

**Mid Snake River / Succor Creek Addendum  
Implementation Plan for Agriculture  
(17050103)**



South Fork Castle Creek – Photo Credit Jon Beals

Prepared by the Idaho Soil and Water Conservation Commission, in cooperation with the  
Owyhee Soil Conservation District

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# Table of Contents

|  |    |
|--|----|
| List of Figures .....                        | ii |
| List of Tables .....                         | ii |
| Introduction .....                           | 1  |
| Background .....                             | 1  |
| Project Setting .....                        | 5  |
| Land Use and Lane Ownership .....            | 19 |
| Accomplishments .....                        | 20 |
| Resource Concerns .....                      | 23 |
| Agricultural Inventory and Evaluation .....  | 27 |
| Treatment .....                              | 27 |
| Priorities .....                             | 27 |
| Funding and Technical Assistance .....       | 30 |
| Maintenance, Monitoring and Evaluation ..... | 31 |
| References .....                             | 32 |

## List of Figures

|            |  |    |
|------------|--|----|
| Figure 1.  | 303(d) listed intermittent streams within the Mid Snake / Succor Creek watershed ..... | 4  |
| Figure 2.  | Mid Snake / Succor Creek subbasin .....  | 5  |
| Figure 3.  | Succor Creek subwatershed land use .....   | 7  |
| Figure 4.  | Jump Creek subwatershed land use .....   | 9  |
| Figure 5.  | Sinker Creek subwatershed land use .....   | 10 |
| Figure 6.  | Castle Creek subwatershed land use .....   | 11 |
| Figure 7.  | Birch Creek subwatershed land status .....   | 13 |
| Figure 8.  | Hardtrigger Creek subwatershed land status .....                                       | 14 |
| Figure 9.  | McBride Creek subwatershed land status .....   | 16 |
| Figure 10. | Pickett Creek subwatershed land status .....   | 17 |
| Figure 11. | Vinson Wash subwatershed land status .....   | 18 |

## List of Tables

|           |  |    |
|-----------|--|----|
| Table 1.  | Excerpt from Idaho 303(d) list, 1998 .....   | 2  |
| Table 2.  | Mid Snake River / Succor Creek Subbasin assessment units with established TMDLs .....  | 2  |
| Table 3.  | Mid Snake River / Succor Creek 2013 addendum assessment units with established TMDLs .....   | 4  |
| Table 4.  | Mid Snake River / Succor Creek watershed accomplishments .....   | 20 |
| Table 5.  | Mid Snake River / Succor Creek projects completed with DEQ 319 funds .....   | 21 |
| Table 6.  | Mid Snake River/Succor Creek projects completed with Idaho Soil and Water Conservation Commission and Owyhee Conservation District programs assistance ..... | 21 |
| Table 7.  | Projects completed with USDA NRCS Program assistance .....   | 22 |
| Table 8.  | Projects completed by the Owyhee Conservation District with Water Quality Program for Agriculture (WQPA) funds .....   | 22 |
| Table 9.  | Stream bank erosion load allocations for Sinker Creek, upper Succor Creek and Castle Creek .....   | 23 |
| Table 10. | Total suspended solid load allocations for Jump Creek and Lower Succor Creek .....   | 24 |
| Table 11. | Gross total suspended sediment load allocations for Birch Creek and Vinson Wash .....  | 24 |
| Table 12. | Streambank erosion load allocation for Hardtrigger, McBride and Pickett Creeks .....   | 25 |
| Table 13. | State of Idaho water temperature criteria .....  | 25 |
| Table 14. | Total existing and target solar loading for Succor Creek and Castle Creek sub-watersheds..   | 26 |
| Table 15. | Conservation practices recommended to address water quality degradation resource concerns in Mid Snake / Succor Creek subbasin .....                         | 28 |

## Introduction

The federal Clean Water Act requires states and tribes to restore and maintain the chemical, physical, and biological integrity of the nation's waters and to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible. To that effect, water quality standards have been established by the Idaho legislature and approved by the US Environmental Protection Agency (EPA). States and tribes are required to identify and prioritize water bodies that do not meet water quality standards and develop water quality improvement plans called total maximum daily loads (TMDL(s)) for those water bodies (DEQ 1999).

An implementation plan is a document guided by an approved TMDL that provides details of the actions needed to achieve load reductions, outlines a schedule of those actions, and specifies monitoring needed to document action and progress toward meeting water quality standards. An implementation plan provides a framework for local stakeholders to use to reach the goals established in the TMDL (DEQ 1999).

Once an implementation plan is written and approved, designated agencies and others begin to implement the actions outlined in the plan. Controlling pollutants is a long term process, not something that occurs at just one point in time. Designated agencies regularly monitor progress toward meeting TMDL goals and revise plans accordingly. Implementation plans are designed to be living documents that regularly change based on new knowledge or technologies and the results of continued monitoring that show progress, or the lack thereof, toward meeting goals. The Idaho Soil and Water Conservation Commission is the designated agency responsible for preparing and revising implementation plans for agriculture and grazing issues (ISCC & IASCD 2005).

## Background

### Mid Snake / Succor Creek Integrated Report - 1998

The segments of the Mid Snake River/Succor Creek subbasin that were placed on the 303(d) list of impaired waters in 1998 by the Environmental Protection Agency (EPA) are summarized in Table 1. These waters were listed for reasons associated with sedimentation, temperature, streamflow alterations and bacteria criteria violations (Table 1.) (DEQ 2003).

### Mid Snake / Succor Creek TMDL - 2003

The Idaho Department of Environmental Quality (DEQ) completed the Mid Snake / Succor Creek Subbasin Assessment and TMDL in 2003. The assessment described the physical, biological, cultural, water quality status and pollutant sources in the subbasin. The overall purpose of the assessment was to characterize, and document pollutant loads within the subbasin and use that information to develop a TMDL for each pollutant exceeding water quality standards (DEQ 2003). Specific assessment units for which TMDL's were set are summarized in Table 2 (DEQ 2003).

### Mid Snake / Succor Creek TMDL Implementation Plan - 2005

The Mid Snake / Succor Creek Watershed TMDL Implementation Plan for Agriculture was drafted in 2005 by staff from the Idaho Association of Soil Conservation Districts, working collaboratively with Idaho Soil and Water Conservation Commission (ISWCC), the Bureau of Land Management (BLM) and the Idaho Department of Lands (IDL) (ISCC & IASCD 2005). The 2005 implementation plan identified the Lower Succor Creek and Jