Creek's historic flows – which had been enough at times in its upstream reaches (near Kuna) to cause accidents[74] – occurred

---

Columbus Haynes, Dec. 11, 1894, Homestead Entry Patent File 1090, Township 3 North, Range 1 East, Frank Foster, Box 322, Land Entry Files, Boise City. (NMID185); and Homestead Proof-Testimony of Witness, Fayette Baker and Ephraim Belfoag, Aug. 5, 1896, and Homestead Proof-Testimony of Claimant, Edward Crawford, Aug. 5, 1896, Homestead Entry Patent File 1222, Township 3 North, Range 1 East, Edward Crawford, Box 324, Land Entry Files, Boise City. (NMID180); Homestead Proof-Testimony of Witness, David Dealy and Causfield Towner, Aug. 23, 1897, and Homestead Proof-Testimony of Claimant, John Clauson, Aug. 23, 1897, Homestead Entry Patent File 1289, Township 3 North, Range 1 East, John Clawson, Box 325, Land Entry Files, Boise City. (NMID198) (There are 4 others we have as well if we want to be inclusive.)

[70] Final Proof under the Desert-Land Act of March 3, 1877, James Nelson, June 18, 1890, Desert Land Entry Patent File 123, Township 3 North, Range 1 West, Fremont Wood, Box 397, Land Entry Files, Boise City. (NMID191)

[71] "Local Brevities," *Idaho Daily Statesman*, Feb. 28, 1896. (NMID News80)

[72] "Brief Local News: Water Location," *Idaho Daily Statesman*, Apr. 27, 1901. (NMID News81)

[73] "Damage to Canals and Railroad Lines," *The Idaho Daily Statesman*, Mar. 31, 1904. (NMID News82)

[74] "Accident," *Tri-Weekly Statesman*, Feb. 23, 1884. (NMID News83)

frequently enough to require bridges at certain places. The *Statesman* had even reported in June 1887 that a bridge was being placed over Indian Creek on the Nampa branch road.[75] Despite these instances, residents typically expected the creek to be dry most of the year in many places.

One such resident was George Fulmer who owned property in Section 31 of Township 3 North, Range 1 West. While filing his Final Proof for his Desert Land Entry application in 1892, Fulmer asserted that "the bed of Indian Creek runs through the land, [however] it is a dry stream except in early spring and affords no natural irrigation." Thomas McKee bolstered Fulmer's assertion and explained that Indian Creek ran through Fulmer's property but described it as a "dry run except in early spring. It does not naturally irrigate the land." Needing a secure irrigation source, Fulmer chose to obtain water from the Boise River via the canals of the Boise and Nampa Irrigation, Land and Lumber Company in addition to his own laterals.[76]

Indian Creek's surrounding topography presented additional challenges for settlers attempting to reclaim their land. In 1907 Jennie Beck submitted the Final Proof for her Desert Land Entry application for property in Section 24 of Township 1 North, Range 4 East, close to where the creek rises in present day Elmore County. According to Beck, Indian Creek ran across her land and was eight feet wide and two feet deep. But in spite of Beck's best efforts to utilize water in Indian Creek, the banks of the creek proved too high and prevented her from naturally irrigating her land.[77] A settler downstream by the name of John McGinty had made similar assertions years earlier. Indian Creek wound through McGinty's land in Section 6 of Township 3 North, Range 2 West. An 1894 plat map appended to McGinty's entry maintained that "Indian Creek is a deep ravine where it passes through the land."[78] The combination of a dry bed and high banks clearly deterred settlers from relying on Indian Creek to irrigate their land throughout its entire course.

Multiple maps submitted for land entries over the years underscored Indian Creek as a historically "dry" course.[79] In fact, a 1894 map of the Boise & Nampa Irrigation Canal which showcased the majority of Ada County went so far as to categorize Indian Creek as "Indian Canal," insinuating both manipulation and diversion were required in order for adequate use. Interestingly, the same map

---

[75] "Local and General," *Tri-Weekly Statesman*, June 21, 1887. (NMID News84)

[76] Final Proof Under the Desert-Land Act of March 3, 1877, Deposition of Applicant, George Fulmer, May 17, 1892 and Final Proof Under the Desert-Land Act of March 3, 1877, Deposition of Witness, Thomas McKee, May 17, 1892, Desert Land Entry Patent File 172, Township 3 North, Range 1 West, George Fulmer, Box 398, Land Entry Files, Boise City. (NMID229)

[77] Final Proof under the Desert-Land Acts of March 3, 1877, and March 3, 1891, Deposition of Witness, Grover Corder, March 13, 1908 and Final Proof under the Desert-Land Acts of March 3, 1877, and March 3, 1891, Deposition of Applicant, March 13, 1908; Desert Land Entry Patent 47861, Township 1 North, Range 4 East, Jennie Beck, Box 420, Land Entry Files, Boise City. (NMID244)

[78] Desert Land Act of March 3, 1877, Affidavit of Witness, John McGinty, Feb. 7, 1893 and Plat Map illustrating irrigation water, Updated, Desert Land Entry Patent 352, Township 3 North, Range 2 West, John McGinty, Box 405, Land Entry Files, Boise City. (NMID225)

[79] Plat Map illustrating irrigation water, Undated, Desert Land Entry Patent File 352, Township 3 North, Range 2 West, Jennie Harris, Box 405, Land Entry Files, Boise City. (NMID225); Map of Desert Land Entry of Edwin Herrington, Undated, Desert Land Entry Patent File 352, Township 3 North, Range 2 West, Edwin Herrington, Box 405, Land Entry Files, Boise City. (NMID225); Plat Showing Source of Water for Sec.'s 5 and 8, Undated, Desert Land Entry Patent File 401, Township 2 North, Range 1 West, Richard Green, Box 408, Land Entry Files, Boise City (NMID231); Untitled Hand Drawn Map, Undated, Desert Land Entry Patent File 594, Township 2 North, Range 1 East, Ellery Coles, Box 418, Land Entry Files, Boise City. (NMID235)

identified "Ten Mile Canal" and "Five Mile Canal" which were often referred to in other documentation as creeks.[80]

That same year, 1894, the company secretary, Fremont Wood provided testimony which corresponded with the Boise City and Nampa Irrigation, Land and Lumber Company's application for the location and withdrawal of several reservoir sites. Wood specifically addressed the characteristics of Indian Creek, stating that aside from a short time in the spring, the creek was "not a living stream of water during the entire year anywhere within" Ada and Canyon counties. Additionally, Wood's testimony revealed that a small body of water flowed for a few miles in Elmore County, after which the creek "sinks and is lost." Most importantly, Wood emphasized that water did not pass through Indian Creek "where it crosses the canal of the Boise City and Nampa Irrigation, Land and Lumber Company at any time during the irrigation season," except in the spring due to the snow melt.[81]

The following year Wood addressed Indian Creek again while filing a Right of Way for the Boise City and Nampa Irrigation, Land, and Lumber Company. Wood explained that the company's proposed reservoir site was situated on what was commonly known as Indian Creek which he claimed was "dry during the entire year." He also noted that the right-of-way's location did "not appropriate any natural stream…and reservoir locations do not embrace any Lake [sic] bed or the bed of any natural stream." Wood concluded his testimony by stating that the spring water and the water appropriated to the dry bed of Indian Creek was specifically for the purpose of filling a potential reservoir thirty miles north east of Lake Nampa.[82] This lake was never constructed, but both of Wood's explanations clearly demonstrate that by 1895 Indian Creek was both unreliable in terms of regular flows, as well as intended for artificial delivery of water to support the Boise City & Nampa Irrigation, Land and Lumber Company's growing irrigation network.

Such manipulation and the increase in return flows caused Indian Creek to begin flowing with more regularity in the early 1890s. In 1891 the *Idaho Daily Statesman* reported:

> It has been a matter of surprise and wonder to a great many why Indian creek, which runs through the center of the town [Caldwell], has so much running water this year, when heretofore it was as dry as a bone, save a short time in the spring when the snow went off. The explanation is simple. All the waste water of the Ridenbaugh and Phyllis ditches eventually gets into Indian creek and down it comes. The more canals they build above us,

[80] Map of Boise & Nampa Irrigation Canal, Ada County, Idaho, circa 1894, Entry UD 569 Old Canal & Reservoir Files, Boise City and Nampa Irrigation & Lumber Co., Record Group 49, Records of the Bureau of Land Management, U.S. National Archives, Washington D.C.. (NMID275)
[81] Before the Secretary of the Interior, Washington D.C., Application for the Location and Withdrawal of Reservoir Sites for what is known as Lake Nampa, Lake Geneva, and Lake Paradox, Feb. 23, 1894, Entry UD 569 Old Canal & Reservoir Files, Boise City and Nampa Irrigation & Lumber Co., Box 2, Record Group 49, Records of the Bureau of Land Management,, U.S. National Archives, Washington D.C. (NMID275)
[82] Boise City and Nampa Irrigation, Land, and Lumber Company, a corporation, Right of Way Filing for Extension of Canal and for Reservoir Locations in the Boise City Land District, April 24, 1895, Entry UD 569 Old Canal & Reservoir Files, Boise City and Nampa Irrigation & Lumber Co., Box 2, Record Group 49, Records of the Bureau of Land Management, U.S. National Archives, Washington D.C. (NMID275)

> the more water for Caldwell. All that is necessary now is to dam the creek, construct a reservoir and let it fill with waste water.[83]

Declaring Caldwell to have "cinched" the water question, the paper ran regular reports over the ensuing few years about plans to dam Indian Creek and use the water for orchards and farms. In 1893, the newly formed Orchard Irrigation Company purchased the reservoir sites, reservoirs, dams, and ditches on Ten Mile and Indian Creeks from J.M. Clark, who then stayed on as manager and superintendent of the operations.[84] The major 1894 flood noted above caused the Indian Creek dam to breech, but that did not stop the residents from continued efforts to use Indian Creek for irrigation purposes.

Therefore, by the 1890s, the configurations and flows of Five Mile, Ten Mile, and Indian Creeks were no longer indicative of their natural, pre-engineered state. All three creeks had been naturally ephemeral streams in pre-settlement times; none flowed except in the spring and during floods. The application of artificial irrigation through the construction of laterals and canals to serve the additional lands being settled changed the hydrology of these creeks. The creeks now carried return flows and were utilized to deliver water for irrigation purposes, both of which altered their course and their flows.

THREE MILE, EIGHT MILE, NINE MILE, AND MASON CREEKS

The historical record shows that by the turn of the 20th century, many new "creeks" also began to appear, none of which were noted to have existed in the GLO surveys discussed above. In fact, by the middle of the 1890s, water was flowing across the south desert in places that had heretofore been even drier than Five Mile, Ten Mile, or Indian Creeks and had never been recorded by the surveyors who were specifically directed to note such features. The record reveals that the water was definitively a consequence of the increasing acreage subjected to artificial irrigation from the sundry canals being constructed. This part of the report will describe the appearance of these new "creeks" from east to west.

Three Mile Creek first appears as a place name just after the turn of the 20th century. Maps typically show Three Mile Creek heading in Section 20 of Township 3 North, Range 2 East – the precise location that was subject to a lawsuit filed by A.H. Eagleson & Sons in 1904. John W. Eagleson had obtained a federal patent for 160 acres of land in Section 20 in 1896. Various family members also owned land nearby in adjacent Sections 29 and 30. Making the land agriculturally productive had become a problem since 1903, when, according to the complaint filed by the Eaglesons, the New York Canal Company had begun delivering water through the basin, or draw, on their land. This draw had come to be known as Three Mile Creek. (See Figure 7.)

---

83 "Idaho State News: Water for Caldwell," *Idaho Daily Statesman*, June 9, 1891. (NMID News85) Interestingly, the GLO contracted with surveyor Frederick Mills to re-survey the eastern boundary of Township 3 North, Range 3 West in 1891. Mills recorded the creek's crossing in this relatively downstream location as being less than seven links (or less than five feet) wide. The apparent (although not express) presence of water in this survey can be attributed to the time of year the survey was performed (April), as well as the increasing presence of wastewater from upstream canals. Frederick Mills, Exterior Line Field Notes for Township 3 North, Range 3 west, under Contract 126, approved November 1891. (NMID217)

84 "Local Brevities," *Idaho Daily Statesman*, Jan. 17, 1893. (NMID News86)

The Eaglesons claimed that an agreement had been struck in April 1902 in which nearby land owners had requested permission from the Eaglesons to have the New York Canal Company deliver their water through a ditch they planned to dig in the depression known as Three Mile Creek and thus through the Eaglesons' lands. The Eaglesons claimed to have approved of this plan as long as a ditch was actually dug to contain the water, and wagon bridges placed over the newly constructed ditch. Judge Stewart heard the case, and according to his Findings of Fact, signed in April 1905, the ditch was:

> to be constructed so as to carry said water from New York canal through and along said Three Mile ~~creek~~ bottom to a point in Three Mile creek near the south line of the S.E. ¼ of the S.W. ¼ of sec. 20, to the beginning of a surveyed line for a ditch and thence along said surveyed line across the lands of the said Martha Eagleson.[85] (Strikethrough in original.)

Things did not go as planned. In 1904, the Eaglesons filed a lawsuit asserting that the 1903 irrigation season had witnessed the New York Canal Company turn the water from its waste gate into the so-called Three Mile Creek to deliver water to the defendants, but that no ditch existed. The lack of ditch caused flooding on the Eaglesons' land because there was no channel to contain the flow. The Eaglesons filed suit against both the canal company as well as the landowners.

During the course of the litigation, the key question became whether Three Mile Creek was a natural creek. Documents filed by the defendant land owners asserted that the creek was a natural water way. Three Mile Creek, they claimed:

> Is a natural depression and water-way, carrying large quantities of water at different periods of the year, and especially in the Spring and early Summer months, and is and was such natural stream and water-way carrying large quantities of water as aforesaid, and a drainage channel for all the lands riparian and contiguous thereto, long prior to the acquisition by plaintiff or its predecessors in interest, of the lands set forth and described in the complaint herein, and while said lands were the property of the United States, and prior to the time that the defendant the New York Canal Company, Limited, and prior to plaintiff or its predecessors in interest being upon said land, or in any way connecting itself or themselves therewith.[86]

The decision about whether Three Mile Creek was a natural creek became the linchpin in the case. As we know from examining Peter Bell's General Land Office field notes and survey plat of Township 3 North, Range 2 East done in 1867, no such creek had been noted by the surveyor.[87] In fact, Bell did not even mention the existence of a creek bed. Judge Stewart's Findings of Fact supported that conclusion, and he found for the plaintiffs. He wrote:

> The country slopes from said New York canal in a westerly direction; and that the natural slope of the surface of the land forms a draw, basin or low bottom extending from said New

[85] *A.H. Eagleson & Sons Ltd. Vs. New York Canal Company Ltd. Et al.*, Civil No. 427, Findings of Fact, April 14, 1905. Ada County District Court Cases 1890-1920, Cases 415-460, AR 202, Records of Ada County, SARA. (NMID210)

[86] *A.H. Eagleson & Sons Ltd. Vs. New York Canal Company Ltd. Et al.*, Cross Complaint. (NMID210)

[87] Subdivision line field notes and survey plat for Township 3 North, Range 2 East of Boise Meridian by Peter W. Bell under contract 4, approved January 1868. (NMID13 and NMID22)

> York canal across the said land of the plaintiff toward the land of the said defendants, the same being commonly known as "Three Mile," and that the water naturally drains from said New York canal across the land of the plaintiff along said Three Mile bottom, and that the same is a broad flat bottom, and that artificial water turned therein, without being confined in a natural channel, will spread out and form a swamp therein.[88]

Stewart also found that "the only available water supply for use upon the lands of the answering defendants and cross-complainants is the water diverted from the Boise River by the New York canal and conveyed through said canal." Therefore, he enjoined the New York Canal Company, Ltd. from turning any water into Three Mile "bottom" for irrigation purposes until a proper ditch was constructed.[89]

Like Three Mile Creek, Eight Mile, Nine Mile, and Mason Creeks were also not natural creeks and had no flow at all before artificial irrigation was applied to surrounding lands in the 1890s. "Eight Mile" appeared in the local newspaper for the first time as a named location on February 29, 1896, when it was reported that a woman had died at a residence there, but no further details were provided.[90] In the multiple patent application files for land along the modern course of so-called Eight Mile Creek, none of the applicants or their witnesses mentioned a creek or other natural water course running through their land. In fact, in examining six such patent files of settlers whose patents were perfected between 1890 and 1904, not a single person mentioned the presence of a water body, and some even specifically stated that there was no such water body.[91] This finding is consistent with the lack of such a water object in all of the surrounding GLO surveys from 1867 and 1875. The first time that Eight Mile Creek appears on a map as a water body was on an undated map of the Boise & Nampa Irrigation & Power Company's system.[92] Drawn in approximately 1896, the stream was labeled as the "Eight Mile Lateral." (See Figure 8.) By 1901, a map showing the lands watered under the New York Canal (see Figure 7) referred to the same water body as "Eight Mile Creek," demonstrating that Eight Mile was in fact a human-constructed water object. As it turns out, Nine Mile Creek figures into the history of this same water body. Following the line of that lateral and comparing it with the course of the stream labeled "Nine Mile Creek" on a 1914 Reclamation Service map (see Figure 9), it is clear that the two depictions follow an identical course, leading to the conclusion that Nine Mile Creek began as a water conduit (Eight Mile Lateral) for the Ridenbaugh Canal, was intermittently referred to as "Eight Mile Creek," and was man-made.

---

[88] *A.H. Eagleson & Sons Ltd. Vs. New York Canal Company Ltd. Et al.*, Civil No. 427, Findings of Fact. (NMID210)
[89] *A.H. Eagleson & Sons Ltd. Vs. New York Canal Company Ltd. Et al.*, Civil No. 427, Findings of Fact and Conclusions of Law. (NMID210)
[90] "Local Brevities," *Idaho Daily Statesman*, Feb. 29, 1896. (NMID News88)
[91] Final Proof under the Timber Culture Act of June 14, 1878, Hugh Rutledge, July 8, 1901, Timber Culture Entry 69 (978), Township 3 North, Range 1 West, Fremont Wood, Box 385, Land Entry Files, Boise City. (NMID171); Homestead Entry Patent File 2078 (4069), Township 3 North, Range 1 West, Warren Walt, Box 3337, Land Entry Files, Boise City. (NMID172); Desert Land Entry Patent File 200, Township 3 North, Range 1 West, Edward Shainwald, Box 399, Land Entry Files, Boise City. (NMID177); Final Proof under the Timber Culture Act of June 14, 1878, John Simmons, January 15, 1900, Timber Culture Entry 68 (932), Township 3 North, Range 1 East, Box 385, Land Entry Files, Boise City. (NMID179);Desert Land Entry Patent File 148, Township 3 North, Range 1 West, Mary Curtis, Box 397, Land Entry Files, Boise City. (NMID189); Desert Land Entry Patent File 215, Township 3 North, Range 1 East, Cordillia Mason-Wilburn, Box 400, Land Entry Files, Boise City. (NMID204)
[92] This company was the predecessor in interest to Ridenbaugh Canal before Nampa & Meridian Irrigation District purchased it.

Regardless of its name, the creek was not present on any GLO plat through its entire course, leading to the conclusion that this water body was also a man-made one.

Finally, it is important to provide details on the man-made history of Mason Creek in the early 1890s. First, Mason Creek – either as a creek or a dry creek bed – does not appear in the 19th century GLO survey field notebooks or plats for Townships 3 North, Ranges 1 and 2 West where Mason Creek flows today. However, in 1891, the *Idaho Daily Statesman* reported that approximately a quarter mile from Nampa, a new lake had been made "by turning water from the Ridenbaugh ditch into a depression on the prairie. This lake is a quarter of a mile in length and an eighth of a mile broad and in many places fifteen feet in depth. There is an old bed of a *dry creek* at one end of this pond which is filled with water and is very deep in places."[93] [Emphasis added.] The paper reported that this was Lake Ethel, one of the Boise & Nampa Irrigation, Land and Lumber Company's planned lakes, and legal documents from a 1913 case confirm that the "dry creek" was in fact a reference to Mason Creek.[94] An 1896 map depicting the canal system of the Boise & Nampa Irrigation & Power Company (Figure 8 in this report) shows that what we know today as "Mason Creek" was called the "Ethel Lateral" for several years following its construction to denote the diversion of water from the Ridenbaugh Canal to Ethel Lake.

By the early years of the 20th century, however, the watercourse was commonly known as "Mason Creek."[95] As in other parts of the valley lying south of the Boise River, engineers affiliated with irrigation enterprises used the natural depression in the land as a course through which to gather waste waters from irrigated lands higher up, and also as a lateral to feed Ethel Lake. The engineers manipulated the valley's water supply – as it did with Three Mile and Nine Mile – to serve its water users' needs. Records associated with a legal dispute over flooding in 1913 recognized the natural drainage function of the depression in the land that came to be known as Mason Creek:

> said Mason Creek Flat or Basin in which plaintiff's land is situated is a depression in the nature of a basin into which the surface waters of the surrounding country drain and flow, the entire water-shed [sic] of Mason Creek finding its way down to this Basin, said water-shed [sic] being very extensive and comprising many thousands of acres of land; that the Phyllis Canal owned and operated by the Pioneer Irrigation District is a large canal and the waters from this canal irrigate many hundreds of acres of land lying under the same, but above that of plaintiff, and from which land so irrigated the water naturally seeps under-ground [sic] and flows down into said Mason Creek Basin and forms the water table of the community and of the land of plaintiff.[96]

Further documentation from the case described the natural state of this so-called "creek:"

---

[93] "The City in Type: Making a Lake," *Idaho Daily Statesman*, June 5, 1891. (NMID News87)
[94] *Finding of Facts*, Judge Ed L. Bryan, May 16, 1913, in *Charles Verheyen vs. E.H. Dewey and the Nampa & Meridian Irrigation District*, Transcript on Appeal, 23, in No. 2293 Verheyen v. Dewey (envelope and 2d vol. transcript), Idaho Supreme Court Case Files, AR9, Box 85. (NMID381)
[95] See 1914 Reclamation Map (Figure 9 in Appendix), as well as "Boy Drowned," *Idaho Daily Statesman*, June 1, 1900: "Mason Creek, the stream that flows into Lake Ethel." (NMID News90)
[96] *Charles Verheyen vs. E.H. Dewey and the Nampa & Meridian Irrigation District*, Transcript on Appeal, 15, in No. 2293 Verheyen v. Dewey (envelope and 2d vol. transcript), Idaho Supreme Court Case Files, AR9, Box 85. (NMID381)

> That said Mason Creek is the natural drainage channel for a large area of land situated above the plaintiff, and has a channel over a portion of its course, but has not now and never did have a natural channel or defined course or banks over the land of plaintiff or in the vicinity of plaintiff's said land.[97]

Materials in the case further confirmed that Lake Ethel was constructed in the bed of a dry Mason Creek, and that the water table had risen dramatically in the previous decade: "the water under said land of plaintiff eight years prior to commencement of this action was 40 feet below the surface of the ground and at the time this action was commenced was from 16 to 30 inches below the surface of the ground on plaintiff's land."[98] Mason Creek-area settlers pointed to the lateral as part of their efforts to prove up their lands. Settlement in the area began in the 1890s, and one patent file in particular shows the lateral – known today as Mason Creek – as part of the water delivery system for the land.[99] Additionally, in 1892 the Boise Land Office Register transmitted to the General Land Office in Washington D.C. the Boise City & Nampa Irrigation, Land and Lumber Company's plat and field notes associated with Lake Ethel "and its supply canal," further indicating that Mason Creek did not naturally carry water.[100] Lake Ethel remained a lake subject to water use and local recreation until the Nampa & Meridian Irrigation District sold the land underlying it in 1918 to E.H. Dewey.[101] It was the only lake planned by that company that was ever constructed.

CONCLUSION

The changes to Boise Valley's hydrology and landscape accelerated rapidly once settlers began to arrive. Their demand for water gave rise to an intricate water delivery infrastructure consisting of dams, canals, and laterals. The construction of these systems, paid for in part with eastern capital, transformed the Valley almost unrecognizably. The changes and developments wrought by artificial irrigation posed a stark contrast to its image of only 30 years earlier. The lands that were dominated by sagebrush plains had been converted into productive agricultural lands, and through these properties that had heretofore been dry most of the year, were irrigation canals snaking through the desert, complete with laterals and "creeks" branching off in many directions.

The application of irrigation on these lands created a shallow aquifer which in turn resulted in several newly formed waterways in the natural depressions of the valley. Ultimately, many of these came to be called creeks. However, settlers and irrigation engineers soon discovered that the perfect system of drainage described by A.D. Foote in the 1880s was not as efficient as he had proclaimed. The irrigation of lands on the Boise River's south side caused the aquifer to rise,

[97] *Finding of Facts*, Judge Ed L. Bryan, May 16, 1913, in *Charles Verheyen vs. E.H. Dewey and the Nampa & Meridian Irrigation District*, Transcript on Appeal, 23, in No. 2293 Verheyen v. Dewey (envelope and 2d vol. transcript), Idaho Supreme Court Case Files, AR9, Box 85. (NMID381)
[98] *Finding of Facts*, Judge Ed L. Bryan, May 16, 1913, in *Charles Verheyen vs. E.H. Dewey and the Nampa & Meridian Irrigation District*, Transcript on Appeal, 23, in No. 2293 Verheyen v. Dewey (envelope and 2d vol. transcript), Idaho Supreme Court Case Files, AR9, Box 85. (NMID381)
[99] Plat Map, Undated (c.1893?), Desert Land Entry Patent File 247, Township 3 North, Range 1 West, Pringle Jones, Box 401, Land Entry Files, Boise City. (NMID260)
[100] Chas Kingsley to Hon. Commissioner General Land Office, Sept. 9, 1892, Entry UD 569 Old Canal & Reservoir Files, Boise City and Nampa Irrigation & Lumber Co., Bureau of Land Management Record Group 49, U.S. National Archives, Washington D.C. (NMID275)
[101] "Lake Ethel Site Is Sold," *The Idaho Daily Statesman*, Feb. 19, 1918. (NMID News89)

creating new surface waterways that were not deep enough to prevent hundreds of acres of lands from becoming swamped and useless for agriculture. It was not long before farmers complained not about a lack of water on their arid lands, but a surplus of water on lands that did not naturally drain. The farmers and the newly formed irrigation districts – Nampa & Meridian and Pioneer – realized they could benefit from the federal government's newly created Reclamation Service, which they hoped could assist with this new problem.

SECTION 2: FORMATION OF THE NAMPA & MERIDIAN IRRIGATION DISTRICT AND ACQUISITION OF THE RIDENBAUGH CANAL SYSTEM: 1904-1905

By the turn of the 20th century, private development was reaching the limits of what it could accomplish for irrigation in the West. Private interests, as shown in Section 1 of this report, repeatedly failed to provide reliable water for all the settlers in the Boise Valley. Between 1891 and 1905 ownership of the Ridenbaugh canal irrigation system passed through at least two different companies, possibly three.[102] An 1895 Desert Land Patent document referenced a settler who obtained water from the "Boise and Nampa Irrigation and Power Company's Canal."[103] But by 1900 the Boise City Irrigation and Land Company had gained control of the Ridenbaugh Canal and its related irrigation system and held onto it until the formation of the Nampa & Meridian Irrigation District.[104]

Both state and federal governments recognized that to accomplish the development and settlement desired by public policy, they would have to design and pass better laws to assist the farmers. Idaho passed the first law authorizing the organization of irrigation districts in the 1890s, and by 1900 the legislature had perfected it enough to allow for the organization of the Pioneer Irrigation District. The irrigation district law was intended to facilitate cooperation among farmers working toward a common end. But the lack of funds and the volatility of the investment market continued to point toward a different solution from Congress. Finally, in 1902, Congress passed the Reclamation Act, creating the Reclamation Service as a new federal agency and providing federal funding to irrigate the West.

---

[102] Both MacDonald and Murphy cite three. However, neither identifies the company names. Reconstructing ownership names from *The Idaho Daily Statesman* and other sources suggests that Rodolphus Purdum owned part of the Boise City & Nampa Irrigation, Land, and Lumber Co. between 1891-1893, together with H.E. Simons (of New Jersey) and J.M. Jones (of Nampa). Following a judgment against them in 1893-1894, the Ridenbaugh was sold in 1894 to H.L. Taylor and John Satterfield of Buffalo, New York, who then arranged a sale to Utah interests led by J.E. Jennings, who planned a large colonization scheme. The *Idaho Daily Statesman*, March 29, 1893; Feb. 16, 1894; Feb. 20, 1895.

[103] Affidavit of Witness, Rodolphas Purdum, Oct. 29, 1895, Desert Land Entry Patent File 401, Township 2 North, Range 1 West, Richard Green, Box 408, Land Entry Files, Boise City. (NMID231)

[104] In the District Court of the Third Judicial District of the State of Idaho, In and For the County of Ada, *The Boise City Irrigation and Land Co., a corporation, Plaintiff, vs. Luther Snyder and Susan S. Snyder, Defendants*, Complaint, Oct. 3, 1900, Civil No. 66 in the District Court, Boise City Irrigation and Land Company, a corporation vs. Luther Snyder and Sarah Snyder, Action for Injunction, Ada County District Court Civil Cases, 1890-1908, Cases 46-83, AR 202, Records of Ada County, SARA. (NMID269)

The arrival of the U.S. Reclamation Service[105] in the Boise River Valley in the early 20th century changed the valley, the state, and the region forever. The federal agency's mission was to reclaim the arid land of the western United States through the construction of large-scale irrigation projects. The Boise Project was one of the first such projects, and its construction was well underway by 1908, augmenting the acreage being brought under production and expanding the practice of using these natural depressions on the sagebrush plain to deliver water.

The inconsistent private ownership and development of the Ridenbaugh Canal system made it ripe for takeover by the farmers. Recognizing the opportunity, the canal's water users joined together and in February 1904 voted to organize a district pursuant to Idaho's recently passed irrigation district law.[106] Soon after, some of the Nampa & Meridian Irrigation District's new members met to discuss the bond issue that would be needed for the district to purchase the canal from its existing owner, the Boise City Irrigation and Land Company. Despite some price disputes with the existing owners, Taylor and Satterfield, the new irrigation district Board voted to purchase the canal system for $270,000, including all personal property and reservoir sites.[107] The bond issue that would be used to pay for the canal system would have to be put to the voters.

Initially, the Board entertained the idea of enlarging the Ridenbaugh Canal system in conjunction with the filing of new water rights that would serve unimproved lands. The system would include new reservoirs (Lake Marie and Lake Nampa, both of which had been planned for more than a decade by Nampa & Meridian Irrigation District predecessors), enlargement of the Ridenbaugh Canal, the dam across the Boise River, headgates, rights of way, and other items. The system was to distinguish between the new and old lands and water rights, to be charged accordingly at a rate of $675/second cubic foot of new water.[108] But District members voted the plan down in December of 1904 with Nampa voters favoring the plans and Meridian voters opposing them. The newspaper explained that Meridian farmers' opposition was based on the proposed system of rotation, a system they felt would unfairly benefit Nampa farmers further down the system.[109] Therefore, to purchase the system, the Board would have to come up with an equitable payment mechanism for all the users in the system.

The evident divide of the Nampa & Meridian Irrigation District electorate would prove to be persistent as the users faced multiple issues in the ensuing years that pitted the old water right users against the new, and it took many years for the operations and assessments issues to be settled. Thus, in spite of the District's formal organization, they still did not own the canal by the end of 1904.

As the farmers approached the 1905 irrigation season, the reclamation and political landscape had changed significantly in the Boise River Valley. The Secretary of Interior approved the Boise Project that spring, enhancing Ridenbaugh water users' role in the development of Boise River water and irrigation and making them integral to the changes underfoot. It took the federal government's

---

105 Predecessor to the U.S. Bureau of Reclamation.
106 "Irrigation District is to be Formed," *The Idaho Daily Statesman*, Feb. 10, 1904.
107 Minutes of the Nampa & Meridian District Board July 6, 1904, at the Nampa & Meridian Irrigation District archives (hereafter referenced as NMID Board Minutes). (NMID267)
108 NMID Board Meeting Minutes, July 6, 1904. (NMID267)
109 "Proposed Bond Issue Defeated," *The Idaho Daily Statesman*, Dec. 14, 1904.

assistance to cement the infrastructure construction that private financiers and irrigation district could not accomplish on their own.

Through negotiations and discussions between Nampa & Meridian Irrigation District Board members and the Reclamation Service over the next few months, it was decided that the new bond issue should reflect construction plans that were closely coordinated with the federal project so as to avoid duplicative efforts. They also agreed that the Ridenbaugh Canal as it existed should be used up to its present capacity to serve the old lands, but that lands not currently served by the canal would secure their entire supply of water from the government project.[110] This solution offered the kind of compromise that everyone hoped would satisfy both Nampa and Meridian land owners.

The Board adopted a resolution to that effect on July 21, 1905.[111] The resolution made it clear that the users would pay for the purchase of the canal system through assessments and that the District would purchase additional lands totaling 6,000 acres that would be watered by government water. This clause thereby released the District from any obligation to water those lands (known as the Taylor & Satterfield estates), which the board decided on July 24, 1905 not to assess for the work in securing new water.[112] On July 22, 1905, *The Statesman* reported that the deal to purchase the canal system had been completed, for a total of $285,000.[113] Idaho's State Engineer, James Stephenson, Jr. approved the plan just a few days later, recommending that the new plan for Nampa & Meridian Irrigation District should: "call for the minimum amount of new construction, leaving that to the government works…in other words, the district plan is really a part of the government plan, the district doing only what is necessary in order that the government plan shall have a clear field." Thus, the proposal, which would forthwith include the construction of only one reservoir, Lake Nampa and therefore be less costly, was to be submitted to the voters anew. The election was held on August 26, 1905,[114] with voters approving the plan, including the requisite sale of District bonds to pay for the plan by year's end and an enlargement of the Ridenbaugh so as to increase the irrigated acreage in the District.[115] The District acquired the Ridenbaugh Canal System in late December 1905.[116]

On December 23, 1905 the Boise City Irrigation and Land Company's Board of Directors executed Instrument Number 9582, deeding its irrigation system and water rights to the Nampa & Meridian Irrigation District. The deed specifically described and conveyed the Ridenbaugh Canal as well as several laterals, including the South Slough Lateral, North Slough Lateral, Duval Lateral, Mason Creek Lateral, North Nampa Lateral, South Nampa Lateral, Heron Lateral, Ridenbaugh Lateral and

---

[110] NMID Board Meeting Minutes, June 9, 1905. (NMID267); "Plan for the Ridenbaugh," *The Idaho Daily Statesman,* June 10, 1905.
[111] NMID Board Meeting Minutes, July 21, 1905. (NMID267)
[112] NMID Board Meeting Minutes, July 24, 1905. (NMID267)
[113] "Sale of Canal," *The Idaho Daily Statesman*, July 22, 1905.
[114] NMID Board Meeting Minutes, James Stephenson, Jr. to Nampa & Meridian Board of Directors, July 25, 1905. (NMID267)
[115] "Canal Bonds All Regular," *The Idaho Daily Statesman,* Nov. 26, 1905.
[116] *Findings of Fact and Conclusions of Law, May 20, 1915*, by Judge Ed. L. Bryan, In the Matter of the Petition of the Board of Directors of the Nampa and Meridian Irrigation District for the Examination, Approval, and Confirmation of the proceedings for the Authorization of the Execution of a certain contract with the United States of America, In the District Court of the seventh Judicial District of the State of Idaho, in and For the County of Canyon, Civil No. 1782 (on microfilm), Canyon County Courthouse. (NMID282)

the Mason Creek High Line Lateral. Additionally, four reservoir sites were relinquished, including Lake Ethel, Lake Paradox, Lake Geneva, and the Lake Ether Reservoir site.[117]

Operation of the District in ensuing years was tenuous as the details of large-scale water delivery were ironed out. Many of the land owners whose rights did not pre-date the Ridenbaugh's 1888 water right – a water right that was filed when the ditch was being enlarged – and who recognized that their Ridenbaugh rights were subject to being cut off during dry seasons signed individual contracts during the 1905 to 1907 period with the Payette-Boise Water Users Association, allowing them to purchase water from the Boise Project.[118] Later, to ensure that the various entities in the Valley did not duplicate efforts and that a single system of delivery was utilized, the District negotiated a series of agreements, starting in June 1909 with the Payette-Boise Water Users Association. The 1909 contract allowed the United States or the Association to "enlarge, improve and extend all existing lateral ditches now owned or hereafter acquired by the District." It also permitted the construction of new laterals to connect the system as a unified whole. The purpose of the agreement was to prevent any sort of duplicative efforts between the District and the Reclamation Service, since the contract stated that it was "deemed inadvisable to construct in connection with the Payette-Boise Project a system of canals and laterals paralleling or duplicating the existing system of the District and it is to the interest of all parties that there should be but one distribution system for the lands within the District." The contract further allowed for reimbursement to the District by the United States or the Association for proportional parts of the expenses involved in the repair and maintenance of the canal system in the lower portions of the project that were considered new lands and receiving government water.[119] To pay for said work, the District assessed its users an annual fee.

Early operations of the District continued to be complicated by the mixture of land owners claiming water under different appropriation dates as well as the mix between Boise Project lands and old water right lands. In 1913, the issue came to a head when the Third Judicial District Court of Idaho (Ada County) issued a judgment that forced the Board of the Nampa & Meridian Irrigation District to divide lands irrigated by the district into classes based on their appropriation dates.[120] In addition to differences between the landowners in the District, the water users would soon face a new and unanticipated problem that would complicate District operations even further.

SECTION 3: SOLVING THE DRAINAGE PROBLEM, 1910-1925

Although the increasing flows of these various creeks and the gradual improvement of land south of the river was a positive sign for the growth of this frontier town, one unforeseen major problem soon plagued many of the farmers: a rising water table that resulted in waterlogged lands and an inability to farm productively. To contend with the issue, a period of drainage planning and construction began in 1910 and lasted into the 1930s. It was during this period of grand

[117] Boise City Irrigation and Land Co. to Nampa & Meridian Irrigation District, Instrument Numbered 9582, Dec. 23, 1905, Special Projects, 1900-1925, Nampa & Meridian Irrigation District Office. (NMID277) It is unclear if the names of these lakes changed over the years, or if these were additional lakes planned by predecessor companies.
[118] Findings of Fact, May 20, 1915, p. 6. (NMID282)
[119] NMID Board Meeting Minutes, June 1, 1909. (NMID267)
[120] NMID Board Meeting Minutes, July 18, 1913. (NMID270)

engineering that these so-called creeks became permanent, man-made fixtures on the landscape. This section of the report will provide an overview of the changing relationship between farmers and the formal irrigation entities and detail the infrastructure development done by the Pioneer and Nampa & Meridian Irrigation Districts in conjunction with the Reclamation Service.

Troubles with swamped, over-wet lands began on neighboring properties in the Pioneer Irrigation District as early as 1904,[121] but they spread rapidly onto Nampa & Meridian District lands in just a few years. By the summer of 1910, an engineer studying the problem found that 36 blocks in the vicinity of Nampa, Idaho were "wholly submerged," and that "much property was injuriously submerged along the low lands of Indian Creek." Over the 7.5 miles of Indian Creek he studied, the engineer noted that the movement of sand in that water body had exacerbated existing drainage difficulties as had weeds, brush, and other debris that retarded water flow. He noted that the growth of willows, weeds, and other vegetation had also added to the clogging of waterways. "Since the advent of the settler and the introduction of irrigation on the lands adjacent to Indian Creek Valley," he wrote, "the seepage and waste waters have brought about a changed condition along the Creek during the entire year now."[122] This change in Indian Creek was exacerbated by the man-made engineering that occurred over the ensuing 15 years of drainage construction, rendering the original creek bed and ephemeral characteristics permanently gone. Indian Creek was not the only water way to be altered so dramatically by the advent of artificial irrigation. Farmers along Mason Creek were also affected, as he also described: "much injury to the farm lands along Mason Creek and on adjacent slopes is being done by the accumulation of this groundwater." Seepage there had grown serious enough that alkaline salts began to accumulate in some places. His vision for relief involved "straightening the bends when too abrupt and widening and deepening the creek bed to a sufficient size, so as to allow the flood waters to pass by with a minimum of injury to property." He wanted to take care of the ground water by constructing "proper ditches or canals which will carry away the excess, and have a sufficient depth to lower the water plain [*sic*] of the low lands through which it must run. Smaller side drains discharging into the larger drainage canal will be necessary."[123]

In 1912, the farmers in the parts of the valley most seriously impacted by swamping petitioned the U.S. Reclamation Service to help them with this very serious problem. Pioneer Irrigation District attempted to obtain the cooperation of the U.S. Reclamation Service in constructing a system of surface drains similar to that described and envisioned years earlier by A.D. Foote to contend with the issue. The Service was initially reluctant since it was unsure that it possessed the legal authority to finance such drainage systems. But after overcoming that hurdle, the Service deepened, straightened, and otherwise altered Five and Ten Mile Creeks as well as Indian Creek between 1913 and the early 1920s to accommodate additional inflow from newly constructed diversions. Additionally, the man-made watercourses created over the previous two decades – Eight Mile, Nine

[121] See Jennifer Stevens, "A History of the Pioneer Irrigation District, Idaho: An Initial Report, 1884-1938," submitted in the matter of *Pioneer Irrigation District v. City of Caldwell* (CV-08-556-C), 2009.
[122] Robert Milliken, Engineer to President and Members of the Idaho Promotive and Protective Association, Nampa, Idaho, Dec. 28, 1912, Entry 3, General Administrative and Project Records, 1902-1919 (cited hereafter simply as "Entry 3"), Box 393, R.G. 115, Records of the Bureau of Reclamation, U.S. National Archives, Denver (cited hereafter as "R.G. 115" and referring to the records at the Denver branch of the U.S. National Archives unless stated otherwise). (NMID118)
[123] Milliken to President, Dec. 28, 1912, Entry 3, Box 393, R.G. 115. (NMID118)

Mile, and Mason Creek – also were permanently changed in order to allow the adjacent lands to produce crops and remain well-drained.

By 1912, a preliminary drainage plan had been devised that looked similar to that described by Foote. It called for drainage lines along the principal sloughs, although engineers believed that there was "a wide choice of location within these sloughs, especially as some of them are comparatively wide and nearly level from one side to the other."[124] Drainage ditches were proposed for construction in the sloughs known as Dixie, Wilson, Elijah, Isaiah, Moses and Noble; Mason and Indian Creeks; Purdam Gulch; and the Wilson Drain.[125] Because the lands in the Pioneer District were in more dire condition, a contract was signed in February 1913 between the Reclamation Service and the Pioneer Irrigation District in which the Service financed the drain construction over time.[126] Nevertheless, because the line between the districts had no relation to the natural drainage of waters, several of the proposed drains fell partially in the Nampa & Meridian Irrigation District, including Mason, Wilson, Elijah, Purdam, and Five and Ten Mile Creeks.[127] Soon it was clear that lands in the Nampa & Meridian Irrigation District were suffering the same fate as that of their neighbors to the west, and the two districts began discussing the possibilities of sharing drainage issues and costs.

However, the Reclamation Service was reluctant to provide funds for the work in the Nampa & Meridian District. To bolster the District's case, the Boise Project Board of Engineers wrote to the Director of the U.S. Reclamation Service in Washington D.C. on August 20, 1913 to describe seepage conditions in the vicinity of Nampa and Caldwell, underscoring the farmers' need for assistance in this District in addition to Pioneer. Their letter provided the agency with a deeper understanding of the continued (and spreading) problems:

> Irrigation of high lands has had the ordinary result of causing a rise in the water table of the lower lands, which condition has been made worse by the absence for long distances of surface channels and by the general presence below the upper soil of a stratum of gravel and sand. In the natural depressions in the lower lands the ground water surface has been rising until it has made its appearance on the surface, converting fertile lands into swamps and injuring adjoining and somewhat higher lands by the formation of alkali on the surface.[128]

As a later study of ground water in the Boise Valley explained, "surface water spread on irrigated land contributed a large volume of new ground-water recharge and drastically changed the ground-water regimen."[129] The result was that the waterlogged lands were rendered unworkable for

---

[124] Engineer in Charge of Drainage, Mitchell, Nebr. to Supervising Engineer, Boise, Idaho, July 5, 1913, Entry 3, Box 391, R.G. 115. (NMID112)
[125] Map, Seepage on Upper Wilson Drain, 1912, Entry 3, Box 393, R.G. 115. (NMID118)
[126] See Stevens, 31.
[127] General Location of Proposed Drainage Ditches in the Pioneer Irrigation District, 1912, Entry 3, Box 391, R.G. 115. (NMID111)
[128] Boise Project Board of Engineers to Director of the United States Reclamation Service, Aug. 20, 1913, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, Box 391, R.G. 115. (NMID112)
[129] S.W. West, *Ground-Water and Drainage Problems in the Whitney Terrace Area, Boise, Idaho* (Open File Report, United States Geological Survey, Water Resources Division, Ground Water Branch, Boise, Idaho, August 1955), 5. (NMID355)

agriculture, and a great deal of acreage was forced out of production until the problem could be addressed. The Board of Engineers' letter explained that "during the last few years [seepage] extended gradually up along the bottom of the draws into the Nampa-Meridian district. These conditions have lately grown worse so rapidly that it is apparent that deep drains in this district will be necessary." They explained that the lands could be drained by constructing "deep drains in the principal depressions," stressing the need for drainage work in both Pioneer and Nampa & Meridian Districts and asking the Reclamation Service to contract with Nampa & Meridian in order to execute the plan. They predicted that such a program would require a year to complete, and that "we see no way in which earlier relief can be had, except to a slight extent by enlarging small culverts under the Phyllis Canal and preventing waste water from entering Wilson and other sloughs as far as feasible."[130]

Construction on the first Pioneer Irrigation District drains began in October of that year, with the removal of a total 48,930 cubic yards from Wilson Slough and Mason Creek drains. That same month, Reclamation Service engineers answered the engineering board's pleas and began preliminary drainage investigations in the Nampa-Meridian Irrigation District.[131] On February 15, 1914, Boise Project engineers again penned a letter explaining the District's seepage problems and how there was no way to avoid constructing drainage ditches that would discharge through Pioneer Irrigation District. They described that some of the necessary work was underway per the provisions of the Pioneer Irrigation District's contract, but that "some additional lines, especially down Five Mile and Ten Mile Creeks will be necessary to provide satisfactory outlets for Nampa-Meridian drains."[132] The letter included a March 1914 map showing the general location of proposed drainage ditches in the Nampa-Meridian Irrigation District, indicating areas (with a list of number of acres, shown below) where the water plane was within six feet of the surface, with predicted increases through 1918 in parentheses (not all showed a predicted increase):

- ✓ - Five Mile Creek 195 (285)
- ✓ - Ten Mile Creek 335 (625)
- ✓ - Nine Mile Creek 165 (205)
- ✓ - Purdam Gulch 235 (220)
- ✓ - Sky Pilot Drain 50
- ✓ - Wilson Slough 240 (30)
- ✓ - Elijah Slough 260 (15)
- ✓ - Joseph Slough 90 (135)
- ✓ - Orr Slough 118 (17)
- ✓ - Aaron Slough 5
- ✓ - Poe Drain 35

[130] Boise Project Board of Engineers to Director, U.S. Reclamation Service, August 20, 1913, Entry 3, Box 391, R.G. 115. (NMID112)
[131] Annual Report Covering History of Boise Project Distribution Unit Boise Idaho for 1913, Boise, Vol 5, 1913, Entry 10, Project Histories 1902-1932 (cited hereafter as "Entry 10"), Box 32, R.G. 115. (NMID95)
[132] Consulting Board, Messrs. Davis, Henny, Weymouth, Bliss and Burkholder to Reclamation Commission, February 15, 1914, 260-A BOISE PROJECT Drainage of Nampa Meridian Irrigation District 1914 Thru 260-B, Entry 3, Box 392, R.G. 115. (NMID116)

✓ - Miller Drain 56 (4)[133] (See Figure 10.)

Before long, all of these drains would appear on the map of the land south of the Boise River.

It was during these years of drainage construction that the greatest engineering of these natural depressions occurred. For instance, construction or deepening of a drainage ditch through the so-called Nine Mile Creek – which showed up for the first time on a map (c. 1896) as "Eight Mile Lateral" (see Figure 8) – was indicated as being high priority on the map accompanying the 1914 engineer letter.[134] Cost estimates for the drainage of the Nampa-Meridian system were performed that year, but the Reclamation Service had concerns regarding the lands in the district that were not signed up with the water users association and therefore had no monetary obligation to the project.[135] Who would be responsible for the cost of drainage construction would in fact become a major concern.

The Nampa & Meridian Irrigation District Board considered the drainage work in 1914. They met in early April and voted to send a letter to each water user in the district, asking for the water users to carefully consider three schemes: a drainage system similar to or an extension of that being constructed by the Reclamation Service in the Pioneer Irrigation District; the purchase by the District of an interest in Arrow Rock Reservoir in order to supplement water rights during periods of low water; and the District's purchase of storage water rights for the Boise Project lands within the District boundaries. Their letter urged the adoption of a contract with the Service that would permit all three.[136] They also hired their own engineer to review the Reclamation Service plans.

In July, the Board's engineer reported his opinion regarding the proposed drainage contract with the Reclamation Service, recommending that the contract be executed at once. He noted that "the ditches as proposed will follow the natural drainage courses, except that where such courses are more or less tortuous, they will be straightened. In fact the location is such as to reduce the amount of material to be excavated to the minimum amount."[137] At a special meeting of the Board on August 25, members unanimously adopted a resolution and general plan to purchase from the Boise Project an additional supply of water for 44,060 acres of heretofore dry lands ("Project Lands"), purchase a $24,840 interest in Arrow Rock Reservoir to provide a supplemental water supply of 828 acre feet for old water right lands in the district, and enter into an agreement with the U.S. Reclamation Service for the drainage of seeped lands, benefits of which would include an increased water supply for the District and assessed to the old water right lands at a rate of only $266,000.[138]

---

[133] Map, Exhibit B, General Location of Proposed Drainage Ditches for the Nampa-Meridian Irrigation District, March 1914, 260-A BOISE PROJECT Drainage of Nampa Meridian Irrigation District 1914 Thru 260-B, Entry 3, Box 392, R.G. 115. (NMID116)
[134] "Exhibit "A," Map Showing General Location of Proposed Drainage Ditches for the Nampa-Meridian Irrigation District," 260-A BOISE PROJECT Drainage of Nampa Meridian Irrigation District 1914 Thru 260-B, Entry 3, Box 392, R.G. 115. (NMID116) A 1917 contract states clearly on pages 4-5 that Nine Mile Creek was sometimes known as Eight Mile Creek: Contract between the United States of America and Nampa-Meridian Irrigation District and the Heirs of J.J. Jones, deceased, June 22, 1917, 695-A3 (J) Boise Project, Idaho. Settlement of Waste Water Rights, Entry 3, Box 403, R.G. 115. (NMID128)
[135] F.E. Weymouth to Chief Engineer, Oct. 12, 1914, 260-A BOISE PROJECT Drainage of Nampa Meridian Irrigation District 1914 Thru 260-B, Entry 3, Box 392, R.G. 115. (NMID116)
[136] NMID Board Meeting Minutes, April 7, 1914. (NMID270)
[137] NMID Board Meeting Minutes, Aug. 4, 1914. (NMID270)
[138] NMID Board Meeting Minutes, Aug. 25, 1914. (NMID270)

The contract was intended to provide for a single system to solve the drainage issue for both public (still unpatented) and private lands, the costs of which would be apportioned equitably between old water right lands and public lands, so as not to overburden the public lands with a high cost system.[139]

A draft of the contract was included with the August 25 Board minutes. It separated the construction into three phases to denote the order in which the drains would be constructed, with drains numbered "one" being highest priority and "three" intended for final construction. The contract made clear that the intent behind the construction of drains was to reclaim land which was uncultivable due to "seepage conditions." It also provided a budget of $557,000, which was intended to pay for construction but also to cover any damages resulting to users holding water rights on any of the "sloughs or natural channels" of the Nampa & Meridian Irrigation District.[140] The contract explained that the plan was only intended to provide for "principal drains," and that individual and community farm drains might be necessary in order to "completely drain" the lands in the District. The contract also spelled out that the District would be in charge of maintenance, and would charge the cost of such to the old water right lands in the District in the same proportion as the cost of the construction, and that stored water from Arrow Rock would not be available to these lands since they had first priority rights. Finally, the contract outlined that the project lands in the District would be apportioned:

> to the project lands in the District a total of Three Million Three Hundred Four Thousand Five Hundred ($3,304,500) Dollars, being a charge of seventy-five ($75.00) Dollars per acres the benefits under this contract to said lands; provided, however, that if the building charge per acre announced by the Secretary of the Interior in his Public Notice for similar lands of the Boise Project, is less than seventy-five ($75.00) Dollars per acre, then the assessment of benefits against the project lands in the District shall be reduced to the same amount per acre as is announced by the Secretary of the Interior…and the District will collect the sums so apportioned to such project lands in the District and pay the same to the United States. …The District will be reimbursed by the United States for the cost of distributing the water to said project lands in the District by the payment to the District of the pro-rata share of the cost of operation and maintenance provided in the contract of April 1. 1909. [sic][141]

Finally, the contract provided for the cancellation of all individual contracts between landowners and the Payette-Boise Water Users Association in lieu of the new arrangement.[142] The Idaho State Engineer approved the plans on September 2, 1914, and the election was to be held on October 10, 1914.[143]

[139] Findings of Fact, May 20, 1915, p. 4-5. (NMID282)
[140] Perusal of Board minutes and other Board records demonstrates that this clause was utilized only to cover damages to users on Five and Ten Mile Creeks.
[141] NMID Board Meeting Minutes, Aug. 25, 1914. (NMID270)
[142] Findings of Fact, May 20, 1915, p. 6-7. (NMID282)
[143] NMID Board Meeting Minutes, Sept. 3, 1914; Oct. 12, 1914. (NMID270)

A contract was expected to solve the Reclamation Service's concerns since it would "[compel] all the lands in the district to pay their proportionate share of the project charges."[144] Thus, when the votes were tallied and found to be lopsidedly in favor of the contract by a count of 1206 to 160, the Service and the District Board were optimistic. The Board met several times in the next few months to determine a fair apportionment of the benefits of the drainage system across the District lands. In January, they received 47 written protests from land owners on the bench in the upper end of the District between Boise and Meridian who opposed the contract and the proposed assessments.[145] But in May, the Board finally determined the benefits that would accrue to each of the subdivision tracts from the drainage works due to be constructed by the United States, and filed said list and apportionment with the Idaho State Engineer.[146]

In the meantime, the differences between water users in the District reared their ugly heads once again, this time in the courtroom. Following the election, and in accordance with the law, the District filed its petition with the District Court in the 7th Judicial District of Canyon County to examine, approve, confirm, and authorize the proceedings which led to the contract. Almost immediately, representatives of the 160 "no" votes filed an objection to the petition. They offered many arguments, among which were their recent conclusions that they were not in need of supplemental water per their individual contracts with the Payette-Boise Water Users Association, since their water rights were only partly served by the District and otherwise served by private water rights obtained through sub-irrigation, or wells. They disputed that the District could force them to pay for the new system, and that they would suffer economic damages at the presumed rate of $75/acre for the work described and outlined in the contract and drainage plan.[147]

Many landowners offered testimony that spring as part of the legal tangle that made its way through Judge Bryan's courtroom in 1915. They argued that they were not actually part of the Boise Project, and that the proposed (and elector-approved) plan was inequitable to them. In its responses, the District explained that each landowner would have the opportunity to challenge their individual assessment in court when the District filed its petition to approve and confirm the assessments, as they were required to do by law, but that the law was on their side for the execution of the contract. Bryan was convinced by the District's arguments, and issued his Findings of Fact and Conclusions of Law in favor of the District in May.[148]

DRAINAGE CONSTRUCTION, 1915-1917

Drainage construction in the Nampa & Meridian Irrigation District evolved quickly after the litigation concluded. In June 1915, Nampa & Meridian Irrigation District finally signed the 1914 draft contract with the Reclamation Service to drain lands in their district. The total expenditure of $557,000 for said drainage system was divided between the United States ($291,000 to be paid by the United States for District lands watered by the Reclamation Service) and Nampa-Meridian

[144] F.E. Weymouth to Chief Engineer, Oct. 12, 1914, 260-A BOISE PROJECT Drainage of Nampa Meridian Irrigation District 1914 Thru 260-B, Entry 3, Box 392, R.G. 115. (NMID116)
[145] NMID Board Meeting Minutes, Dec. 14, 1914; Jan. 18, 1915. (NMID270)
[146] NMID Board Meeting Minutes, Feb. 13, 1915; May 4, 1915. (NMID270)
[147] In the Matter of the Nampa and Meridian Irrigation District, Answer and Cross-Complaint, p. 15
[148] Case file, Civil No. 1782, Canyon County Courthouse; Judgment and Findings of Fact and Conclusions of Law, May 20, 1915. (NMID282)

Irrigation District ($266,000 to be paid for land watered by landowners holding water rights belonging to the District.) Under Reclamation laws, the District was enabled to collect the repayment money on behalf of the Service, and therefore assessed landowners under the revised system – once for delivery water, and a separate amount for drainage.

The greatest concern in the Nampa & Meridian Irrigation District was not the existing number of seeped acres, which was still relatively small, but the expected and imminent spread of such seeping.[149] The agreement included five pages of cost estimates, and proposed that the ditches would "follow the natural drainage courses as closely as feasible, and…be straightened and deepened." These courses were: Five Mile Creek, Purdam Gulch, Wilson Slough, and Elijah Slough. All ditches in the Nampa & Meridian District, with the exception of the Five Mile Creek and Ten Mile Creek Drainage Systems, would discharge into drainage ditches in the Pioneer Irrigation District below the Phyllis Canal. The agreement listed Ten Mile Creek along with Nine Mile Creek, and Sky Pilot, Orr, Joseph and Aaron Sloughs as the "drains together with their branches [that] compose the entire system."[150]

The Reclamation Service planned to construct the drains in three phases, according to the most urgent need based on swamped lands. The first phase, or "Number 1" drains, included alterations to almost five-and-a-half miles of Five Mile Creek, and the entire planned construction of Ten Mile Creek, Nine Mile Creek, Wilson Slough, Elijah Slough, and Orr Slough. The "Number 2" drains included the final two miles of construction on Five Mile Creek, Purdam Gulch, and Joseph Slough. The final phase, consisting of the "Number 3" drains, included the Aaron and Sky Pilot Sloughs. In total, construction of the drains was expected to result in the excavation of almost 1.3 million cubic yards of material, deepening the natural surface depressions in the District, thereby relieving the waterlogged lands of their excess water and making them productive again.[151] [See Figure 11.] The contract signing was followed by water measurements in open test wells throughout the district.[152]

As the Reclamation Service prepared to execute the work, they set about obtaining the needed rights-of-way for the new waterways. Because the land in the District had been settled many decades prior, virtually all of it was privately owned. According to the 1916 project history, "the work of securing rights of way has…constituted a considerable portion of the year's work for the survey party, the office engineer and the drainage engineer." By year's end, the Service had obtained 69.59 acres of right-of-way through donations and 88.79 acres through purchase at an average price of $89.60 per acre. Condemnation suits were pending on two additional tracts.[153]

---

[149] Annual Project History of Boise Project Idaho for 1915, 246-47, Boise, Vol 7, 1915, Entry 10, Box 33, R.G. 115. (NMID97)
[150] 1915 Agreement, United States of America and Nampa & Meridian Irrigation District, 13, Contracts, 1900-1940, Nampa & Meridian Irrigation District archives (NMID64)
[151] Nampa-Meridian Drainage System, Estimate of Cost, March 24, 1914, 260-B BOISE PROJECT Drainage of Nampa Meridian Irrigation District Contracts 260-B, Entry 3, Box 392, R.G. 115. (NMID117)
[152] Nampa-Meridian Drainage System, Estimate of Cost, 260-B BOISE PROJECT Drainage of Nampa Meridian Irrigation District Contracts 260-B, Entry 3, Box 392, R.G. 115. (NMID117)
[153] Annual Project History of Boise Project, Idaho for 1916, Boise, Vol. 8, 1916, Entry 10, Project Histories 1902-1932, Box 33, R.G. 115. (NMID99) The U.S. Reclamation Service was not required to obtain rights-of-way for the drainage construction that commenced pursuant to the contract on lands settled *after* October 2, 1888, thanks to a law passed by Congress on that day. The legislation was intended to permit the U.S. Geological Survey to survey the entire West for national irrigation projects under Major John Wesley Powell,

During and after construction, many additional landowner accommodations were necessary, as the newly constructed drains impeded landowners' access to their lands. The modification most frequently needed by landowners was the placement of bridges across newly constructed drains, since many of the drains segmented otherwise cohesive parcels of land. During the two-year course of drainage system construction, many bridges were built over the drains, including: Elijah, Wilson, Ten-Mile, Purdam, Nine Mile,[154] and Sky Pilot.[155]

Alterations to the existing creeks during the drainage construction were so great that other adjustments to the system were needed, as well. For instance, waste water rights filed in the 1890s (when irrigation return flows and waste water began to accumulate in Five and Ten Mile Creeks) were compromised by the deepening of these drainage channels, since the lowered surface water level removed the gravity needed to continue diverting water into the owners' pre-existing laterals. The District signed many agreements to settle such issues during the years of drainage construction and to accommodate new methods of delivery.[156] Even Settlers Irrigation District – which had been utilizing the course of Five Mile Creek to deliver water for decades (see Section 1 of this report for details) – signed an agreement with the United States that allowed the Reclamation Service to move the canal company's facilities.[157]

The Reclamation Service began to analyze the drainage work at the end of 1916. Generally, the work was successful, with workers having excavated 725,498 cubic yards of material and reclaimed 6,000 acres of seeped land in the Nampa & Meridian Irrigation District in 1916 alone. The year-end assessment underscored the man-made character of these various new creeks, although the changes would become even more evident in ensuing years. For instance, Reclamation engineer D.J. Paul began his annual report on drainage in the area below the Boise Project by describing the region: "The only natural water courses of any considerable extent are those of Indian Creek, Five Mile Creek, and Ten Mile Creek." Paul then explained that "during the year 1916, *the natural water courses of Five mile Creek and Ten Mile Creek have been replaced* thru [sic] this section by the constructed system of deep drains, a great portion of the drainage area lying below the Ridenbaugh

---

and once passed, was followed by the General Land Office withdrawing 850,000,000 arid acres from entry and reclaiming it for the federal government. Thus, the government did not require rights-of-way for reclamation work on any parcel that was settled after that date. In cases where the government did in fact need the right-of-way, many landowners donated it in exchange for a bridge being built over the drain or some other accommodation. One exception was a group of land owners living in Section 7 of T3N, R1E that made what the District believed were "unreasonable" demands on the United States and the District for rights of way through their lands. Therefore, on March 6, 1917, the Board authorized and instructed the Reclamation Service to stop the construction of Five Mile Drain on the north side of the section. Annual Report of the Commissioner of the General Land Office for the Fiscal Year Ended June 30, 1890, "Public Lands of the Arid Region," citing Executive Document No. 136, Senate, 51st Cong., 1st sess. (Oct, 2, 1888), (25 Stat. 526), pg. 59 (NMID279); NMID Board Meeting Minutes dated: June 6, 1916 (Elijah); Nov. 9, 1916 (5- or 9-mile); Jan. 4, 1917 (Purdam Drain and Ten Mile); Feb. 6, 1917 (Ten Mile); March 6, 1917 (Five Mile); April 3, 1917 (Ten Mile).

[154] For each bridge over Nine Mile, the land descriptions offered in every case referred to the location of a portion of the previously referred to Eight Mile Lateral, per NMID 164.

[155] NMID Board Meeting Minutes, June 6, 1916-Dec. 3, 1918 (entire). (NMID272)

[156] See NMID64, NMID128, NMID124, NMID123, NMID127 as examples, and NMID Board Meeting, June 6, 1916-Dec. 3, 1918 (entire). (NMID272)

[157] United States 1917 Agreement with Nampa & Meridian Irrigation District, Settlers Canal and Five Mile Drainage Canal, Contracts, Nampa & Meridian Irrigation District archives. (NMID64)

Canal brought within the limits of the affected area of deep drainage."[158] [Emphasis added.] The Five Mile Creek system, construction on which began in February 1916, consisted of 26 miles of drains by the end of that year. Paul detailed the results in this way: "It follows that at the beginning of the year the seepage inflow was but a small part of the discharge. At the end of the year seepage inflow became a considerable factor."[159] A table that was included in the 1916 report showed that Mason Creek Drain discharge increased by more than 20,000 acre-feet, Five Mile Creek by 20,000 acre-feet, and Indian Creek by 4600 acre-feet.[160] Even so, the impact of the drains on the system's hydrology was only starting to be realized.

As noted above, drainage work had commenced under the Pioneer contract in 1913, and work began in the Nampa & Meridian District in 1915. Construction did not always proceed as planned, since alterations to the original scheme were periodically required when plans did not perfectly translate on the ground. In most cases, the changes involved extensions of planned drains so that they could serve additional lands. In other cases, it was determined that the proposed drain needed to be deeper or even to take a slightly different course. At the end of 1916, only Five Mile, Ten Mile, and Sky Pilot remained incomplete.[161]

By 1918, the Service began to report on the major hydrological changes that had begun to appear in the wake of drainage construction. One study described the pre-drainage conditions this way:

> under irrigated areas there was a more or less rapid rise of the ground water table until a point was reached where part of the areas became seeped and swamped and the evaporations together with the natural drainage and the less application of water on account of diminished crop area established a partially balanced condition.

The unproductive lands were unsatisfactory, and the engineers' goal with the drainage construction was to establish this same "balanced condition" between surface and ground water while *also* facilitating the cultivation of land.[162]

---

[158] Report on Drainage Investigation of Pioneer and Nampa-Meridian Districts in Boise Valley for the year 1916, 4-5, BOI-530.00-16C-1, Report on Drainage Investigations 1916, Project Reports, 1910-1955, Box 60, R.G. 115, p. 6. (NMID89). Patent files for lands in upstream portions of Indian Creek, such as Townships 1 North, Ranges 2 & 3 East underscored the dry nature of that creek into these later years. One such patentee explained that "Indian Creek … does not carry water all the time," and that his efforts to obtain irrigation water from Indian Creek for seven years demonstrated "that it would be wholly and totally impossible to develop sufficient water for the irrigation of land." (Aug. 30, 1915) His witness explained that "there is no water in the creek only flood water in the spring." (Oct. 27, 1917) Desert Land Entry Patent File 623602, T1N, R2E, Halvor Jorde, Box 22087, Land Entry Files, Boise City. (NMID241)
[159] Discharge of Drains, by D.J. Paul, 1916, part of Annual Project History of Boise Project, Idaho for 1916, Boise, Vol. 8, 1916, Entry 10, Project Histories 1902-1932, Box 33, R.G. 115. (NMID99)
[160] Discharge of Drains, by D.J. Paul, 1916, part of Annual Project History of Boise Project, Idaho for 1916, Boise, Vol. 8, 1916, Entry 10, Project Histories 1902-1932, Box 33, R.G. 115. (NMID99)
[161] Discharge of Drains, by D.J. Paul, 1916, part of Annual Project History of Boise Project, Idaho for 1916, Boise, Vol. 8, 1916, Entry 10, Project Histories 1902-1932, Box 33, R.G. 115. (NMID99)
[162] "Report on How the Return Flow from Land son the South Side of the Boise River is Effected by Drainage, Evaporation, and Reservoir Losses, Supplimentary [sic] to the 1916 and 1917 Drainage Reports for the Pioneer and Nampa-Meridian Districts," by W.G. Steward, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1915-1919 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Box 391, R.G. 115. (NMID110)

It took some months before such equilibrium was achieved, and when it was, major changes to the hydrology had occurred. *Prior* to drain construction, "the ground was fully saturated at the beginning of the irrigation season." *Immediately* after construction, a great deal of the water applied immediately ran off into the drains instead of into the ground and was carried off during the early irrigation months of June and July. But soon, there was a major and permanent shift. As the system moved toward a balance between surface and ground water, the period of maximum discharge of return flows to the Boise River occurred in August and September instead of June and July. One engineer explained it this way: "This is very important because the Boise River is usually at maximum discharge in May and June and at the low stages in Aug. and Sept. hence these drains suppliment [sic] the river rights during the low water period."[163] Thus, the increased runoff caused by the drainage construction, which was accounted for in part by the fact that evaporation was reduced over the impacted area, helped supply farmers with late season irrigation water, as well.[164] The entire system of water rights and deliveries had been altered by draining these seeped lands and constructing the surface drains.

Construction of the Wilson Drain is a telling example of how the drainage work and additional water developed together. The Wilson Drain was one of the first to be constructed during the project, and was intended to drain the waterlogged lands near the modern-day Nampa Fish Hatchery. However, the completed product provided only partial (and temporary) relief from the problem. By 1919, the seepage problem had spread. In a June 25, 1919 letter, the Drainage Engineer for the Bureau of Reclamation wrote the following:

> Seepage on the Upper Wilson Drain is very much worse than in previous years and probably over one hundred acres is now badly affected. In the study of existing ground water data, it seems probable that the seepage water is an accumulation of irrigation and canal losses on the higher surrounding areas and that the Deer Flat Reservoir losses have little or no effect on this area. The deep percolating seepage water finds its way into the porous lava beds which underlie the higher areas as well as in the immediate vicinity of the seeped tract and causes water-logging by direct upward pressure.[165]

The new, additional solution for drainage was to drill wells. The Drainage Engineer explained the rationale to provide drainage for the seepage:

> It seems probable that no relief could be afforded by ordinary drainage means since the present water-logged condition extends to the banks of the present deep drain and the proposed method of drilling deep wells under the lava rock is believed to be

---

163 "Report on How the Return Flow from Lands on the South Side of the Boise River is Effected by Drainage, Evaporation, and Reservoir Losses, Supplimentary [sic] to the 1916 and 1917 Drainage Reports for the Pioneer and Nampa-Meridian Districts," by W.G. Steward, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1915-1919 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Box 391, R.G. 115. (NMID110)

164 B.E. Stoutmeyer to Chief Counsel, U.S. Reclamation Service, June 6, 1918, 260. Boise Project Engineering Reports, etc. January 1, 1917 - June 30, 1919 260. Entry 3, General Administrative and Project Records, 1902-1919, Box 390, R.G. 115. (NMID107)

165 Drainage Engineer to Chief of Construction, June 25, 1919, 260-B BOISE PROJECT General Correspondence re Drainage of Lands 260-D, Entry 3, General Administrative and Project Records, 1902-1919, Box 393, R.G. 115. (NMID118)

a proper method of accomplishing drainage. It seems probable that a considerable flow *can be developed by such wells* since there is available at grade elevations of the Wilson drain approximately a maximum head of 20 feet. [Emphasis added.][166]

The engineer enclosed a 1912 map of the drainage system (including the Wilson Drain) with his letter, showing the proposed location of the Wilson Drain prior to construction. As it appeared in his enclosure, the 1912 map had been modified to indicate the approximate location of the new, additional "Seepage on Upper Wilson Drain."

Efforts to drain the seeped area by drilling three 6-inch wells began as early as 1919. The Project Manager penned a letter on August 16, 1919 and enclosed another map which depicted the locations of the new wells.[167] It explained that engineers had encountered lava rock a short distance below the surface in the wells, and a large water-bearing seam was encountered at a depth of 45 to 65 feet. The wells produced a combined flow of approximately 6.5 cfs.[168]

The 1919 Annual Project History discussed the well drilling progress, and noted that improvement had been observed in the wet condition of the area.[169] But the 1919 irrigation season was very dry, and little irrigation water was applied in the area after the end of August. Flow from the wells diminished significantly thereafter in September and October. However, it was but temporary relief. The 1920 "Annual Project History" picked up the theme of seepage conditions at the head of the Wilson Drain again:

> As mentioned in the 1919 Project History, since the construction of the Wilson Drain by the Government for the Nampa & Meridian Irrigation District, a portion of the land adjacent to the upper end of the drain remained water-logged. Despite the fact that three flowing wells were drilled in the area in the early fall of 1919, and four more in the spring of 1920, the seepage conditions remained bad. Five more wells were drilled in the late fall of 1920, and these five at the present time are flowing more than the seven previously drilled. At the end of the year all of the wells were flowing a total of 10 cubic feet per second. It will take some time to see what effect the additional wells have in draining this area.
>
> The flow of these wells is into the constructed Wilson Drain, from which a feeder canal diverts at the lower end to water the lands of the Notus extension. Thus, if the constructed flowing wells are not effective in draining the seeped area referred to, they will be put to beneficial use in the irrigation of new lands. *If they do drain this*

[166] Drainage Engineer to Chief of Construction, June 25, 1919, 260-B BOISE PROJECT General Correspondence re Drainage of Lands 260-D, Entry 3, General Administrative and Project Records, 1902-1919, Box 393, R.G. 115. (NMID118)
[167] Boise Project Manager to Chief of Construction, Aug. 16, 1919, General Correspondence regarding Drainage Thru 1929, General Administration and Project Records, 1919-1945, Box 436, R.G. 115. (NMID82)
[168] Boise Project Manager to Chief of Construction, Aug. 16, 1919, General Correspondence regarding Drainage Thru 1929, General Administration and Project Records, 1919-1945, Box 436, R.G. 115. (NMID82)
[169] Annual Project History for Boise Project, Idaho for 1919, Boise, Vol. 11, 1919, Entry 10, Project Histories 1902-1932, Box 34, R.G. 115. (NMID108)

area, they will serve the double purpose of drainage and irrigation. [Emphasis added.][170]

With work like that done on the Wilson Drain and others like it, the creeks whose flows had been altered by the commencement of artificial irrigation in the 19th century were transformed once again. The deepening of their channels and diversion of drainage water into them caused a great increase in flow that became more regular and consistent throughout the months of the year. The construction of the drains also developed *additional* seepage water flows, flows that the District was entitled to recapture pursuant to its 1915 contract with Reclamation and state law. The volume of water developed in these drains was significant. In describing the changed hydrology of the system and the hydrographs created to demonstrate the changes, Reclamation engineer W.G. Steward explained in 1918 that, "the shape of the discharge curves prior to the diggings of the drains is *materially different* from the curves subsequent to drainage." [Emphasis added.] Referring to the changes in the system that had taken place since the alterations of Indian Creek, Mason Creek, Five Mile Creek and Wilson Creek, Steward noted that "since the drains were dug the crop acreage has been increased due largely to the cultivation of the areas which were previously seeped or swamped. The ground water over the affected area has been lowered and has reached a fairly stable condition so that the main increase in the permanent ground water storage will occurr [sic] on the lands above the present drains."[171] Figures 18-21, which demonstrate pre-construction and post-construction discharges for Indian Creek, Five Mile Creek, and Mason Creek, make clear the significance of the hydrological alterations resulting from the drain construction. Similar changes took place on the other drains, as well. Today, many of these drains flow at a depth approaching eight feet. Finally, the construction of the drains also altered the routes of these creeks significantly, the result of which can be seen in Appendices 2 and 3, attached to the end of this report. [See Appendices 2 and 3.]

The following sections indicate original plans for the drains as well as the alterations that took place during construction. In the 1915 contract, the system was separated into five separate drainage systems, which is how they will be described herein.

FIVE MILE DRAINAGE SYSTEM

The drains making up the Five Mile drainage system included Five Mile, Nine Mile, and Sky Pilot drains. Together, the drains made up the biggest section of the initial drainage system in the Nampa & Meridian Irrigation District.

The original plans for Five Mile Creek estimate the stream's post-construction discharge to be between 62 and 90 second feet, creating a water surface area of between 13.6 and 16.6 feet and a water depth (as opposed to channel depth) of 1.2 – 2.2 feet. The drains were ultimately cut to a

170 Annual Project History for Boise Project, Idaho, 133-134, Boise, Vol 12, 1920, Entry 10, Project Histories 1902-1932, Box 34, R.G. 115. (NMID109)

171 "Report on How the Return Flow from Land son the South Side of the Boise River is Effected by Drainage, Evaporation, and Reservoir Losses, Supplimentary [sic] to the 1916 and 1917 Drainage Reports for the Pioneer and Nampa-Meridian Districts," by W.G. Steward, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1915-1919 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Box 391, R.G. 115. (NMID110)

depth of about eight feet below the existing creek channels.[172] To accomplish this, 358,920 cubic feet of soil was excavated in order to drain the 27,000+ acres of land in the system.[173]

Nine Mile Creek – previously known as the Eight Mile Creek Lateral – was estimated to generate a nine (9) second feet discharge following construction, with a base width of five (5) feet, water surface of 7.1-7.7 feet, and water depth of between .7 and .9 feet. This drain was also eventually deepened. To accomplish the drainage of 3,150 acres of land, 134,725 cubic yards of material was excavated.[174]

The Sky Pilot Drain (or slough) was the smallest of the three in this drainage system. It was planned to carry a discharge of four (4) second feet by giving it a base width of five (5) feet, which would generate a surface water width of 6.8 feet and a water depth of .6 feet. The Service expected to excavate 59,420 cubic yards of material to construct the drain.

Name	Est. Dis. Sec. Ft.	Base Width	Water Surface in feet	Water Depth in feet	Acreage Drained	Cubic Yards	Length in miles	Priority[175]
Five Mile	62-90	10'	13.6-16.6	1.2-2.2	27,165	358,920	12.23	1
Nine Mile	9	5'	7.1-7.7	.7-.9	3,150	134,725	3.64	1
Sky Pilot	4	5'	6.8	.6	1,175	59,420	2.27	3

Work to deepen and widen Five Mile Creek was done in 1915. But the plans for the Five Mile drainage system were altered slightly over the course of the two years of construction. For instance, on November 8, 1915, the Nampa & Meridian Irrigation District Board met and entertained a change proposed by Reclamation Engineer J.L. Burkholder, in charge of drainage construction under the plan approved by the Board on August 25, 1914. Burkholder requested that instead of utilizing the Five Mile Creek channel all the way to the Boise River, that a change in course be made for the Five Mile Drain, diverting it from Five Mile Creek near the center of Section 21, Township 4 North, Range 2 West, and then running it westerly along the foot of the bluff through Sections 21, 20, and 19, ultimately discharging into the Lower Mason Creek Drain as it was then constructed in the NW 1/4 of the NW 1/4 of Section 19, Township 4 North, Range 2 West. The Board approved the change.[176] Additionally, as the construction entered into its final phase, the Nampa & Meridian Irrigation District board approved an extension for Sky Pilot in January 1917, taking it an additional

[172] Board of Engineers to Chief of Construction, Feb. 8, 1916, BOI-530.00-16-02-08 Project Manager's Copy, 5 & 10 Mile Drainage Channels - Coop. Drainage, Feb. 8, 1916, Project Reports, 1910-1955, Box 60, R.G. 115. (NMID90)
[173] June 1, 1915 Contract between the Nampa & Meridian Irrigation District and the United States of America, Nampa & Meridian Irrigation District archives. (NMID276)
[174] June 1, 1915 Contract between the Nampa & Meridian Irrigation District and the United States of America, Nampa & Meridian Irrigation District archives. (NMID276)
[175] The drains were to be built in order of priority in three groupings. This number refers to the group in which each drain was planned, as described earlier in this report.
[176] NMID Board Meeting Minutes, Nov. 8, 1915. (NMID270)

one-half mile to the southeast, heading near the east quarter corner in Section 4, Township 3 North, Range 1 West.[177]

TEN MILE DRAINAGE SYSTEM

The Ten Mile Drainage system, while made up of only one drain, was the second largest in the proposed system. Engineers explained that conditions for the Ten and Five Mile were "essentially different…as the storm run-off from relatively large and un-irrigated areas is naturally tributary to them."[178] Therefore, extensions and enlargements were necessary. Ten Mile was originally designed to permit a discharge of 34 second feet of water and drain 8,710 acres. To carry this, the creek was to be deepened and widened by excavating 389,950 cubic yards of material in order to create a base width of six (6) feet, a surface width of 9.4-10.8 feet, and a water depth of 1.1 – 1.6 feet.[179]

Name	Est. Discharge Sec. Ft.	Base Width	Water Surface in feet	Water Depth in feet	Acreage Drained	Cubic Yards	Length in Miles	Priority
Ten Mile	34	6'	9.4-10.8	1.1-1.6	8,710	389,950	Total: 14.4	1

But more than a year after construction began, it was clear that additional work in Ten Mile Creek would be necessary. In December 1916, the Nampa & Meridian Irrigation District Board recognized that the developing system required the Ridenbaugh Canal to waste "large quantities of water" into Ten Mile Creek at the crossing. To accommodate the volume – at least 50% of the maximum capacity of the Ridenbaugh Canal – the Board authorized the Reclamation Service to construct a reinforced concrete structure at the point where the drain and Ridenbaugh canal intersected in order to allow the water to be "delivered from said Canal into said Ten Mile Drain." They also approved the extension of Ten Mile Drain for an additional 1.5 miles to the southeast, so that it would head further upstream in Section 33, Township 3 North, Range 1 East. (It was previously designed to head in Section 29). The extension was needed in order to "properly drain lands" further up in the system that were now showing signs of seepage.[180]

PURDAM GULCH DRAINAGE SYSTEM

The Purdam Gulch drainage system was the third largest of the set. Planned for the drainage of 11,195 acres, it was engineered to provide capacity for 20-28 second feet of discharge by

[177]NMID Board Meeting Minutes, March 7, 1916, 173; Jan. 5, 1917, 250, Nampa & Meridian Irrigation District archives. (NMID270 & NMID272) A 1916 report explained that unlike Five and Ten Mile Creeks the Nine Mile Drain was not subject to a "drainage area above the irrigated land likely to discharge into it," which confirmed that this was not a natural creek.[177] (See Figure 9.)
[178] Board of Engineers to the Chief of Construction, February 8, 1916, quotes at 2, 9, 260-A BOISE PROJECT Drainage of Nampa Meridian Irrigation District 1915 Thru 260-B, Entry 3, Box 392, R.G. 115. (NMID 115)
[179] June 1, 1915 Contract between the Nampa & Meridian Irrigation District and the United States of America, Nampa & Meridian Irrigation District archives. (NMID276)
[180] NMID Board Meeting Minutes, Dec. 5, 1916. (NMID272)

excavating 120,020 cubic yards of material, providing a base width of five (5) feet, a water surface width of 8-9.8 feet, and a depth of 1-1.6 feet.[181]

Name	Est. Discharge Sec. Ft.	Base Width	Water Surface in feet	Water Depth in feet	Acreage Drained	Cubic Yards	Length in Miles	Priority
Purdam Gulch	20-28	5'	8.0-9.8	1.0-1.6	11,195	120,020	3.64	2

On August 1, 1916, as the Reclamation Service entered phase two of construction, the Nampa & Meridian Irrigation District approved the Reclamation Service's plan to extend the Purdam Drain beyond its initial end point a short distance to the south, in order "to connect with a natural depression which exists at this point." The drain would now extend across the State highway and across the Interurban Rail Road Company, though still remain in Section 10, Township 3 North, Range 1 West.[182]

ELIJAH SLOUGH DRAINAGE SYSTEM

The Elijah Slough Drainage System was the third largest in the plan and included the Elijah, Joseph, and Aaron drains. Together, they were to drain more than 15,000 acres through the excavation of almost 300,000 cubic yards of material. The Elijah was the biggest of the three, engineered to handle a discharge of between 23 and 33 second feet through the excavation of 123,650 cubic yards of material, creating a base width of five (5) feet, a water surface of 9.8 – 11 feet, and a water depth of 1.2-1.5 feet. The Elijah alone was intended to drain 13,040 acres. The second largest drain in this subsystem was the Joseph drain, constructed to carry only 3.5 second feet of water, although it, too, would be five (5) feet wide at its base, run water at .5 feet, and have a surface width of seven (7) feet. It was intended to drain 960 acres through the excavation of 95,160 cubic yards of material. Finally, the Aaron drain was expected to carry an estimated discharge of four (4) second feet, with a base width of five (5) feet, a water depth of .5 feet, a surface width of seven (7) feet, and an excavation of 79,080 cubic yards. The Aaron was intended to drain 1,140 acres.[183]

Name	Est. Discharge Sec. Ft.	Base Width	Water Surface in feet	Water Depth in feet	Acreage Drained	Cubic Yards	Length in Miles	Priority
Elijah	23-33	5'	9.8-11	1.2-1.5	13,040	123,650	3.68	1
Joseph	3.5	5'	7	.5	960	95,160	2.9	2
Aaron	4	5'	7	.5	1,140	79,080	1.51	3

[181] June 1, 1915 Contract between the Nampa & Meridian Irrigation District and the United States of America, Nampa & Meridian Irrigation District archives. (NMID276)
[182] Board Meeting Minutes, Aug. 1, 1916 (NMID272)
[183] June 1, 1915 Contract between the Nampa & Meridian Irrigation District and the United States of America, Nampa & Meridian Irrigation District archives. (NMID276)

Although the Joseph was meant to be constructed after the Elijah was completed, the Reclamation Service requested permission from the Nampa & Meridian Irrigation District Board in January 1916 to construct a portion of the Joseph Drain before completing all of the class 1 drains, those slated for the first phase of construction. The government wanted to construct the Joseph Drain, a drain which stretched from Section 33, Township 3 North, Range 2 West northwest and drained into the Elijah Slough Drain in Section 20 of the same township,[184] before constructing the Elijah, even though the Elijah was in class 1 and the Joseph in class 2. In January, the Nampa & Meridian Irrigation District Board of directors approved the change. (See Figure 10.)[185] By March 7 of that year, the construction of the Elijah Drain also needed further refinement. Originally designed to end about 1000 feet north of the southeast corner of Section 35, T3N, R2W, Reclamation came to the Board and requested permission to survey and construct an additional 1.5 miles of drain to the southeast in order to "properly drain the land, which naturally drains into this drainage channel." The Board approved the request.[186]

A few years following the completion of construction, the Nampa & Meridian Irrigation District Board heard a request from N.L. Moen, the owners of property in the NE 1/4 of Section 2, in T2N, R2W, that the District extend the head of the Aaron Drain to the location where the "natural channel" crosses the Murphy branch of the OSL Rail Road adjacent to his land. He also wanted the District to lower the culvert under the Murphy branch by four feet. The Board asked the Manager to talk to the USRS about making an examination and report on the drainage of this land, and also to provide an estimate.[187] It is unclear whether this extension was ever completed.

WILSON CREEK DRAINAGE SYSTEM

The Wilson Creek drainage system included the Wilson drain and the Orr drain. Together, they were expected to drain approximately 12,000 acres through the excavation of more than 200,000 cubic feet of material. The Wilson drain, with a base width of five (5) feet, was expected to carry a discharge of between 13 and 27 second feet of water. Its water surface width would be 9.8 – 11 feet and its depth would be 1.2 – 1.5 feet. It would drain 10,530 acres through the excavation of 154,336 cubic yards of material. The Orr drain would carry a discharge of 5.1 second feet of water through engineering a base width of five (5) feet. Its water depth would be .5 - .6 feet and its surface width 7.0 – 7.4 feet. It would drain 1,530 acres through the excavation of 53,390 cubic yards of material.[188]

Name	Est. Discharge Sec. Ft.	Base Width	Water Surface in Feet	Water Depth in feet	Acreage Drained	Cubic Yards	Length in Miles	Priority
Wilson	13-27	5'	9.8-11.0	1.2-1.5	10,530	154,336	3.79	1
Orr	5.1	5'	7.0-7.4	.5-.6	1,530	53,390	1.51	1

[184] Nampa & Meridian Irrigation District Board Minutes, Jan. 4, 1916, 165, Nampa & Meridian Irrigation District archives, Nampa & Meridian Irrigation District archives. (NMID65)
[185] NMID Board Meeting Minutes, Jan. 4, 1916. (NMID270)
[186] NMID Board Meeting Minutes, March 7, 1916. (NMID270)
[187] NMID Board Meeting Minutes, June 1, 1920. (NMID268)
[188] June 1, 1915 Contract between the Nampa & Meridian Irrigation District and the United States of America, Nampa & Meridian Irrigation District archives. (NMID276)

The Wilson Drain provides another excellent example of the changes in flow brought by the drainage construction. In this case, the discharge of Wilson Creek drain in 1915 was 34,662 acre-feet, but additional excavation totaling 206,049 cubic yards of material and the natural move toward equilibrium between surface and ground water brought that drain's discharge to 54,828 acre-feet at the end of 1916.[189] In fact, the Wilson Drain was never able to fully drain the surrounding lands, and property owners later dug wells in the area – financed in part by the District – to provide further relief, creating an additional water supply voluminous enough to support a fish farm facility.[190]

APPORTIONMENT AND ASSESSMENT

By late 1917, much of the drainage work had been completed and had come in significantly under budget. When the District signed the 1915 contract it also decided upon a benefits and assessment schedule that would assess all agricultural landowners in the District equally based on the benefits that would accrue to each tract or subdivision of land. The Board filed its apportionment plan and petition with the District Court in 1915 for confirmation immediately after signing the contract with the United States,[191] but the complicated nature of the petition and the number of individuals protesting the plan greatly delayed the settlement. Protestants consisted of landowners in upper portions of the District whose lands were not in immediate need of drainage work and who did not feel that they should be required to pay any part of the system's cost. As part of the legal proceedings that slowly unfolded, a lengthy trial on the petition occurred between November 1917 and January 1918, during which many landowners in the District provided testimony regarding the proposed assessment of their lands.[192] Then, unexpectedly, the judge in charge of the case died, further delaying the process. The courts did finally make a decision regarding the apportionment plan, approving the District's assessments at $7/acre across the board, the price that landowners would have to pay to maintain the facilities to serve their original intent: drainage of the land and delivery of a secondary supply of storage water.[193]

But just as the court handed down its decision, construction of the drainage system was being completed. A system map created in 1917 following the system's implementation demonstrates the level of human engineering present in the area. (See Figure 14.) A Drainage Investigation report for that year analyzed the total drainage area of the West End, Dixie, Mason Creek, and Five Mile Creek Drain Systems, as well as the Indian Creek system which included the Wilson Creek drain system. D.J. Paul provided a narrative description of the system in his report. The smallest of the areas, the

---

[189] Discharge of Drains, by D.J. Paul, 1916, part of Annual Project History of Boise Project, Idaho for 1916, Boise, Vol. 8, 1916, Entry 10, Project Histories 1902-1932, Box 33, R.G. 115. (NMID99)
[190] See for example, NMID Board Meeting Minutes regarding Hosack Wells, Nov. 29, 1929 (NMID348); Sept. 4, 1934. (NMID349)
[191] Petition in the Matter of the Board of Directors of Nampa – Meridian Irrigation District for the Examination, Approval, and Confirmation of the Assessment, Apportionment, and Distribution of Costs of Certain Works of Said District upon the Lands Within the District," June 5, 1915. Civil No. 3238 (Petition is not actually available, but reference to it was made on the ledger of actions in the case.), Canyon County Courthouse, Idaho. (NMID281)
[192] SHRA has searched for the transcript of this proceeding, but has not been unable to uncover it.
[193] "Flat Rate is Confirmed," *The Idaho Daily Statesman*, July 11, 1918. (NMID324)

Dixie Drain, had a single tributary drain, the Yankee. The West End Drain's system had two tributaries, the Parker Drain and the Bardsley Drain. Five Mile Creek's system had three tributaries (Ten Mile, Sky Pilot, and Nine Mile), while Mason Creek Drain had five (Solomon, Lower Five Mile, Noble, Madden Spur, and Grimes). The Indian Creek system had the largest number of tributaries (East Caldwell, Moses, Midway, and Nampa drains, along with Indian Creek itself) with Wilson Creek serving as a tributary with tributaries of its own (Orr, Upper Embankment and Jonah Drain) in addition to the Elijah Drain (tributary to Wilson Creek) which was fed by Isaiah, Joseph, and Aaron Drains.[194]

With construction complete and a significant amount of money remaining in the budget, the District Board met in November 1917 and agreed that a supplementary contract with the Reclamation Service was in order to address repayment, cost, and additional water supply needed on lands in Nampa. The new agreement specified that the primary drainage construction would be terminated at a cost not to exceed $340,000 (as opposed to the original cost of $557,000), leaving some funds from the original budget available to pay any contingent liabilities. The supplemental contract also noted that a new law passed on August 13, 1914 known as the Reclamation Extension Act, would have the effect of extending repayment of charges from the 1915 contract an additional 10 years from the original 10. The same proportion of the final construction costs would be charged to old water right lands in the District as had been contemplated in the original contract, and payments would be due annually. Voters authorized the District to enter the contract on December 11, 1917. By the time the Board determined the benefits for each tract or subdivision for apportionment in September 1918, approval of the flat rate assessment for the first apportionment of benefits had been handed down, and so the Board took the same approach for the supplemental contract. They heard protests from various parties in September, adopted the benefits and assessment schedule in October, and finally entered the contract with the United States on November 5, 1918.[195]

1917 was an important year for reasons other than the completion of the drainage work in the Nampa & Meridian Irrigation District. As noted above, the state legislature recognized that there was a drainage "emergency" in the Boise Valley (as noted in House Bill 254), and passed legislation authorizing irrigation districts to pursue the same functions for drainage as they did for irrigation: namely, construction, operation, maintenance, and assessment. That bill was codified in Idaho Code section 43-305 that year. Additionally, on July 2 of that year, Secretary of the Interior Franklin K. Lane also issued a public notice to users under the Boise Project stating that if any additional funds were used to pay for further drainage work, they would be paid for with an increase in the construction costs charged to the users.[196] However, when the Reclamation Service did in fact expend additional funds on drainage *outside* the boundaries of the Nampa & Meridian Irrigation District, it tried to recoup the costs by adding an additional $1/acre to the operation and maintenance assessment it issued to the District. The District believed this charge to be illegal, arguing that construction costs were fixed by contract and that increases could not be moved over to the operation and maintenance assessment. In protest, the District filed a lawsuit against the federal agency in 1921.

---

194 Report on Drainage Investigation of Pioneer and Nampa-Meridian Dist. Of Boise Project, Idaho for the Year 1917, by D.J. Paul, under direction of W.G. Steward, Project Reports, 1910-1955, Box 60, R.G. 115. (NMID92)
195 Board Meeting Minutes, Nov. 7, 1917; Sept. 3, 1918; Nov. 6, 1918. (NMID272)
196 17th Annual Report of the Reclamation Service, 1917-1918 (U.S. Government Printing Office: Washington, D.C., 1918), 129. (NMID379)

In conjunction with the lawsuit, the Nampa & Meridian Irrigation District Board opted not to assess its members for the agency's work and not to pay the bill. In return, the Reclamation Service threatened to withhold irrigation water from the landowners in the District. The court proceeding that resulted between the Service and the District, *Nampa & Meridian Irrigation District v. Bond*, centered on the question of whether the Reclamation Service could charge the district for the drainage work under an "operation and maintenance" umbrella, and in turn, whether the District could assess its members. The District did not believe it could legally do so. The Courts (ultimately, the United States Supreme Court in 1925, which affirmed the two lower court rulings) disagreed with the District, ruling that the Service did in fact have the authority to assess maintenance and operations charges to pay for drainage construction under the Reclamation Act in order to drain all project lands, not only those within the District boundaries:

> The irrigation system is a unit, to be, and intended to be, operated and maintained by the use of a common fund, to which all the lands under the system are required to contribute ratably, without regard to benefits specifically and directly received from each detail to which the fund is from time to time devoted.[197]

While the lawsuit was winding its way through the courts, drainage demands in the area continued, and Reclamation continued to pay the way while the Drainage Fund still contained funding. An example of continued Reclamation work on drains came soon after initial construction was complete. Mason Creek Drain, which is underlain in part by lava rock and therefore difficult to dredge, had not been dug as deep or as long as some of the landowners had originally desired. Between July and November 1921, the Nampa & Meridian Irrigation District Board met with representatives of the U.S. Reclamation Service, the Pioneer Irrigation District, Carnation Milks Products Co., and the city of Nampa to discuss drainage from a point in the Pioneer District (where a drain was already constructed), through the city of Nampa to a point above the city limits in the Nampa & Meridian Irrigation District.[198] In November, the Nampa & Meridian Irrigation District offered a proposal to: "clean out the old Mason Creek Channel down to rock from the point where said creek crosses the boundary line between the Pioneer Irrigation District and our Irrigation District up said creek to a point where it is possible to construct a deep drainage channel and further proposes to excavate a deep drain from the last described point to the East line of Section 25, Township 3 North, Range 2 West."[199] The proposal recognized that it would be "impossible to construct a deep drain in many places on Mason Creek within a reasonable cost on account of lava rock but hoping that this meeting will result in a contract between all interested parties for the construction of the best possible drain on said creek for the benefit of lands now badly in need of drainage." The Nampa & Meridian Irrigation District Board met again on February 20, 1922 and authorized $12,000 for the project, directing the Reclamation Service to complete the work.[200] But when it became clear that the Reclamation Service was unable to begin the work, the District permitted the Pioneer Irrigation District to construct the drain instead, still utilizing money from the Drainage Fund.[201]

---

197 *Nampa & Meridian Irrigation District v. Bond*, 268 U.S. 50 (1925). (NMID378)
198 NMID Board Meeting Minutes, July 9, 1921; Nov. 1, 1921. (NMID268)
199 NMID Board Meeting Minutes, Nov. 1, 1921. (NMID268)
200 NMID Board Meeting Minutes, Feb. 20, 1922. (NMID271)
201 NMID Board Meeting Minutes, June 6, 1922. (NMID271)

In addition to existing drains, landowners in the District also needed additional drains over the next several years. In 1923, Nampa & Meridian Irrigation District Manager G.A. Remington submitted an annual report to the Board summarizing the current status of seepage in the District and explaining that the conditions again were becoming serious, even in areas with open drains. He predicted that it would be "impossible to avoid additional drainage construction indefinitely," but that more careful use and delivery of irrigation water in cooperation with water users would help delay the need. He also reported that the drainage construction on Mason Creek was under way and would be completed in 1923, exhausting the balance in the Drainage Fund of the U.S. Reclamation Service.[202]

Land owners on Five Mile Creek hoped to take advantage of the deepening of Mason Creek Drain in 1923. They approached the Nampa & Meridian Irrigation District Board that March regarding their water rights and water delivery in the hopes that their problems could be solved, explaining that when water was turned into the Five Mile Drain, it caused a greater flow of water than the existing facilities could handle. The land owners requested that the District raise the concrete check in Five Mile Drain to divert the excess water into the newly improved Mason Creek Drain. After the Board members adjourned and investigated the site, they agreed to approve the request if Pioneer Irrigation District would pay one-half the cost of the structure.[203]

But with the Reclamation Fund depleted, the District members recognized that additional requests for drainage such as these could be handled more efficiently by examining the District's needs as a whole. Following the court's decision in *Nampa & Meridian Irrigation District v. Bond*, the District met to determine its assessments for 1926. In August, the District Board noted that it needed to raise the amount necessary to "operate and maintain" the property of the District. In response, the Board voted to assess its landowners in three classes, "proportionate to the benefit received by such lands growing out of the operation and maintenance of such works," with the majority – the lands not lying in the towns of Nampa or Meridian – receiving a single, flat rate assessment. The Board noted in the record that those lands, called "Class No. 3," were "equally benefited by the operation and maintenance of the works of the District, and the sum of $2.20 per acre is hereby levied against such lands."[204] Soon after, the Board had to issue another assessment to repay the Reclamation Service for drainage construction costs when those payments came due. Thus, the District assessed its old water right lands (Class A) and its project lands (Class B), at the rate of $5.40/acre and $8/acre respectively, to meet the District's annual respective payments due on the old Ridenbaugh lands as well as the newly watered Project lands.[205]

As the system of assessment was worked out and the continued needs of the landowners were analyzed, the financial statements presented to the Board by the District's treasurer began to break down the balances in a different way, including a new category termed, "N&MID Drainage Fund." This category was distinguished from the "U.S. Maintenance Fund," which was presumably used to pay for the items that fell under that umbrella and for which the Reclamation Service charged the District annually; the "U.S. Storage Water Fund," used to pay the agency for storage water; and the "U.S. Construction Fund," which carried the largest balances and was undoubtedly used to repay the

[202] NMID Board Meeting Minutes, Jan. 2, 1923. (NMID271) Drainage issues on Mason Creek continued well into the 1930s, during which wells were dug as a potential solution to the problem. See NMID Board Meeting Minutes Sept. 15, 1936 and Nov. 3, 1936. (NMID350)
[203] NMID Board Meeting Minutes, March 16, 1923. (NMID271)
[204] NMID Board Meeting Minutes, Aug. 18, 1925. (NMID377)
[205] See NMID Board Meeting Minutes, Oct. 6, 1925. (NMID377)

Reclamation Service for construction of both Arrowrock Dam and the drains contracted for in the 1915 agreement.[206] By January 1926, the District's Drainage Fund was already carrying a balance of almost $10,000.[207] Although the Reclamation Service was still improving and enlarging the drains it had constructed pursuant to the 1915 contract, the District had begun collecting money that would allow it to make further strides in drainage should it prove necessary.

Lands in the District continued to require drainage work in the ensuing years, as did lands outside the District and even outside the Project. As such, the District simply used money it collected in its assessments to manage drainage needs within its boundaries. The District also worked with other entities in the area to manage drainage issues collectively. In 1923, for instance, Ada County formed Drainage District #3 (pursuant to enabling legislation passed by the Idaho legislature in 1917[208]) to drain lands outside of the Boise Project but which were no doubt affected by irrigation on Project lands. Nampa & Meridian Irrigation District's Board met to discuss and investigate the county's plans, including their intent to assess Nampa & Meridian Irrigation District for a portion of the work. Ultimately, the District approved of the Drainage District formation by resolution that summer, although the nature of the continuing relationship between the two is unclear. [209] Initial plans of the Drainage District included the construction of a drainage canal paralleling the main Ridenbaugh Canal through the waterlogged portion of the Drainage District, intended to protect Nampa & Meridian Irrigation District against claims for damages on account of seepage from the Ridenbaugh.

ADDITIONAL DRAINAGE IN THE NAMPA & MERIDIAN IRRIGATION DISTRICT, 1926-1960

As noted above, it soon became clear that drainage was going to be an ongoing concern across the entire project region south of the Boise River. Throughout the ensuing several decades, the District continued to assist landowners with the costs of draining their lands. Depending on the property and the severity of the problem, the District helped pay for either new surface drains or drainage wells into which excess flows would be directed through the collection of assessments that went into the District's Drainage Fund. Additional construction as well as maintenance on the original drains also continued.

Nampa & Meridian Irrigation District ultimately provided the services of both a water delivery district as well as a drainage district and assessed their landowners accordingly. As the official drainage entity, then, Nampa & Meridian Irrigation District received many further requests for assistance over the next several decades, and the record makes clear that additional drains were dug, although details of their construction are nonexistent. In addition to the many drains, the District and landowners also began to consider the drilling of wells in the 1920s to reclaim seeped lands. In some cases, it appears that the cost of drains and wells was shared in part by the landowners, while other times the District absorbed the entire expense.

---

[206] NMID Board Meeting Minutes, Oct. 6, 1925. (NMID377)
[207] NMID Board Meeting Minutes, Jan. 5, 1916. (NMID377)
[208] An Act Provided For the Establishment Of Drainage Districts, And The Construction And Maintenance Of A System Of Drainage, And To Provide For The Means Of Payment Of The Costs Thereof, And Declaring An Emergency (1913) (NMID372)
[209] NMID Board Meeting Minutes, Aug. 17, 1923. (NMID271)

Regardless of the financing, it was abundantly clear that parts of the District would soon need more drainage work. Farmers therefore faced a serious dilemma: an ongoing agricultural depression rendered them unable to pay for the needed additional drainage – in fact many of them were having trouble meeting the existing payments required under terms of the 1915 repayment contract with the Reclamation Service – yet they could neither afford for their lands to become unproductive, as they would if the seepage continued to worsen. Lands across the District on Indian Creek, Mason Creek, the Wilson Slough, and below the lower embankment of the Deer Flat Reservoir all needed the drainage relief, and the District manager recommended that the District pursue a new contract with "all possible haste" with the United States in order to help finance the work.[210] Shortly thereafter, the Board resolved to negotiate with the Bureau of Reclamation[211] to obtain a new contract, which they ultimately signed in 1926.[212] According to District minutes, a five-year drainage program was outlined in 1929, and by 1931, "considerable work [had] been completed in the way of ditches. Many weeping wells [were] put down, all of which have been very effective and a large acreage has been drained."[213] During that same period, Five Mile Creek underwent additional improvements, and the connection secured between Mason Creek and Five Mile Creek.

Unfortunately, it is unclear exactly how these improvements were financed, and to what degree, if any, the Bureau of Reclamation was involved. However, the historical record seems to suggest that the Nampa & Meridian Irrigation District was constructing many of the additional 69 drains in existence today in the 1920s and 1930s, and sharing the cost for their construction with landowners, paying their portion out of the drainage funds collected through assessments. The details on the drains, as noted above, are scant, but a few specifics are noted in the records that provide certainty as to continued progress. For example, the Board Minutes for December 1937 describe a drainage inspection trip taken by Board members in which they examine the Rachel Drain, the Purdum Drain, a proposed drain on the Frank Rosenlof ranch, the Roundhouse Drain, the Hubbard Drain, and a stub drain to be constructed off the Aaron.[214] Later in the 1930s, the District applied for a $20,000+ grant from the federal Public Works Administration for the construction of drainage ditches and drainage wells.[215]Although we do not know for certain whether the District received the grant, the record makes it clear that beginning in 1941, the expenditures on drainage construction fell precipitously from an average of about $10,000 annually throughout the decade to less than $200 in 1941, remaining at minimal levels until 1944, when capital expenditures approached $5500.[216] The following year, the Idaho Legislature passed a law permitting irrigation districts to levy their landowners for the purpose of draining any lands within their boundaries.

---

210 NMID Board Meeting Minutes, Jan. 2, 1924. (NMID271)

211 The name was changed from the Reclamation Service.

212 NMID Board Meeting Minutes, Jan. 11, 1924. (NMID271)

213 NMID Board Meeting Minutes, Jan. 6, 1931. (NMID348)

214 NMID Board Meeting Minutes, Dec. 28, 1937. (NMID350) Construction of the stub, and payment of half its cost, was agreed to at the January 4, 1938 Board meeting. Another drain, the Tobias, was mentioned in the minutes of February 1, 1938. And the Rosenlof, mentioned in the December 1937 minutes, was shown to be constructed by March 1938. (NMID350)

215 NMID Board Meeting Minutes, Aug. 2, 1938. (NMID351) A note of interest: Pioneer Irrigation District applied for and was granted money from this same agency for additional drainage within its boundaries, as well. See Stevens, *A History of Pioneer Irrigation District*.

216 NMID Board Meeting Minutes, Feb. 17, 1942, Financial Statement Nampa & Meridian Irrigation District for the Year 1941 (NMID352); NMID Board Meeting Minutes, March 20, 1945, Financial Statement Nampa & Meridian Irrigation District for the Year 1944

Therefore, in August 1945, the Nampa & Meridian Irrigation District adopted a resolution stating the need to create a drainage fund through a new assessment on landowners, to be known as the Drainage Fund of Nampa & Meridian Irrigation District.[217] How this differed from the earlier Drainage Fund is not clear.

Examination of financial information that appears in the Board minutes over the next several years demonstrates that the construction of drains and wells continued after this resolution was passed and continued into the 1950s, when the District continued to finance the cost of drain construction through the Drainage Fund in an effort to maintain the balance between surface and ground water.[218] Today (2013), there are a total of 80 drains in the Nampa & Meridian Irrigation District, only 11 of which are drains that were constructed with the U.S. Reclamation Service during the 1916-1920 period. The remaining 69 drains are referred to as "District drains," and were built and paid for in part by the District, and in part by private landowners. Together, the constructed drains allowed crops to again grow on the lands south of the Boise River.

MODERN DRAIN OPERATION IN THE NAMPA-MERIDIAN IRRIGATION DISTRICT

WORK IN PROGRESS

CONCLUSION

It would be difficult to overstate the impact of irrigation on the Boise Valley landscape and hydrology in the 50 years following the first white settlement of the Boise Valley. The planning and toil of many men created irrigation and drainage systems that enabled thousands to settle and make productive use of the vast plains of sagebrush in the Boise Valley.

The 1904 creation of the Nampa & Meridian Irrigation District formalized the organization of many farmers on the lands south of the Boise River, but the completion of the District's irrigation system took several additional decades. Artificial irrigation was responsible for turning sagebrush into productive farmland, a development that began in the 19th century and continued well into the 20th. The drainage problem on these lands stalled the District's progress, as there were no surface channels available to capture the excess water and drain it to the Boise River. Farmers on the swamped lands demanded a drainage system that was constructed by the United States Reclamation Service. By the 1920s, many of these issues had been resolved, and the farmers in the Nampa & Meridian Irrigation District were well positioned to contribute their goods to a growing Boise Valley economy. Although the District's infrastructure continued to be refined over the ensuing century as urbanization encroached onto the farmlands, the system as it existed in the 1920s would persist for many years to come. It was augmented by the District throughout much of the 20th century, and paid for by the farmers through assessments. As the system matured, it

[217] Idaho Code 42-305-A referred to in the NMID Board Meeting Minutes, Aug. 21, 1945. (NMID 353)
[218] For example, the financial statement for 1949 shows an expenditure of $32,398.57 for new drainage construction, while the financial statement for 1950 shows a cost of $21,031.44. NMID Board Meeting Minutes, Feb. 15, 1949 and Jan. 17, 1950. (NMID354)

facilitated a balance between surface and groundwater and resulted in a balance that supported great population growth in the valley.

APPENDIX 1: FIGURES

APPENDICES 2 AND 3: MAPS SHOWING CHANGE IN CREEK COURSES, 1860S-PRESENT

APPENDIX 4: HYDROLOGY OF THE BOISE RIVER LANDSCAPE, BY DAVE SHAW, ERO

APPENDIX 1

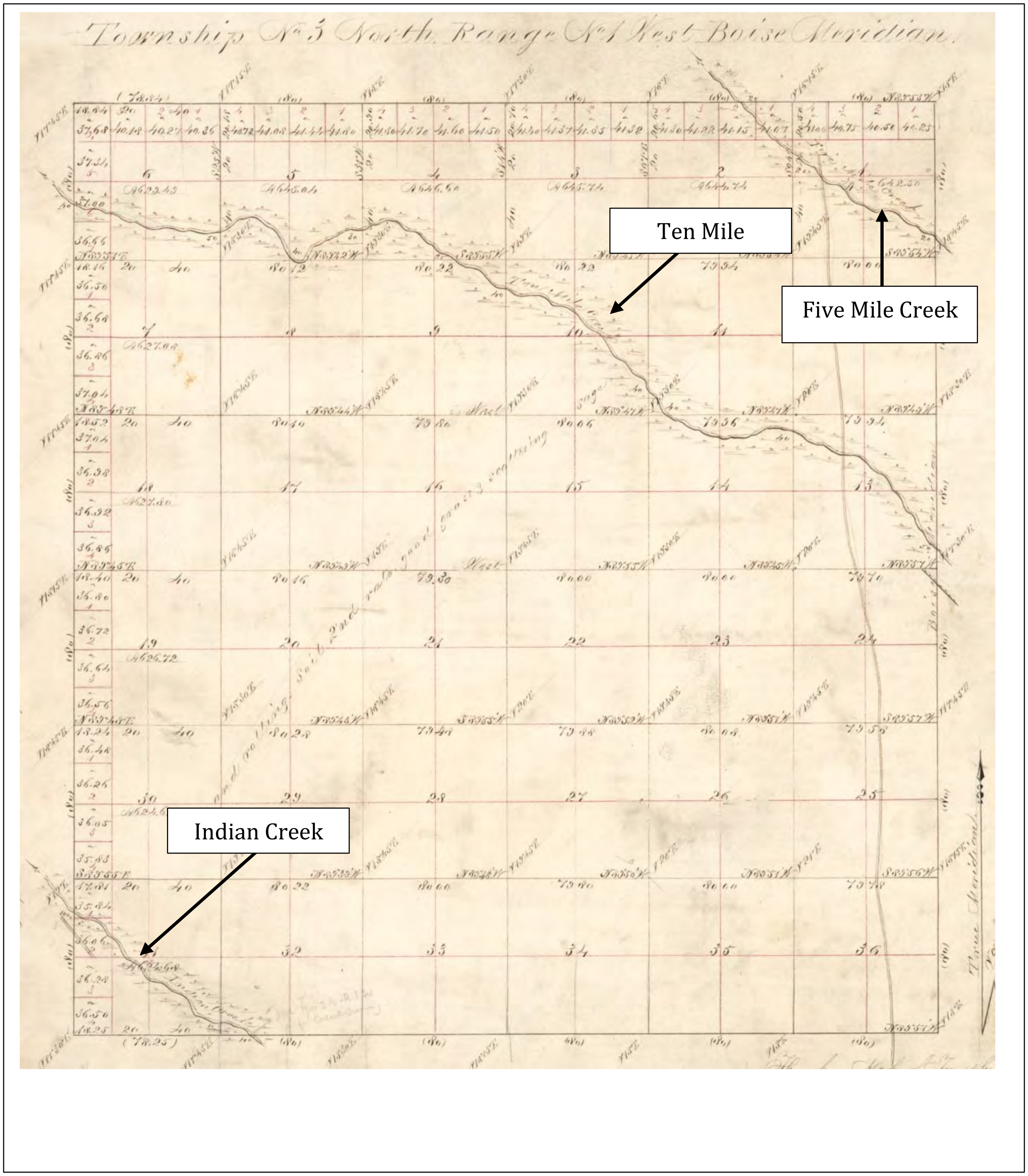


Figure 1: Original Survey Plat, Township 3 North, Range 1 West, Boise Meridian. Surveyed 1867/1875, accepted 1875. Courtesy Bureau of Land Management online (NMID20)

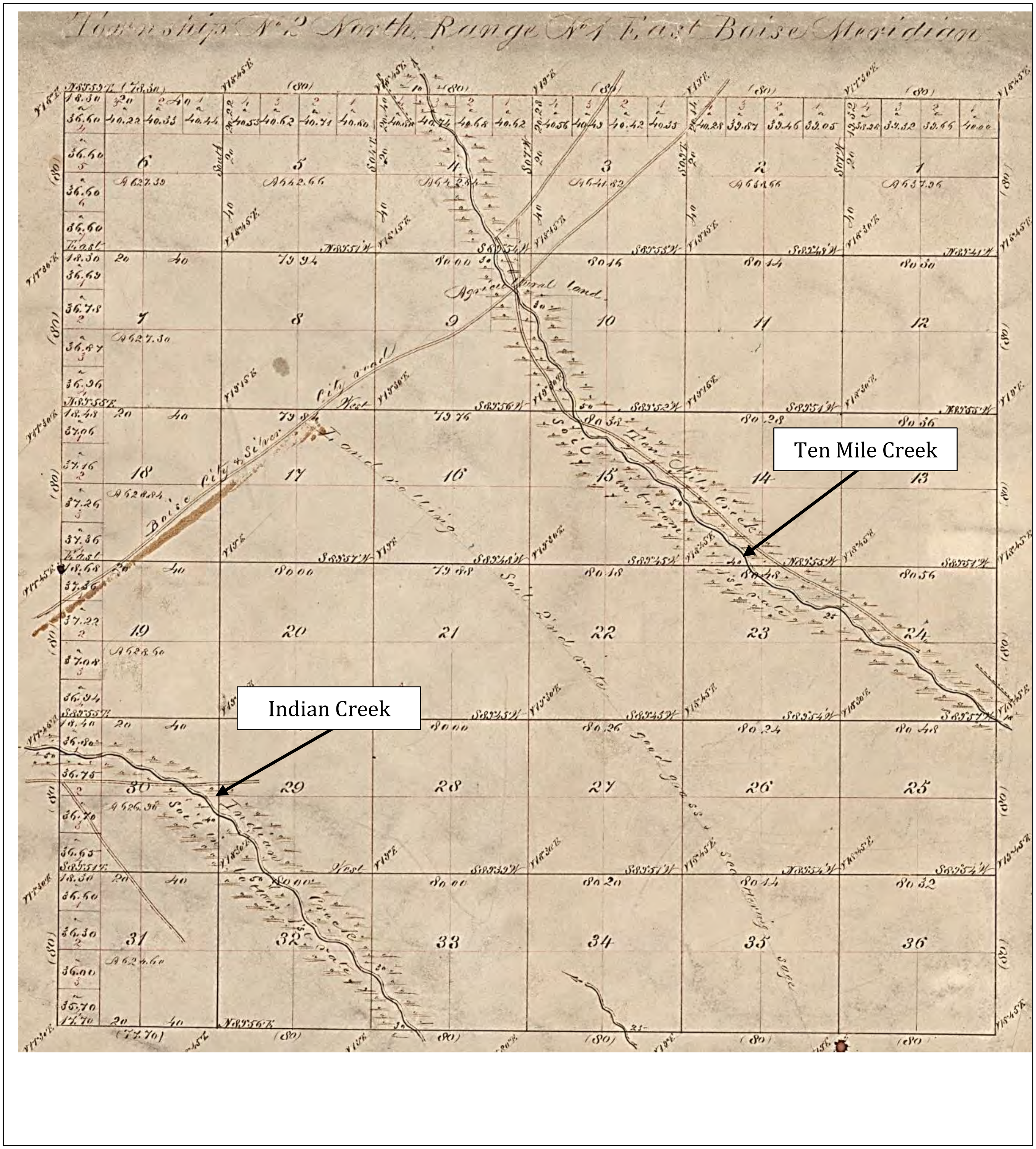


Figure 2: Original Survey Plat, Township 2 North, Range 1 East, Boise Meridian. Surveyed 1867/1875, accepted 1875. Courtesy Bureau of Land Management online (NMID43)

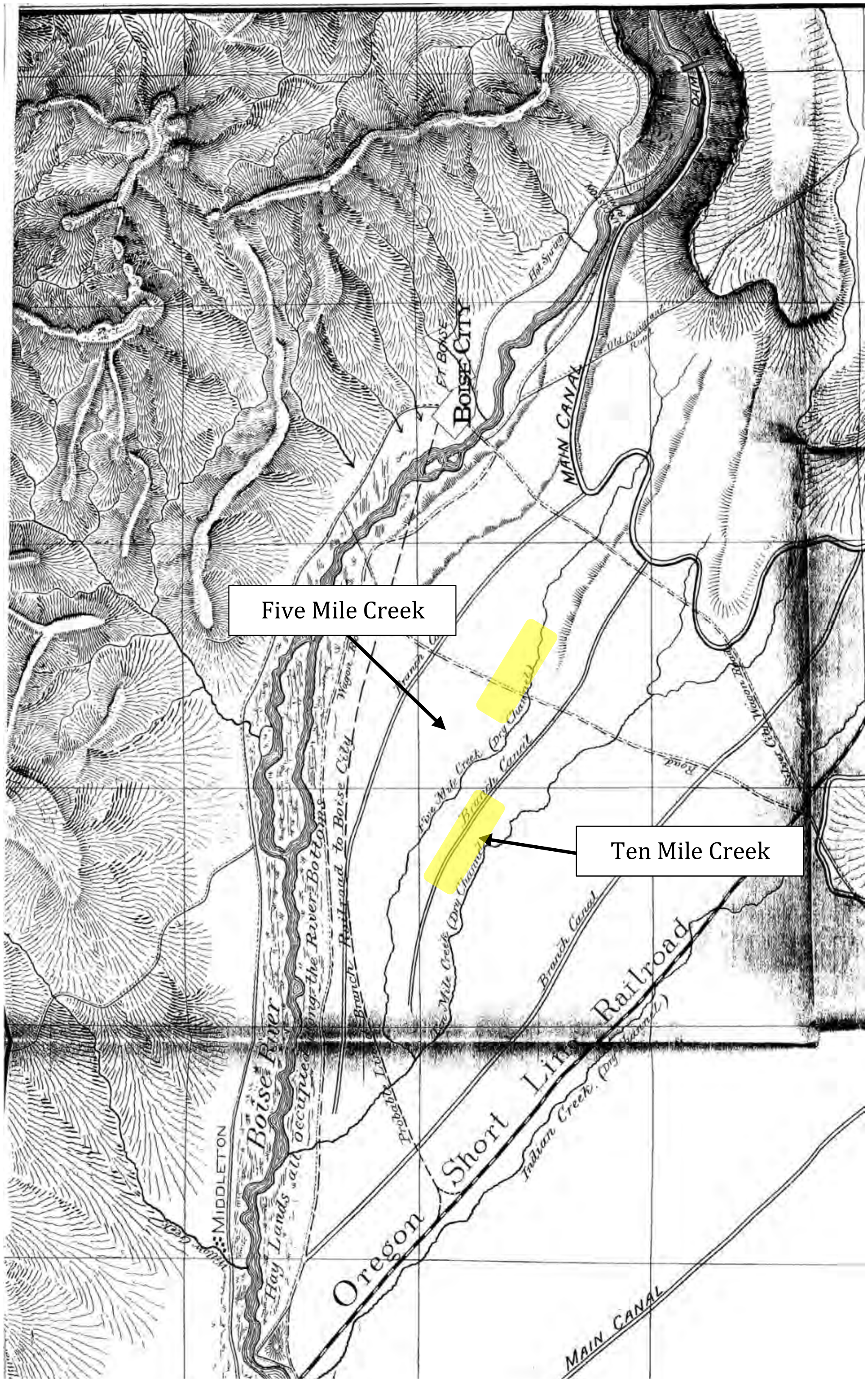


Figure 3: A.D. Foote, Report on the Feasibility of Irrigation and Reclaiming Desert Lands Between the Snake and Boise Rivers, 1883 (NMID41)

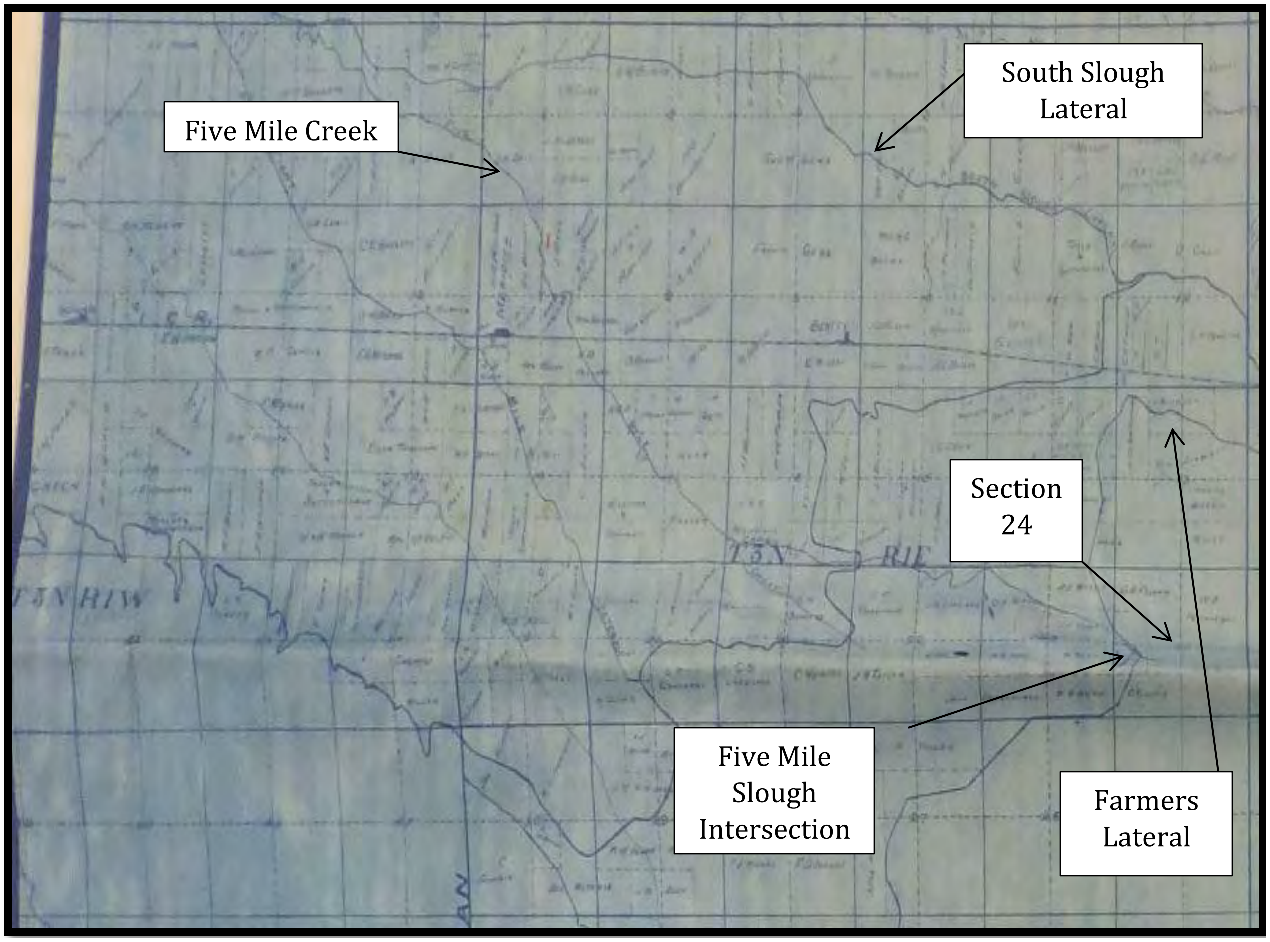


Figure 4: 1902 Map of the Boise and Nampa Irrigation and Power Co. Canal, used in Snyder Case (NMID269)

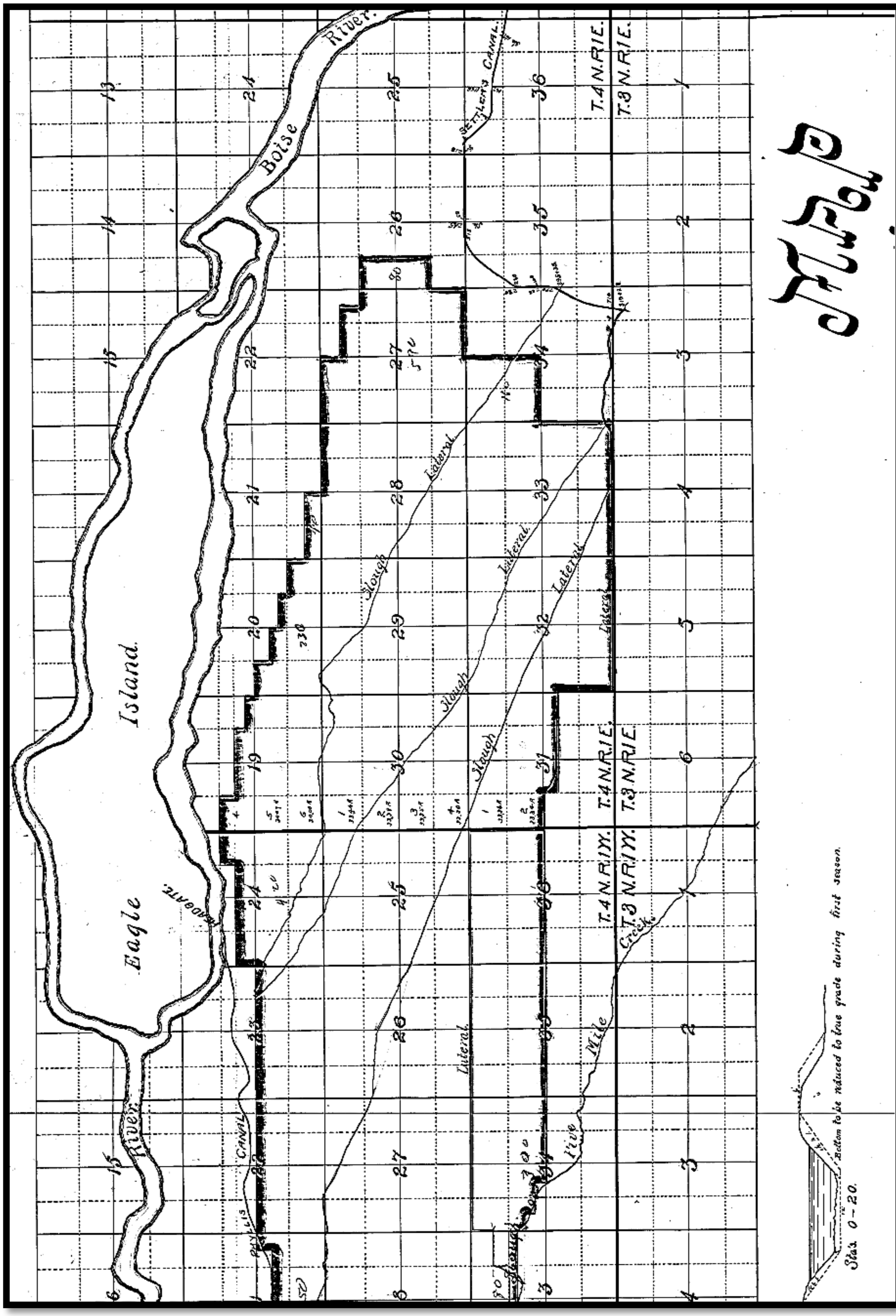


Figure 5: Map of Settlers Irrigation District, 1901. Courtesy of Boise City Record Center

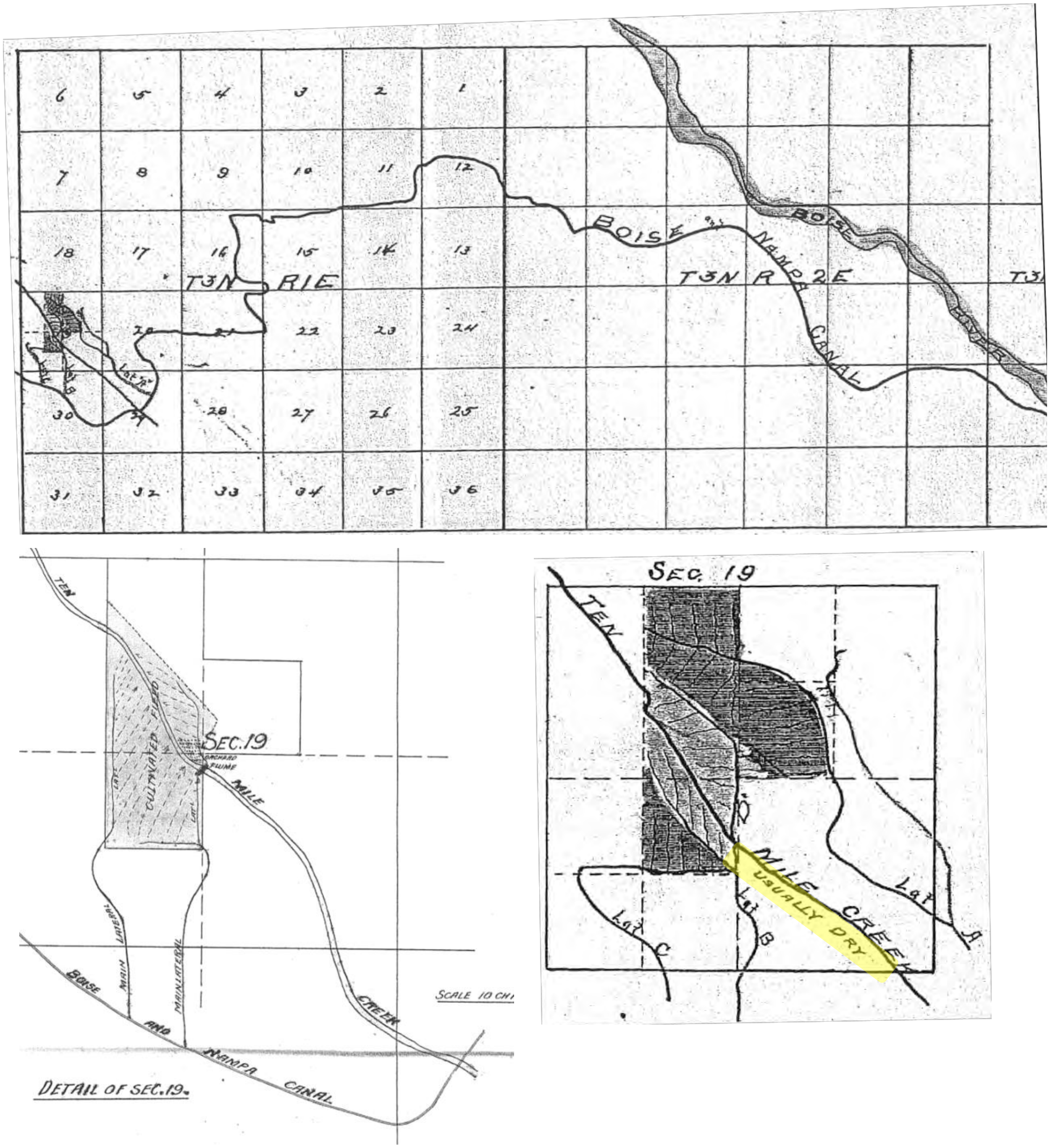


Figure 6: Desert Land Patent of W. Scott Neal (NMID96)

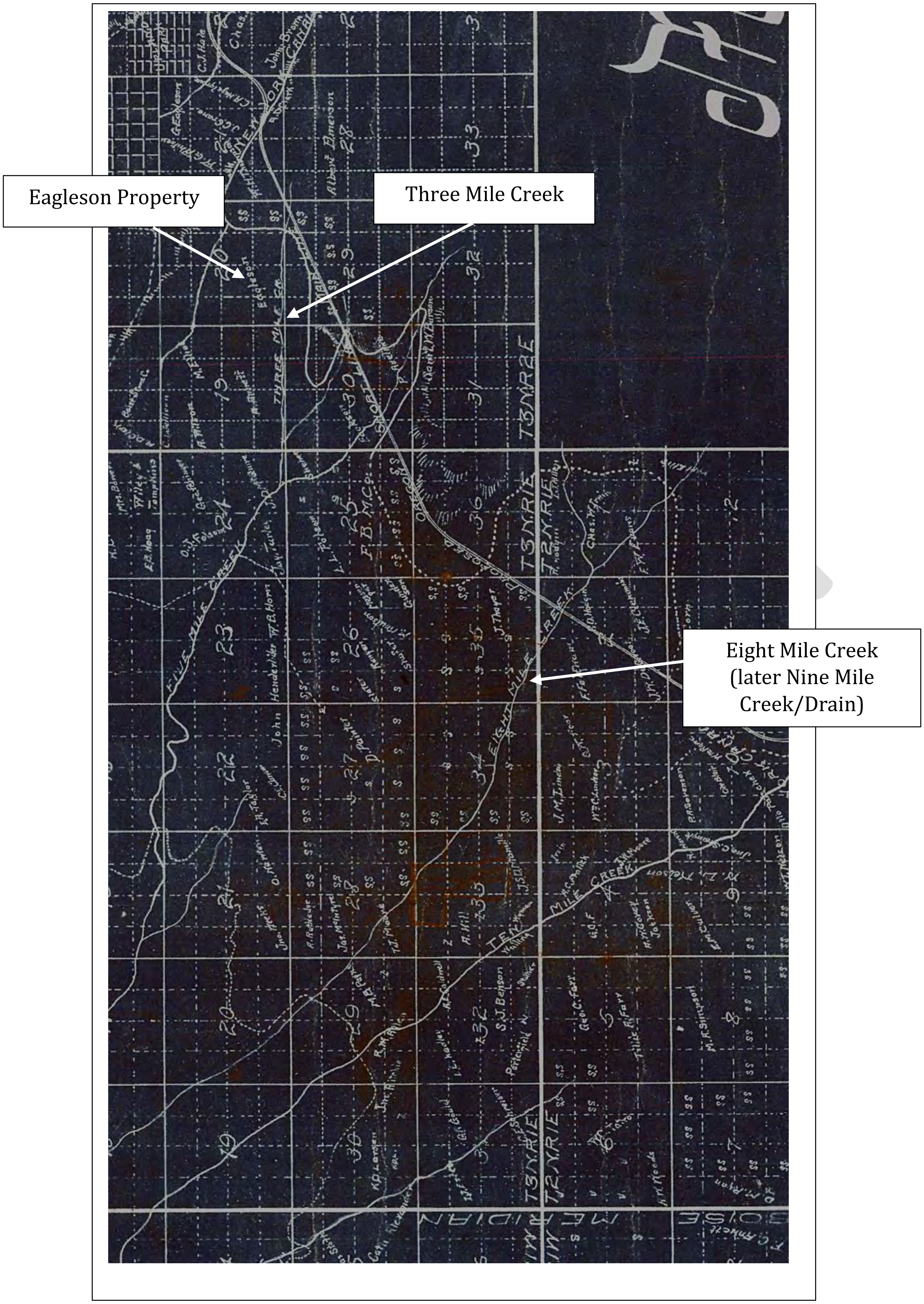


Figure 7: "Map Showing Desert Lands Under New York Canal," 1901. (NMID163)

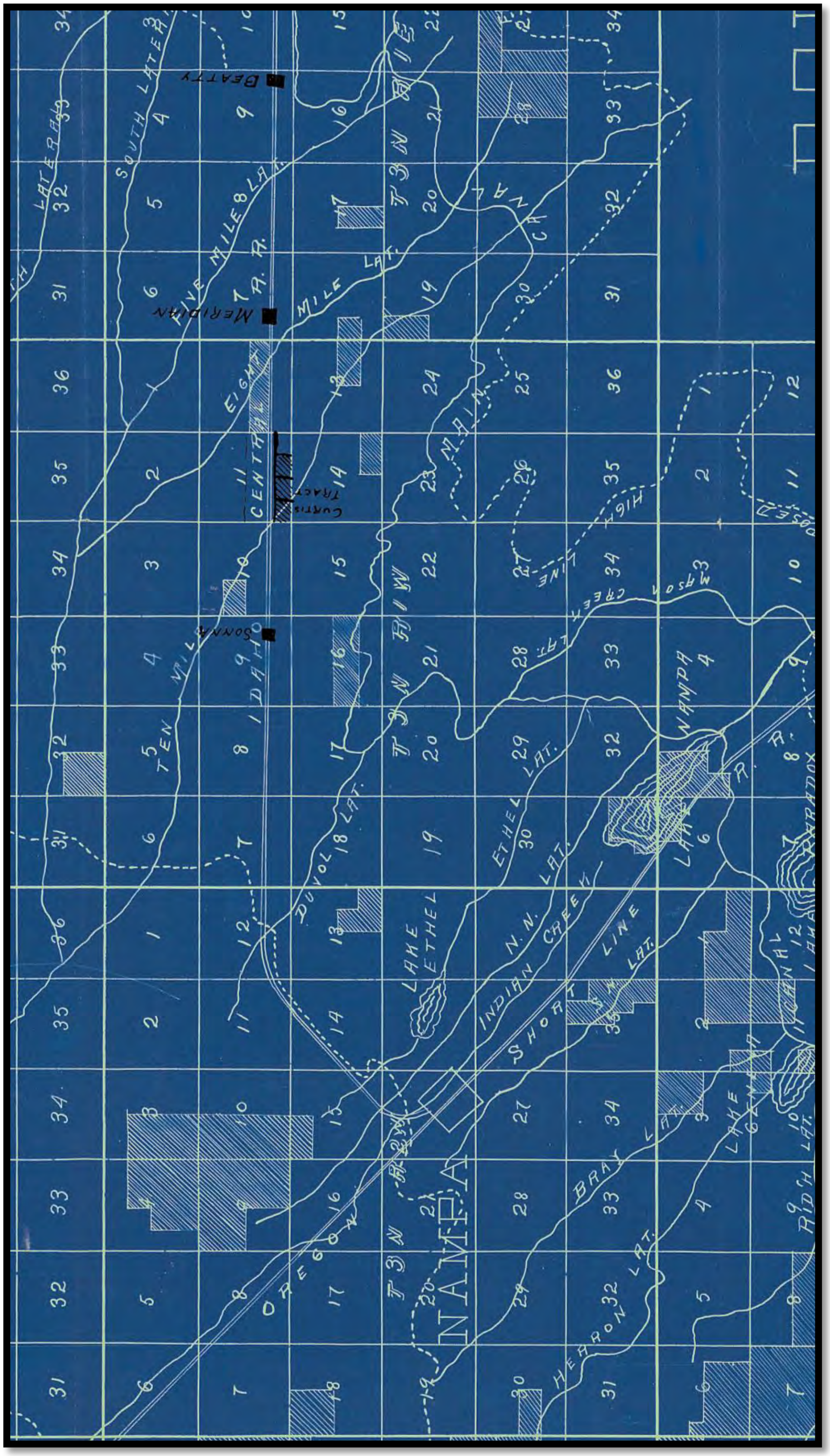


Figure 8: "The Boise & Nampa Irrigation & Power Company's Canal System," c.1896 (NMID164)

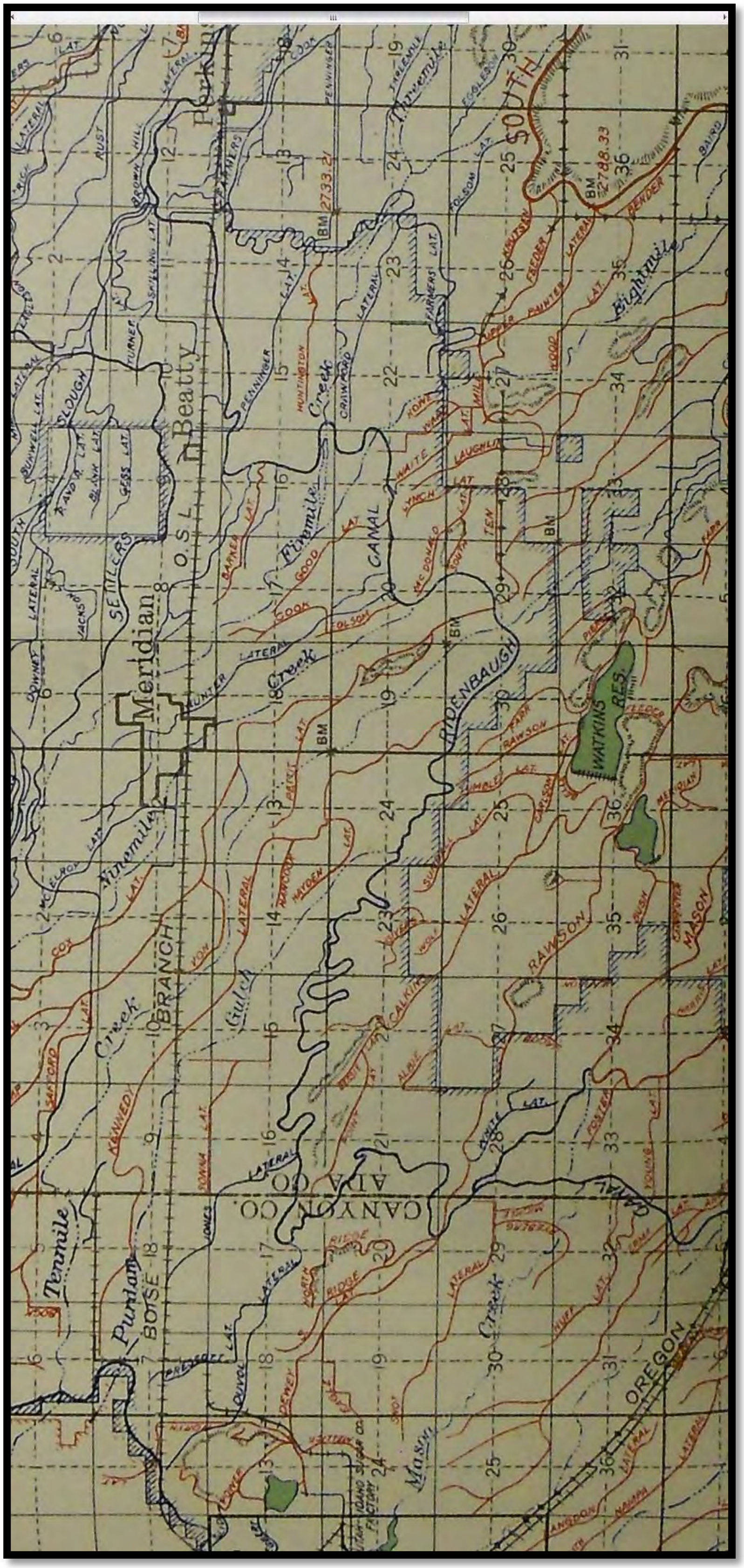


Figure 9: 1914 Reclamation Map

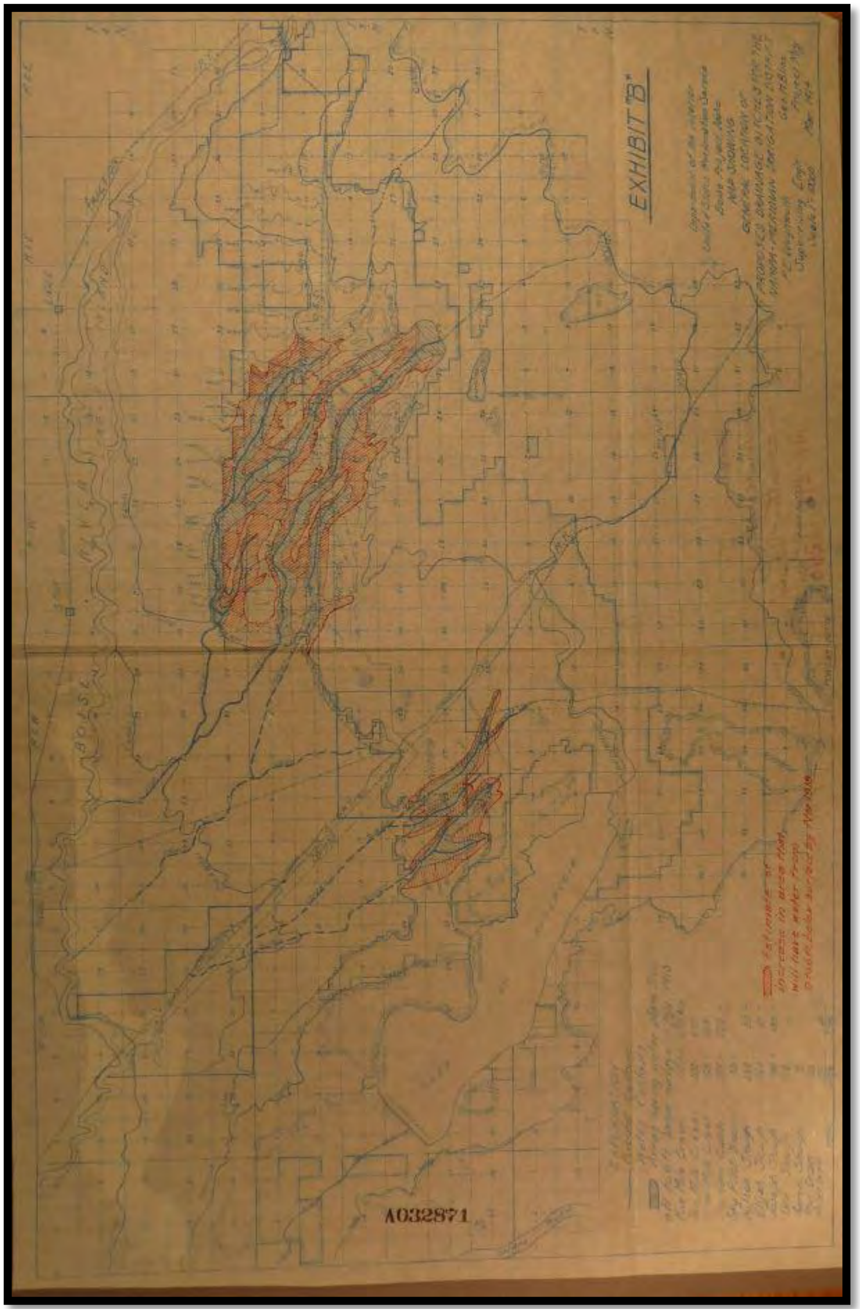


Figure 10: Map associated with Exhibit B, March1914 (NMID116)

Figure 11: Map from "Exhibit A," March 1914 (NMID116)

Figure 12: Eight Mile Lateral and Five Mile Drain, 1919 (NMID92)

“In this view is shown the debris that has accumulated in Five Mile drain where the eight Mile lateral waste empties into the drain thru a corrugated pipe passing under the Five Mile Phyllis feeder…This picture was taken at the bridge over Five Mile above the Phyllis crossing.” [sic]

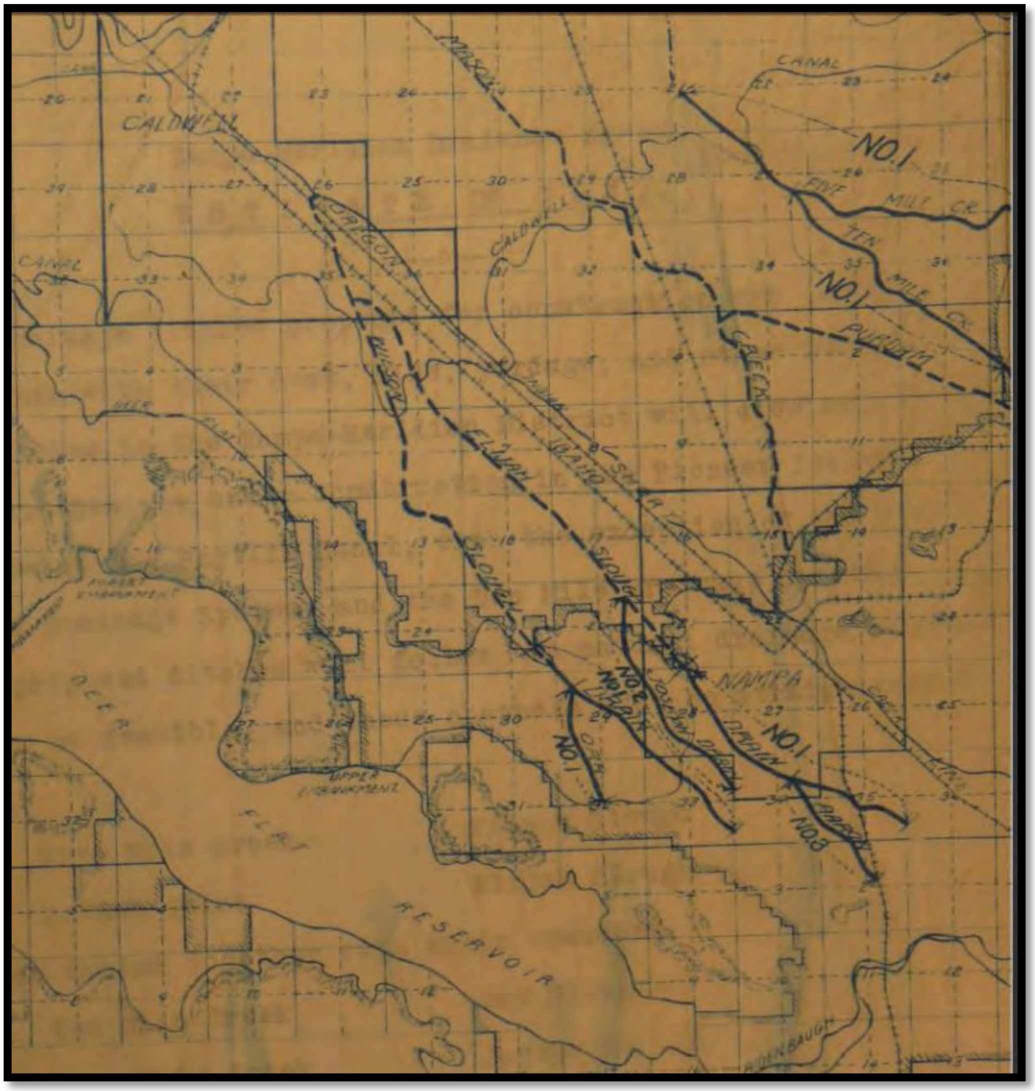


Figure 13: Reclamation Service Map Showing General Location of Drainage Ditches for NMID, March 1914 (NMID116)

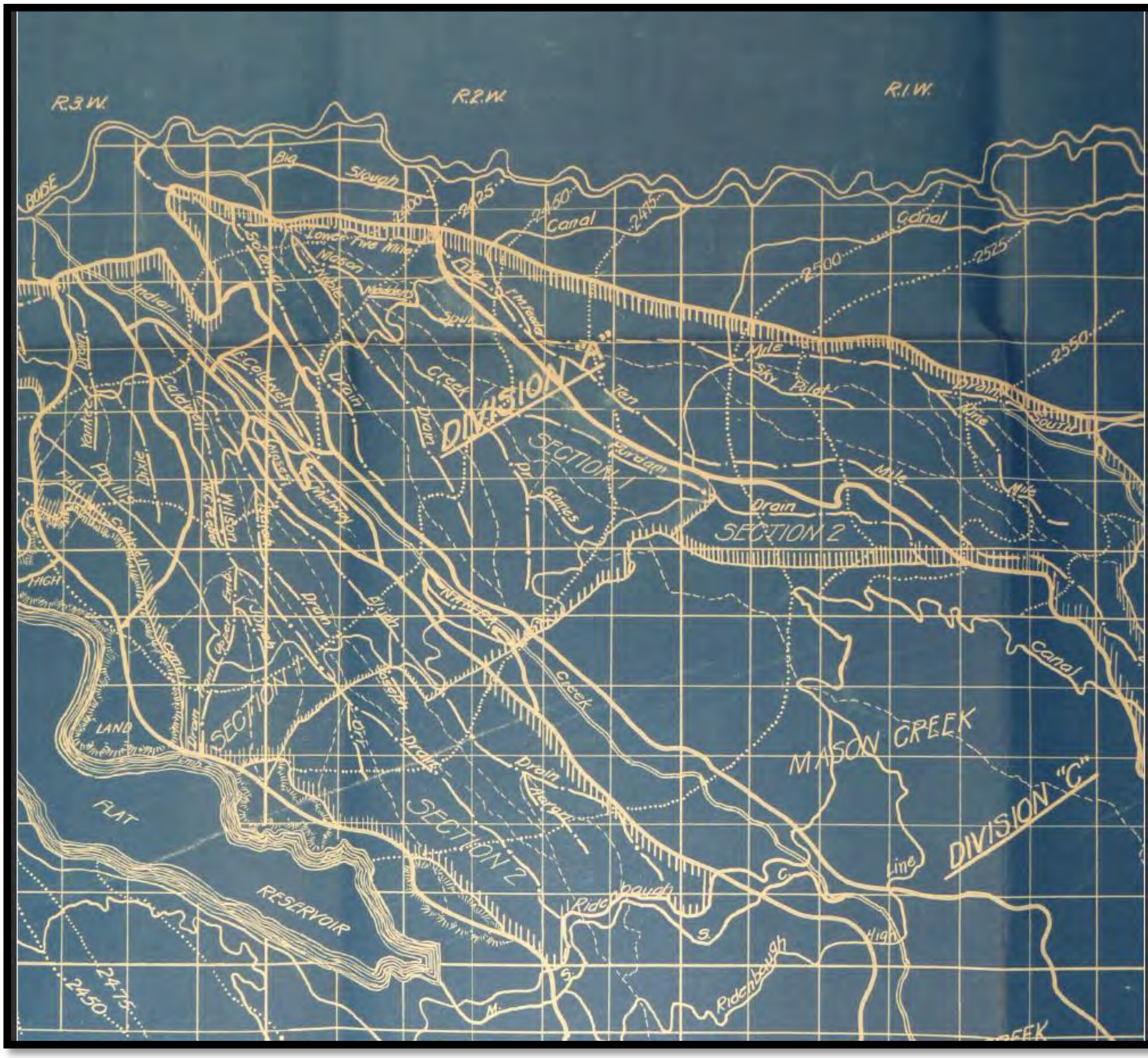


Figure 14: Map for 1917 Drainage Report on Pioneer & Nampa Meridian Irrig. Dists (NMID92)

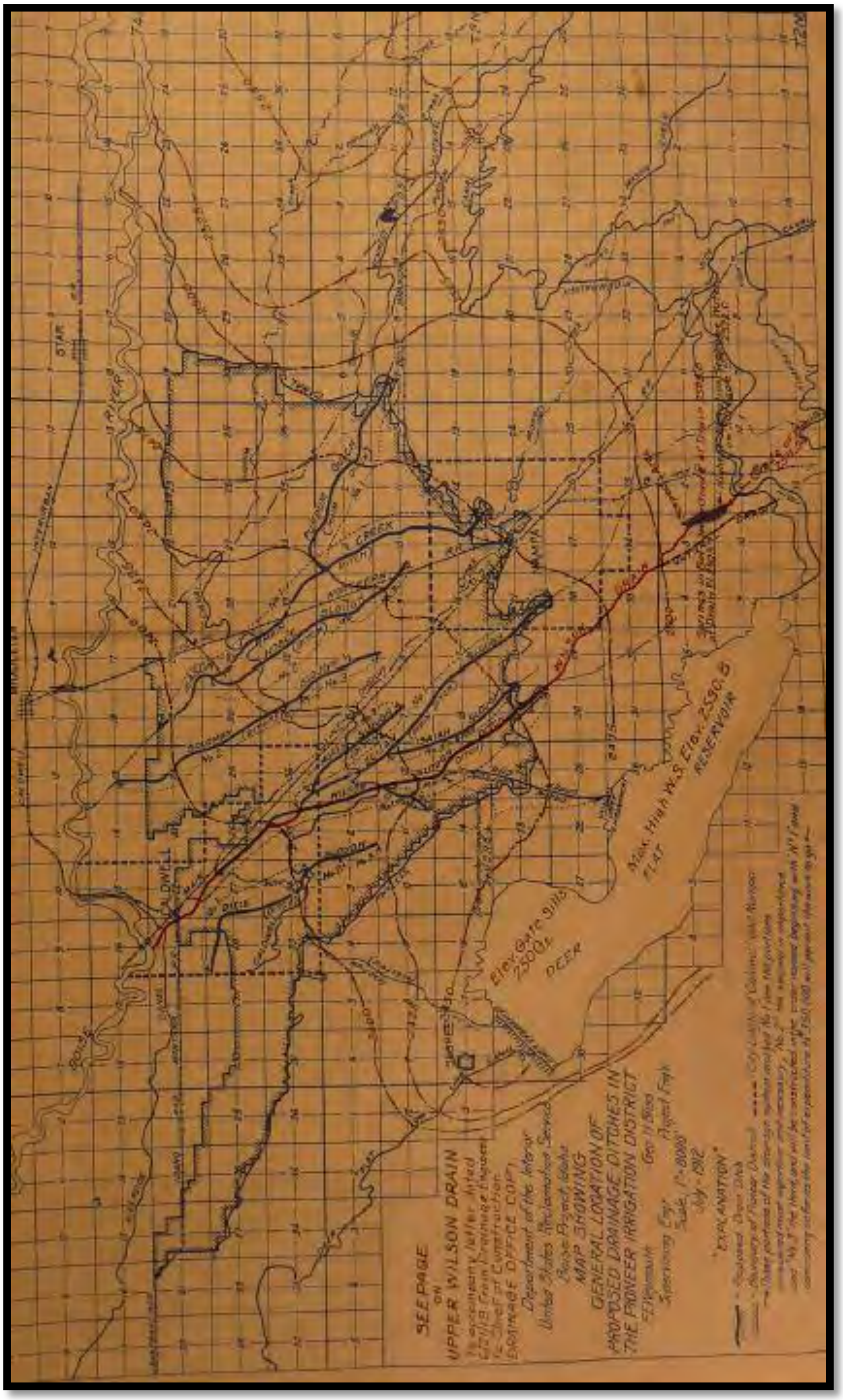


Figure 15: Seepage on Upper Wilson Drain Map Showing General Location of Proposed Drainage Ditches In The Pioneer Irrigation District, July 1912 (NMID118)

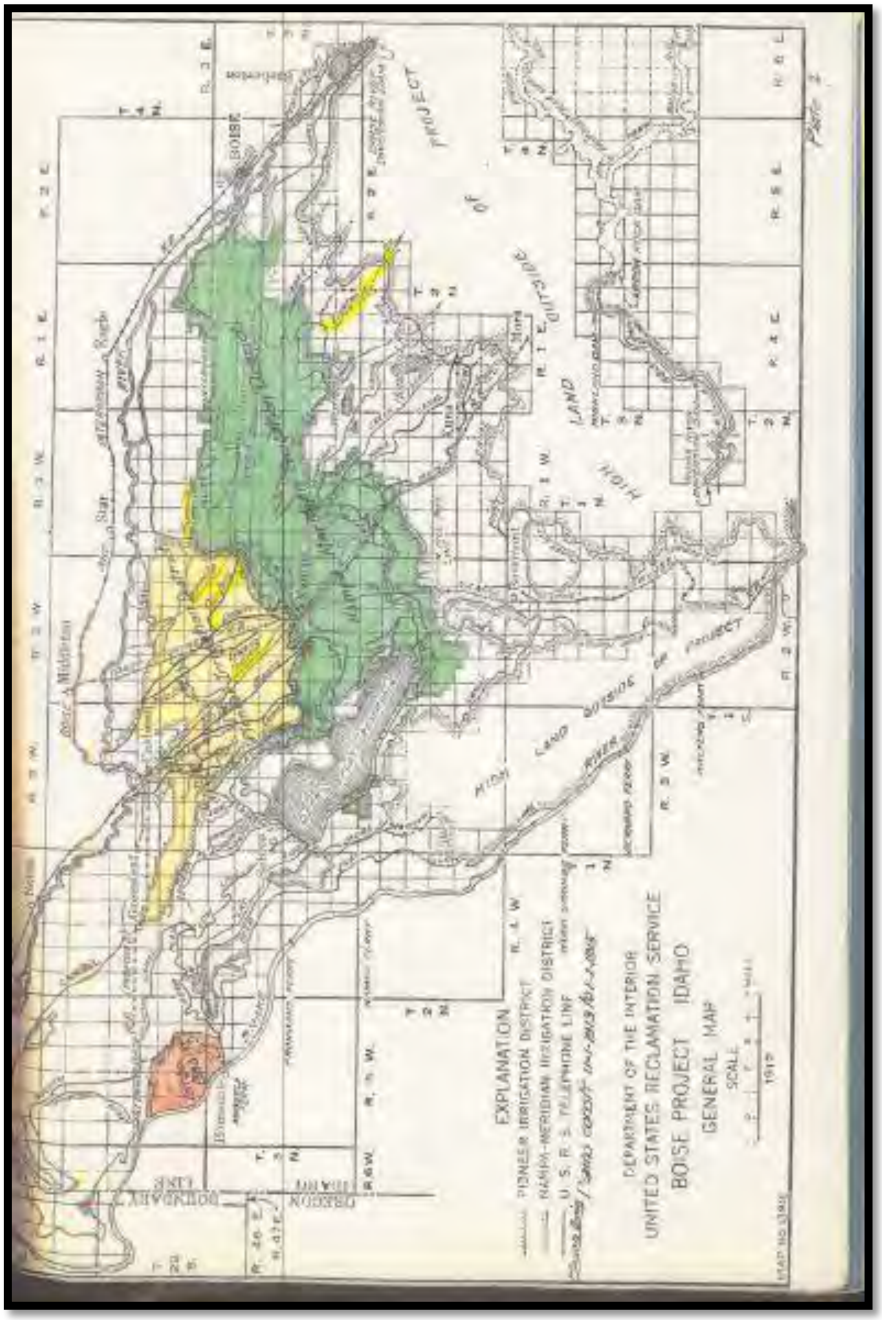


Figure 16: USRS Boise Project Map showing Mason Drains construction from Nov. 1, 1913 to Jan. 1, 1915 (NMID328)

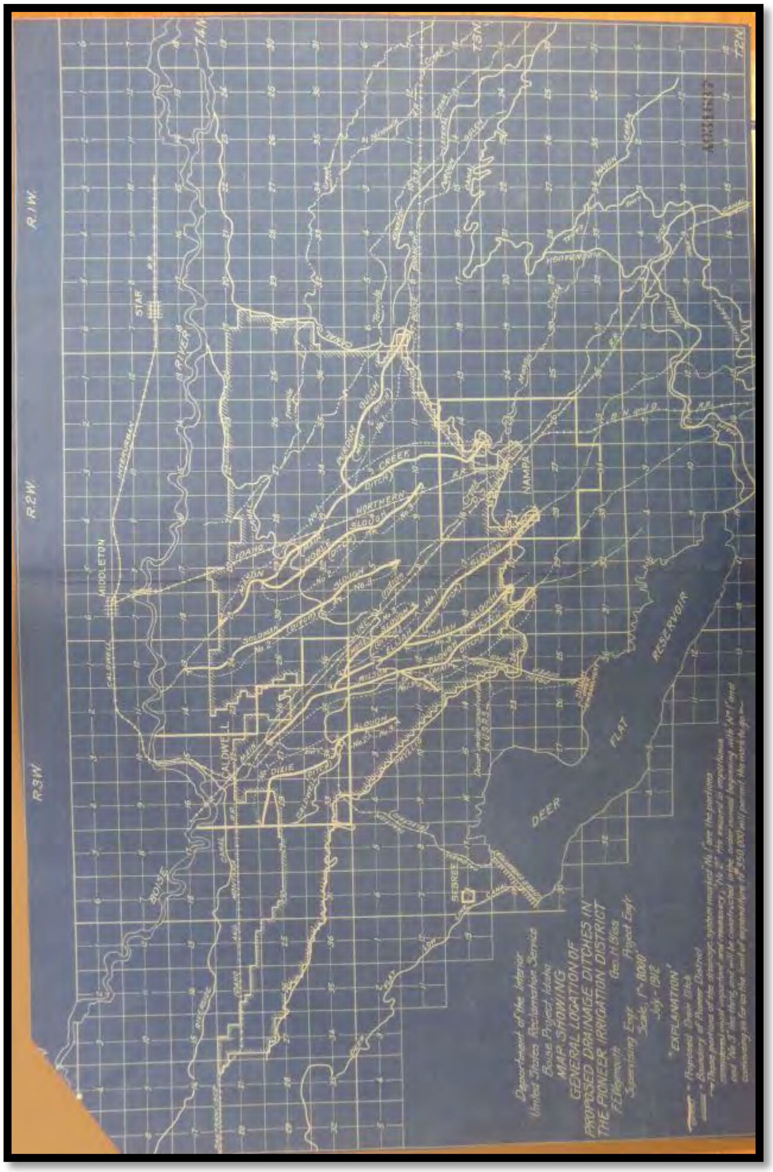


Figure 17: USRS Map Showing General Location of Proposed Drainage Ditches, July 1912 (NMID114)

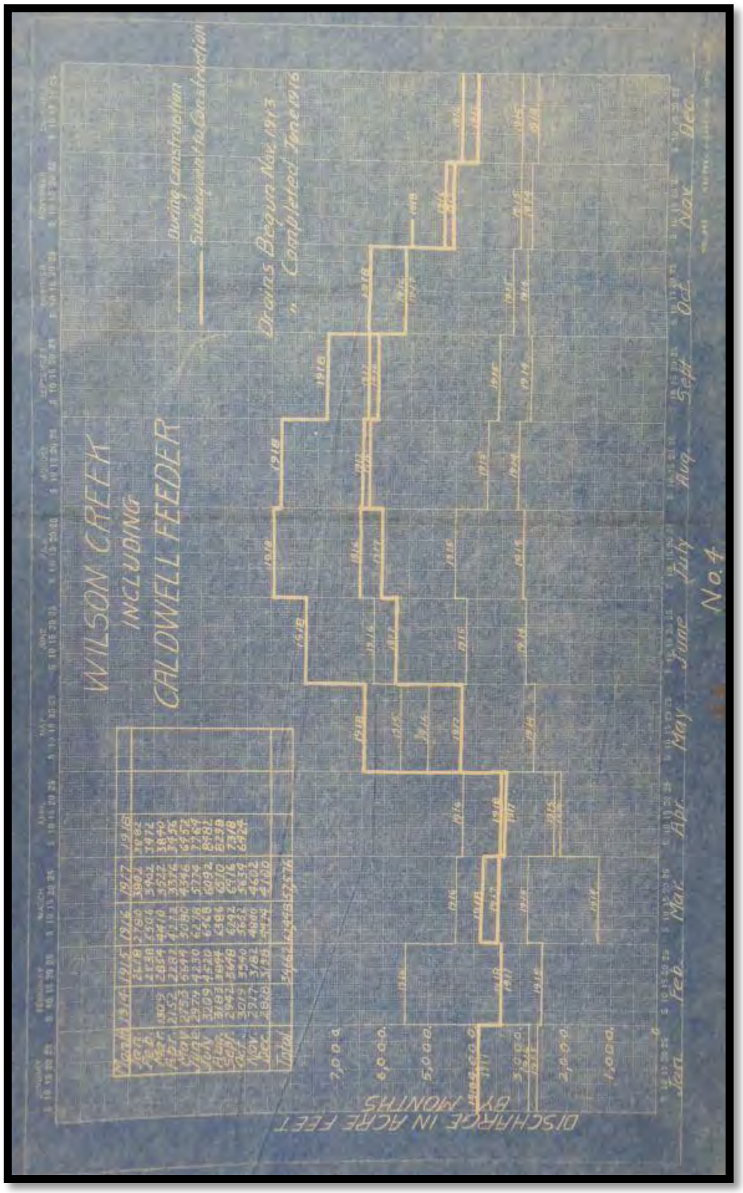


Figure 18: Flow Chart showing Wilson Creek Discharge between1914-1918 (NMID110)

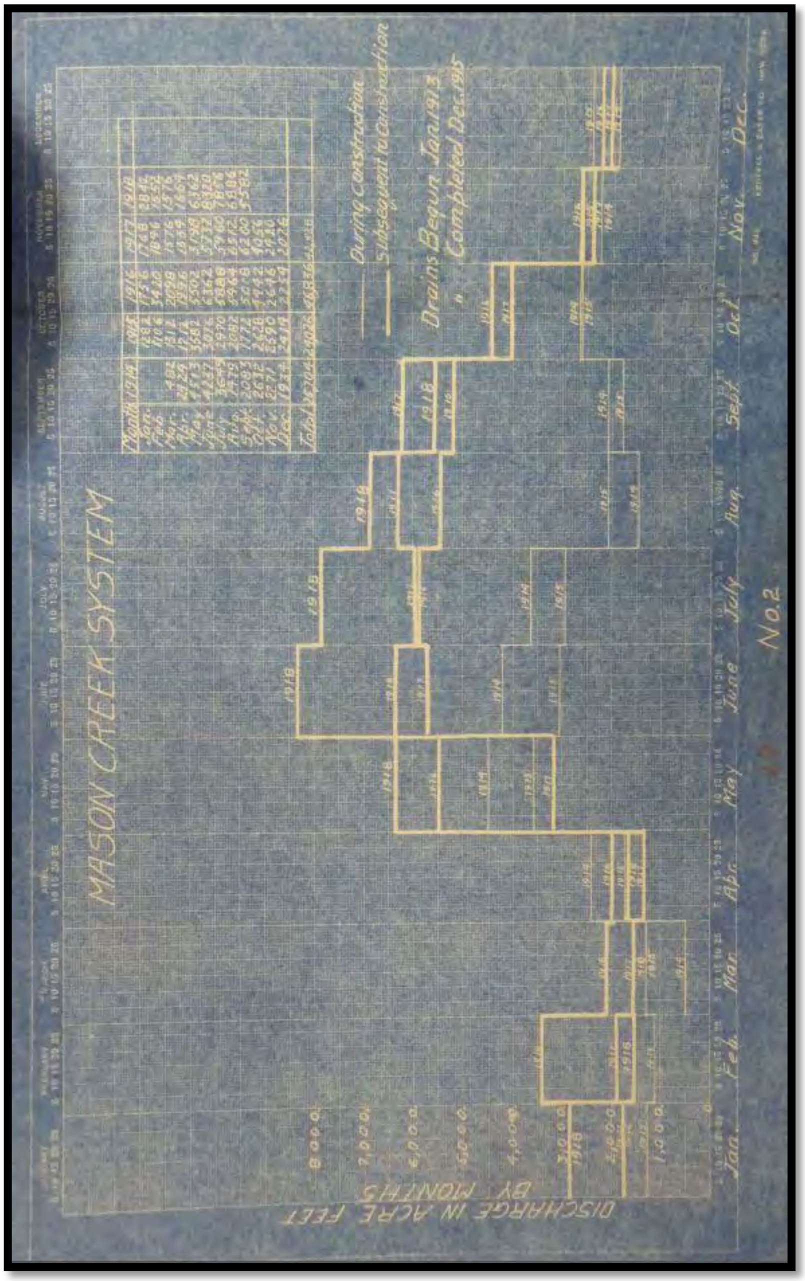


Figure 19: Flow Chart showing Mason Creek System discharge, 1914-1918 (NMID110)

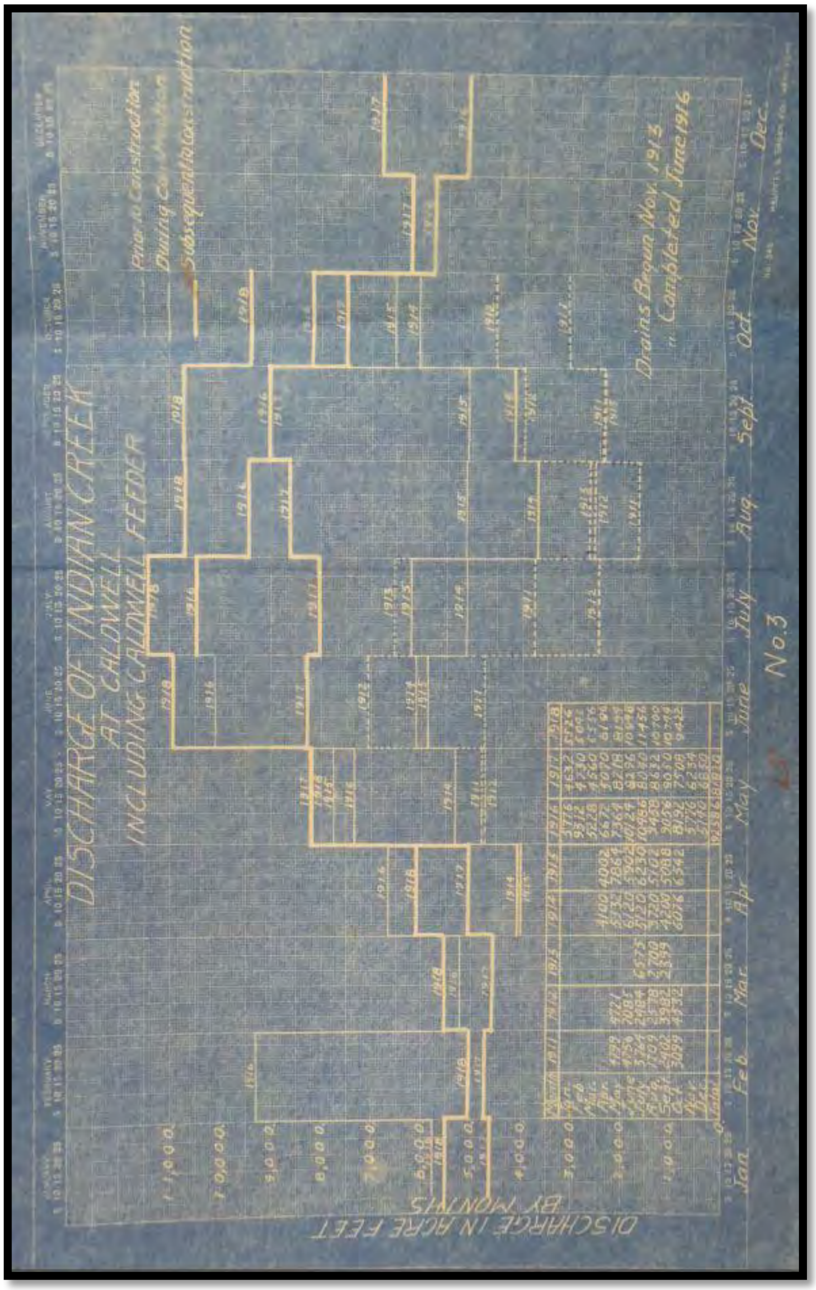


Figure 20: Flowchart displaying IndianCreek Discharge, 1911-1918 (NMID110)

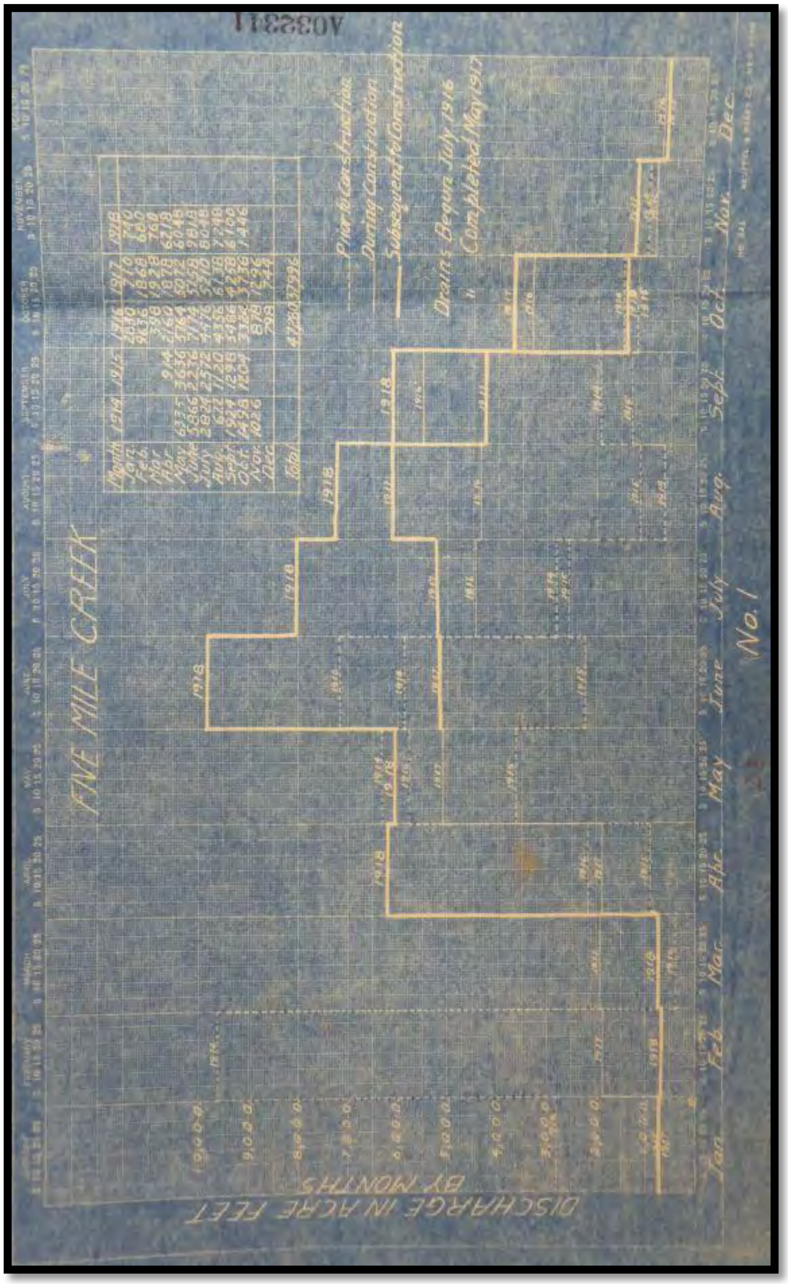


Figure 21: FlowChart showing 5MileCreek Discharge from 1914-1918 (NMID110)

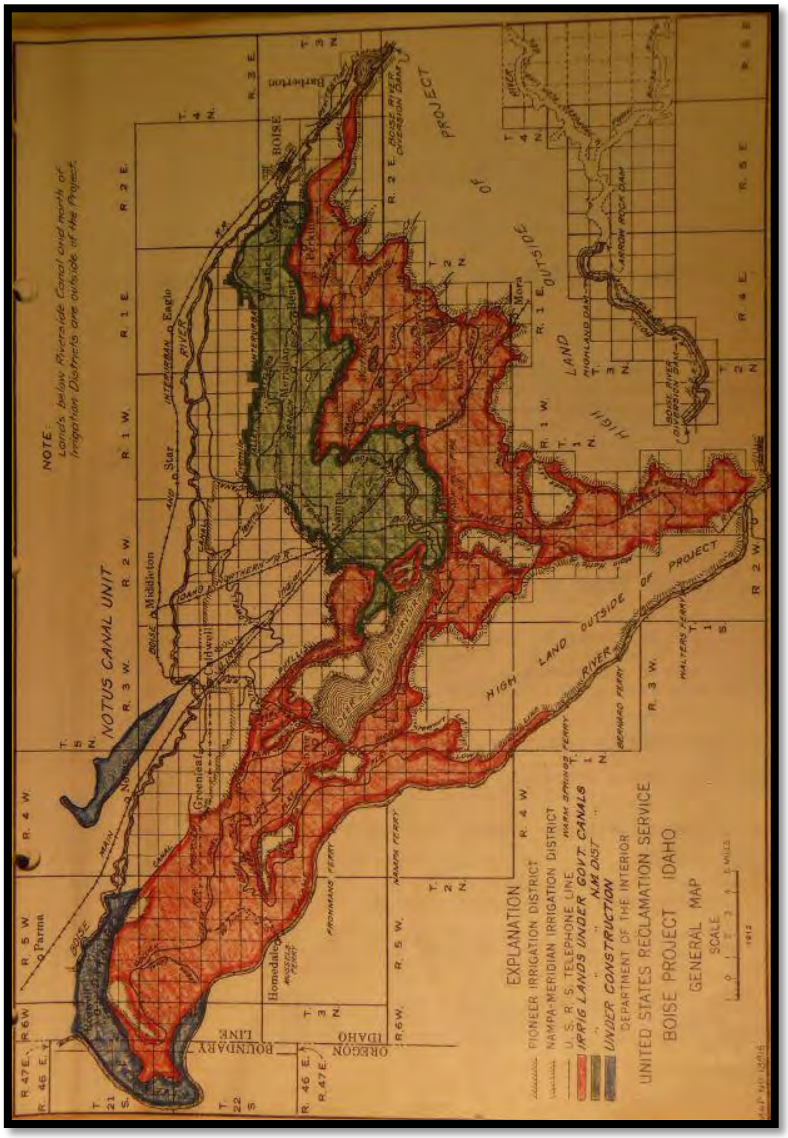


Figure 22: USRS Boise Project Idaho General Map Showing Irrigation Districts and Areas under construction (NMID109)

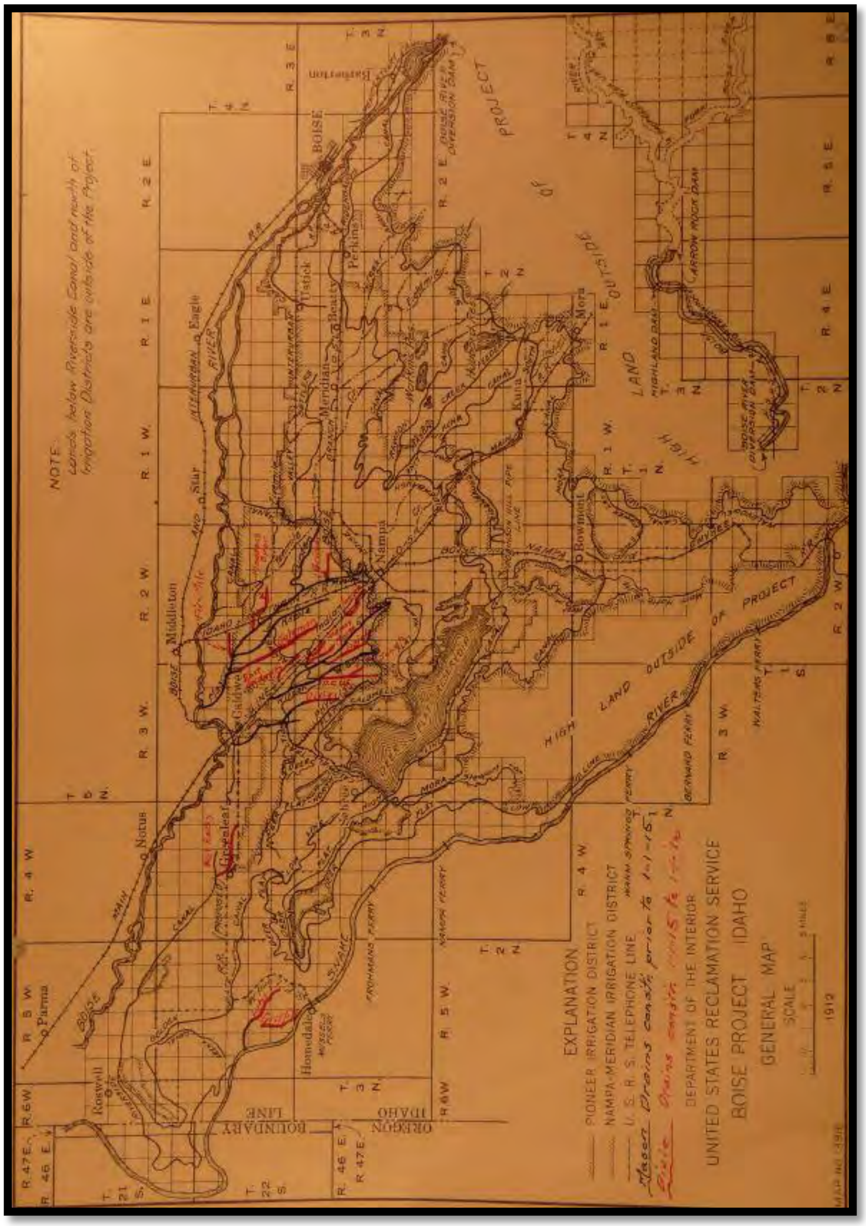


Figure 23: USRS Map Displaying Mason Drains Construction Prior to 1915 and Dixie Drains Construction from 1915-1916 (NMID97)

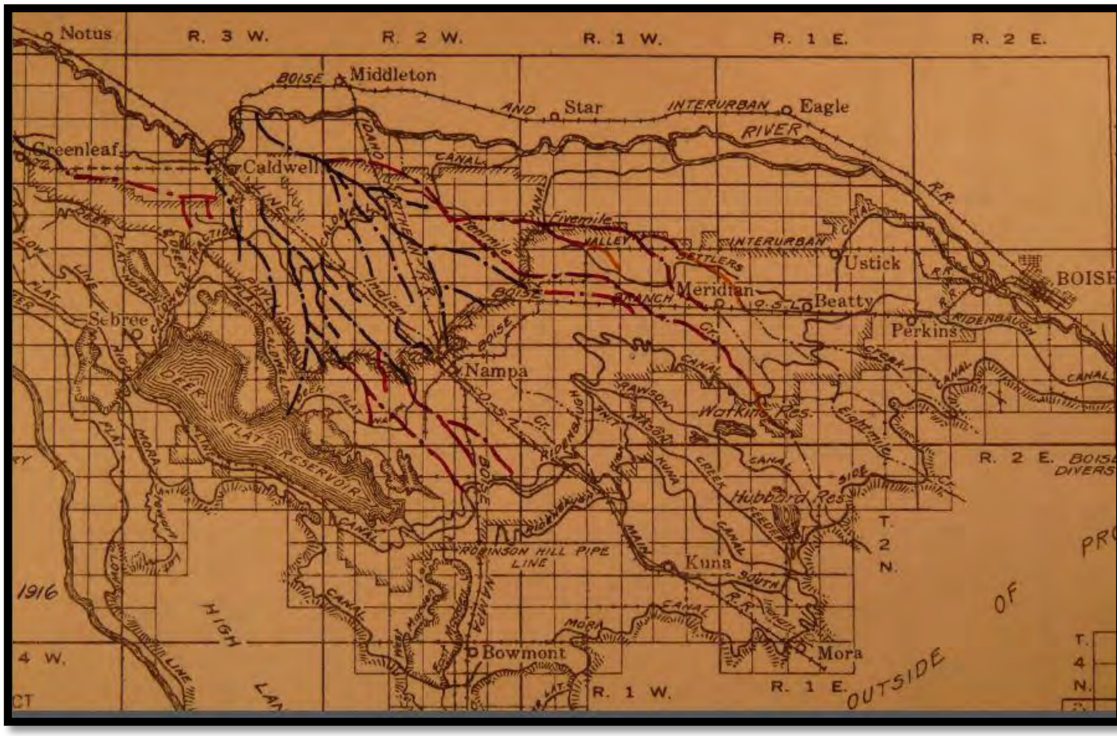


Figure 24: USRS Map Displaying drain construction prior to 1916 and during 1916 (NMID99)

Figure 25: Photograph of Construction of Bridge over Indian Creek, No Date (NMID105)

Figure 26: View of Wilson Drain showing Diversion of Feeder No. 1 on left, June 5, 1919 (NMID108)

Figure 27: View of Mason Drain Below the Purdum junction (NMID110)

Figure 28: View of 5Mile Drain about two miles above Phyllis Crossing (NMID110)

Nampa Meridian Irrigation District

- GLO Water Courses, 1868-1875
- Stewart Water Courses and Canals, 1906
- Current Water Courses and Canals
- Township Boundary

Sources:
General Land Office Original Survey Plat, 1875
Stewart Decree Maps, 1906
Idaho Department of Water Resources, 2013

0 2,300 4,600 Feet

N

Title

ERO Resources Corp.

SHRA StevensHistoricalResearchAssociates

Nampa Meridian Irrigation District

GLO Water Courses, 1875

Stewart Water Courses and Canals, 1906

Current Water Courses and Canals

Sources:
General Land Office Original Survey Plat, 1875
Stewart Decree Maps, 1906
Idaho Department of Water Resources, 2013

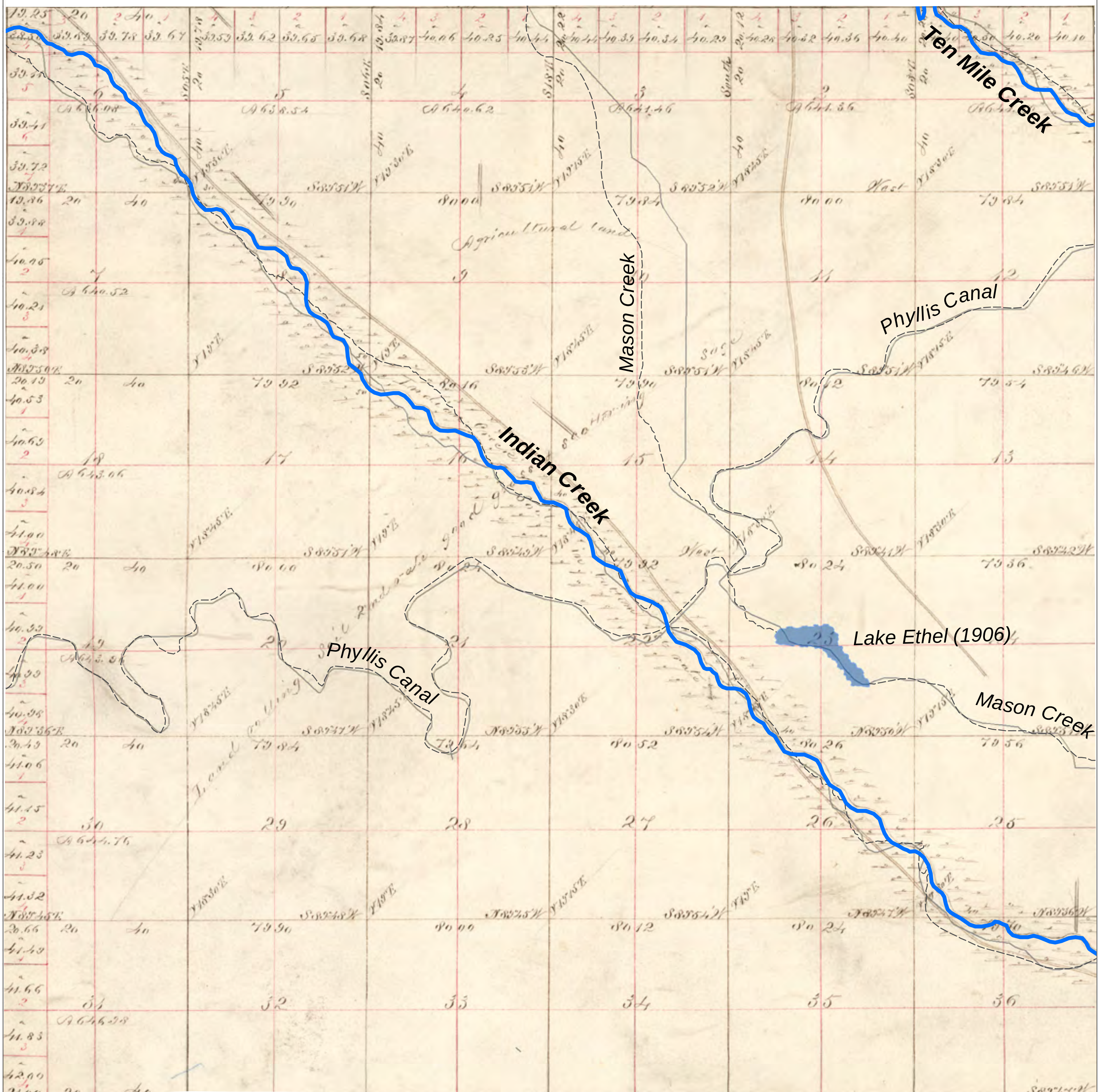
0 2,125 4,250 Feet

N

Township 3 North, Range 1 East

ERO Resources Corp.

SHRA StevensHistoricalResearchAssociates



Nampa Meridian Irrigation District

- GLO Water Courses, 1875
- Stewart Water Courses and Canals, 1906
- Current Water Courses and Canals

Sources:
General Land Office Original Survey Plat, 1875
Stewart Decree Maps, 1906
Idaho Department of Water Resources, 2013

0 2,125 4,250 Feet

N

Township 3 North, Range 2 West

ERO Resources Corp.

SHRA StevensHistoricalResearchAssociates

APPENDIX 4

HYDROLOGY OF THE BOISE RIVER LANDSCAPE

INTRODUCTION

The hydrology of the Boise River Landscape has been dramatically changed by man since he began to settle the area. The history of those changes is fully described in the main part of this report. The purpose of this Appendix is to contrast the current Boise River Landscape with the predevelopment landscape based upon the changes to the hydrology of the area.

The Hydrology Handbook lays the foundation for this comparison:

> The concept of water as a renewable resource stems from the hydrologic cycle. Hydrology, as the engineering science that analyzes the various components of this cycle, recognizes that the natural cycle can be altered by human and natural activities.[1]

This Appendix will provide a refresher on the hydrologic cycle then describe the water supply originally available to the Boise River Landscape originating from incident precipitation. The use of that precipitation by native plants will be reviewed to describe the water balance that was in place prior to man's introduction of water for irrigation purposes.

The changes brought about by the introduction of irrigation water supplies will be reviewed and compared to predevelopment conditions. The pre and post development conditions will be compared from the standpoint of the water balance that was in place predevelopment and the balance that is in place today.

Water Cycle

The basics of the water cycle are illustrated in Figure 1A attached. This figure shows water availability at any location is dependent upon incident precipitation, proximity to a stream or lake, or in some cases shallow ground water. In every case the original source of water is precipitation.

The main report establishes the Boise River Landscape on the south side of the Boise River above the level of the flood plain? was traversed by three ephemeral streams, Indian Creek, Ten Mile Creek and Five Mile Creek. The reason the streams were ephemeral was due to limited precipitation within their respective drainages. The three streams and incident

[1] *Hydrology Handbook, Second Edition, ASCE Manual and Reports on Engineering Practice No. 28,* Task Committee on Hydrology Handbook of Management Group D of the American Society of Civil Engineers, American Society of Civil Engineers, 1996, 3.

precipitation were the only sources of water for the landscape on the south side of the Boise River prior to the introduction of water for irrigation purposes by man.

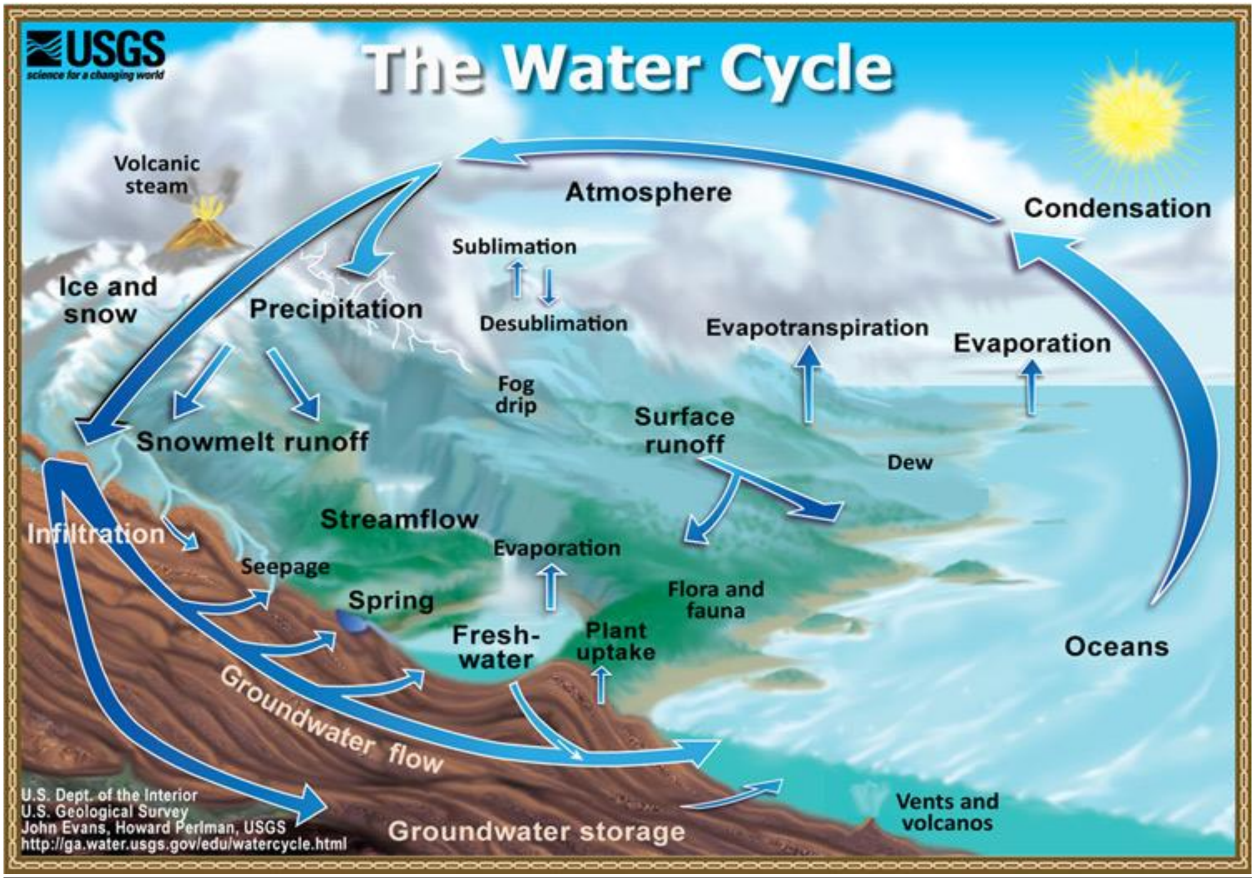


Figure 1A

Precipitation

Precipitation on the Boise River Landscape is illustrated in Figure 2A. Figure 2A reflects the 30 year average precipitation from 1981 through 2010. This reflects the current 30 year average used by NOAA for determining average precipitation. Although it is unlikely precipitation averages have changed substantially on the Boise River Landscape the current records were compared to the average for the period 1895 through 1910. That comparison is shown in Table 1A below.

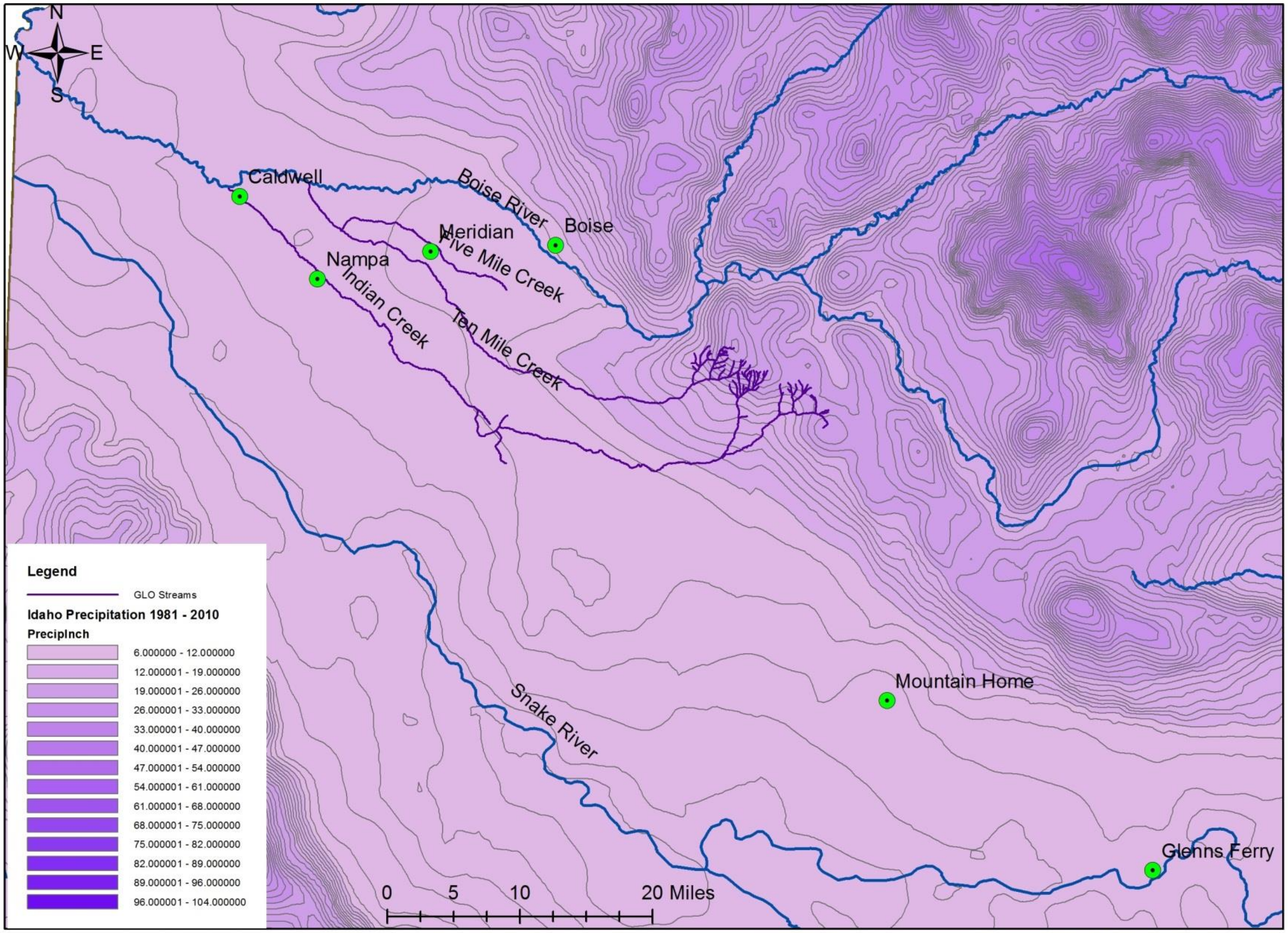
Average Precipitation for 1895-1910 and 1981-2010 in Inches[2]					
	Mtn Home	Boise	Meridian	Nampa	Caldwell
1895-1910	10.0	12.1	11.3	10.6	10.8
1981-2010	9	11	11	10	10

Table 1A

Table 1A shows the precipitation was slightly greater in the 1895-1910 period but the averages would not have changed the shape of the 6 – 12 inch precipitation range that covers the area south of the Boise River in Figure 2A.

[2] PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, Maps created 8-15-2013.

Precipitation Ranges for Southwest Idaho



Copyright 2013, PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu
Map Created January 2014

Prepared for NMID by ERO 1/2014

Figure 2A

Figure 2A shows the area south of the Boise River is in the same 6 – 12 inch precipitation range as the existing Mountain Home desert. Portions of the Mountain Home desert have been developed for irrigation with the use of water imported from the Boise River drainage and from deep ground water but substantial areas, where imported water and deep ground water are not available, remain desert. The existing Mountain Home desert gives a modern day view of the landscape south of the Boise River and above the flood plain prior to the introduction of irrigation water by man.

Evapotranspiration (ET)

Evapotranspiration or ET is illustrated as a component of the hydrologic cycle in Figure 1A. ET is the process by which plants transpire moisture to the air and the moisture from the wetted surfaces of plants or the soil evaporates to the air. ET is enhanced when plants raised for crops are provided with a full water supply and nutrients to make the plants grow vigorously but ET also occurs when native plants are present or when bare soil is moist.

The bare soil evaporation for the area south of the Boise River above the flood plain ranges from 14 – 15 inches per year. Short season native grasses in the area have the ET potential to also use 14 – 15 inches of water per year if the water is available. Sage can use 24 – 25 inches of water if it is available.[3] Water use potential in this area is similar to the water use potential in the Mountain Home desert of today.

The water use potential across the area south of the Boise River is greater, on average, than the precipitation that is available today or that was available during the 1895 – 1910 period. This is the same situation that occurs in the Mountain Home desert today. Prior to the introduction of additional water for irrigation purposes the native plants were able to use all the available precipitation.

Changes to the Boise River Landscape

The introduction of water from the Boise River into the area south of the Boise River above the flood plain is well documented in the main report. The introduction of the additional water changed the water balance as did the introduction of crops with higher ET than the native plants.

As would be expected, more water was introduced than could be utilized by the crops being raised. A portion of this “extra” water was lost through seepage from canals and ditches, a portion runs off the end of the field where the crops are raised and a portion soaks deep into the ground beyond where the water can be reached by the crop’s roots. This “extra” water upset the water balance that was in place prior to the introduction of water for irrigation onto the Boise River Landscape.

Since the area being developed was a desert there were few, if any, existing water ways to help carry the extra water to the Boise River. Instead, much of the water, particularly that

[3] Allen, Richard G. and Clarence W. Robison, 2012. **Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2008**, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.

water that soaked into the ground, stayed near the location where it entered the ground. The extra water thus began to create a shallow aquifer that eventually increased in depth until it reached land surface. It was at this point that land owners began constructing drains as documented in the main report. But for the extra water introduced by man's desire to bring irrigation water into the area, the drains of today would not have been needed.

Conclusions

Predevelopment, the Boise River Landscape above the Boise River flood plain was a desert with water provided by precipitation used by native plants or evaporated from bare soil. Two of the ephemeral steams have a relatively small portion of their drainage area in areas with precipitation in the 19 – 26 inches per year range. These areas are small compared to the drainages as a whole but could have provided some runoff early in the season. If long season native plants were present in the upper parts of these drainages, those plants could have used in excess of 20 inches of water through ET.[4]

The water balance that was in place prior to the introduction of irrigation water did not require drains to be in place and did not support a shallow aquifer of any significant extent, if at all. The introduction of water from the Boise River changed that balance and is the sole reason for the presence of the shallow ground water aquifer and for the development of drains on the Boise River Landscape.

[4] *Ibid.*

Appendix B. ERO Report

This page intentionally left blank for correct double-sided printing.

Consultants in Natural Resources and the Environment

Denver • Durango • Hotchkiss • Idaho

ESTIMATES OF IMPACTS ON LOWER BOISE VALLEY DRAIN DISCHARGE WITH ELIMINATION OF GRAVITY IRRIGATION

Prepared for—

Nampa and Meridian Irrigation District
1503 1st Street South
Nampa, Idaho 83651

Prepared by—

ERO Resources Corporation
4001 Main Street
Emmett, Idaho 83617
(208) 365-7684

April 17, 2014

ERO Resources Corp.
4001 E. Main St.
Emmett, ID 83617
208.365.7684
www.eroresources.com

ERO Resources Corporation

Estimates of Impacts on Lower Boise Valley Drain Discharge with Elimination of Gravity Irrigation

Introduction

Water quality limitations that have been proposed by the Idaho Department of Environmental Quality (IDEQ) in its development of total maximum daily loads (TMDLs) for water bodies in the Lower Boise River Valley will require that sediment concentrations in several large irrigation drains including Indian, Mason, Fifteen Mile, Willow and Sand Hollow Creeks be reduced by up to 90%. Achieving the proposed sediment reductions may require eliminating or significantly reducing return flows from the irrigated agricultural lands that utilize these drains.[1] Eliminating or reducing return flows from agricultural fields requires cessation of gravity (flood) irrigation by either retiring the land from agricultural production or converting the irrigation method from flood to sprinkler, drip or another irrigation method by which the water applied to the field is consumed by crops through evapotranspiration with minimal loss to the shallow ground water and no surface water runoff. Retiring or converting agricultural lands will eliminate surface return flows and reduce subsurface seepage return flows to the drains.

With the exception of brief spring runoff flows in the historic drainages that predated the irrigation drains, water flows in these constructed irrigation drains rely entirely upon runoff and seepage from the numerous canal systems and from gravity irrigation of agricultural lands in the Boise Valley. The shallow aquifer in the Boise Valley is also largely a consequence of these irrigation practices.[2] Consequently, attaining IDEQ's proposed sediment targets by eliminating surface and reducing subsurface return flows from agricultural fields is likely to significantly reduce drain flows and recharge to the shallow aquifer.

This analysis estimates the reduction in drain discharge if all surface return flows and most on-farm infiltration from the irrigation of agricultural lands in the lower Boise Valley were eliminated.

The basis for this analysis is the unpublished report "A Distributed Parameter Water Budget Data Base for the Lower Boise Valley," prepared by the U.S. Bureau of Reclamation, Pacific Northwest Region, River and Reservoir Operations Group, Boise, Idaho and the Idaho Department of Water Resources, Planning Bureau, Boise, Idaho, Revised January 2008 (hereinafter "Report"). The printed Report is accompanied by Attachment C, a CD-ROM containing Lower Boise Valley GIS water budget data base and shareware, and a PDF copy of the Report.

Some of the analysis in the Report is based upon data from the mid-1990s, but it is the most recent compilation and analysis of drains in the Lower Boise Valley that could be

---

[1] Stone, Hawk, State of Idaho Department of Environmental Quality, "Draft Lower Boise River Tributaries, 2013 Addendum, Hydrologic Unit Code 17050114," June 14, 2013, 30.
[2] Stevens, Jennifer A, Stevens Historical Research Associates, "A History of the Boise River Landscape, *Entrepreneurs, Settlers, and Farmers, 1850-1925",* January 2014 Draft.

located. The Report suggests the need for ongoing efforts to update both the data the Report is based upon and also the analysis. Contacts with both the Bureau of Reclamation and the Idaho Department of Water Resources did not disclose any subsequent updates or any ongoing efforts to update the Report.

Assumptions

If gravity application of irrigation water is discontinued in the Lower Boise Valley, the water budget[3] in the Report will be significantly changed. Some of the changes can be projected and some will be unknown until a new water budget analysis is conducted in the Lower Boise River Valley. The following assumptions will be used in an attempt to estimate the impacts that can be projected.

- There will no longer be an agricultural return flow surface water component to the water supply for the drains.
- The on-farm infiltration will be reduced to an amount consistent with current sprinkler irrigated lands.

Analysis

Data for the five drains identified as sediment limited were selected from Attachment C of the Report and analyzed to determine if reductions in drain discharge could be estimated from the available data. All data are in monthly time steps along with annual totals for the various parameters included for each of the drains.

The Willow Creek and Hartley Gulch drain quantities are reported together in Attachment C. A number of attempts were made to separate the drain amounts for Willow Creek and Hartley Gulch, but there was not sufficient data available to separately analyze these drains. The remainder of this report will address only four of the sediment limited drains, Indian, Mason, Fifteen Mile and Sand Hollow Creeks.

Attachment C provided the current discharge of each of the four drains and also the separate surface and ground water components of that discharge. The current discharge for each of the drains is shown in Figures 1 – 4.

On-farm infiltration was also included in Attachment C for each of the four drains. This element is significant because converting from gravity surface irrigation to sprinkler or drip irrigation is expected to reduce the amount of on-farm infiltration.

The last paragraph of Section 2.6.1 on page 21 of the Report estimates the average net ET on sprinkler irrigated lands to be 1.8 acre-feet per acre with average irrigation diversion of 2.1 acre-feet per acre. Assuming sprinkler irrigation does not produce surface runoff, the difference between the 1.8 acre-feet per acre used by the crop and

[3] Water budget in this case refers to the sum total of water entering the Lower Boise River Valley (the area downstream from Lucky Peak Dam), the water leaving the Lower Boise River Valley and any changes to aquifer storage, Report at 1. The water budget in the Report separates the various routes "… spatial and temporal distribution of groundwater (sic) and surface-water usage …" taken as the water is routed through the Lower Boise Valley. Significant reductions of water applied to gravity irrigated lands will alter that spatial and temporal distribution.

the 2.1 acre-feet per acre diverted, or 0.3 acre-feet per acre, is infiltrated to the shallow ground water. For the purposes of this analysis these values are assumed to be uniform within the Lower Boise River Valley. Sprinkler irrigated lands for the various drainage areas were determined by the percentage of sprinkler irrigated lands from each water delivery entity within each drainage basin. Table 1 lists the number of sprinkled acres in each of the drain areas along with the total irrigated acres within the drain area and the percentage of sprinkler irrigated lands.

	Fifteen Mile Creek	Indian Creek	Mason Creek	Sand Hollow Creek
Sprinkler Irrigated Acres	1,082	1,117	1,852	4,436
Total Irrigated Acres	22,408	21,059	35,330	28,138
Percent Sprinkler	4.8%	5.3%	5.2%	15.8%

Table 1. Sprinkler Irrigated and Total Irrigated Acres by Drain Area.

Ground water infiltration for the currently sprinkler irrigated acres was calculated at 0.3 acre-feet per acre of sprinkler irrigated land. The balance of the on-farm infiltration was attributed to the gravity irrigated lands. The reduction in infiltration was calculated by reducing the infiltration for the gravity irrigated lands to 0.3 acre-feet per acre and the new amount of on-farm infiltration was calculated as 0.3 acre-feet per acre for all irrigated lands within each of the drain areas.[4]

Once the reduced on-farm infiltration due to conversion to sprinkler irrigation was determined, a relationship was developed to estimate the reduction in the ground water component of drain discharge. From the data available in Attachment C, the main sources of ground water in the drains appears to be from on-farm infiltration and canal losses. The ground water remaining in the drains after conversion to sprinkler irrigation is estimated by reducing the current ground water in the drains by the ratio of the current combined canal loss and on-farm infiltration to the canal loss[5] and on-farm infiltration after conversion to sprinklers.

Table 2 shows the current components of the discharge, primarily from agricultural return flow, for each drain as well as the projected drain discharge after conversion to sprinkler irrigation. The surface water component is assumed to be zero after conversion to sprinklers so the entire projected drain discharge is supplied by infiltration from sprinkler irrigation and canal seepage loss to the shallow ground water. Table 2 also shows the percent reduction in annual drain discharge as a result of conversion to sprinkler irrigation.

---

[4] Attachment C of the Report showed a negative on-farm infiltration for the Indian Creek drain area. The logic for reducing a negative on-farm infiltration by conversion to sprinklers did not yield a meaningful result. As a result, the average change per acre of infiltration from Fifteen Mile and Mason Creeks was used to calculate the new on-farm infiltration for the Indian Creek drain area.

[5] No attempt has been made to estimate whether changes in canal loss would occur as a result of conversion from gravity surface irrigation to sprinkler. No data are available in the Report or are known to exist elsewhere to attempt to estimate whether changes in canal loss would occur.

	Fifteen Mile Creek	Indian Creek	Mason Creek	Sand Hollow Creek
Current Surface Water (ac-ft)	27,128	46,770	35,500	54,959
Current Ground Water (ac-ft)	34,360	55,427	43,134	45,132
Current Total Discharge (ac-ft)	61,488	102,197	78,634	100,091
Projected Drain Discharge (ac-ft)	21,886	35,230	18,842	30,708
Percent Reduction	64%	66%	76%	69%

Table 2. Current and Projected Drain Discharge

Finally, the annual totals from Table 2 were redistributed to monthly time steps for plotting. The current and projected drain discharge amounts were converted from acre-feet to cubic feet per second (cfs) for plotting in Figures 1-4. These Figures illustrate that the most dramatic reductions in drain discharges will occur during the irrigation season, from May through September.

The foregoing analysis estimates drain discharges after 100% conversion of agricultural irrigation practices from gravity to sprinkler within the identified drainage basins. Reductions to drain discharges resulting from less extensive conversion to sprinkler may be estimated proportionately from this analysis. If, for example, there is 50% conversion of agricultural irrigation practices from gravity to sprinkler within a drainage basin, the projected drain discharge would be approximately 50% greater than the projected discharge shown in Table 2, and percentage reduction would be approximately 50% less than the percentage shown in Table 2, based upon the data from Attachment C of the Report.

This analysis shows that widespread conversion of gravity irrigation will reduce drain discharges to the Boise River. Flows and water levels within the drains will be correspondingly reduced, though this analysis does not attempt to predict the extent of the reduction at any upstream location in the drains.

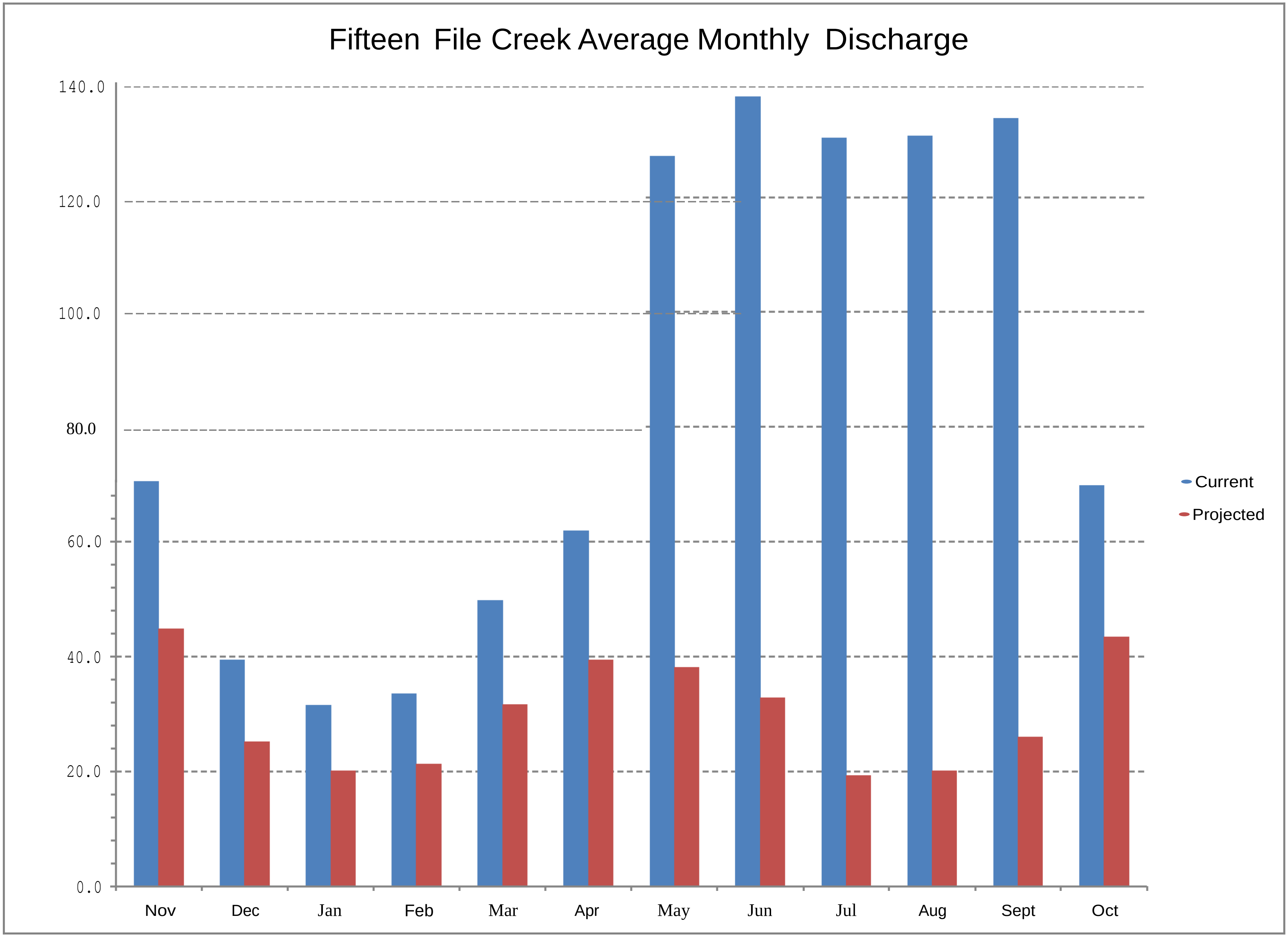
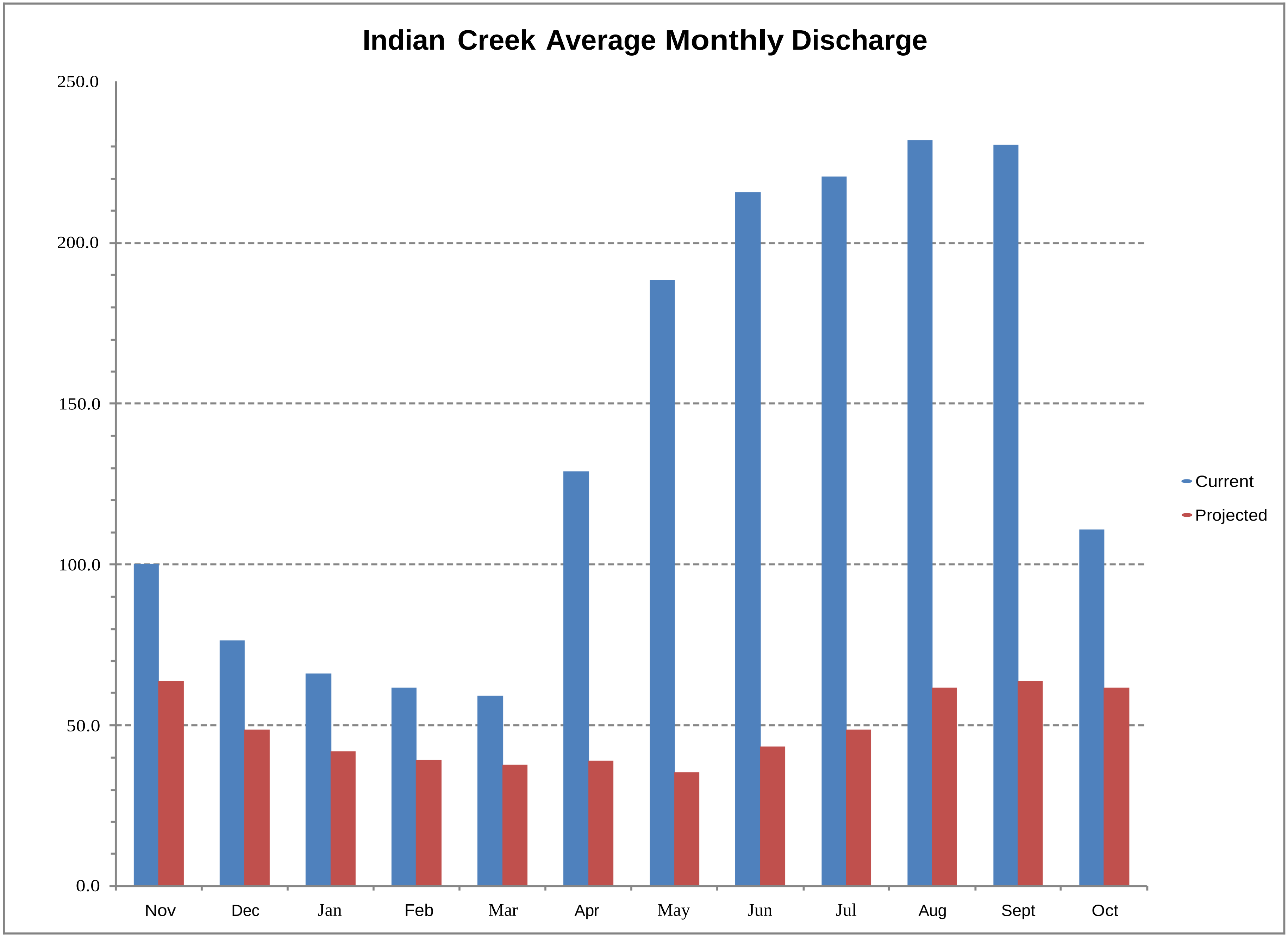

Fifteen File Creek Average Monthly Discharge
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Current
Projected

Figure 1



Indian Creek Average Monthly Discharge
250.0
200.0
150.0
100.0
50.0
0.0
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Current
Projected

Figure 2

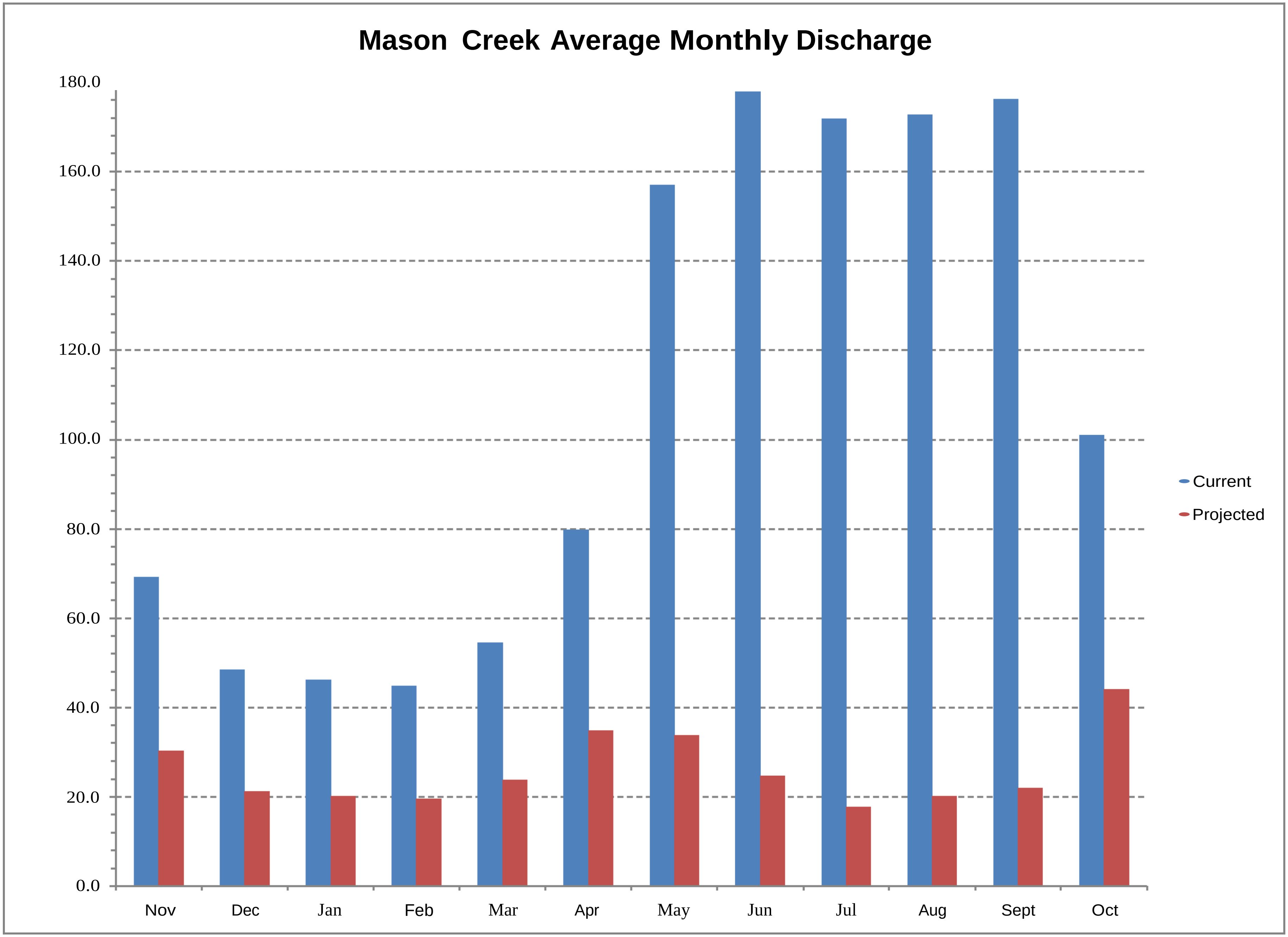

Mason Creek Average Monthly Discharge
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Current
Projected

Figure 3

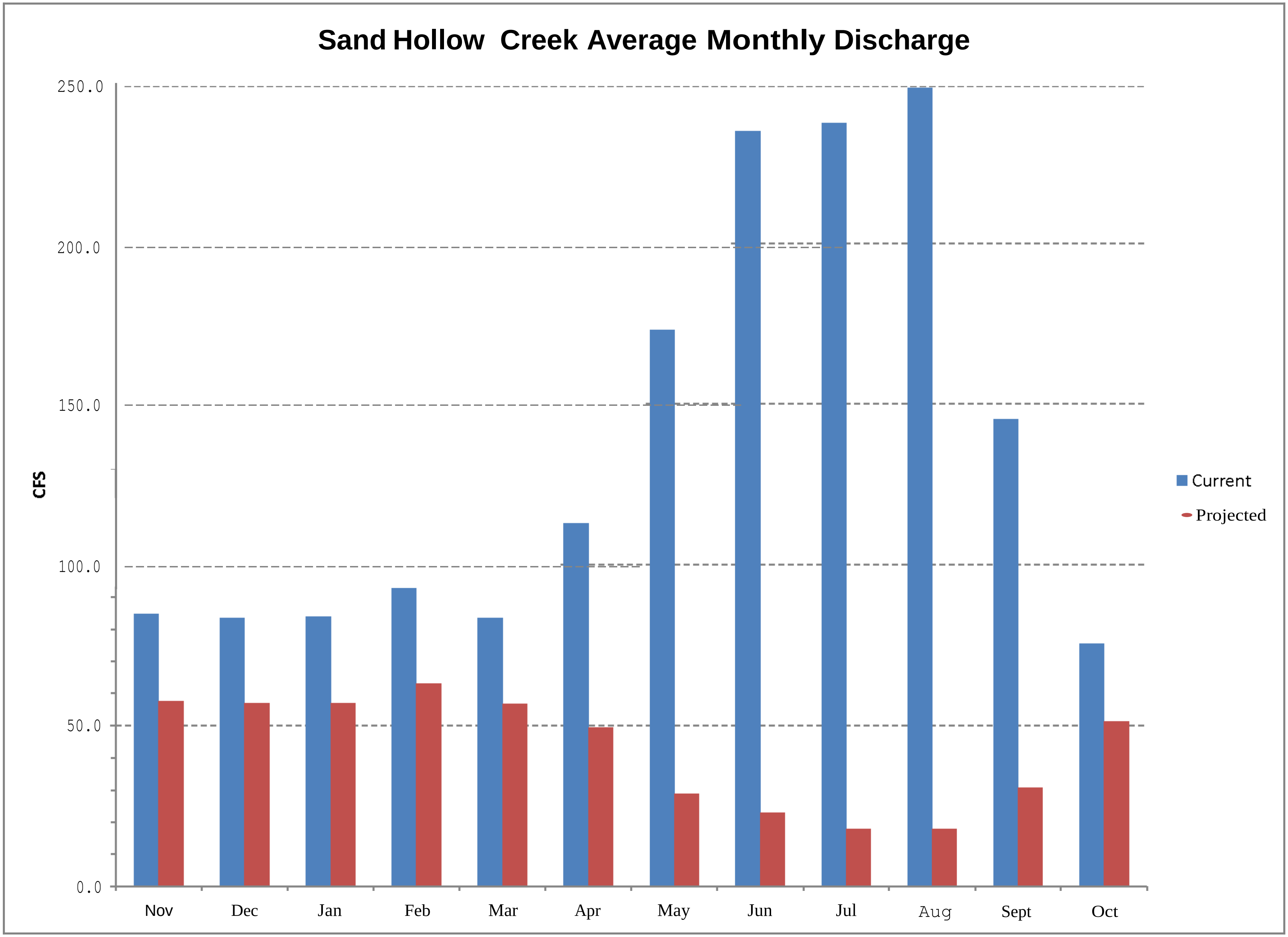
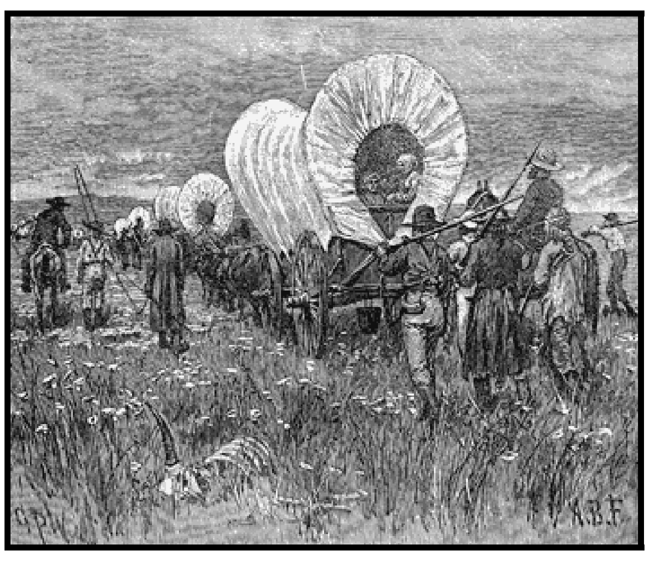

Sand Hollow Creek Average Monthly Discharge
CFS
250.0
200.0
150.0
100.0
50.0
0.0
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Current
Projected

Figure 4

Appendix C. Pioneer Historical Report

This page intentionally left blank for correct double-sided printing.

SHRA StevensHistoricalResearchAssociates



A History of the Pioneer Irrigation District, Idaho,

An Initial Report

1884-1938

By Jennifer Stevens, Ph.D.

Table of Contents

A History of the Pioneer Irrigation District

While the author of this report verifies the accuracy of all facts and statements set forth herein, it is the intent to supplement this initial report with additional data, opinions, and photos or maps for purposes of expert witness disclosures and/or rebuttal of opinions not yet disclosed by the opposing party.

Expert Background

I obtained a Ph.D. in American History in 2008 from the University of California, Davis. Additionally, I obtained a Master of Arts in American History in 1995, and a Bachelor of Arts in both History and Political Science in 1993, both from the University of California, Santa Barbara. My graduate level coursework focused generally on American History in the late nineteenth and twentieth centuries, and more particularly the settlement of the American West. In addition, I took two historical methods courses, one at each University of California campus. In these courses, faculty helped students understand how to utilize archival resources and how to analyze historical documents. They also guided vigorous discussions over historical objectivity, which was the subject of much debate in seminar. My graduate level, pre-dissertation research and writing revolved around water and the history of water in the West. The subject of my M.A. research was the role of the agrarian myth in the passage of the 1902 Reclamation Act. I also wrote a history of water use and states' rights as they pertained to the Deschutes River in Oregon. My dissertation research focused on land use in the West during the twentieth century, with chapters on land use in Boise, Portland, Oregon, San Francisco, and Los Angeles. Having studied with Pulitzer Prize winning and other distinguished historians, I have been taught to thoroughly examine historical documents and to critically evaluate the validity of both primary and secondary materials.

The above described graduate work required a great deal of archival research. In addition to my academic training, I also have approximately fifteen years of experience conducting archival research as an independent scholar in a business capacity. My early professional years, 1995-1998, were spent as a research associate for a historian with a Ph.D. from the University of California, Los Angeles, and following that, for another Ph.D. historian. Both have environmental expertise, and were critical to my training. I have spent the past fifteen years developing my own expertise in land and water history, and have become an expert on the types of records that provide the background for the history of an irrigation district. In particular, I have worked extensively in the National Archives and Record Administration facilities across the country, studying records from Record Group Group 115, records of the Bureau of Reclamation; Record Group 49, records of the General Land Office; Record Group 57, records of the U.S. Geological Survey; and Record Group 48, records of the Secretary of the Interior, among others.

As part of my research and archival experience, I have conducted research in a large number of archival facilities and libraries, from National Archives noted above to various state archives including Arizona, California and Idaho, and special library collections such as the Bancroft Library and others in states across the West. My knowledge of western settlement provides me with an understanding of the federal government's role in that process, leading me to the most voluminous source of information about the American West.

Additionally, the vast amount of research that I have done has resulted in an understanding of archival organization, providing me with knowledge of how to access records that may not be explicitly identified in electronic catalogues or paper finding aids.

Methodology

For this report, which covers the history of irrigation and drainage facilities in the Pioneer Irrigation District from their construction beginning in the late 19th century through 1938, I deployed a typical methodology used by historians. To reliably write and make conclusions about history, one must depend upon a variety of sources, including trustworthy secondary sources together with an adequate volume of primary sources. In other words, a historian cannot credibly draw conclusions on any particular subject based on his or her use any single source. I began this research by studying any and all material already written about Pioneer Irrigation District, the City of Caldwell, the Boise Project, and irrigation in Idaho. Being quite familiar with most of those materials already, I then proceeded to look at primary source material, including the historical records of the Pioneer Irrigation District, to which I was provided unrestricted access, as well as archival collections located in the Idaho State Historical Society, Boise State University, and the National Archives and Record Administration's Rocky Mountain Branch in Denver, CO, where the records of the U.S. Bureau of Reclamation are housed. In addition to these archival sources, I also examined three historic newspapers published during the period in question, *The Idaho Statesman*, *The Idaho Leader*, and *The Caldwell Tribune*.

The History of the Pioneer Irrigation District Facilities, 1886-1899

When Robert and Carrie Strahorn drove a stake into the desert land that would become the town of Caldwell, Idaho in the spring of 1882, only sagebrush and greasewood marked the landscape. As Carrie Strahorn later wrote in her memoir *15,000 Miles by Stage*, "Not a tree, nor a sign of habitation on the townsite - only the white desolate glare and clouds of alkali dust –it looked like a place deserted by God himself."[1] Indeed, prior to the development of irrigation in Caldwell, the local paper described the area as "a resort for jack rabbits and badgers."[2] Nevertheless, Robert Strahorn, acting as the "advance man" for the Oregon Short Line, chose Caldwell to be the next stop for the railroad, thus bypassing Boise and making Caldwell a new "center of commerce."[3] Named for Robert Strahorn's business partner, Alexander Caldwell, the railroad town's first investor was Strahorn himself. As the manager-in-chief of The Idaho & Oregon Land Improvement Company, Strahorn set out to encourage merchants from nearby Middleton and Boise to set up shop in the new railroad town. By the fall of 1883, Caldwell was still a "town of tents" with only the depot finished.[4] In order to transform this resort for badgers and jackrabbits into a thriving western town, Strahorn needed one essential element: water.

By early 1886, two irrigation canals – the Caldwell and Phyllis – were transforming the landscape of Caldwell. Robert Strahorn's Idaho and Oregon Land Improvement Company financed the Caldwell Canal, which developed in two sections – the main canal (often referred to as the Caldwell or the Strahorn) and a "high line" extension located above the main canal and surveyed in the 1890s. In March of 1887, the *Caldwell Tribune* reported that the main canal, measuring twenty-four miles long, had already been in operation for "two or three seasons" with plans for a six mile expansion. "This canal has caused the growth of grain and vegetables where sage brush had held possession of the land from long before white men visited it," wrote the newspaper, "and along the line of this canal the desert puts on a brighter and more pleasing aspect." The canal had already reclaimed 10,000 acres of land and was designed to reclaim 15,000 more, "nearly all in sight of Caldwell."[5] By 1889, the Caldwell Canal was delivering water to the lower bench lands eighteen miles below Boise.[6]

---

[1] Carrie Strahorn as quoted in Elaine C. Leppert and Lorene B. Thurston, *Early Caldwell Through Photographs* (Caldwell, ID: The Caldwell Committee for the Idaho State Centennial, 1990), 2.
[2] *The Caldwell Tribune*, July 30, 1887.
[3] Early Caldwell, 2.
[4] Early Caldwell, 2.
[5] *The Caldwell Tribune*, March 12, 1887. The cost for building the canal was estimated to be, at that point, 25,000; it also supplied Caldwell with water and power.
[6] *Idaho Daily Statesman*, Aug. 21, 1889. The Caldwell Canal was described as running 15 miles long to the West, watering the lower bench lands, and measuring six feet wide on the bottom.

In the fall of 1890, the Caldwell Canal was officially sold to the Caldwell Real Estate & Water Company, whose owners – Howard Sebree among them – undertook improvements to transform this "poor piece of property" into "one of the finest ditch properties in Idaho." Repairs to the headgates, the reinforcement of the banks, and securing of the grade allowed the canal to "measure out ten inches to 50,000 inches of water with perfect ease" and deliver "three times as much water as in former years." [7] Under the ownership of the Caldwell Real Estate and Water Company, the High Line extension was surveyed for the first time.[8] Designed to be 12 miles long, 12 feet wide on the bottom, 14 feet and three inches higher than the Strahorn, the owners hoped that the high line extension would reclaim an additional 3,000 acres of land surrounding Caldwell.[9] But despite the company's best efforts, by the spring of 1894, flood waters threatened to damage the canal and wash away the headgate at the Star Wagon Bridge.[10] Although the Caldwell Real Estate & Water Company made efforts to improve the Strahorn and invest in the high line, farmers must nonetheless have been frustrated by the inconsistent delivery of water. In the summer of 1895 citizens made the first of three efforts to form an irrigation district in order to execute on the "high line extension" of the Strahorn Canal.[11] The situation, however, was not yet fit for such an organization, and the Caldwell Irrigation District died shortly after it was proposed.[12] [See Exhibit A.]

While the Caldwell Canal initially received consistent financing from an investment company, the Phyllis canal struggled with financial concerns from its inception. As a result, the farmers under the canal faced great hardship from the time they filed for their land. In August of 1886, the *Idaho Statesmen* reported that the Phyllis was "partly constructed" by the Oregon-based Phyllis Canal Company. But by October, construction had stopped as the owners looked for more investors in the Portland area.[13] In July 1887, the lack of progress on the company's ditch enterprises caused the *Idaho Tri-Weekly Statesman* to criticize the company as the "dog in the manger," with only about $500 worth of work done to date.[14] By the 1888 irrigation season, the Phyllis Canal remained stalled with no prospects in sight. However, in August of 1888, the Phyllis Canal Company received an offer by Howard Sebree's Idaho Irrigation and Colonization Company to purchase and resume work on the important project. Although the existing owners rejected Sebree's offer, ownership rights to the Phyllis were sold to the Idaho Mining and Irrigation Company (sometimes referred to

---

[7] *The Caldwell Tribune*, May 2, 1891; *Idaho Daily Statesman*, Sept. 28, 1890.
[8] Alexander Caldwell was Secretary of this company, but he, like Robert Strahorn, was not himself a full-time resident of the area, instead residing in Leavenworth, Kansas and periodically inspecting the railroad's interests for whom he worked. Sebree, on the other hand, did in fact permanently settle in the Caldwell area, becoming an important investor and patron of the fledgling town. *Idaho Daily Statesman*, Sept. 8, 1894.
[9] *The Caldwell Tribune*, Oct. 31, 1891; Nov. 7, 1891.
[10] *Idaho Daily Statesman*, April 20, 1894.
[11] *Idaho Daily Statesman*, June 13, 1895.
[12] *The Caldwell Tribune*, April 10, 1897.
[13] *Idaho Tri-Weekly Statesman*, Aug. 21, 1886; *Idaho Tri-Weekly Statesman*, Oct. 30, 1886.
[14] *Idaho Tri-Weekly Statesman*, July 23, 1887.

as the New York Canal Company) shortly thereafter.[15] "It is believed by many that this ditch will now be pushed to completion," wrote the *Caldwell Tribune* on September 22, 1888.

Following the ownership change, construction on the ditch steadily proceeded. In March of 1890, representatives of the Idaho Mining and Irrigation Company, A.D. Foote and C.H. Tompkins, Jr., signed a contract with W.C. Bradbury to complete the canal to the Snake River, giving the canal the capacity to irrigate 40,000 acres of land, much of it between Nampa and Caldwell.[16] A flurry of construction occurred during 1890 under Bradbury's contract.[17] In May of 1890, the Phyllis reached all the way to Nampa and by June, water was turned on in the upper portions.[18] In 1891, estimates of the length of the Phyllis in the local papers varied from 20-50 miles.[19] Two years later in 1893, the U.S. Geological Survey provided a more picture of the canal, describing it as 54 miles in length, with a bottom of 12 feet at its head, depth of water 5 feet, and grade of 2 feet per mile.[20]

Perhaps due to litigation between Bradbury and the Idaho Mining and Irrigation Company, the farmers under the canal began to suffer from an unreliable water supply even after the ditch was completed. In 1893, the *Idaho Daily Statesman* reported that the Phyllis had not carried water for more than a year and the canal had become damaged due to neglect.[21] In March of 1893, Bradbury reached a settlement with the Idaho Mining and Irrigation Company that allowed him to begin repairs so that the Phyllis would deliver water for the upcoming irrigation season, but Bradbury himself remained obstinate and a source of great difficulty to the landowners.[22] Water was again officially turned into the Phyllis in June of 1893, but the unwillingness of Bradbury to act in the best interest of the farmers led to unrest and anxiety.[23]

Matters did not improve with Bradbury's purchase of the Phyllis and New York Canals at a sheriff's sale for $184,000 in February of 1894.[24] When subcontractors who had worked on the ditch began to file claims against Bradbury, he was forced to file a petition with the courts to sell both the Phyllis and New York Canals in order to settle said claims against him.[25] During Bradbury's ownership of the Phyllis – which continued until the Pioneer Irrigation District purchased it from him almost a decade

[15] *The Caldwell Tribune*, Aug. 25, 1888; *The Caldwell Tribune*, Sept. 22, 1888. *Idaho Daily Statesman*, Aug. 22, 1889.
[16] *Idaho Daily Statesman*, Feb. 23, 1890; March 2, 1890.
[17] *Idaho Daily Statesman*, April 27, 1890.
[18] *Idaho Daily Statesman*, May 20, 1890; *Idaho Daily Statesman*, June 1, 1890.
[19] *Idaho Daily Statesman*, Jan. 1, 1891; *Idaho Daily Statesman*, May 13, 1891; *The Caldwell Tribune*, Jan. 9, 1892.
[20] *Thirteenth Annual Report of the United States Geological Society to the Secretary of the Interior 1891-1892, Part III-Irrigation* (Washington: GPO, 1893).
[21] *Idaho Daily Statesman*, March 14, 1893.
[22] *Idaho Daily Statesman*, March 26, 1893
[23] *Idaho Daily Statesman*, June 10, 1893.
[24] *Idaho Daily Statesman*, Feb. 9, 1894.
[25] *Idaho Daily Statesman*, Aug. 28, 1894; Aug. 14, 1895.

later – a three mile lateral to serve the south and west parts of Caldwell was under construction. Despite these improvements, the farmers who depended on water from the Phyllis struggled to obtain an adequate and reliable supply for the next few years.[26] In fact, the *Statesman* reported that the lack of water during the 1899 season had caused an "almost entire loss of crops to some and great damage to others."[27] Without water, the landowners had nothing.

[26] *Idaho Daily Statesman*, July 9, 1900.
[27] *Idaho Daily Statesman*, July 9, 1900.

Figure 1 Phyllis Canal Pipeline, c. 1890 Compliments of A.D. Foote
Courtesy of Brigham Young University, Idaho Mining and Irrigation Co., Photo Collection

Figure 2 Phyllis Line, 13-foot Drop at Nampa, c. 1890
Courtesy of Brigham Young University, Idaho Mining and Irrigation Co. Photo Collection

Figure 3 Phyllis Canal, Side Hill Work, c. 1890
Courtesy of Brigham Young University, Idaho Mining and Irrigation Co. Photo Collection

Figure 4 Phyllis Canal, Crossing, Five Mile Creek, c. 1890
Courtesy of Brigham Young University, Idaho Mining and Irrigation Co. Photo Collection

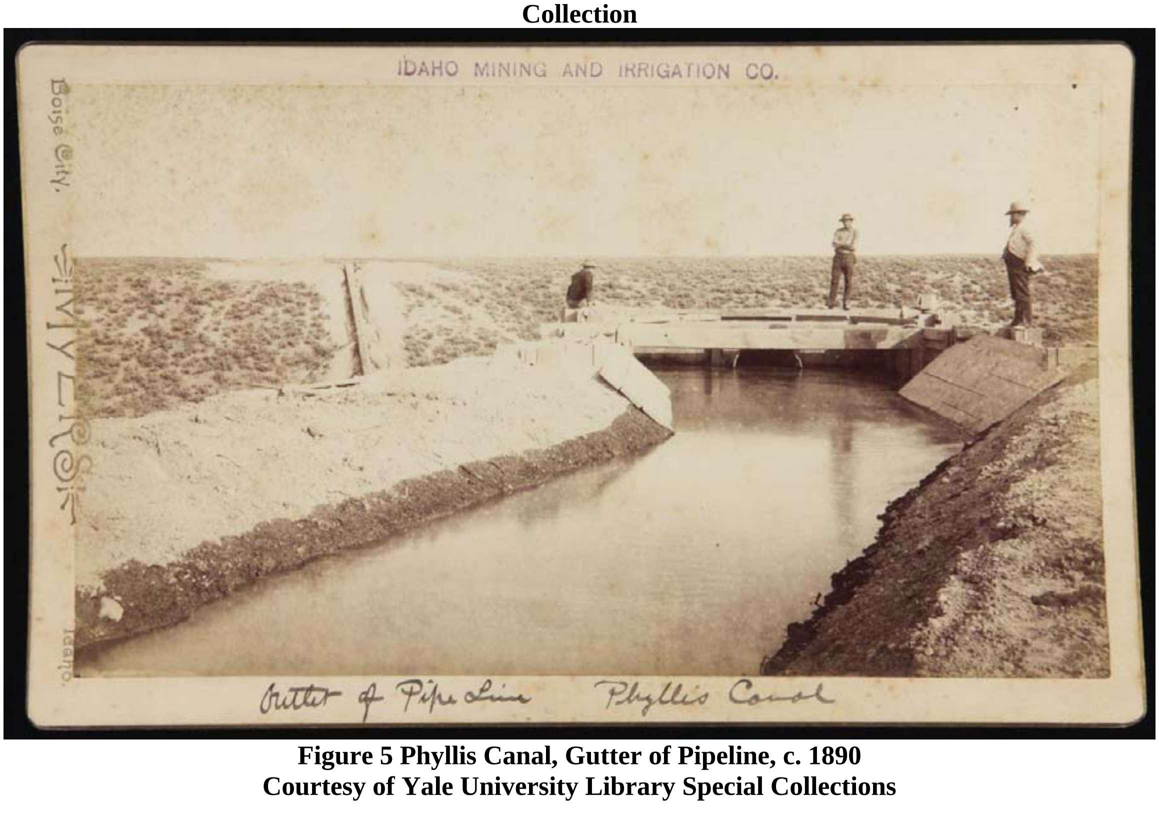


Figure 5 Phyllis Canal, Gutter of Pipeline, c. 1890
Courtesy of Yale University Library Special Collections

Formation of the Pioneer Irrigation District: 1899-1901

By the turn of the twentieth century, the farmers living on the land south of the Boise River had begun to realize that their fates were largely in the hands of absentee businessmen and faceless corporations who owned the canals and the water rights. The farmers suffered great losses by said owners' seemingly arbitrary decisions about when or even if to repair canals or other irrigation works. Those decisions, which determined whether or not water was delivered, meant the difference between a good crop that could sustain the family and be sold at market or a bad crop that would necessitate the head of the family obtaining other work that took him away from his homestead. Without a reliable source of water, the lands south of the river were wasteland, barely able to support a farming population.

The farmers, who were angered by the lack of reliable water under the Phyllis Canal during the 1899 season, attempted to organize under the Idaho Irrigation District law which the state legislature passed March 6, 1899. Creating a district would provide the farmers with some degree of self-control over their water and give them the flexibility to operate and maintain the canal as they wished. Two districts were conceived in the fall of 1899. The first, called the Phyllis and Caldwell Irrigation District, was proposed to include lands lying under both the Phyllis and the Caldwell Canals. The other, smaller district would have covered lands lying only under the Caldwell.[28] The former comprised approximately 22,000 acres, the latter 12,000.[29] The Canyon County Board of Commissioners met in January 1900 and approved the larger district, which embraced lands lying under the Phyllis Canal and above the Riverside Canal from the head of the Phyllis as far west as the Pipe Line Gulch, 35 miles from the head, with the exception of lowlands of the river bottom and adjacent to Dixie Slough along with other lands already having water rights from another source. The total acreage was 32, 515, only about 4000 acres of which was already being irrigated.[30] Following a February vote in which landowners approved the district by a large margin, the new district elected a Board of Directors in early March.[31]

The petitioners, upon meeting with State Engineer D.W. Ross, immediately hired Engineer A.J. Wiley to conduct surveys for them and to report on the potential viability of an irrigation district in the areas proposed. The newly elected Board of Directors designated Wiley to draft "such plans, maps, estimates, etc. as are required by law in the preliminary work of perfecting the system whereby the distribution of water for the district is to be effected."[32] In another early action, the board also began

[28] *The Caldwell Tribune*, Nov. 11, 1899.
[29] *The Caldwell Tribune*, Dec. 23, 1899.
[30] *Idaho Daily Statesman*, Jan. 5, 1900*; The Idaho Leader*, Jan. 6, 1900; PID Minutes, May 15, 1900.
[31] Pioneer Irrigation District Board of Directors Minutes, May 15, 1900, Pioneer Irrigation District offices, Caldwell, ID. Hereafter "PID Minutes."; *The Idaho Leader*, March 3, 1900.
[32] *The Caldwell Tribune*, March 10, 1900; PID Minutes, March 8, 1900.

negotiations with Mr. Bradbury, the Phyllis's existing owner, who offered to sell the Phyllis Canal for $75,000. The board took the offer under advisement and directed the Secretary to communicate and negotiate with Bradbury so as to obtain control over the critical canal.[33] The local paper speculated correctly that similar negotiations were ongoing with Mr. Sebree regarding the purchase of the Strahorn, or Caldwell, Canal as well.[34] Acting in his role as the engineer, Wiley offered preliminary opinions in the fall of 1899 on the work to be done to the Phyllis to make it fully functional. In reporting on the events, the *Idaho Daily Statesman* described the Phyllis Canal as 35 miles long. However, according to Wiley, it was no longer carrying its original capacity of water. At original construction, the canal had been 12 feet wide on the bottom and 20 feet wide at water level. When the canal reached Nampa, its width was reduced to 8 feet wide on the bottom and 13.5 on the top. Breaks and disrepair had limited its carrying capacity. Nonetheless, repairs to the side hill portion could, according to Wiley, restore the canal's original capacity.[35] With regard to the Caldwell Canal, Wiley's early assessment was that it could be extended on a higher line (i.e. the "High Line") from Ten Mile Creek west, and that the original canal could then be used as a distributing lateral. He also noted that said plan would require an enlargement of the canal, including a ditch on the side hill measuring 24 feet wide on the bottom, 3.5 feet deep, and 10 (ten) feet wide on the top. He estimated that such improvements would cost $43,000, plus the $10,000 that the existing owner, Mr. Sebree (acting on behalf of the Caldwell Real Estate and Water Company, soon to be the Caldwell Land Company Limited), was asking for the canal itself.[36]

By spring 1900, Sebree was said to be strongly in favor of the district system and "cheerfully" willing to do anything in his power to assist in facilitating a system of water distribution.[37] The local papers contrasted his "spirit of liberality" with Bradbury's tendency to "squeeze from the farmers every cent that can be squeezed" in the negotiations over the Phyllis.[38] In May of 1900, the Pioneer Board of Directors adopted a General Plan to address the District's needs and turned the plan over to the State Engineer.

The plan itself was two-fold: a detailed explanation of the district's intentions with regard to the purchase of the two canals and its plans for further improvements. Even as early as 1900, the farmers in the district were aware of the natural features of the land on which they had settled and how those features affected the behavior of irrigation water. They knew that the lands in their District lay at the low end of a basin to which water from upper lands drained, and they also had some level of awareness of the rather shallow water table that existed in some parts of their district. They were also acutely aware of the arid climate and the desperate need for water that

[33] PID Minutes, March 8, 1900; *The Caldwell Tribune*, March 10, 1900; *Idaho Daily Statesman*, March 1, 1900.
[34] *The Caldwell Tribune*, March 17, 1900; PID Minutes, March 15, 1900.
[35] *Idaho Daily Statesman*, Dec. 1, 1899.
[36] *Idaho Daily Statesman*, Nov. 17, 1899.
[37] *The Caldwell Tribune*, April 7, 1900.
[38] *The Caldwell Tribune*, May 12, 1900.

farmers typically experienced each season between August and the first half of September, when the rains ceased and the rivers ran low. They noted that although there may someday be plans for "storing the abundant flood waters of the Boise" to accommodate this late season need, there did not yet exist any reservoirs to provide reliable water for the last part of the growing season.[39] Thus, the district was left to determine the best way to accommodate the necessity for water on a vast acreage throughout the entire irrigation season. In its General Plan, the board noted:

> Of the water applied in irrigation a part is absorbed by the crop, a part is evaporated from the ground, a part runs off the surface and returns directly to the stream, and the remainder sinks into the ground. The water used by the crop and evaporated from the soil is lost to the irrigation system, but that running from the surface and that sinking into the ground is not lost. *The waste water from the fields will return by natural channel to the main stream or it may be gathered in artificial channels and used on other land. The water which sinks into the ground will first fill the sub-soil, and then reappear as springs in the lowest part of the valley, where the main stream is located.* [Emphasis added.]

To take advantage of the return flows and seepage water, the plan suggested constructing a new Caldwell Canal upon the high line location rather than enlarging the existing canal. "The greatest possible percentage of the land in the District should be irrigated from the lowest available point on the river in order to take advantage of the return waters," the plan contended, "and the High Line covers a considerably larger tract than the present canal." Thus, even the District's original construction plans included comprehensive strategic engineering to both drain upper lands and to in turn deliver that water to lower lands. Under "System of Distribution," the board continued to make its point:

> As a necessary adjunct to its lateral system the District will provide drainage channels to collect the water waters, and convey them to lower laterals for redistribution. Title to all waste waters must be vested in the District, whose duty it will be to see that they are not allowed to become a menace to the health and a damage to the property of the residents, as well as an eyesore to its visitors, when by a *properly arranged drainage system they can be converted into an important aid to the water supply*. [Emphasis added.]

Finally, after examining various alternatives, the report recommended the purchase of the Phyllis Canal – even at the somewhat exorbitant price of $75,000 – as well as the purchase of the Caldwell Canal. It explained the plan for canal improvements to be made, and also outlined the type of works that would be used for water measurement and headgates. The estimated cost for purchase and improvements of both canls came to $193,315, and the plan recommended that bonds in said amount be issued.

[39] Deer Flat and Arrowrock Reservoirs were part of the U.S. Bureau of Reclamation's Boise Project, and were completed in 1908 and 1915, respectively; Lucky Peak was an Army Corps of Engineers project and was completed in 1955.

They would only be disposed of by the District "as necessity may direct."[40] A bond election was ordered to be held on July 28, 1900, at which time the board was authorized by voters to issue $200,000 in bonds to pay for the purchases and planned works.[41]

Upon the bond election's results and in accordance with the law, the District board directed its attorney to initiate special proceedings at the District and Supreme Courts to confirm the board's proceedings thus far.[42] Unfortunately for the people who had worked so hard to make the District a reality, the courts ruled against the District's plans in November 1900. The ruling stated that the District was "a trifle short on land," and that not enough of it was assessable. The law required that 25% of land in a District be assessable, and petitioners had not been accurate in their calculations.[43] To the farmers' dismay, the Phyllis remained in the hands of Mr. Bradbury.

Discouraged but determined, the petitioners submitted a new petition to the Canyon County Commissioners, who were expected to hold a hearing on it on January 15, 1901.[44] The record indicates that the commissioners did not hear the petition until April 15, 1901, after the District petitioners adjusted the boundaries to exclude some lands not benefited by the proposed District.[45] State Engineer D.W. Ross presented his report on the proposal to the Commissioners in May, the District held its election in early July, and the courts ruled favorably on the district in December.[46] Throughout 1901, the board made an examination of all of the lands in the district to determine assessments, opting to charge all the lands at the same rate of $6/acre.[47] The board also passed bylaws, a revised General Plan, and held a bond election in October to raise funds for the purchase of the canals.[48]

The new plan, passed in September 1901 was almost identical to the plan passed by the board during the first iteration of the District's petition. The plan specified that the District planned to re-build the Caldwell Canal on a higher level with a shallower grade, using the same heading on the river. The plan noted that the current canal's grade was 3 ¾ feet to the mile, "which is greatly in excess of what is either necessary or desirable." The plan was to keep the canal's same line for the first three miles to what was known as the "big cut," and then diverge from it and run from half to ¾ of a mile above it at a grade of 35 inches per mile. The board also hoped to take advantage of the area's return flows with this canal. Estimates of the new canal's

[40] "General Plan," in PID Minutes, May 15, 1900.
[41] PID Minutes, June 26, 1900; *The Caldwell Tribune*, June 30, 1900; PID Minutes, July 31, 1900.
[42] PID Minutes, July 31, 1900.
[43] *The Caldwell Tribune*, Nov. 17, 1900.
[44] *The Caldwell Tribune*, Dec., 15, 1900.
[45] PID Minutes, General Plan, Sept. 3, 1901.
[46] *The Idaho Leader*, May 25, 1901; *The Idaho Leader*, Dec. 14, 1901; PID Minutes, July 11, 1901.
[47] PID Minutes, July 24, 1901. The flat rate assessment became a general policy of the district throughout the period that this report covers.
[48] PID Minutes, Sept. 10, 1901.

costs had crept up slightly over the previous year, coming to a total of just over $207,000, for which the District planned to issue bonds.[49]

After much angst over the cost of the Phyllis, the board secured purchase of the two canals from Bradbury (for the Phyllis) and Sebree/Caldwell Real Estate and Water Company (for the Caldwell) during the first six months of 1902.[50]

Early Years of the Pioneer Irrigation District: 1901-1912

With the canals purchased and the existence of the Pioneer Irrigation District secure, the next few years were spent upgrading the facilities and ensuring the delivery of water to the farmers. The board also maintained a dogged focus on improvements that would increase the irrigable acreage within the District. The neighboring areas to the east and the south were also in the midst of expansion, thanks to the passage of the Reclamation Act in 1902 and the subsequent authorization of the Boise Act in 1905. (See below.) No one anticipated, however, the problems that would come with such a vast increase in irrigation.

In September 1902, the Pioneer board voted to advertise for bids to enlarge the two canals. With regard to the Phyllis, the Board proposed improvements to enable the canal to carry its ultimate capacity of water from its point of diversion to Five Mile Creek, a distance of about six miles. The board also envisioned the Caldwell Canal being enlarged from its point of diversion to the point where it encountered the line of the High Line survey at Indian Creek.[51] Work on both canals involved repairing the side hill cuts, where the canals climbed out of the river bottom and up to the bench land.[52] Such work was some of the hardest and most expensive to construct. In November, the board awarded the contract for both the Phyllis and Caldwell enlargements to Faris and Kesl who offered a bid of $65,000 for the work. The enlargement plans included taking the Phyllis canal from 14 feet wide on the bottom to 28 feet, with a top width of 45 feet. The District hoped to use it as a feeder canal to the Caldwell.[53] Although their contract required them to complete their work in the spring of 1903, the contractors encountered difficulties in fulfilling their obligations and did not complete the work until sometime in 1904.[54]

---

[49] PID Minutes, Sept. 5, 1901.
[50] *Idaho Daily Statesman*, April 30, 1902; *The Idaho Leader*, May 3, 1902; *Idaho Daily Statesman*, June 24, 1902; PID Minutes April 10, 1902; PID Minutes, June 14, 1902.
[51] PID Minutes, Sept. 20, 1902.
[52] *The Idaho Leader*, Oct. 1, 1902.
[53] PID Minutes, Nov. 6, 1902; Dec. 11, 1902; *Idaho Daily Statesman*, Dec. 12, 1902; *The Idaho Leader*, Dec. 10, 1902; Dec. 13, 1902.
[54] *Idaho Daily Statesman*, April 29, 1903; Oct. 1, 1903. There was some concern on the part of the Pioneer Board that Faris and Kesl would not complete the work. The board passed an extension for the contractors on April 14, 1903. Even after that time, the work was not completed. The record is unclear as to when and how the work was finalized.

The year after awarding the initial enlargement work to Faris and Kesl, the District decided to continue the enlargement of the two primary canals for a further distance. At the same time, it opted to cease allowing new lands into the District for fear of being unable to provide water for them.[55] During 1903, new contracts were let to continue the work of enlarging the Phyllis an additional twelve miles to Star, going from a bottom width of eight feet to 27 feet.[56] The board also accepted and awarded bids to construct the Caldwell High Line to two contractors for two different sections of the work, the first to Bisset, Marsh, and Reeser, who would construct the canal from station 171 to station 358, and the second to Metcalf and Nicholas who would construct the High Line from Mason Creek to Indian Creek.[57] The new canal was to take out of the Boise River at the same place as the original Strahorn (Caldwell) Canal and run 10 miles along higher bench land than the original ditch. It was surveyed to be in the shape of a crescent.[58] In the meantime, during the 1904 season, the old Caldwell Canal continued to be utilized as a lateral.[59] Work on both the Phyllis and Caldwell Canals was completed to a degree, without incident. That spring water was turned in to the delight of the farmers, who now felt assured of a reliable water supply.[60]

As with most projects in the Boise Valley, the next stage of progress was not immediate or linear. There was some hesitation – perhaps dictated by monetary concerns – to continue work on the High Line of the Caldwell. In May 1904, a board member formally suggested that the board examine the old Caldwell Canal from the point where the new High Line Canal emptied into it to its terminus, to determine whether it was necessary to complete the new "lateral" right away. After conducting the examination, the board decided that "the completion of the High Line lateral is not necessary."[61] Additionally, they did not abandon the Old Caldwell Canal in the area in which it *had* been replaced by the new High Line, being instead "convinced that benefit will accrue to the District through maintaining the old Caldwell Canal, from Mason Creek down," and opting to keep the canal open "for the *purpose of catching waste water and redistributing the same*."[62] [Emphasis added.]

Additional improvements were made over the course of the next six years. The Phyllis side hill section was enlarged again between 1907-1908 with the use of a District-purchased dredge.[63] The farmers in the District were increasingly successful, subsisting and supporting families thanks to the water being delivered through these two canals onto their largely productive lands.

[55] PID Minutes, June 2, 1903.
[56] *Idaho Daily Statesman*, Oct. 1, 1903; *The Caldwell Tribune*, Oct. 17, 1903.
[57] PID Minutes, Oct. 1, 1903.
[58] *Idaho Daily Statesman*, Sept. 13, 1903; PID Minutes, Oct. 1, 1903.
[59] PID Minutes, April 5, 1904.
[60] *The Caldwell Tribune*, March 14, 1904; April 16, 1904; *Idaho Daily Statesman*, April 28, 1904.
[61] PID Minutes, May 3, 1904.
[62] PID Minutes, May 12, 1904.
[63] PID Minutes, Oct. 15, 1906; Feb. 6, 1907

Pioneer Irrigation District, the Boise Project, and the United States Reclamation Service, 1902-1912

As the Pioneer District continued its work during the first decade of the 20th century, irrigation and reclamation in the West underwent a dramatic transformation. And while the Pioneer District was determined to remain a private entity, it did not operate in isolation from broader changes in neighboring desert lands south of the Boise River. The most significant event to occur during this period was Congress's passage of the Reclamation Act, or the Newlands Act, in 1902. The law provided federal dollars for the construction of reclamation projects across the West, and the Boise area was one of the new agency's first targets.

Because hydrological systems do not conform to arbitrarily created human boundaries, irrigation development that occurred in the desert south of the Boise River but outside of Pioneer's boundaries nonetheless impacted the District's operations. Thus, while the particular history of the U.S. Reclamation Service's Boise Project itself is not within the scope of this report, it is important to understand three issues: the general history of the Project, the federal activity in the Boise desert during the first two decades of the twentieth century, and the evolving relationship between the Pioneer District and the Project.

Created by the 1902 Reclamation Act, the U.S. Reclamation Service was highly aware of the problems confronting farmers who needed water late in the irrigation season. Because the agency had access to the funding for the construction of water storage facilities, the Service began to actively survey this land in 1903-1904 in an attempt to determine the best location for a dam and reservoir. Upon receiving an enthusiastic report on the project's potential, Congress authorized the project, initially called the "Payette-Boise Project," in March 1905, and allocated $1,300,000 from the Reclamation fund to conduct the work.[64] By then, landowners throughout the Boise Valley had formed the Payette-Boise Water Users' Association, contracting with the United States to return the cost of building the necessary structures.[65] The Service commenced work immediately, completing the Deer Flat Reservoir just a few years later, an off-river reservoir site approximately four miles west of Nampa fed by water diverted through the Reclamation Service's New York Canal.

Soon after the Project's authorization, a relationship developed between the Reclamation Service and the Pioneer District. Many landowners in the Pioneer District signed stock subscriptions with the Payette-Boise Water Users' Association in 1905, and the District itself signed a contract with the association in 1906 in the hopes of receiving late season water through the Service's facilities. But being a part of the Association meant that the District lands were subject to liens held by the

---

[64] F.H. Newell, *Ninth Annual Report of the Reclamation Service* (Washington, D.C.: Government Printing Office, 1911): 107.
[65] Ibid, 107.

Association, which later posed problems for the District.[66] Additionally, the newly developed lands watered by the Boise Project created a good deal of seepage water that, by virtue of Pioneer's location in the hydrological system, waterlogged large swaths of District lands, thereby rendering much it useless for meaningful cultivation. By 1909, it had become clear that the two Reclamation Service and Pioneer Irrigation District would have to work together to ensure the continuation of productive lands.

Drainage of Desert Lands South of the River and other Improvements, 1909-1922

Individual landowners began reporting waterlogged lands in the Pioneer Irrigation District as early as December 1904.[67] The continued irrigation of lands under the Phyllis and Caldwell Canals and the increased irrigation on other lands across the southern desert created a dual set of concerns for the farmers in the Pioneer District. First, there was a great deal of unabsorbed water flowing onto the lower-lying lands in the Pioneer District; second, the water table underlying the lands had gradually begun to rise either to land surface levels or very near. The continued seepage and return flow water gradually began to ruin what recently had been productive farmlands. Farmers, who relied exclusively on the productiveness of the lands for their livelihood, could not survive in the barren desert without water to farm or drainage in the areas which had become swamped. The economic impact of the swamping was severe. The farmers, who could finally rely on a steady delivery of water, were now faced with a problem that none had anticipated – too *much* water on their land.

The Reclamation Service was also struggling to solve the problem of seepage in the Boise Project. Because their upland projects were often the cause of seepage onto lower lands, the Service found itself subject to liability. To contend with the issue, the District and the Service began working together to solve the problem soon after Deer Flat Reservoir was constructed in 1908. Beginning in March 1909, the Reclamation Service's Project Engineer, Edward Hedden, came frequently to the Pioneer Irrigation District board meetings to discuss the Service's desire to divert seepage water from Deer Flat into the Phyllis Canal, which ran immediately below it. The District was wary of the partnership, engaging in it only reluctantly and insisting that the Service cease the diversion into the Phyllis as of October 1, when the District needed the Phyllis to be dry in order to conduct seasonal repair work.[68]

---

[66] F.W. Hanna, Project Engineer to Supervising Engineer, U.S. Reclamation Service, Feb. 9, 1912, "260-A BOISE PROJECT Drainage of Pioneer Irrigation District Thru 1912 260-A," Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, Record Group 115, Records of the Bureau of Reclamation, National Archives and Record Administration, Rocky Mountain Region. Hereafter "RG 115."

[67] PID Board Minutes, Dec. 6, 1904; Sept. 5, 1905.

[68] PID Minutes, March 2, 1909; May 4, 1909; June 1, 1909; Aug. 3, 1909. F.E. Weymouth to Director, U.S. Reclamation Service, July 8, 1909, 699-6 Boise Project, Idaho. Grant of right for U.S. to flow seepage water into canal of 699-6, Entry 3, General Administrative and Project Records, 1902-1919, box 406, RG 115.

Figure 6 June 22, 1914
"Reclaimed land on U.S. Drain to Upper Embankment. Flats on either side of drain are now covered with heavy wheat crop. Before drain was constructed they were immense swamps covered with bullrushes."[69]

[69] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

By January 1910, the seepage problem clearly necessitated a District-wide solution. Describing the situation some years later, engineer R.J. Newell wrote:

> There was a large increase in the irrigation of lands lying higher on the valley slope, mainly in the federal project, and the water table began to rise rapidly. Seepage conditions, already observable, spread and demanded attention. Forests of tules took possession of the low lands in the principal draws and alkali deposits appeared in many cases. Apparently the groundwater table did not parallel the ground surface but was near level transversely to the general valley slope, thus coming to or near the surface in the draws while the slightly higher ridges did not suffer.[70]

The District board approached what it called "the waste water problems" with its attorneys in January of that year,[71] but it was not until July 1910 that the board was forced to deal with the matter by a group of landowners living in the vicinity of the Midway school house (located on the Oregon Short Line approximately halfway between Nampa and Caldwell). The landowners had met earlier in the month and appointed a three-person committee to petition the board, resolving that there was "great need of such drainage system at the present time, and this need is growing greater and more urgent each succeding [SIC] year." Therefore, they requested that the District construct a system to:

> provide drainage channels to collect the waste waters and convey them to lower laterals for redistribution. Title to all waste water must be vested in the district, whose duty it will be to see that they are not to become a menace to the health and a damage to the property of the residents, as well as an eyesore to its visitors, when by a properly arranged drainage system they can be converted into an important *aid to the water supply*.[72]

Upon receiving the resolution at a special board meeting, the board directed its attorneys to submit a written opinion at their next meeting on whether or not the district could legally issue bonds for the construction of a drainage system.[73] The attorneys offered their opinion at the next board meeting, recommending two strategies: first, that the board should first obtain a survey and an estimate of the drain system before issuing bonds, and second, that they needed to call an election and obtain a ruling from the courts as to whether or not the board had the legal right to issue bonds for drainage purposes.[74] The board directed their attorneys to advise them on the best way to proceed.

---

[70] R.J. Newell to Chief Engineer of Bureau of Reclamation, Jan. 22, 1931, 636 Payments – Drainage, Pioneer Irrigation District Historic Records, Basement Drawers.
[71] PID Minutes, Jan. 20, 1910.
[72] PID Minutes, July 16, 1910.
[73] PID Minutes, July 16, 1910.
[74] PID Minutes, Aug. 2, 1910. Edward Hedden also provided a written opinion at this board meeting that the cost of surveying the district would be approximately $10,000, or $.30/acre.

Surprisingly, in spite of the great need for drainage, there remained a simultaneous need for supplemental water, particularly in the lower ends of the District and in the late irrigation season. A group of landowners who were at the low end of the District had created an organization called the Idaho Promotive and Protective Association. The association petitioned both the District board and the Reclamation Service to cooperate with them in inaugurating a "more complete irrigation system"[75] so as to obtain additional water. The farmers on District lands, accustomed to fending for themselves, were clearly suffering from one of two opposite plagues: waterlogged land or inadequate water.

After struggling with the problem, the District board came to realize that it could simultaneously solve its drainage problem *and* provide additional water in the late season. Although it was clear that there would have to be some level of cooperation between the District and the Reclamation Service and that by working together, all the land south of the river might be aided, the Pioneer Board did not feel it had the luxury of waiting for the Reclamation Service to join its efforts. Discussions had begun between the entities in 1911, both regarding collaboration on drainage beyond the Deer Flat seepage as well as the release of District lands from the Water Users Association. But communication was painfully slow and tedious at the time, and various Reclamation Service officials provided conflicting messages as to whether the agency would participate in either the draining of the lands or the release of District lands from the Water Users Association.[76] With the final decision in *Farmers' Cooperative Ditch Company vs. Riverside Irrigation District* decided in 1909 and the District now clear on their decreed yet inadequate water rights,[77] Pioneer realized that its needs could not wait. Thus, it resolved in September 1911 that:

> there are large quantities of waste and seepage water within the boundaries of the District which, if the same could be conserved, could be applied to a *beneficial use* upon the lands of the District and would thereby be a great benefit to the District…these waste and seepage waters within the District are ruining the lands of the District and that by collecting the same in ditches and by pumping the water collected thereby into our canals, the District would work a double benefit for itself.[78] [Emphasis added.]

In particular, the board believed that by digging a large ditch through the lands bordering Mason Creek, Indian Creek, and the Dixie slough, "a large supply of water could be obtained, which is greatly needed for irrigation." The members then hired Edward Hedden, previously employed by the Reclamation Service, to examine the lands in those areas and determine the amount of water that could be obtained by such a plan.[79] It took only two months for Hedden to examine the tract and create a

[75] PID Minutes, Oct. 4, 1910; Dec. 3, 1910.
[76] PID Minutes, Feb. 11, 1911, March 7, 1911; April 4, 1911. Director to F.E. Weymouth, Sept. 25, 1911, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District Thru 1912 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.
[77] *Farmers' Co-operative Ditch Company v. Riverside Irrigation District*, Ltd., et al.,16 Idaho 525
[78] PID Minutes, Sept. 19, 1911.
[79] PID Minutes, Sept. 19, 1911.

general plan of construction, the estimates for which came to slightly over $313,000. The board approved his plans unanimously on November 18, 1911, and set the bond election for February 9, 1912.[80]

Immediately thereafter, the Pioneer Irrigation District officially petitioned the Payette-Boise Water Users Association to be released from the obligation of membership. Pioneer explained its history with the Boise Project in its request, stating that the original 1905 contract with the Service had provided the District with late season water from Deer Flat Reservoir. Sometime after that contract was signed, the Reclamation Service changed its storage of late season water to the Arrow Rock Reservoir, causing an increase in cost to Pioneer Irrigation District without its consent, according to the official petition. Thus, the District felt it had ample justification for requesting release. Additionally, the District wanted to construct the drainage facilities privately, and knew that without such a release, it would be difficult to raise the bonds necessary to finance the construction.[81] The District's pleas fell on deaf ears, and the Association voted to deny the petition, forcing the District to remain in the Association. The Director of the Service informed the District of the decision by letter.[82]

---

80 PID Minutes, Nov. 18, 1911.

81 Petition in the Matter of the Application of the Pioneer Irrigation District and the Landowners Within the Boundaries of Said District to Withdraw from the Payette-Boise Reclamation Project, Jan. 10, 1912, in 260-A BOISE PROJECT Drainage of Pioneer Irrigation District Thru 1912 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

82 Director of U.S. Reclamation Service to the Directors of Pioneer Irrigation District, Dec. 14, 1911, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District Thru 1912 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 7 June 22, 1914
"Scene on Upper Wilson Slough four miles above where the dredge is now working...[This will be] made ready for crops in 1915. Four years ago this was some of the finest agricultural land in the Boise Valley, now a lake of rushes."[83]

[83] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 8 June 22, 1914
"Whitehead & Bradley's once prosperous 10 acre prune orchard from which four car loads of prunes were marketed four years ago. Now completely ruined by seepage."[84]

[84] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 9 June 22, 1914
"Scene in H.G. Monce's orchard. Trees dying off and a heavy growth of rushes growing up among the trees."[85]

[85] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 10 June 22, 1914
"Young orchard on Chas Verheyn's Ranch giving way to serious seepage conditions. These trees blossomed this spring but were to [sic] nearly drowned to produce foliage. Some of the trees may live as the ground water has been lowered approximately 6 ft. by the Mason Creek Drain."[86]

[86] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 11 June 22, 1914

"The famous Pittenger nursery on Mason Creek which netted the owner an income of $9,000 per year but which has been practically submerged for the past three years. The drain has been dug through this place for 40 days. Mr. Pittenger has mowed and burned most of the rushes and has a large acreage plowed."[87]

[87] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 12 June 22, 1914
"Whitehead & Bradley's ruined orchard in the foreground. H.G. Monce's apple orchard in the back ground. Note lack of foliage on trees due to waterlogging of ground by seepage from ground waters."[88]

[88] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Despite early indications that the Reclamation Service would not participate in the construction of Pioneer's drainage facilities, cooperation with the government now looked likely. The Reclamation Service had never disagreed that drainage was necessary throughout the lands south of the Boise River, but for a variety of reasons, had initially thought it impossible to pay for such works. After months of back and forth communication among themselves, however, Service engineers and attorneys had since concluded that the work was better done by the government and not by the District, and they had also opined that the 1902 law did in fact enable such work. It was near impossible to construct a drainage system that would serve *only* the lands in the District, they reasoned, with one engineer arguing: "The drainage system…of the Pioneer Irrigation District cannot be made an entirely independent system from some of the lands of the rest of the Boise project."[89] They therefore agreed that it would be more appropriate to build a system that would serve all the lands in the area jointly. Reclamation Service officials felt that the cost estimates Hedden came up with in the fall of 1911 were fair.[90] Thus, although the Water Users Association had voted to deny the District's withdrawal, the Director of the Reclamation Service recommended to the Secretary of the Interior in January 1912 that the District be released from the Boise Project under certain conditions: 1) that a stipulation be made with regard to exchange of water with the Phyllis Canal; 2) that the proposed drainage ditches be large enough to carry water from Deer Flat and other lands above the Phyllis; and 3) that the land owners below the Phyllis agree to make no further claim for damages from seepage water above the Phyllis.[91]

Almost as though the Reclamation Service had ordered it, the special bond election in called by Pioneer for February to pay for drainage construction failed, and the District was left no choice but to negotiate with the government agency regarding the drainage. The engineers on the Boise Project were now convinced of the importance of building an integrated system for the entire area south of the River. As Frederick Newell, director of the Reclamation Service reiterated, the District itself is "practically surrounded by the Boise project, and no adequate system of drainage for the Boise project can be carried out without at the same time providing for a certain amount of drainage of the Pioneer District."[92] As part of the Service's effort to propose a solution of its own, an engineer on the Boise project provided his own version of a plan for the drainage system in July 1912. It included estimates and project plans for the various ditches, as well as a map indicating what he believed the

[89] F.W. Hanna to Supervising Engineer, U.S. Reclamation Service, Feb. 9, 1912, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District Thru 1912 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.
[90] F.W. Hanna to Supervising Engineer, U.S. Reclamation Service, Feb. 9, 1912, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District Thru 1912 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.
[91] F.W. Hanna to Supervising Engineer, U.S. Reclamation Service, Feb. 9, 1912, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District Thru 1912 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

[92] F.H. Newell to the Honorable Secretary of the Interior, April 26, 1912, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District Thru 1912 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

priorities should be, based on what he perceived to be the greatest need. The majority of the drains covered in the 1913 contract were built in the western part of the District. Mason Creek, Dixie Slough, Wilson Slough, Purdum Gulch, and Elijah Slough were included in the group he called the "No. 1" drains. "No. 2" drains included Dixie Slough, Noble Slough, and Solomon Slough. Finally, the lowest priority group, the "No. 3" drains consisted of Dixie Slough, Moses Slough, Noble Slough, Solomon Slough, Jacob Slough, and Isaiah Slough.[93] The Service plan included a slightly greater number of drains than Hedden's plans had envisioned, and limited the financial outlay to $350,000.

The Service drafted a contract favorable to Pioneer, with the Reclamation Service building and financing the drains and Pioneer paying the costs back over time. Electors in the District approved the terms of the contract in a special election that fall,[94] and directors immediately arranged for a petition to be reviewed by the courts in order for the contract to be "judicially examined, approved and confirmed."[95] Pioneer Irrigation District and the United States signed the agreement in February 1913, providing a $350,000 advance by the government for a drainage system in the Pioneer Irrigation District, and new terms for water delivered from Arrow Rock Reservoir to the District.[96] The contract became effective on April 23 of that same year.[97] The $350,000 was expected – and stated as such – to be insufficient to drain the entire District, but any degree of construction was expected to make some significant progress toward drainage of the worst waterlogged lands and to help deliver water to lower lying lands in the late season. Crews were employed throughout the summer of 1913 to conduct surveys, make test pits, determine topography, and classify subsoil. Construction of the drains began in November, and continued into 1915.[98] And in October 1913, the Payette-Boise Water Users Association finally released all lands within the Pioneer District from obligation.

---

[93] Walter Ward to Acting Project Engineer, July 30, 1912, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District Thru 1912 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

[94] PID Minutes, Nov. 6, 1912. Election was held Oct. 29, 1912.

[95] PID Minutes, Dec. 3, 1912.

[96] The voters approved the contract in October 1912; the Idaho Supreme Court passed favorably on the contract on February 15, 1913. The contract provided the District with a $560,000 interest in Arrowrock Reservoir in addition to the drainage authorization. William M. Green, "Report of Drainage Operations in the Pioneer Irrigation District and the Nampa and Meridian Irrigation District of the Boise Project," Dec. 1917, p. 9, Project Reports, 1910-1955, 8NN-115-85-019, Box 59, RG 115.

[97] William M. Green, "Report of Drainage Operations in the Pioneer Irrigation District and the Nampa and Meridian Irrigation District of the Boise Project," Dec. 1917, p. 9, Project Reports, 1910-1955, 8NN-115-85-019, Box 59, RG 115.

[98] William M. Green, "Report of Drainage Operations in the Pioneer Irrigation District and the Nampa and Meridian Irrigation District of the Boise Project," Dec. 1917, Project Reports, 1910-1955, 8NN-115-85-019, Box 59, RG 115.

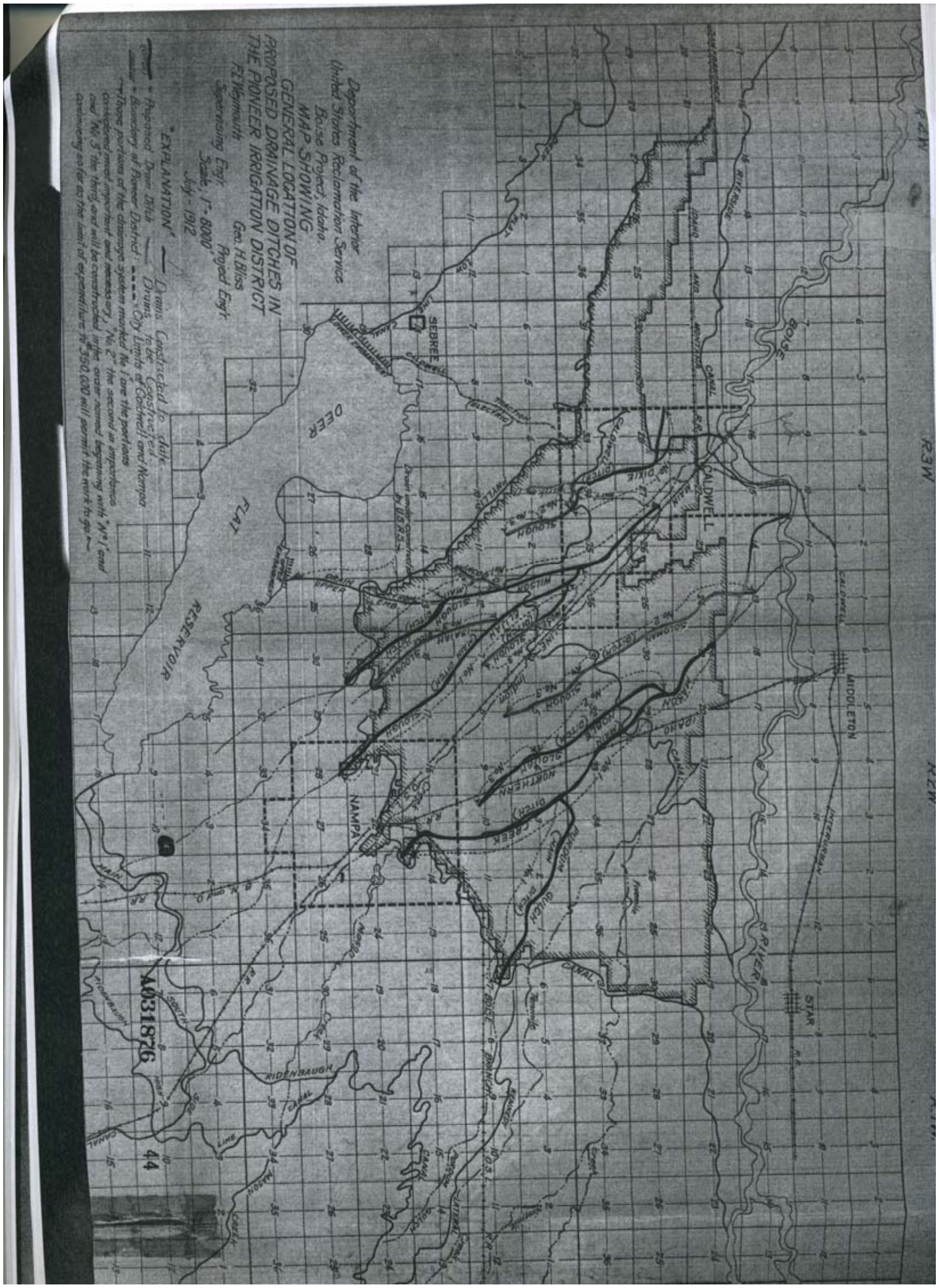


Figure 13 July 1912
Map Showing General Location of Drainage Ditches in the Pioneer Irrigation District[99]

[99] Map Showing General Location of Proposed Drainage Ditches in the Pioneer Irrigation District, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

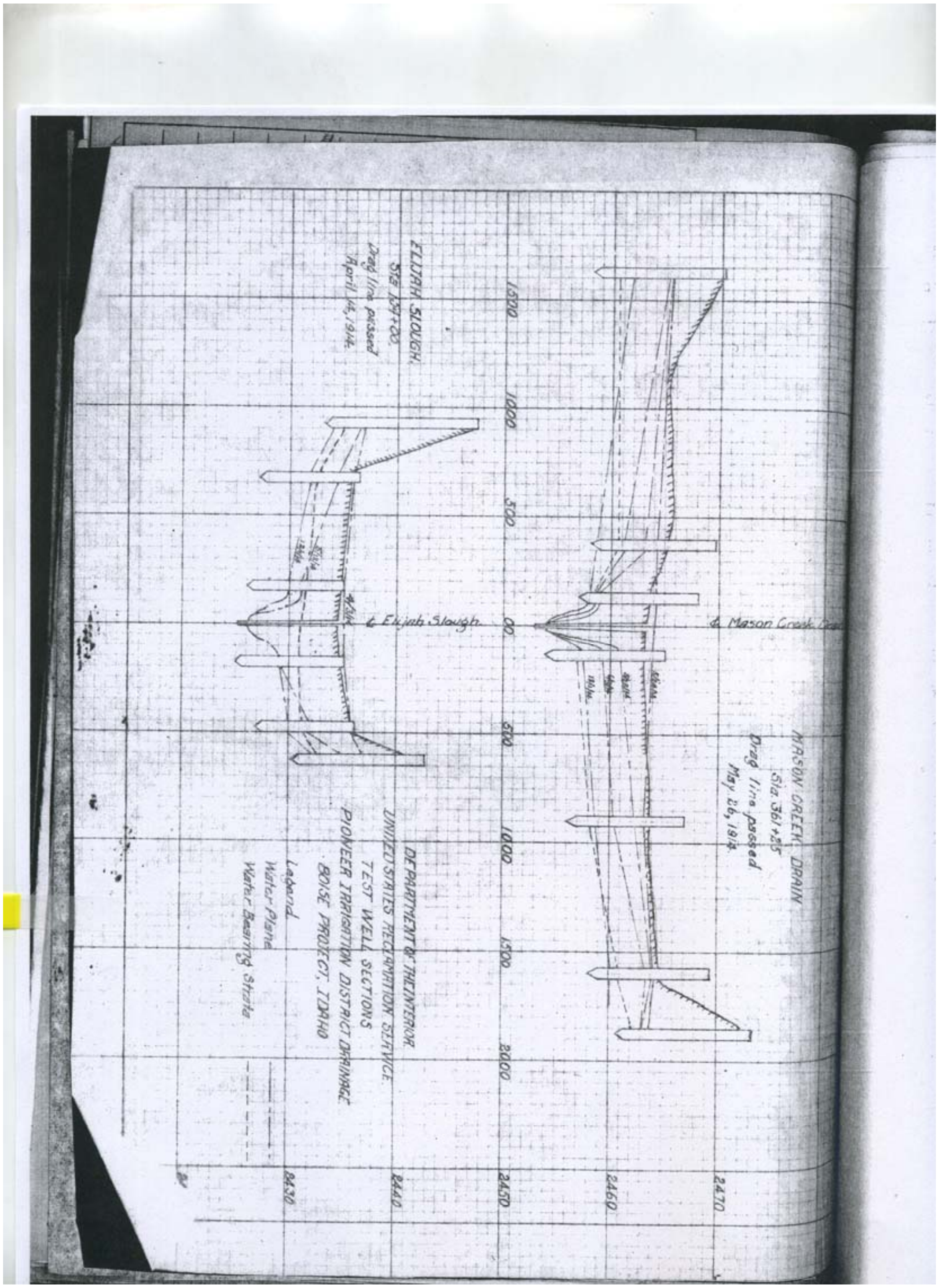


Figure 14 1914
U.S. Reclamation Service Diagrams of the Mason Creek and Elijah Slough Drains[100]

[100] Report of Drainage Operations in the Pioneer Irrigation District and the Nampa and Meridian Irrigation District of the Boise Project, by Wm. M. Green, Dec. 1917, Project Reports, 1910-1955, 8NN-115-85-019, Box 59, RG 115.

Figure 15 June 22, 1914
"Electric Dredge on Wilson Slough Drain."[101]

[101] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 16 June 22, 1914
"Electric Dredge on Wilson slough drain about three miles from Caldwell, showing immense tract of swamp land."[102]

[102] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 17 June 22, 1914
"Dredging on Wilson Slough Drain. Note development of water, approximately 2 sec. ft. in 600 feet of ditch."[103]

[103] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 18 (no date, likely June 22, 1914)
"View showing drainage from water bearing strata on Mason Creek Drain."[104]

[104] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 19 June 22, 1914
"View on Mason Creek Drain showing large discharge of water from water bearing strata. This picture was taken 30 days after the dredge passed this point. The drain through this section of the country is developing approximately 7 sec. ft. of water per mile."[105]

[105] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 20 June 22, 1914
"View on Mason Creek Drain near the Chas. Verheyn orchard. This drain is developing approximately 7 sec. ft. of water per mile through this country."[106]

[106] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 21 June 22, 1914
"Mason Creek Drain where it passes through the once famous orchard section about one and one-half miles from Nampa, Idaho."[107]

[107] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 22 June 22, 1914
Electric Dredge excavating, Purdam Slough Drain on Lemp's Ranch."[108]

[108] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 23 June 22, 1914
"Dredge bucket loading in hard cemented gravel on Purdam Slough Drain."[109]

[109] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Figure 24 June 22, 1914
"Excavating for bridge sills on road crossing on Purdam Drain."[110]

[110] 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

Between 1913 and 1915, the drainage ditches, which were intended to not only drain waterlogged lands, but to augment the District's water supply, were built across the Pioneer Irrigation District in the phases outlined in the Reclamation Service's plan.[111] It was clear by late 1914 that the costs incurred in building the system were considerably less than all parties had expected. However, in that same short period of time, the water table in the *eastern* end of the District has risen rapidly, causing damage to farmlands there, as well. Thus, arrangements were made to negotiate a supplemental contract between the Pioneer District, the Nampa Meridian Irrigation District (which borders Pioneer on the East), and the Reclamation Service to construct additional drainage works.[112] By June 5, 1915, all work under the original 1913 contract had been completed successfully at an approximate cost of only $193,000,[113] and the supplemental contract was signed ten (10) days later. The contract itself acknowledged the rise in the water table, noting "that the danger of seepage in that portion of the District is becoming alarming, and that an additional drain or drains should be constructed in said portion of the Pioneer District at a location where non was…contemplated under the original contract."[114] The 1915 contract included plans to construct a deep drain at the eastern end of the Pioneer District, as well as the Moses, Nampa, Midway, East Caldwell, Grimes,[115] Madden Spur, West End, Parker, Bardsley Gulch, North and South Phyllis drains, and Caldwell Feeder drains.[116] Not all of the drains were anticipated or planned when the contract was signed; some were added as construction progressed and needs were better understood.[117] In 1916, Pioneer also requested that funds be spent out of the initial $350,000 to construct a cement lining for the Phyllis Canal, which had been responsible for a great deal of seepage water at the place where it skirted the hillside in Ada County, near the head of the canal. The Service denied that request.[118]

---

[111] There are many references to such intentions. There was an agreement drawn up between the Reclamation Service, the Pioneer Irrigation District, and the Nampa Meridian Irrigation District in approximately 1916 specifically for the saving of water in the Five and Ten Mile drainage systems. Said water was to be, with "three short ditches" constructed, "turned into the Caldwell High Line Canal and through said canals applied to beneficial use for irrigation purposes." Draft agreement between United States of America, Nampa & Meridian Irrigation District and the Pioneer Irrigation District, undated, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1915-1919 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

[112] E.B. Hoffman to Mssr Bien, Nov. 30, 1914, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1913-1914 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

[113] William M. Green, "Report of Drainage Operations in the Pioneer Irrigation District and the Nampa and Meridian Irrigation District of the Boise Project," Dec. 1917, p. 15, Project Reports, 1910-1955, 8NN-115-85-019, Box 59, RG 115.

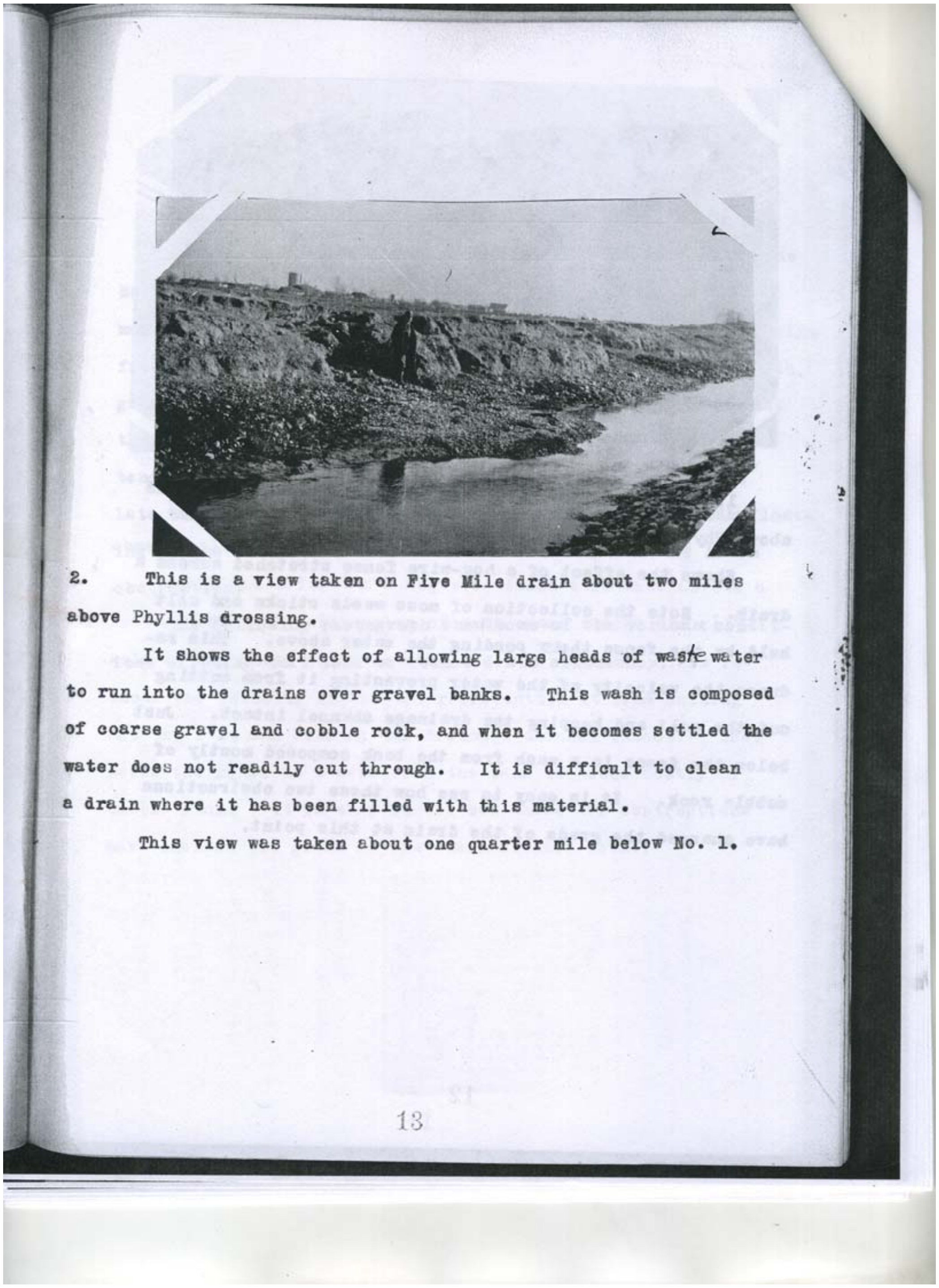
[114] Jan. 2, 1915 Draft of 1915 contract, 636 Payments – Drainage, Pioneer Irrigation District Historic Records, Basement Drawers.

[115] PID Minutes, Aug. 10, 1915.

[116] A.P. Davis to the Secretary of the Interior, Aug. 14, 1916, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1915-1919 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

[117] R.M. Patrick to Chief Counsel, March 2, 1916, 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1915-1919 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115; PID Minutes, Feb. 1, 1916.

[118] In the Matter of the Application of the Pioneer Irrigation District to Use Balance of Drainage Fund for the Cementing of Phyllis Canal Where Said Canal Skirts the Hillside in Ada County, Idaho, June 6, 1916;



2. This is a view taken on Five Mile drain about two miles above Phyllis crossing.

It shows the effect of allowing large heads of waste water to run into the drains over gravel banks. This wash is composed of coarse gravel and cobble rock, and when it becomes settled the water does not readily cut through. It is difficult to clean a drain where it has been filled with this material.

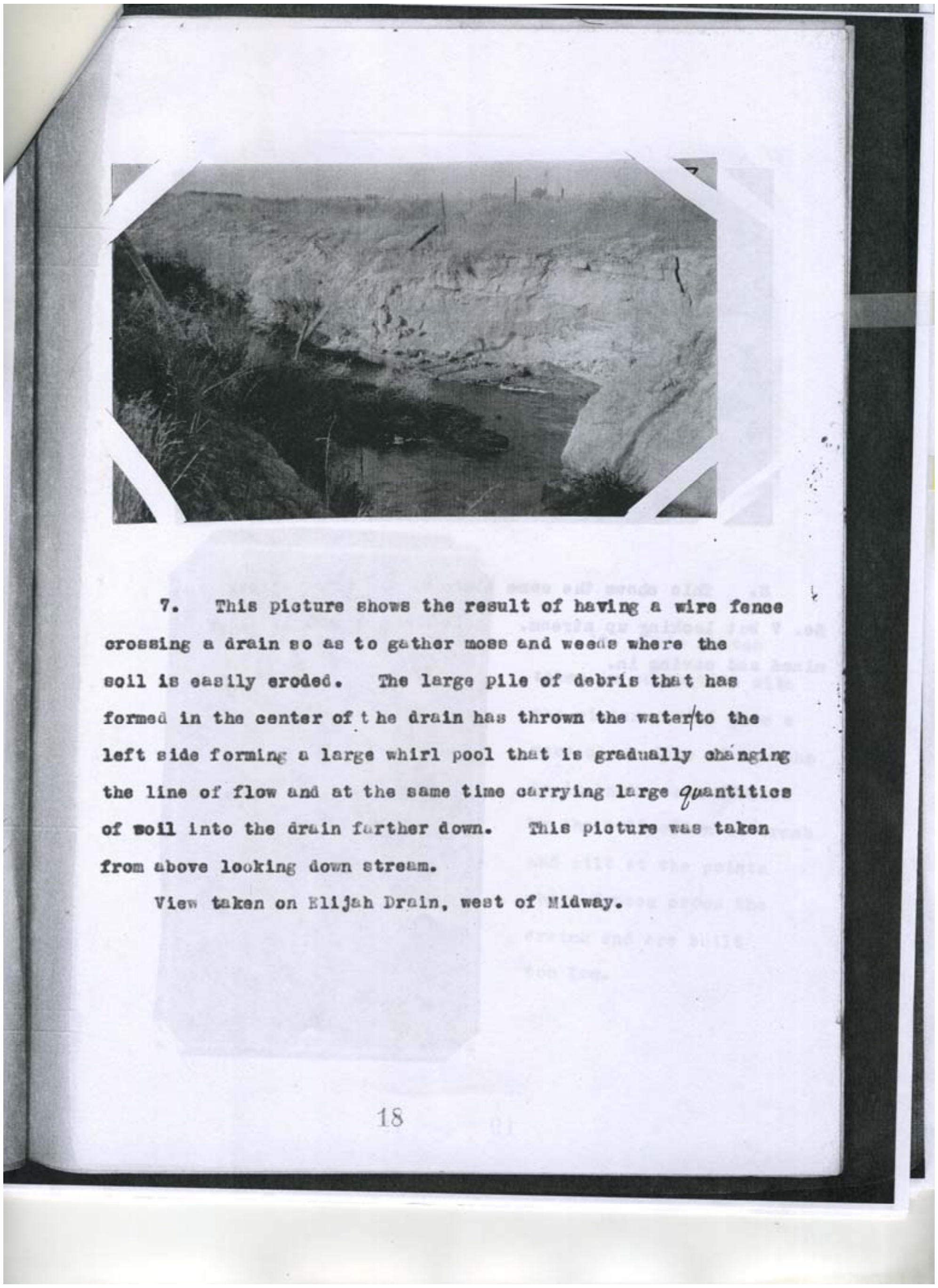
This view was taken about one quarter mile below No. 1.

13

Figure 25
Five Mile Drain above Phyllis Crossing[119]

D.W. Cole to J. Jester, Jr., Pioneer Irrigation District, June 27, 1916, both in 260-A BOISE PROJECT Drainage of Pioneer Irrigation District 1915-1919 260-A, Entry 3, General Administrative and Project Records, 1902-1919, Boise 260A, Box 391, RG 115.

[119] Report on How the Return Flow from Lands on the South Side of the Boise River is Effected by Drainage, Evaporation, and Reservior [sic] Losses, Supplimentary [sic] to 1916 and 1917 Drainage Reports for the Pioneer and Nampa-Meridian Districts, by W.G. Steward, April 1919, Report on How the Return



7. This picture shows the result of having a wire fence crossing a drain so as to gather moss and weeds where the soil is easily eroded. The large pile of debris that has formed in the center of the drain has thrown the water to the left side forming a large whirl pool that is gradually changing the line of flow and at the same time carrying large quantities of soil into the drain farther down. This picture was taken from above looking down stream.

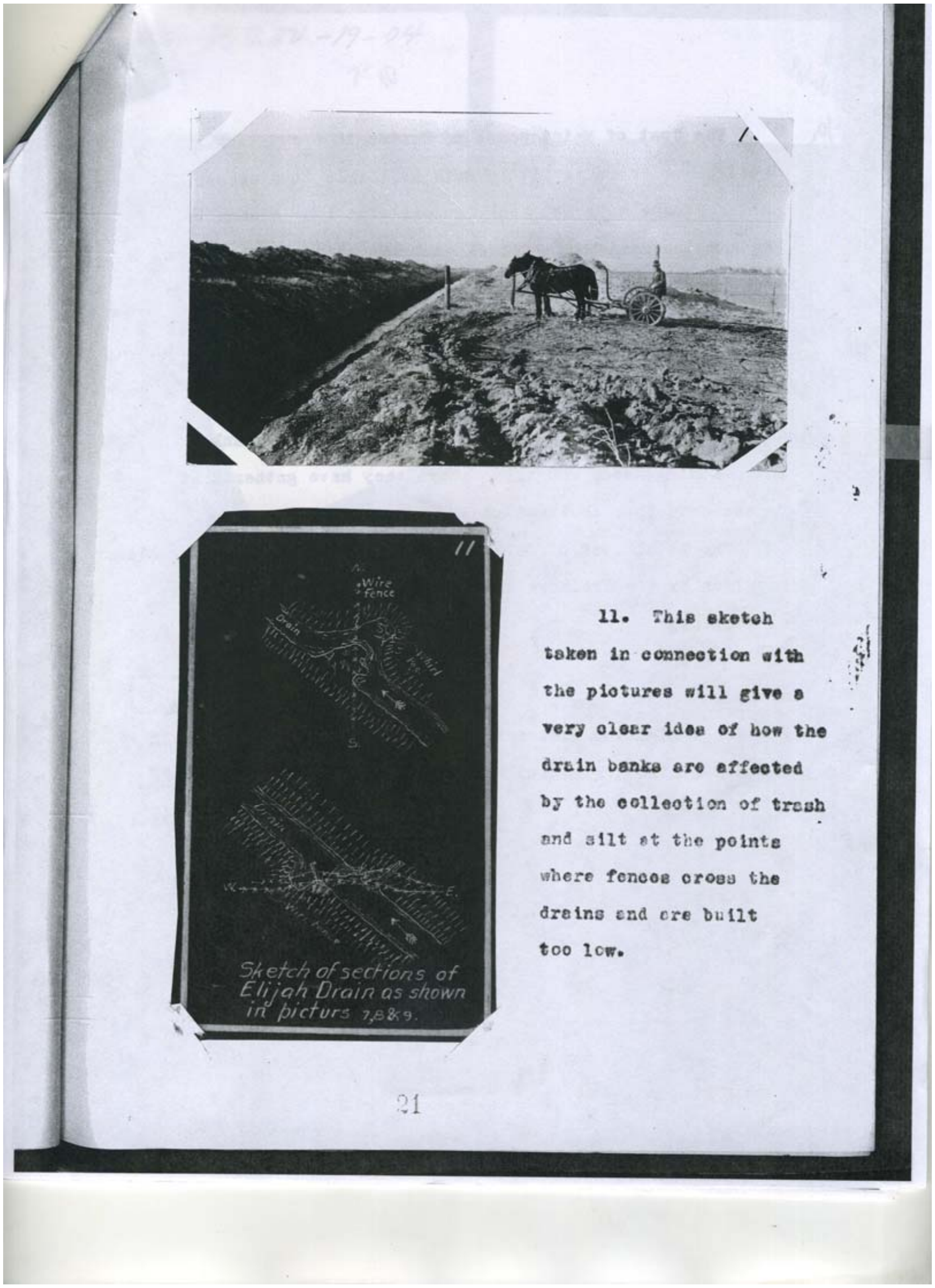
View taken on Elijah Drain, west of Midway.

18

Figure 26
Elijah Drain[120]

Flow from Lands on the South Side of the Boise River is Effected by Drainage, Evaporation, and Reservior [sic] Losses, Supplimentary [sic] to 1916 and 1917 Drainage Reports for the Pioneer and Nampa-Meridian Districts, by W.G. Steward, April 1919, RG 115.

[120] Ibid.



11. This sketch taken in connection with the pictures will give a very clear idea of how the drain banks are affected by the collection of trash and silt at the points where fences cross the drains and are built too low.

21

Figure 27
Elijah Drain and Elijah Drain Diagram[121]

[121] Ibid.

No. 4 shows the sharp depression at the left angle of the inlet. No. 5 is a view of the left side showing the waves continuing down the flume on account of the inlet disturbance. This wave action is described in a paragraph above. No. 6 shows the turbulence and backwater movement below the outlet. This condition is probably caused by the abbreviated form of outlet. No. 7 is another view giving an even better idea of the disturbed condition of the water.

-8-

Figure 28
Indian Creek Flume[122]

[122] Report on Heads Lost and Recovered in Five Boise Project Flumes, by W.G. Steward and K.B. Keener, Project Reports, 1910-1955, 8NN-115-85-019, Box 43, RG 115.

Figure 29
Indian Creek Flume[123]

[123] Ibid.

PHOTOGRAPHS. No. 1 is a ggod view of the inlet, and of the water surface in the flume, looking down stream. It can be seen in this how little is the wave action in the flume. No. 2 is a view of the right portion of the inlet, looking upstream, and showing the decided dip at the angle. No. 3 shows the conditions at the outlet, and the tubulence created by the piers of the foot bridge.

-11-

Figure 30
Five Mile and Phyllis[124]

[124] Ibid.

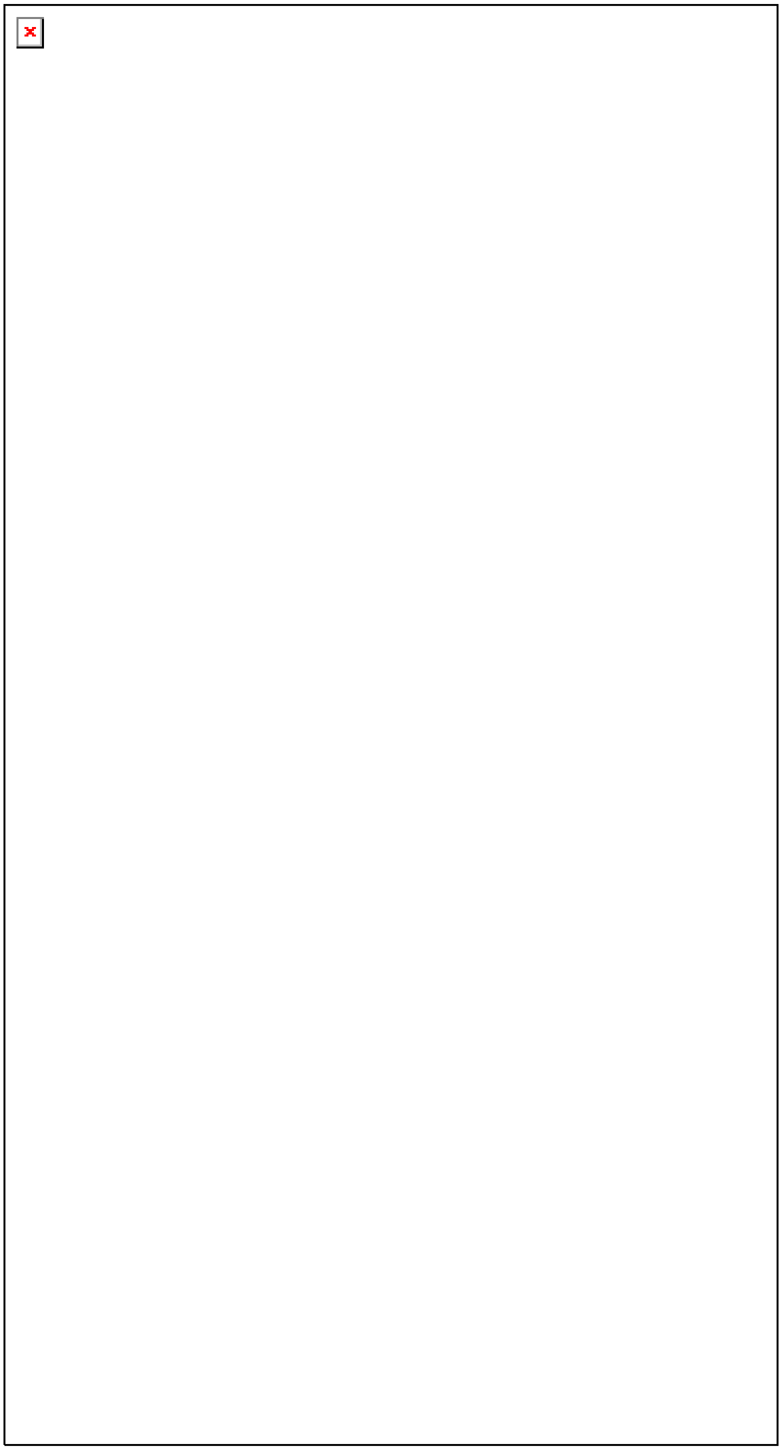


Figure 31
Aug. 8, 1917 Map of Pioneer Irrigation District Showing Newly Constructed Drains[125]

[125] Idaho State Historical Society, Records of the Idaho Department of Reclamation, AR 20.

Whether or not the Reclamation Service became involved, Pioneer needed to contend with the concerns over the Phyllis canal's seepage. In order to do so, the District held an election on August 28, 1916. Voters were asked two questions. The first was whether or not to issue refunding bonds in the amount of $189,200, to which the electors said "yes," and the other to issue new bonds to cover the lining of the hillside portion of the Phyllis Canal, to which the electors said "no."[126] However, some 35 patrons of the District – from various parts therein – approached the board about the project again regarding this issue in July 1920. The landowners were concerned about the liability of canal breakage on these "dangerous portions of the side hills," (see Figure 3 Phyllis Canal, Side Hill Work, c. 1890) and also desired the enlargement of the canal in order to increase capacity where needed.[127] The board voted to obtain estimates for the improvements, and discussed them at their meeting in November. During that discussion, the board members noted that without lining the canal, it would continue to be necessary to "keep men on this section of the canal, day and night, to prevent, as far as possible, these breaks and to report any signs of leaks or dangerous conditions along this embankment. These helpers could be dispensed with if the canal were lined."[128] In addition to the cement lining of the side hill and other parts of the Phyllis, the District also intended to construct a dam at the head of the Caldwell High Line Canal, purchase a drag line dredge, and construct the North Caldwell drainage ditch north of town. The total cost was estimated to be $214,979, and the voters elected to authorize bonds in that amount on December 14, 1920.[129] Despite its lack of involvement, the Reclamation Service supported the projects emphatically.[130]

When the engineer charged with making the Phyllis plans reported to the board, his recommendation changed the District's plans for the canal. Fred McConnell reported to the board on August 20, 1921 his belief that lining the canal with concrete on the side hill section would not solve the main problem. As it stood, the "seepage water from higher lands above the Phyllis Canal has water logged the lower bank of the canal and caused it to slide and at present the canal is in grave danger of being ruined from this slide. Also, the chances are good that the seepage will increase and endanger the stability of the lower bank even after the canal is lined." McConnell believed that the best course of action was to actually change the line of the canal so as to place it entirely "in cut" and back away from the brow of the hill. The solution was also less costly than cement lining. The board unanimously approved the new plan, and executed it with contractor Morrison Knudson, who moved the canal to the north half of the southeast quarter of section 20 in Township 4 North, Range 1 West.[131]

[126] PID Minutes, Sept. 5, 1916.
[127] PID Minutes, July 19, 1920.
[128] PID Minutes, Nov. 2, 1920.
[129] PID Minutes, Dec. 20, 1920.
[130] W.G. Swendsen to Pioneer Board of Directors, Nov. 9, 1920, in PID Minutes, Nov. 9, 1920.
[131] PID Minutes, Aug. 25, 1921; Oct. 13, 1921; Oct. 17, 1921.

Pioneer Irrigation District and the New Deal, 1927-1937

In spite of all of the drainage work done in the preceding years, farmers in the Pioneer Irrigation District continued to approach the Board for drainage assistance.[132] Beginning in the late 1920s, farmland was being swamped again, and crops were failing both due to the waterlogging as well as the growing lack of water. Seeking a new solution to the ongoing drainage issues, the District began to experiment with drainage wells. In combination with open drain ditches, the drainage wells could aid in the drainage of over watered lands as well as provide a supplemental source of additional irrigation water for use elsewhere.

To execute this new solution, the District began contracting with outside companies. In May of 1927, the District issued contracts to make test or observation holes and to dig wells where observation holes suggested a successful well could be dug. The "essence" or intent of the contracts was "the development of a water supply by the installation of one scientifically constructed drainage well."[133] In a continued exploration of its options, the District sent Engineers W.G. Sloan and Superintendent J.W. May to California's San Joaquin Valley on a reconnaissance trip in 1928 to investigate the construction and operation of drainage wells there.[134] Their trip found such wells to be successful, and upon their return to Caldwell, the District board appointed Sloan as the District's drainage engineer, charged with completing three additional drainage wells that year.[135] In October 1928, after noting that "a large amount of land lying within the District is already seriously damaged by seepage of underground water, and that the rising water table seriously threatens damage to much more land, and that the recurring years of water shortage make the acquirement of more water necessary," the board asked Sloan to prepare a plan and cost estimate both for drainage and for acquiring an additional water supply.[136] Sloan's plans caused the board to resolve to construct an additional twenty drainage wells according to Sloan's maps and plans, upon raising the funds by which to do so.[137] However, the matter appears to have been dropped until the same resolution was passed at another board meeting eighteen months later.[138] In just a few weeks, the board unanimously passed a resolution adopting Sloan's plans as the "general plan for the drainage of the water-logged area in said District and the development of an increased water supply," noting that funds could not be secured through an annual levy to pay for drainage, and that the recurrent shortages in the water supply had decreased the return flows upon which the District had come to depend. Sloan's plan included the twenty additional wells together with some open ditches.[139] With the approval of the State Department of Reclamation, the District called a special election on February 26, 1930 to vote on

[132] PID Minutes, Dec. 1, 1925, Nov. 23, 1926; March 6, 1928.
[133] PID Minutes, May 4, 1927.
[134] PID Minutes, Jan. 13, 1928.
[135] PID Minutes, Feb. 16, 1928; March 7, 1928.
[136] PID Minutes, Oct. 2, 1928.
[137] PID Minutes, Oct. 19, 1928.
[138] PID Minutes, Jan. 7, 1930.
[139] PID Minutes, Jan. 18, 1930.

bonds to pay for the work, which Sloan had estimated would cost $100,000.[140] The wells, the District argued, were especially useful because they not only drained the lands, but provided additional irrigation water in a time of severe shortage. The District's plan also included drain extensions and the cleaning and enlargement of certain existing drains. Despite the clear need for the work, farmers were wary of additional assessments during a time of great economic uncertainty, and voted the bonds down, leaving the District to find other means of financing the work.[141]

[140] George N. Carter to Board of Directors, Pioneer Irrigation District, Jan. 21, 1930, in PID Minutes, Jan. 23, 1930.
[141] PID Minutes, March 4, 1930.

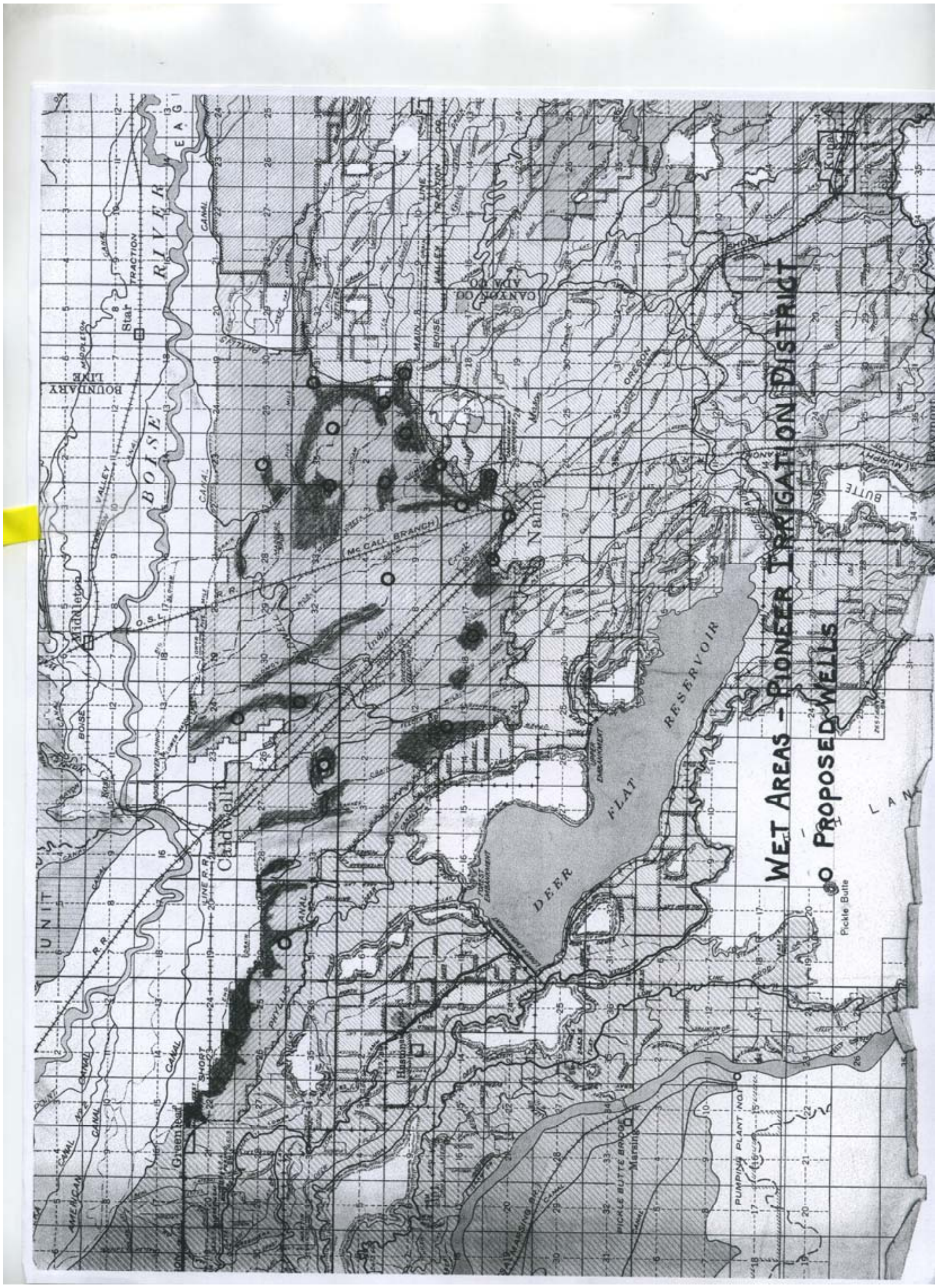


Figure 32
Wet Areas and Proposed Wells[142]

[142] Pioneer Irrigation District, Payments – Drainage, Historic Records of Pioneer Irrigation District, Basement Drawers.

Having received financial assistance from the Government in the past, the District turned to the U.S. Bureau of Reclamation (previously the U.S. Reclamation Service) for assistance with additional drainage in December 1930. In its petition to the government, the District requested that the agency expend remaining funds from the $350,000 allowance made in the 1913 contract, as well as postpone the District's annual payment for existing works for the next one to two years until the aggregate amount reached $100,000. According to the District, there should have been slightly more than $52,000 left in the original 1913 budget. To make up the difference, the District figured it would need a postponement of at least its 1931 Arrowrock payment as well as a portion of its 1932 payment in order to obtain the full amount to pay for the plan.[143]

The Bureau of Reclamation took the request seriously. R.J. Newell, superintendent of the Boise Project, acknowledged the needs of the District in a January 1931 letter to the Bureau's chief engineer, but questioned the government's involvement:

> Over the district the progression typical in seeped areas, from deep-rooted crops like alfalfa and orchard trees to small grain and from small grain to blue grass pasture is everywhere apparent. Not enough hay is grown to supply the needs of the district, which is unusual for an irrigated district in Southern Idaho. A few fields were not cropped in 1930 and a very few spots of grain could not be harvested. The fact that the condition is progressive is not doubted but the rate of progress in seepage is usually exaggerated by the apprehensive farmer. Testimony with no intent to deceive that farms have yielded fairly in the past, but are on the verge of going bad and probably can not [sic] be cropped next year unless drained has often been received for the same farms on each of the last five years….The Pioneer District evidently needs continuing drainage work. From the fact that good use could be made of some additional water supply in the latter part of the season, and that test holes often show a formation favorable for drainage by pumping from wells, it is believed wise to give serious consideration to drainage wells, which should furnish additional water and relieve surrounding land from seepage at the same time.[144]

Newell ultimately recommended that a drainage expert be sent to evaluate the situation further. Later that spring, the Bureau sent J.R. Iakisch to conduct additional studies.[145] Iakisch reported that more studies would need to be done before he could recommend endorsement or financing of Pioneer's plans, stating that: "it is entirely impracticable to make a decision as to the type of drainage best suited to the needs of the District or to attempt a layout plan of the drainage required with the present lack

[143] Petition of Pioneer Irrigation District to the Secretary of the Interior and the Commissioner of the Bureau of Reclamation, Dec. 19, 1930, 636 Payments – Drainage, Pioneer Irrigation District historic records, basement drawers.
[144] R.J. Newell to Chief Engineer of Bureau of Reclamation, Jan. 22, 1931, 636 Payments – Drainage, Pioneer Irrigation District Historic Records, Basement Drawers.
[145] PID Minutes, March 25, 1931.

of information relative to subsoil conditions and water table stages."[146] To accommodate this demand, Pioneer sank test wells in order to further study the water table as well as the soil that underlay the District. These actions were conducted in the hopes of obtaining funding for the project.[147]

By now the entire West was in the grips of an extended and relentless drought. The drought, combined with the country's equally ruthless economic depression, made life in the Boise Valley extremely difficult during the 1930s. The Pioneer District, which had always paid its debts to the government in a timely manner, was once again contending with its unfortunate topography: its location in the natural sink of the area's drainage, as well as the area where the underground water table was continuing to rise. [See Figure 33.] But while the water difficulties undoubtedly generated sympathy of farmers across the District, the failure of bond issues during this era points to the farmers' equally strong conservative financial leanings. The farmers were adamantly opposed to increased assessments. To contend with the very serious issues facing these farmers, the Pioneer Irrigation District board passed the following resolution in October 1931, designed to pay for drainage work to be done without further assessing the farmers:

> WHEREAS, Approximately 5,000 acres of District lands are either already seeped or seriously threatened by rising water table, making immediate drainage imperative in order to save the land; and WHEREAS, Two years of water shortage has materially reduced production of many crops, especially late crops, third cutting hay and pasture, making it necessary for farmers to buy hay to feed stock or sell the stock at ridiculously [sic] low prices, and the present extremely low prices for farm products requiring double the amount of produce now to raise a stated sum compared with recent years, thus making it extremely hard for farmers to pay assessments at all, and wholly impossible for many to pay any increase of assessments necessary for required drainage; Now therefore BE IT RESOLVED, By the Board of Directors of the Pioneer Irrigation District, that we respectfully petition the Government of the United States to grant the District a moratorium of not less than three years, that necessary drainage may be done without increased assessments, and that many of the land owners may be saved from a total loss of their possessions.[148]

Faced with similar pleas from irrigation districts across the West, the U.S. Congress recognized the farmers' tenuous situation and therefore passed a moratorium and

[146] Report on Drainage Pioneer Irrigation District, Boise Project, April 6, 1931, by J.R. Iakisch, Engineer, 636 Payments – Drainage, Pioneer Irrigation District historic records, basement drawers.
[147] R.J. Newell to Chief Engineer, June 12, 1934, 246. Corres. RE Activities under National Industrial Recovery (Public Works) Act of June 16, 1933 1930 thru June 1945 246, Entry 7, Project Correspondence, 1930-1945, Boise Project 225.11-246, Box 56, RG 115. At least one well was referenced in the PID Minutes of April 7, 1931, where a Memorandum of Agreement between Pioneer Irrigation District and Allen E. Hosack for the purposes of drilling a well "for drainage and irrigation purposes" is copied into the record.
[148] PID Minutes, Oct. 20, 1931.

payment deferment bill in early 1932.[149] In addition to relief provided by the government, Pioneer's farmers also pleaded for relief from the District itself. In July 1932, a group of landowners representing a new group called the Pioneer Water Users' Association, appeared before the board and requested a series of cutbacks in the District's budget, including reductions in salaries and the sale of one of the District's automobiles. The farmers also requested that the use of pumps to raise water from canals be ceased, and that all open drain ditches be cleaned and put in "first class condition" before any additional drainage wells were dug.[150] The board took the requests under advisement. And, when faced with maturing bonds just a year later and knowing full well the precarious situation of its landowners, the board unanimously resolved to issue a series of refunding bonds to pay its debt *without* holding an election for approval.[151] Even so, the District was obviously in very serious trouble and expressed its concern that it had "no prospect of receiving any bids" for the bonds.[152]

[149] Senate Bill 3706, signed by President Herbert Hoover on April 1, 1932, as referenced in the PID Minutes, June 7, 1932.
[150] PID Minutes, July 5, 1932.
[151] PID Minutes, June 6, 1933.
[152] Secretary to Frank Keenan, Reconstruction Finance Corporation, June 26, 1933, 618-A P.I.D. P.W.A. Loan 618-A, Drawer 5, Historic Records – Basement, Pioneer Irrigation District.

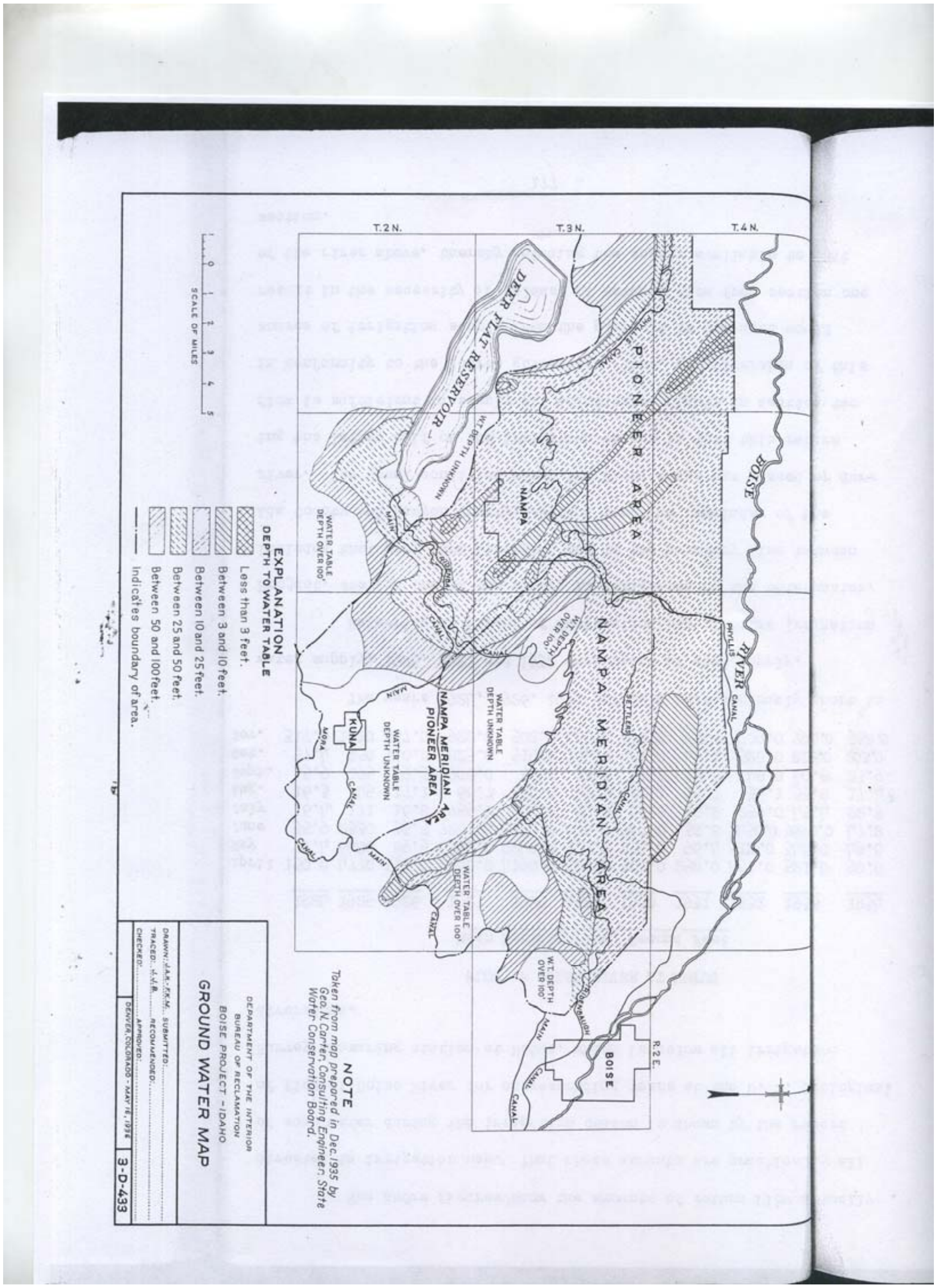


Figure 33 December 1935
Ground Water Table Map[153]

[153] Boise River Investigations, Idaho, by J.R. Riter and John A. Keimig, April 1936, Project Reports, 1910-1955, 8NN-115-85-019, Box 47, RG 115.

While recognizing the farmers' plight, the Bureau of Reclamation nonetheless declined to assist Pioneer monetarily with its plan for additional water-producing and drainage wells, again leaving the District in a financial dilemma. Despite acknowledging that "there is no doubt that additional drainage is needed and justified" in the District, the Bureau's superintendent, R.J. Newell, again expressed reluctance for getting involved in the matter.[154] Sensing the Bureau's wariness even before receiving a final answer (the Bureau had been under a great deal of scrutiny over the previous decade and was far more cautious with spending than it had been in earlier years), the District simultaneously opted to investigate the New Deal programs initiated by the newly elected President of the United States, Franklin D. Roosevelt, as a potential funding mechanism.

Upon taking office in March 1933, Roosevelt had immediately created a series of emergency relief agencies designed to provide prompt assistance to those with the most urgent needs. The most significant for the purposes of Pioneer Irrigation District was the National Industrial Recovery Act, passed in June, which created the Emergency Administration of Public Works. In September 1933, Robert Ednie, employed as an engineer by the Pioneer Irrigation District, proposed a plan of 5 new drains, labeled A-E, as well as 16 additional wells. Other than Drain "A," which was proposed to originate in section 25 of Township 4 North, Range 3 West and run north and was the longest and most expensive of the proposed drains, the other letter drains – D through E – were located to the west of the city of Caldwell and below the line of the Phyllis Canal. The District submitted a report to the Idaho Commissioner of Reclamation that included a map showing the location of said drains in addition to the wells he proposed. The report also provided specific information about the length and location of the drains, as well as their estimated cost.[155]

---

[154] R.J. Newell to Chief Engineer, June 12, 1934, 246. Corres. RE Activities under National Industrial Recovery (Public Works) Act of June 16, 1933 1930 thru June 1945 246, Entry 7, Project Correspondence, 1930-1945, Boise Project 225.11-246, Box 56, RG 115.

[155] Map of Pioneer Irrigation District, Caldwell, Idaho, Sept. 15, 1933, E07E02/012.15a, Idaho Department of Reclamation, AR 20, Idaho State Historical Society (hereafter ISHS); Ednie Report,

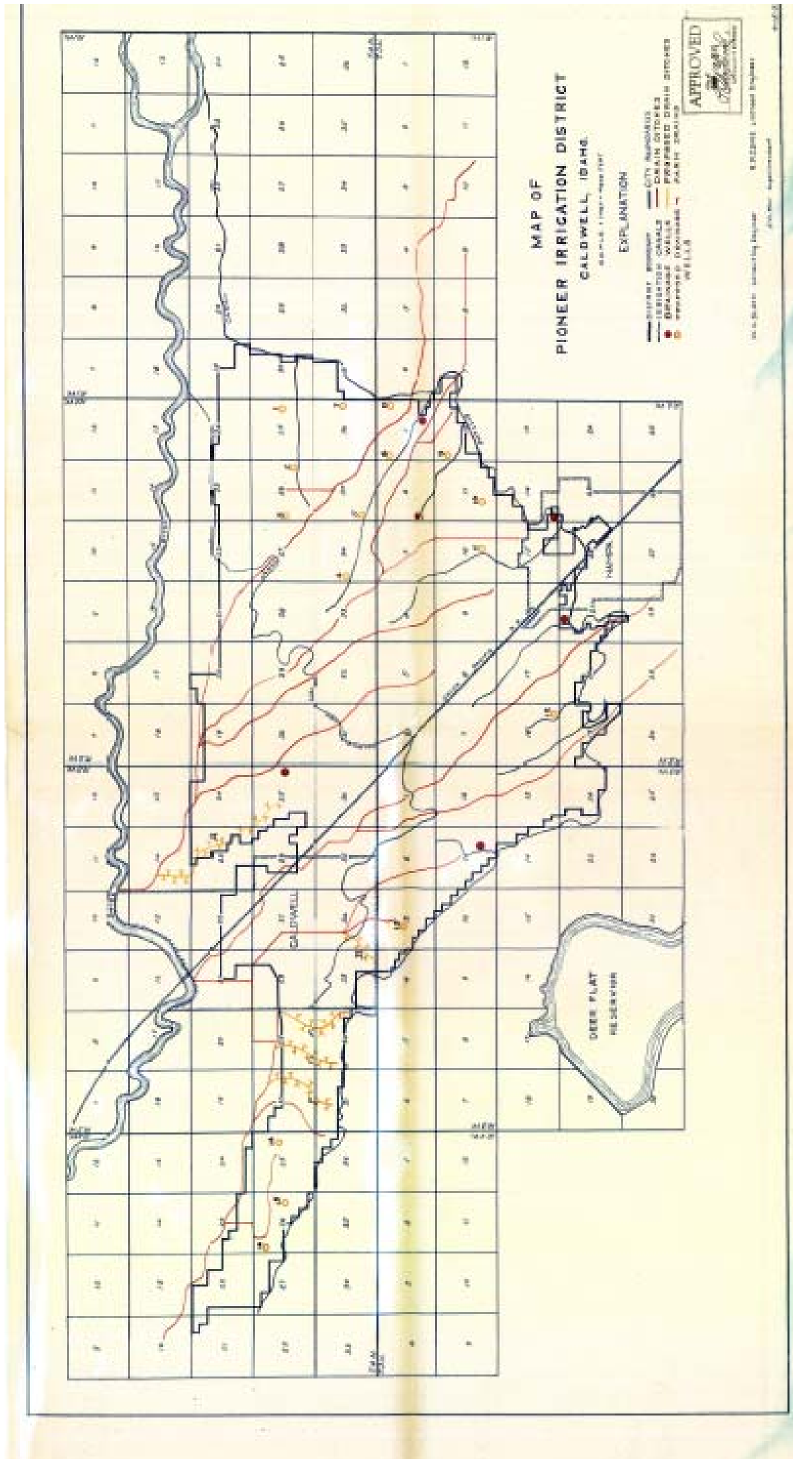


Figure 34 September 15, 1933
Ednie Map Showing Location of Proposed Wells and Drains A-E[156]

[156] Map of Pioneer Irrigation District, AR 20, 012.15a drawer E07 E02, Idaho State Historical Society.

In October 1933, with approved report in hand,[157] the Pioneer Irrigation District applied for a loan in the amount of $100,000 from the Federal Emergency Administration of Public Works.[158] Sloan, under whose supervision the plan originated in 1930, provided his blessing in a letter to the Public Works Advisory Board, noting that "the program herein outlined…is an ultimate solution of the [District's] problem."[159] The District waited for what must have seemed an interminable two years for a response to its loan request. In September 1935, Pioneer finally received notice that it had received money from the Public Works Administration in the form of a $45,000 grant, and an offer to purchase bonds in the amount of $55,000. The board immediately accepted the offer of aid, and put matter to the voters on November 26. Voters approved the bond issue by a vote of 258 to 121, and construction on the drain ditches began in November 1936. The board awarded the contract to local contractor J.A. Terteling & Sons once the funds were made available.[160] The wells followed later in the year after that contract was awarded to Allen Hosack and G.H. De Coursey.[161] Less than a year later, Ednie reported to the Pioneer board of directors that "the work of constructing the new drain ditches and wells in the Pioneer Irrigation District under Contract A, B, C, D, and E of P.W. A. Docket No. 2363-R have been completed according to the plans, specifications and the change orders." Ednie recommended that the board accept them as complete, which the board did in August 1937.[162]

Conclusion

At the creation of the Pioneer Irrigation District, the lands in the area were only beginning to get transformed from a desolate landscape into viable farms. Although the two main canals supplying water to the Pioneer Irrigation District were originally conceived and built with capitalist money from afar, farmers who settled in the area around the town of Caldwell were a self-determining group of people. Upon the successful formation of the District at the turn of the twentieth century, the farmers' early struggles focused on the procurement of water and the maintenance and enlargement of the irrigation canals. Once a reliable system was in place, drainage of

[157] R.W. Faris to Pioneer Board of Directors, Oct. 22, 1935, as recorded in PID Minutes, Oct. 25, 1935.
[158] PID Minutes, Oct. 3, 1933.
[159] W.G. Sloan to Ivan C. Crawford, Sept. 25, 1933, 618-B P.W.A. loan 618-B, Drawer 5, Historic Records – Basement, Pioneer Irrigation District.
[160] PID Minutes, Nov. 5, 1935; Dec. 2, 1935; April 27, 1936; May 2, 1936; Nov. 28, 1936; *The Caldwell Tribune*, Nov. 25, 1935; Nov. 27, 1935; April 17, 1936; Engineer (Ednie) to J. Vernon Otter, Aug. 6, 1936, 1936 PIONEER IRRIGATION DISTRICT Letters on P.W.A. Loan, Pioneer Irrigation District records, from Moffatt Thomas.
[161] PID Minutes, Oct. 24, 1936. Some five wells had been partially constructed by the District's own force immediately upon receiving notification of the funding, but had not been completed. PID Minutes Nov. 5, 1936.
[162] Robert M. Ednie to Pioneer Board of Directors, Aug. 7, 1937, 1936 PIONEER IRRIGATION DISTRICT Letters on P.W.A. Loan, Pioneer Irrigation District records, from Moffatt Thomas; PID Minutes Aug. 3, 1937.

over watered lands and an adequate supply of water in the District became the most frequent problems plaguing the farmers.

As Pioneer negotiated the purchase of its facilities, the simultaneous change in federal policy that led to the passage of the Reclamation Act in 1902 led to a 100-year relationship between the government agency and the farmers. But throughout that history, Pioneer Irrigation District took the initiative to solve its own challenges. Resolving to continue the District's tradition of self-sufficiency and self-determination, farmers throughout the twentieth century demonstrated initiative to solve its irrigation problems, despite facing numerous obstacles, not least of which was an inconsistent water supply, swamped lands, and federal bureaucracies. The development of s system of drainage wells, the "letter" drains, and continued negotiations with the federal government demonstrate a continued commitment to improve the delivery of water to those within the District.

Signature

Jennifer Stevens

Date

6/2/09

Appendix D. Indian Creek Gage Report

This page intentionally left blank for correct double-sided printing.

13211100 INDIAN CREEK NEAR MAYFIELD, ID

Middle Snake-Boise Basin
Lower Boise Subbasin

LOCATION.--Lat 43°25′02″, long 115°53′51″ referenced to North American Datum of 1983, Elmore County, ID, Hydrologic Unit 17050114, Mayfield quad., on left bank just downstream from bridge crossing on Mayfield/Foothills road, about 6 mi northeast of Mayfield exit on Highway I-84, and 20 mi southeast of Boise.

DRAINAGE AREA.--19.1 mi^2.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--June 2010 to June 2012 (seasonal records only)(discontinued).

GAGE.--Water-stage recorder. Elevation of gage is 3,620 ft above NGVD of 1929, from topographic map.

COOPERATION.--Idaho Department of Water Resources

REMARKS.--Records fair except May 2 to June 14, and estimated daily discharges, which are poor. Station equipment includes satellite telemetry and crest-stage gage.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 117 ft^3/s Feb. 22, 2012; no flow for long periods.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge during period Oct. 2011 to June 2012, 117 ft^3/s Feb. 22; no flow for long periods.

Suggested citation: U.S. Geological Survey, 2013, Water-resources data for the United States, Water Year 2012: U.S. Geological Survey Water-Data Report WDR-US-2012, site 13211100, accessed at http://wdr.water.usgs.gov/wy2012/pdfs/13211100.2012.pdf

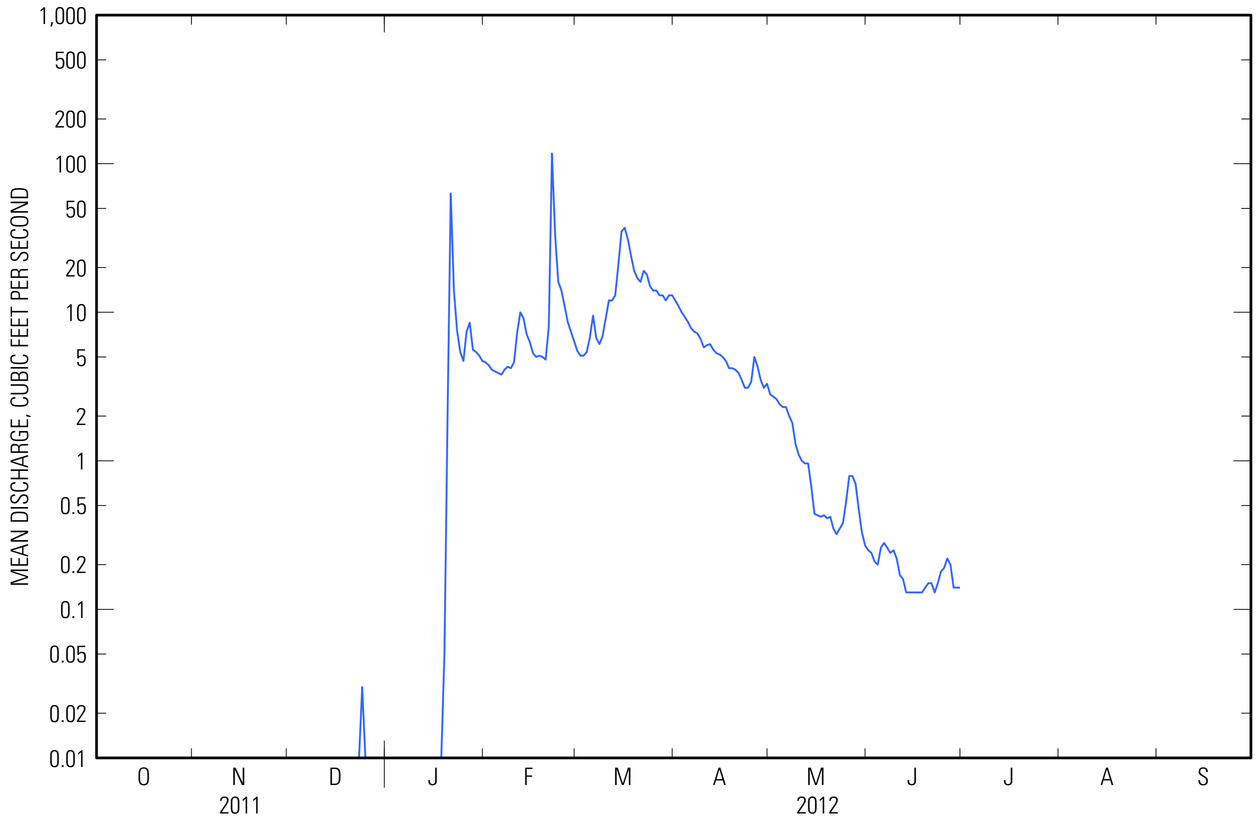
13211100 INDIAN CREEK NEAR MAYFIELD, ID—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2011 TO SEPTEMBER 2012
DAILY MEAN VALUES
[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0.00	0.00	0.00	0.00	4.6	5.5	12	2.8	0.25	---	---	---
2	0.00	0.00	0.00	0.00	4.4	5.1	11	2.7	0.24	---	---	---
3	0.00	0.00	0.00	0.00	4.1	5.1	10	2.6	0.21	---	---	---
4	0.00	0.00	0.00	0.00	4.0	5.4	9.3	2.4	0.20	---	---	---
5	0.00	0.00	0.00	0.00	3.9	6.8	8.6	2.3	0.26	---	---	---
6	0.00	0.00	0.00	0.00	3.8	9.5	7.8	2.3	0.28	---	---	---
7	0.00	0.00	0.00	0.00	4.1	6.7	7.4	2.0	0.26	---	---	---
8	0.00	0.00	0.00	0.00	4.3	6.1	7.2	1.8	0.24	---	---	---
9	0.00	0.00	0.00	0.00	4.2	6.9	6.6	1.3	0.25	---	---	---
10	0.00	0.00	0.00	0.01	4.6	9.1	5.8	1.1	0.22	---	---	---
11	0.00	0.00	0.00	0.01	7.3	12	6.0	1.0	0.17	---	---	---
12	0.00	0.00	0.00	0.01	10	12	6.1	0.96	0.16	---	---	---
13	0.00	0.00	0.00	0.01	9.1	13	5.6	0.96	0.13	---	---	---
14	0.00	0.00	0.00	e0.01	7.1	21	5.3	0.67	0.13	---	---	---
15	0.00	0.00	0.00	e0.01	6.3	35	5.2	0.44	0.13	---	---	---
16	0.00	0.00	0.00	e0.01	5.3	37	5.0	0.43	0.13	---	---	---
17	0.00	0.00	0.00	e0.00	5.0	31	4.7	0.42	0.13	---	---	---
18	0.00	0.00	0.00	e0.00	5.1	24	4.2	0.43	0.13	---	---	---
19	0.00	0.00	0.00	e0.05	5.0	19	4.2	0.41	0.14	---	---	---
20	0.00	0.00	0.00	2.1	4.8	17	4.1	0.42	0.15	---	---	---
21	0.00	0.00	0.00	63	8.0	16	3.9	0.35	0.15	---	---	---
22	0.00	0.00	0.00	14	117	19	3.5	0.32	0.13	---	---	---
23	0.00	0.00	0.00	7.5	33	18	3.1	0.35	0.15	---	---	---
24	0.00	0.00	0.03	5.4	16	15	3.1	0.38	0.18	---	---	---
25	0.00	0.00	0.01	4.7	14	14	3.4	0.53	0.19	---	---	---
26	0.00	0.00	0.01	7.4	11	14	5.0	0.79	0.22	---	---	---
27	0.00	0.00	0.00	8.5	8.6	13	4.3	0.79	0.20	---	---	---
28	0.00	0.00	0.00	5.6	7.4	13	3.5	0.70	0.14	---	---	---
29	0.00	0.00	0.00	5.4	6.4	12	3.1	0.47	0.14	---	---	---
30	0.00	0.00	0.00	5.1	---	13	3.3	0.33	0.14	---	---	---
31	0.00	---	0.00	4.7	---	13	---	0.27	---	---	---	---
Total	0.00	0.00	0.05	133.52	328.4	447.2	172.3	32.72	5.45	---	---	---
Mean	0.00	0.00	0.00	4.31	11.3	14.4	5.74	1.06	0.18	---	---	---
Max	0.00	0.00	0.03	63	117	37	12	2.8	0.28	---	---	---
Min	0.00	0.00	0.00	0.00	3.8	5.1	3.1	0.27	0.13	---	---	---
Ac-ft	0.00	0.00	0.1	265	651	887	342	65	11	---	---	---

	Calendar Year 2011
Total	1,223.04
Mean	3.35
Max	54
Min	0.00
Ac-ft	2,430

13211100 INDIAN CREEK NEAR MAYFIELD, ID—Continued



Appendix E. Example USGS StreamStats Report

StreamStats Ungaged Site Report—For Indian Creek at Reservoir Inlet

Date: Thu Nov 6 2014 15:31:43 Mountain Standard Time
Site Location: Idaho
NAD27 Latitude: 43.3910 (43 23 28)
NAD27 Longitude: -116.0028 (-116 00 10)
NAD83 Latitude: 43.3909 (43 23 27)
NAD83 Longitude: -116.0037 (-116 00 13)
Drainage Area: 46.27 mi2
Percent Urban: 0.74 %
Percent Impervious: 0.0683 %

Peak-Flow Basin Characteristics

100% Peak Flow Region 7A (46.3 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	46.3	0.2	535.3
Mean Basin Elevation (feet)	4020	3605.5	8260.7

Low-Flow Basin Characteristics

100% Low Flow Region 7 (46.3 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	46.3	7.4	535.3
Stream Slope 10 and 85 Method (feet per mi)	78.1	18.4	372.8
Percent Forest (percent)	0	0	38.9
Mean Basin Elevation (feet)	4020	2984.4	7603
Slopes gt 30pct from 30m DEM (percent)	26	0	55.2
Mean Basin Slope from 30m DEM (percent)	19.2	1.7	35.3
Mean Annual Precipitation (inches)	15.1	8.2	29.1
Slopes Greater Than 50 Percent (percent)	2.41	0.189	28.5

Zero-Flow Probability Basin Characteristics

100% Low Flow Region 7 Prob Zero Flow (46.3 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	46.3	7.4	535.5
Mean Basin Slope from 30m DEM (percent)	19.2	10.1	35.3

Monthly and Annual Basin Characteristics

100% Low Flow Region 7 (46.3 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	46.3	7.4	535.3
Stream Slope 10 and 85 Method (feet per mi)	78.1	18.4	372.8
Percent Forest (percent)	0	0	38.9
Mean Basin Elevation (feet)	4020	2984.4	7603
Slopes gt 30pct from 30m DEM (percent)	26	0	55.2
Mean Basin Slope from 30m DEM (percent)	19.2	1.7	35.3
Mean Annual Precipitation (inches)	15.1	8.2	29.1
Slopes Greater Than 50 Percent (percent)	2.41	0.189	28.5

Peak-Flow Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK1_5	69.1	75		20.1	237
PK2	122	66		40.7	366
PK2_33	157	63		54.3	453
PK5	378	55		146	979
PK10	657	51		263	1640
PK25	1160	50		464	2890
PK50	1620	51		637	4120
PK100	2230	52		850	5840
PK200	2920	54		1070	7950
PK500	4030	58		1390	11700

Low-Flow Streamflow Statistics

Statistic	Flow (ft^3/s)	Estimation Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
M1D10Y	0.5	160			
M7D10Y	0.61	140			

M7D2Y	1.18	140			
M30D5Y	0.93	140			

If the Zero-Flow Probability Basin Characteristics given above are within the valid range and one of the probabilities below is greater than 1/n where n is the recurrence interval in years (i.e. 0.1 for M1D10Y or M7D10Y, 0.2 for M30D5Y, or 0.5 for M7D2Y), then the flow estimate for the corresponding flow statistic is zero (0), and 0 should be used instead of the above low-flow estimate derived using regression equations. Also note that Wood and others (2009) presented alternative regression equations for 7-day 2-year low flow (M7D2Y) better suited to extrapolation to small streams, and used those equations to model perennial streams. The perennial streams model results may be viewed in the interactive map by turning on the Perennial Streams Model layer in the Map Contents listing.

Zero-Flow Probability Statistics

Statistic	Value	Standard Error (percent)
PROB_1DAY	0.33	
PROB_7DAY	0.23	
PROB_30DAY	0.16	

Monthly and Annual Streamflow Statistics

Statistic	Flow (ft^3/s)	Estimation Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
QA	5.23	80			
JAND20	26.2	68			
JAND50	6.75	68			
JAND80	3.38	69			
FEBD20	64.6	91			
FEBD50	20.6	75			
FEBD80	5.98	68			
MARD20	34.6	95			
MARD50	11.2	99			
MARD80	3.96	94			
APRD20	39.2	110			
APRD50	16.5	99			
APRD80	8.18	82			
MAYD20	17.3	110			
MAYD50	6.78	120			
MAYD80	3.52	110			
JUND20	8.73	120			
JUND50	4.02	110			
JUND80	2.52	100			

JULD20	3.58	99			
JULD50	2.28	110			
JULD80	1.61	130			
AUGD20	2.31	110			
AUGD50	1.81	130			
AUGD80	1.51	140			
SEPD20	2.53	120			
SEPD50	1.87	130			
SEPD80	1.46	140			
OCTD20	3.07	77			
OCTD50	2.28	98			
OCTD80	1.96	110			
NOVD20	3.51	69			
NOVD50	2.64	75			
NOVD80	2.18	85			
DECD20	4.12	79			
DECD50	2.84	70			
DECD80	2.46	70			

Appendix F. Sediment Targets in the Lower Boise River Tributaries

Rationale for Using Newcombe and Jensen (1996)

Idaho's narrative sediment criterion is expressed in IDAPA 58.01.02.200.08 and states that "sediment shall not exceed quantities … which impair designated beneficial uses."

In this case, every sediment-impaired assessment unit has cold water aquatic life as its most stringent designated or existing beneficial use. TMDL sediment targets must be based on attaining this use. The lower Boise River ("main stem") TMDL (DEQ 1999) used a 1996 paper by Charles Newcombe and Jorgen Jensen to make the link between sediment levels and beneficial uses.

Although many studies have investigated how sediment affects fish, they were conducted over various timescales and species and measured different response variables. Newcombe and Jensen performed a meta-analysis and were able to unify and rationalize the results from 80 different studies. They found an empirical relationship between the concentration and duration of sediment for a given effect on fish. According to DEQ and EPA scientists, and the WAG, this paper is still the best resource for establishing the effects of sediment on fish.

SEV Level

Newcombe and Jensen categorized the negative effects on fish on a scale of severity between 0 and 14. They further divided the scale into 3 categories: behavioral effects, sublethal effects, and lethal and paralethal effects. For the TMDL analysis, we must choose a severity level (SEV) that is protective of cold water aquatic life, thus linking to the narrative standard above.

SEV 9 is the lowest score in the lethal and paralethal effects category. In addition to high levels of physiological stress, the density of fish is reduced at this level and their growth is retarded by as much as 84%. At SEV 9, an angler is less likely to catch a fish because of its behavioral and feeding problems, and any fish he does catch will be a runt, with skin and gill damage. This level clearly does not support the Clean Water Act's goal of "fishable" conditions.

SEV 8 represents the highest level of impacts in the sub-lethal category. In other words, fish experience stress, but it is not sufficient to cause death or growth defects. This stress can be severe and includes skin and gill damage. DEQ believes this is the minimum level to avoid impairment of the fishable use and used this level to tie to the sediment narrative criteria.

The 1998 main stem Boise River TMDL (DEQ 1999 and CH2MHill 1998) set a chronic sediment target at 50 mg/L for 60 days. This level is most closely equivalent to a SEV 8 on Newcombe and Jensen's juvenile salmonid chart (Table F.1).

Table F.1. Sediment effects on juvenile salmonids (Source: Newcombe and Jensen 1996).

Duration of exposure to SS ($\log_e$ hours)

(B) Average severity-of-ill-effect scores (calculated)

Concentration (mg SS/L)	0	1	2	3	4	5	6	7	8	9	10	($\log_e$ mg SS/L)
162755	9	10	11	11	12	13	14	14	-	-	-	12
59874	9	9	10	11	11	12	13	14	14	-	-	11
22026	8	9	9	10	11	11	12	13	13	14	-	10
8103	7	8	9	9	10	11	11	12	13	13	14	9
2981	6	7	8	9	9	10	11	11	12	13	13	8
1097	6	6	7	8	9	9	10	11	11	12	13	7
403	5	6	6	7	8	9	9	10	11	11	12	6
148	4	5	6	6	7	8	9	9	10	11	11	5
55	4	4	5	6	6	7	8	8	9	10	11	4
20	3	4	4	5	6	6	7	8	8	9	10	3
7	2	3	4	4	5	6	6	7	8	8	9	2
3	1	2	3	4	4	5	6	6	7	8	8	1
1	1	1	2	3	4	4	5	6	6	7	8	0
	1	3	7	1	2	6	2	7	4	11	30	
	Hours			Days			Weeks		Months			

Based on the above descriptions, and maintaining consistency with the main stem TMDL, DEQ believes that **SEV 8 is protective of the cold water aquatic life beneficial use**.

Duration and Fish Assemblage

With the severity level determined, to derive a concentration target, we must still choose an assemblage and duration. These will vary from creek to creek.

If the duration matches one of the matrix durations used by Newcombe and Jensen, the sediment concentration can be simply read from the matrix (Table F.1). If an intermediate duration is desired, Newcombe and Jensen provide an equation:

$$\text{SEV} = a + b\ln D + c\ln x$$

Where D is duration in hours; x is concentration in mg/L; and a, b, and c are constants for a given assemblage.

This equation can be rearranged to:

$$x = e^{\left(\frac{SEV-a}{c}\right)} D^{\left(\frac{-b}{c}\right)}$$

Aside from pollutant levels, the largest obstacle to trout in the Boise River tributaries is high water velocities. Raleigh et al. (1984) showed that adult Rainbow Trout are able to persist in velocities up to about 2.4 ft/s before becoming exhausted. Juvenile trout require slower water, ideally between 0 and 2 ft/s. The velocity profiles of each creek have an effect on the biological assemblage that can live there. The assemblages are described using model 1 (juveniles) and model 2 (adults only).

Fivemile and Tenmile Creeks

Instantaneous velocity measurements were taken from these streams during the normal summer time flow period. They varied between 2.0 and 4.6 ft/s. These creeks have had straight, steep-sided denuded channels since they were developed into perennial streams by the Bureau of Reclamation. As vital components in the irrigation system, they will continue to be maintained in this condition. The high velocities, flume-like characteristics, and many diversion structures provide insurmountable barriers to juvenile trout during the summer period of elevated sediment. Although adult trout were found in Tenmile Creek, juvenile trout have not been found in either stream. For these reasons, it is appropriate to use the adult rather than juvenile salmonid assemblage in the Newcombe and Jensen equations (i.e., model 2 rather than model 1.)

Five- and Tenmile Creeks experience extremely high flows in late May as irrigation managers charge the system before the onset of heavy use. This trend has been confirmed by Greg Curtis, district superintendent for the Nampa & Meridian Irrigation District. It is also shown in the 2008 hydrograph for Fifteenmile Creek, as collected by ISDA. These flows are two or three times the normal summertime flows, which commence by June 19 (based on 2008 ISDA data). Given that the normal summertime flow is already at the limit of what adult Rainbow Trout can tolerate, it is unlikely that they will remain in the system during the pre-season charging flow. Therefore, while sediment levels are high earlier in the year, adult trout will not be present and exposed to the sediment levels until June 19.

Sediment levels return to their wintertime baseline by mid-September, specifically September 19 in the 2011 DEQ dataset. The ISDA 2008 data is the most complete summertime flow data (DEQ flow data do not start until mid-July), and the DEQ 2011 dataset is the most recent sediment data. This information leads to an assemblage-led start date of June 19, and a concentration-led end date of September 19. This period of 92 days is the duration of exposure to elevated sediment levels.

Using the equation with SEV = 8, D = 92 days (2,208 hours), and the coefficients a, b, and c from model 2 (adult salmonids only):

$$x = e^{\left(\frac{SEV-a}{c}\right)} D^{\left(\frac{-b}{c}\right)}$$

$$x = e^{\left(\frac{8-1.6814}{0.7565}\right)} \times 2208^{\left(\frac{-0.4769}{0.7565}\right)}$$

$$\boldsymbol{x = 33\, mg/L}$$

The TMDL target only applies to the perennial segments of each creek (i.e., below McDermott Road for Tenmile Creek and below Locust Grove for Fivemile Creek). The monitoring points are at the Franklin Road crossings, at the bottom of each assessment unit.

Fifteenmile Creek and Willow Creek

Instantaneous velocity measurements were taken from Fifteenmile Creek during the normal summertime flow period. Across the stream, the velocity varied between 1.1 and 4.1 ft/s, notably less than Five- and Tenmile Creeks.

In both Fifteenmile and Willow Creeks, the channel dimensions, especially near the mouths, are slightly more natural, and the banks have occasional riparian features that create small refugia for fish. They also both have unbroken connectivity to the Boise River, making them attractive thermal refuges for trout. The low water velocities make Fifteenmile Creek suitable for juvenile trout during the normal summer flow period, and Willow Creek is assumed to function similarly. Therefore, it is appropriate to use the juvenile salmonid assemblage (model 1) in the Newcombe and Jensen equation.

The 2008 ISDA data indicate that the target duration for Fifteenmile Creek and Willow Creeks should begin on June 19, which is the end of the high-velocity system-charging flow that would prevent the presence of trout. The same dataset shows sediment levels return to their wintertime baseline by September 11. This information leads to an assemblage-led start date of June 19 and a concentration-led end date of September 11, a period of 84 days.

Using the equation with SEV = 8, D = 84 days (2,016 hours), and the coefficients a, b, and c from model 1 (includes juvenile salmonids):

$$x = e^{\left(\frac{SEV-a}{c}\right)} D^{\left(\frac{-b}{c}\right)}$$

$$x = e^{\left(\frac{8-1.0642}{0.7384}\right)} \times 2016^{\left(\frac{-0.6068}{0.7384}\right)}$$

$$\boldsymbol{x = 23\ mg/L}$$

The TMDL target would be measured at Lincoln Road on Fifteenmile Creek, and State Highway 44 for Willow Creek. These locations represent the furthest downstream crossing points.

Sand Hollow Creek, Mason Creek, and Indian Creek

Juvenile trout have been found in Sand Hollow and Mason Creeks. Juvenile trout are found upstream and downstream of the sediment-impaired section of Indian Creek, so it is reasonable to use Newcombe and Jensen's model 1 to calculate a sediment target for all three streams.

Sediment levels remain elevated in Sand Hollow and Mason Creeks until at least mid-October. The only long-term dataset for Indian Creek was collected at the Nampa WWTP. At this point, the creek has very few return flows and experiences its highest sediment levels during spring. The Nampa dataset shows that the creek experiences a 4-month spike in sediment levels, typically lasting from January through May.

In all three of these cases, the closest matrix duration is 4 months. Using Newcombe and Jensen's model 1 and choosing the closest matrix duration of 4 months yields a target of 20 mg/L (Table F.2).

Table F.2. Sediment target determination using model 1 for Sand Hollow, Mason, and Indian Creeks.

Juvenile and Adult Salmonids

Duration of exposure to SS (log_e hours)

(B) Average severity-of-ill-effect scores (calculated)

Concentration (mg SS/L)	0	1	2	3	4	5	6	7	8	9	10	(log_e mg SS/L)
162755	10	11	11	12	12	13	14	14	-	-	-	12
59874	9	10	10	11	12	12	13	13	14	-	-	11
22026	8	9	10	10	11	11	12	13	13	14	-	10
8103	8	8	9	10	10	11	11	12	13	13	14	9
2981	7	8	8	9	9	10	11	11	12	12	13	8
1097	6	7	7	8	9	9	10	10	11	12	12	7
403	5	6	7	7	8	9	9	10	10	11	12	6
148	5	5	6	7	7	8	8	9	10	10	11	5
55	4	5	5	6	6	7	8	8	9	9	10	4
20	3	4	4	5	6	6	7	8	8	9	9	3
7	3	3	4	4	5	6	6	7	7	8	9	2
3	2	2	3	4	4	5	5	6	7	7	8	1
1	1	2	2	3	3	4	5	5	6	7	7	0
	1	3	7	1	2	6	2	7	4	11	30	
	Hours			Days			Weeks		Months			

Short-Term Targets

DEQ is also concerned with the effects of shorter-term spikes in sediment, which will typically be associated with storms and runoff events. The effects of a storm may last for hours or days, and it is unclear which timescale (and therefore concentration), should be used as an appropriate target. Rather than arbitrarily picking a duration, we can continue to use Newcombe and Jensen's severity level of 8 as a flexible target for storm timescales (6 days or less). This strategy could eventually provide for a set of short-term numeric targets (such as for MS4 permits) that vary depending on the period of elevated sediment (Table F.3).

Table F.3. Short-term targets based on severity level 8.

Juvenile and Adult Salmonids

Duration of exposure to SS ($\log_e$ hours)

(B) Average severity-of-ill-effect scores (calculated)

Concentration (mg SS/L)	0	1	2	3	4	5	6	7	8	9	10	($\log_e$ mg SS/L)
162755	10	11	11	12	12	13	14	14	-	-	-	12
59874	9	10	10	11	12	12	13	13	14	-	-	11
22026	8	9	10	10	11	11	12	13	13	14	-	10
8103	8	8	9	10	10	11	11	12	13	13	14	9
2981	7	8	8	9	9	10	11	11	12	12	13	8
1097	6	7	7	8	9	9	10	10	11	12	12	7
403	5	6	7	7	8	9	9	10	10	11	12	6
148	5	5	6	7	7	8	8	9	10	10	11	5
55	4	5	5	6	6	7	8	8	9	9	10	4
20	3	4	4	5	6	6	7	8	8	9	9	3
7	3	3	4	4	5	6	6	7	7	8	9	2
3	2	2	3	4	4	5	5	6	7	7	8	1
1	1	2	2	3	3	4	5	5	6	7	7	0
	1	3	7	1	2	6	2	7	4	11	30	
	Hours			Days			Weeks		Months			

It is important to note that the target duration is a *maximum* exposure time before the fish exhibit the effects of SEV 8. In other words, after being exposed for the relevant duration, the fish "need a break." The targets should be expressed as:

An average of <concentration> *mg/L for a maximum of* <duration>.

References

CH2M HILL. 1998. *Selection of a Total Suspended Sediment (TSS) Target Concentration for the Lower Boise River TMDL*. Boise, ID: CH2M HILL.

DEQ (Idaho Department of Environmental Quality). 1999. *Lower Boise River TMDL: Subbasin Assessment, Total Maximum Daily Loads.* Boise, ID: DEQ.

IDAPA. 2014. "Idaho Water Quality Standards." Idaho Administrative Code. IDAPA 58.01.02.

Newcombe, C.P., and J.O.T. Jensen. 1996. "Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact." *North American Journal of Fisheries Management* 16:693–727.

Raleigh, R.F., T. Hickman, R.C. Solomon, and P.C. Nelson. 1984. *Habitat Suitability Information: Rainbow Trout*. US Fish and Wildlife Service. FWS/OBS-82/10.60.

Appendix G. List of Notices of Intent filed under the Multi-Sector General Permit

For waters in the Boise River valley.

Permit Number	Organization Name	Receiving Water	Notes
IDR05CI33	C A Paving Co	Boise River	Boise River impaired, TMDL complete
IDR05C278	Masco dba Knife River	Boise River	Boise River impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter
IDR05C279			Boise River impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter
IDR05CN94			Boise River impaired, TMDL complete
IDR05C218	Staker Parson Companies	Boise River	Boise River impaired, TMDL complete
IDR05C225			Boise River impaired, TMDL complete
IDR05C232			Boise River impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter
IDR05C243			Boise River impaired, TMDL complete
IDR05C417	Simplot Transportation	Boise River (Via Dixie Drain And MS4)	Boise River impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter
IDR05CD07	Rambo Sand and Gravel, Inc.	Boise River—Indian Creek to Mouth	Boise River impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter
IDR05CO01	Highway District #1	Farmers Cooperative Canal	Farmers Cooperative Canal impaired, TMDL complete for one segment, TMDL not complete for another segment/parameter
IDR05C574	Basalite Concrete Products	Fivemile Creek	Fivemile Creek impaired, no data on TMDL
IDR05C321	Central Paving Co., Inc.	Lower Boise River	Lower Boise River impaired, TMDL complete

This page intentionally left blank for correct double-sided printing.

Appendix H. Public Comments and Public Participation

Casey OConnell, Public

I have reviewed and support the Lower Boise River TMDL: 2015 Addendum. I am a resident of Boise and live in a subdivision located to either side of the intermittent portion of Five Mile Creek. There are significant agricultural sedimentation impacts to the creek in the area of my home. Manure from a feedlot is trucked regularly to City of Boise property leased by a local farmer (the Murgoitio Tract), and the resulting sedimentation into Five Mile Creek should be a serious concern for the DEQ. In addition to adding E. coli bacteria into the stream, the sedimentation further slows the water flow by making the stream more shallow.

I would like the DEQ to implement the measures included in this addendum, and would appreciate any further attention our area might receive.

> *Thank you for your comment. We have forwarded your specific complaint to the Idaho State Department of Agriculture. We do not presently have any data on sediment or E. coli levels this high up in the watershed, but we will consider the area in our next round of monitoring.*

John C. McMahon, Idaho Rivers United Monthly Contributing Member

The Boise River is a Precious Water Resource. In these times of severe drought and water shortages, especially for household use, we Idahoans must be ever mindful about what goes into the Boise and all our Rivers!

I have seen what polluted water looks like here in Idaho and in many places in the world. There are places in Idaho where the water is 'orange', and I'm not talking BSU Bronco Pep Rallies. Fortunately that extreme is rare in Idaho, but it does exist from mining activities in some locales.

Most Idaho Farmers and Ranchers are mindful of their responsibilities as stewards of land and water. Nevertheless, it is required of us all that we pay attention to what we do near or on water while farming, ranching and recreating.

I urge all my fellow Idahoans and visitors to our great state to be Good Shepherds and Good Stewards while utilizing our water resources. Our “Mom" (the Earth) can and will clean up after us, but she can only do so much. We reside on a Living Planet. All Life is Precious. Everyone has a responsibility to care for themselves and their surroundings. THINK and do not pollute. Mom cannot do her 'job' if we do not do ours. We must all be good children and clean our rooms; including keeping our waters safe and pure as possible. Thank You for doing that!

> *Thank you for your comment. DEQ agrees that this effort will succeed only if it has broad support and involvement.*

David Monsees, private citizen of Ada County

I strongly approve of the Idaho Department of Environmental Quality plan for addressing the serious bacterial and sediment pollution of the five large creeks that flow into the Boise River and one creek tributary to the Snake River.

These tributaries have become little better than sewers. They cannot safely be used for any recreation where your body comes into contact with the water due to E. coli pollution. The high sediment content of the water results in poor survival of native trout, so fishermen can kiss it goodbye, as well.

It is not only a disgrace to have these rivers so polluted, but it is an additional detriment to the waters downstream.

Please implement this plan to improve our waters.

> *Thank you for your comment. Some of the tributaries are relatively clean, such as Willow Creek and Indian Creek upstream of Wilson Drain. Sand Hollow and Mason Creeks have especially high levels of sediment and E. coli. We recognize that the streams in this TMDL are heavily modified, and integral to the irrigation and drainage network of the valley. However, they should all be able to support aquatic life and recreation uses.*

Paul

I support the DEQ and IRU plan to clean up the Boise River and to keep it clean.

> *Thank you for your comment.*

Ryan McGill, Professional Recreationist and father of two

It is critical that these tribs are cleaned up. Enhance riparian zones, encourage different harvest/planting techniques near the creeks, invite the farmers on a river walk to see what is happening....

We have done well over the past few decades cleaning up the Boise River. We need to continue to improve by reducing the negative impacts of our use of the land.

I imagine there are rules, currently in the books, that can be enforced regarding the pollution. Get as many people on board as possible before you flex the muscle of the DEQ.

I used to float my drift boat from Lansing Lane to crop duster runway in Caldwell. The first few miles are clear water and I caught a variety of fish. At Midland BLVD there is a creek dumping in that is disgusting, brown, and warm. From that point on I would not catch fish and my children were not allowed to get in the water.

We need to fix this as soon as possible.

> *Thank you for your comment. The creek at Midland Boulevard is Fifteenmile Creek, and it does have high sediment and E. coli loads. Generally, nonpoint source pollution originating from agriculture is exempt from regulation under the Clean Water Act. That is why collaborative, voluntary pollution reduction activities must be part of the solution.*

Nate, River-enjoying member of Boise City

I strongly agree with planning for improvement to the water quality of major tributaries/creek feeding the Boise river. Having clean water to fish, boat, swim and take our dogs in is one of the things that makes Boise great. I hope you are able to implement a fiscally responsible plan to restore these waters to state standards. Thank you for your hard work.

> *Thank you for your comment. Implementation of agricultural best management practices is voluntary, and funding is limited. The Lower Boise Watershed Council, amongst other organizations, distributes cost-share funds to encourage landowners to reduce pollution.*

Rick Parrott

I live at the confluence of Mason Creek and the Boise River. On my desk is an Idaho Statesman article from 1996 titled "Downstream and Dirty". It features an aerial photograph of the Mason Creek 'drain' mixing with the Boise. That was 19 years ago and it is the same filthy situation today. I also have a photograph of this same location from 1974. Comparing the 1974 photo, the 1996 photo and the current state of the river is depressing. The river banks and islands were once sand, gravel and rock. Today vegetation dominates the banks, thriving in mud, silt and excessive nutrients. A few miles above this point is the confluence of another drain Fifteenmile Creek. The degradation of the river after the impact of these two drains is enormous.

The miserable condition of the lower Boise River is not something new, it has be seen and measured for years, it is no secret.

We have been told that agriculture is our way of life in this valley and this is the result. Deal with it.

Fortunately this message is losing steam and it is agriculture that needs to step up and fix the mess they have created. There needs to be a tax or penalty for every gallon of waste water entering the river system from agriculture. Solutions are going to be costly, it is not an easy fix, but with time and financial pressure, methods will change and waste will be reduced.
The Boise River may never return to the glory days as a salmon spawning grounds but a healthy river should be on everyone's wish list.

> *Thank you for your comment. Mason Creek and Fifteenmile Creek are responsible for a large percentage of the sediment and E. coli pollution in the Boise River. Agricultural nonpoint source pollution is exempt from regulation under the Clean Water Act, so the solutions will need to be voluntary and cost-effective. We believe that all of these tributaries can support cold water aquatic life and contact recreation. In addition to being valuable in themselves, they are the primary source of pollution to the Boise River. Cleaning them up will also go a long way to fixing the river's problems.*

Suzanne Troje, retired

I am writing to express my support for the Boise River Pollution Reduction Plan which I understand should address the serious bacterial and sediment pollution of creeks that flow into the Boise River and one tributary of the Snake River.

Idaho's Rivers are among the real gems of the gem state! It is shameful that E. coli bacterial pollution in the creeks is so severe that swimming or wading is unsafe, and native trout are unable to survive. We should take the opportunity to protect these important natural resources for us and future generations. Establishing targets for sediment and allocating sufficient resources to help farmers and other agricultural polluters implement Best Management Practices should help get us back on track. Please implement the Boise River Pollution Reduction Plan as soon as possible.

> *Thank you for your comment. DEQ plans to remain closely involved in the implementation of the TMDL after it is approved.*

Caroline Morris, IRU member

I went on a revealing August 2014 Idaho Rivers United (IRU) rafting trip in Caldwell vicinity. We saw unfenced cows drinking while conveniently standing on the eroded banks of the Boise River, and all sorts of chemical and agricultural pollutants. Lots of improvements needed to make this area a clean & healthy waterway.

> *Thank you for your comment. The TMDL author also attended that raft trip, from Fifteenmile Creek to the Sebree Canal, and observed the same pollutant sources.*

The City of Nampa

The city appreciates the DEQ's diligence and hard work in completing this important document. The City supports the DEQ's goal of improving water quality in the Lower Boise River watershed.

> *Thank you for your comment.*

The City supports Indian Creek's designation as Secondary Contact Recreation as noted in the description. However, the statement regarding potentially designating Indian Creek as a primary contact recreation waterbody is inappropriate and should be addressed outside of the TMDL.

> *This section of the TMDL is designed to provide a brief overview of the appropriateness of beneficial uses. Kayaking and swimming have been documented in the restored section of Indian Creek, which immediately suggests that primary contact recreation may be occurring. A TMDL is not the place to change the beneficial use, but these facts should be considered in the future. The water quality standard for primary and secondary contact recreation is the same: 126 E. coli CFU per 100 mL.*

The final bullet at the bottom of the page reads: "Data about the origin and composition of dry-weather stormwater flow is largely absent." Dry weather flows are not specifically stormwater flows. It is suggested that the language be updated to: "Data about the origin and composition of dry-weather flows within the MS4 are largely absent."

> *We agree. The change has been made.*

It should be noted that the data included in Table 16 are based on permit limits and not actual discharge data.

> *The table heading has been altered to make this clear.*

The City agrees with DEQ's assessment that short term discharges (i.e. less than 84 days) are not causing impairment in the assessment units and therefore do not require numeric permit limits.

Data were typically collected every 2 weeks, so the (<14 day) short-term average sediment concentration is unknown. It is correct to say that DEQ has no evidence that short-term discharges are causing impairment. Future intensive data collection efforts may show a short-term sediment problem, in which case the appropriate numeric target could be deduced from Newcombe and Jensen's table. This would be done in the context of a TMDL 5-year review.

The City agrees with the proposed approach for accounting for growth in point source design flows.

Thank you for your comment. DEQ welcomes economic growth, especially when it can help improve water quality.

The City supports DEQ's proposed wasteload allocations for point sources presented in table 26.

Thank you for your comment.

Modify the first sentence of the second paragraph [in section 5.4.7.1]. The MSF permit is intended to protect Waters of the US (not the MS4).

We agree, and have made the change.

"Dry weather stormwater" flows are not defined in the TMDL. It is suggested that the first two paragraphs on Page 52 be replaced with the following, which is slightly modified from the Lower Boise River Total Phosphorus TMDL. "Stormwater is produced by runoff from precipitation-driven storm events. As a result, stormwater ("wet weather") discharges from MS4 systems that result from specific precipitation events will be referred to as stormwater and identified as a point source with a wasteload allocation in this TMDL. Municipal stormwater within the lower Boise River watershed is regulated under either a Phase I or a Phase II NPDES MS4 Permit issued by EPA Region 10. Such NPDES regulated municipal stormwater are point sources and will be assigned wasteload allocations.

MS4 systems in the Treasure Valley also convey other inputs of water such as landscape irrigation, building cooling waters, wash waters, agricultural return, ground water infiltration and construction discharges. These types of discharges are characterized as non-stormwater discharges.

In effect, in some situations, MS4 systems in the valley share 'pipes' with non-point discharges. These non-stormwater ("dry weather") discharges can be authorized in MS4 permits if they satisfy specific conditions (please see individual MS4 permits for more information). As a result, all non-precipitation driven discharges from MS4s will be referred to as non-stormwater and identified as point sources with a wasteload allocation in this TMDL. Non-stormwater discharges origination from agricultural lands, e.g. irrigation return flows will be identified as NPDES-exempt agricultural flows. A complete list of authorized non-stormwater discharges as defined by local MS4 permits is shown in Table 29. There are eight EPA issued MS4 stormwater permits and 12 different permittees in the lower Boise watershed. These entities discharge sediment and bacteria into the lower Boise River tributaries, directly or indirectly, through drains, tributaries and other hydrological connections."

> *Stormwater permitting, and the interpretation of the TMDL, is done by EPA. For that reason, we tried to be as narrow as possible in our discussion of stormwater, and, where possible, to refer back to the stormwater permits, rather than offering new definitions. The nature of dry-weather stormwater is very complicated. By asking each operator to estimate the percentage of dry-weather flow that originated from nonpoint sources, we attempted to include local knowledge and offer maximum flexibility.*
>
> *We note that the term "dry-weather" only appears in two places: table 31 and in a section on "data gaps," and in neither case is it used in a regulatory sense. It is intended to highlight the large contribution of agricultural drainage in the stormwater system.*
>
> *Each stormwater system in the valley behaves differently, and the individual stormwater NPDES permits are the proper venue for the details of each system. There is a very important and ongoing debate about the nature of agricultural return flows in storm drains. The TMDL should not foreclose that debate.*
>
> *The language in section 5.4.7.1 was carefully crafted after many meetings of the stormwater TAC. It represents something that the group was comfortable with. As such, we prefer not to change it.*

The city agrees with the DEQ's approach for separating wet weather and dry weather (i.e. agricultural return and groundwater) allocations. It is the City's view that the dry weather stormwater flows are allowable as non-contaminated flows under its current NPDES permit. However, the City does not have and does not intend to implement any method for controlling these flows outside of routine maintenance and replacement.

> *DEQ's approach was an attempt to apply common sense to the complicated realm of stormwater. Ultimately, however, EPA will decide whether the dry weather stormwater flows are contaminated, and whether they are allowable under the NPDES permits.*

The Clean Water Act lists the allowable non-stormwater discharges included in permits. It is suggested that this serve as the basis for the data in Table 29.

> *EPA is the regulatory agency for stormwater in Idaho. We used terms directly from a local MS4 permit so that they would be locally comparable.*

Monitoring to assess compliance with dry weather loads and wet weather loads could become very challenging given the variability in stormwater runoff.

> *DEQ agrees that monitoring every outfall during every storm would be challenging. However, a rotating panel or windshield-survey approach might go some way to identifying the major outfalls.*

Idaho Rivers United

Idaho Rivers United agrees with the draft Lower Boise River TMDL 2015 Addendum. Thank you for combining a thorough scientific study with an engaging public participation process. The issues were clearly identified and agreed upon, the targets were suggested and vetted before adoption, and the load and wasteload allocations were carefully developed with generous input form the stakeholders.

Thank you for your comment.

There is ample evidence to support an update to the beneficial uses for Indian Creek below Mora, Fifteenmile Creek and Sand Creek. People swim in these creeks and primary contact recreation should be a beneficial use. We believe a case could be made that people swim or would swim in each of these tributaries if they were cleaner and if public access was available. IRU supports the cold water aquatic life beneficial use designations as applied. All of these creeks do now or could in the future support cold water aquatic life.

We believe that primary contact recreation occurs in Indian Creek below Mora, and also in Caldwell. In the upper reaches, where the creek shares a channel with the New York Canal, this recreation is specifically forbidden by the irrigation district.

Sand Creek is very small (around 5 cfs during peak flow, less than 1 cfs during summer recreation season). Children are frequently observed splashing in the creek, but the chance for immersion is low.

Fifteenmile Creek is indeed a likely place for primary contact recreation, especially at its mouth.

In all these cases, secondary contact recreation is already a beneficial use, and the water quality standard is the same as for primary contact recreation. A TMDL is not the proper venue to change a beneficial use. If, however, the use were changed, the TMDL load and wasteload allocations would remain unchanged.

Since the 1999 TMDL was written, stormwater has been reclassified as a point source. The Addendum addresses it as a point source (see Table 16), but the text carried forward from the 1999 TMDL discusses stormwater as a nonpoint source. This is confusing and incorrect.

We have updated the text that refers to stormwater as a nonpoint source.

Similarly, the text carried forward from 1999 does not provide current information about CAFO permitting. According to the EPA, only one CAFO in Idaho has an NPDES permit, so no land application of manure is regulated in the Lower Boise River watershed. Bacteria loads are extremely high in some locations, therefore more information about water pollution coming directly from large CAFOs and from manure spreading should be included in the TMDL.

The NPDES permit program is administered in Idaho by EPA. EPA issued a general permit for CAFOs in 2012, but as you mention, only one facility is presently covered by it. We do not have enough site-specific E. coli data to identify particular facilities, or even localities, as significant E. coli sources. Typically, we have one data location for each creek, and this is usually the mouth. Broader and more targeted E. coli monitoring would be helpful in crafting pollution reductions.

The unnaturally high levels of sediment in the tributaries and in the Boise River significantly impair beneficial uses. The appeal and pleasure of taking a swim is much higher in clear water where the rocks sparkle and you can open your eyes and see underwater. Murky, dirt-filled water is unappealing and it’s easy to stub your toes, step on sharp rocks, and come out with a layer of mud on your skin. Sediment impairs recreation. Sediment also impairs all phases of the fish life cycle and that of the insects they live on. For these reasons, Idaho Rivers United supports attainment of SEV level 8 or lower. We support the long-term duration target that focuses attention on chronic sources of sediment pollution.

> *Thank you for your comment. This TMDL addresses chronic sediment pollution, and we believe Newcombe and Jensen's SEV 8 is supportive of fish and insect life. Short-term discharges are also addressed using their short-duration targets. We have no evidence that these targets are violated, but the data are sparse.*

In addition, we would like to see increased oversight of permitted and illicit stormwater discharges and construction site pollution.

> *EPA is the agency in charge of permitting and monitoring NPDES facilities. DEQ responds to complaints about turbid discharges and refers them to EPA inspectors if necessary.*

Nonpoint sources – agriculture in particular – are the primary source of bacterial pollution of the tributaries. Those sources also contribute a major portion of the sediment load. The goal must be to decrease the amount of these toxic substances in every foot of the creek - there should no sacrifice zones. Each AU must be as clean at the top as it is at the bottom. Clean up strategies that treat the pollution after it's entered the waterway are far inferior to those strategies that prevent pollution from entering the waterway in the first place.

> *The TMDL targets apply throughout each watershed. If there is enough water to support the use, then the targets apply. However, we only have a rich data record at the lower end of each assessment unit. For example, we have sediment data collected at a few locations on Fifteenmile Creek, but the only complete record is at the mouth, where data was collected every two weeks between April and October. The targets are long-term, so it only makes sense to evaluate compliance using long-term monitoring. We suggest sampling every two weeks for a period of at least four months. The lower locations have established data records, so make the most sense for future monitoring. So the practical import is that the targets will be evaluated at the mouth of each creek.*
>
> *The nature of these watersheds is part creek, part agricultural drain. On the small scale, the sediment pollution in the drain is likely episodic, depending on which field is irrigating, and the crops' stage of development. Monitoring at the mouth evens out this noise and provides a clearer signal to compare with past results. We also feel that monitoring at the mouth of each stream provides double benefit, because the results can also be used in evaluating loading to the Boise River.*
>
> *We agree that in general, implementation techniques should focus on reducing the quantity of pollution that enters the waters of the US, rather than treating it post-hoc. However, large treatment facilities at the mouth of each tributary do have the potential to efficiently eliminate huge pollutant loads to the Boise River.*

The title of Table 25 should be changed or modified to reflect the stormwater is also a point source.

> *We could not find a reference to stormwater in the title of table 25.*

On page 7 there is an incomplete sentence in the second paragraph, line 6.

> *Thank you for so thoroughly reviewing the document. We completed the sentence.*

US Environmental Protection Agency, Idaho Operations Office

The title of the document that I downloaded from the IDEQ web site is Lower Boise TMDL, 2015 Addendum. The title should be changed to Lower Boise Tributary Sediment and Bacteria TMDL for the sake of clarity. This title is misleading.

> *Other stakeholders had made the same comment. We have updated the title to "Lower Boise River TMDL: 2015 Sediment and Bacteria Addendum."*

I agree with using the Newcombe and Jensen (1996) paper for developing sediment targets for the tributaries in this TMDL. However, your description of a severity of ill effects (SEV) of 8 seems to be arguable. In Newcombe and Jensen 1996 in Table 1, a SEV 8 is described to include "Indications of major physiological stress: long-term reduction in feeding rate: long-term reduction in feeding success: poor condition…" This does not seem to be fully supporting a cold water aquatic life beneficial use to me. The fish are obviously not in a healthy condition in this environment.

> *The SEV level of 8 was chosen because it falls below the "lethal and paralethal" effects threshold. This means that, although the fish are clearly stressed, they are present and able to persist in the environment. Ill effects include skin damage, gill damage, increased vulnerability to toxics, feeding difficulties, and avoidance behavior. While these things are clearly stressful, the fish are nevertheless able to persist in such an environment. As such, we felt a creek with pollution at the SEV 8 level would be considered "fishable," albeit barely.*
>
> *At SEV 9, the level of stress truly moves into another level. Additional effects include slow egg development, delayed hatching, serious feeding impairments, reduced weight gain, reduced population and growth retardation up to 84%. With little chance for a self-sustaining population, and such severe damage to the fish, this level of severity is clearly not "fishable" under the Clean Water Act, and the beneficial use would not be met.*
>
> *Newcombe and Jensen clearly recognize the qualitative difference between SEV 8 and SEV 9 because they place them in different categories: SEV 4–8 in "sublethal effects" and SEV 9–14 in "lethal and paralethal effects." They also divide their matrices into these categories.*
>
> *We can consider the TMDL as an iterative process. Whether the target is SEV 6, 7, or 8, the fact remains that we would have to pass SEV 8 on the way to achieving further improvements. Reaching SEV 8, which equates to 20 mg/L (from a maximum of 126 mg/L in Sand Hollow Creek) would be a Herculean achievement. At that point, which will be many years in the future, we would directly monitor beneficial uses to see if they were supported. A TMDL review would be the appropriate place to revise the target.*
>
> *Lastly, we note that the choice of SEV 8 was made by unanimous vote of the Watershed Advisory Council, and in consultation with EPA's Idaho and Seattle staff.*

Your explanation for the fish assemblages used in the Newcombe and Jensen scenario seems adequate for the tributaries.

> *Thank you for your comment. We assessed each tributary individually, based on its biological, morphological, flow, pollutant, and operational characteristics.*

When considering duration of flows and "average" concentrations, like in Fifteenmile Creek or Willow Creek for example, the TMDL target calls for a TSS concentration of 23 mg/l for an 84 day time period. Does this mean you need to take numerous samples over an 84 day period to average to see if you are meeting the target? If not, how will this work?

> *We recommend that sediment samples should be collected every 2 weeks throughout the period of interest. This has proven to be a workable monitoring regime and matches that done by DEQ in 2011 and ISDA in 2008. E. coli samples should be 3–7 days apart, collected five times over a 30-day period.*

I believe this is a well thought out document and I appreciate the efforts made by the DEQ staff and the Watershed Advisory Group.

> *Thank you for your involvement and support throughout the TMDL process.*

Appendix I. Distribution List

Lee Van De Bogart, City of Caldwell

Liz Paul, Idaho Rivers United

Robbin Finch, City of Boise

Steve Sweet, Quadrant Consulting

Dan Steenson, Sawtooth Law

Andrew Waldera, Sawtooth Law

Robert Braun, Amalgamated Sugar

Henry Hamanishi, JR Simplot Company

Erica Anderson-Maguire, Ada County Highway District

Jack Harrison, HyQual

Tom Dupuis, HDR

Marti Bridges, DEQ

Bill Stewart, EPA

Hawk Stone, DEQ

Doug Conde, DEQ

This page intentionally left blank for correct double-sided printing.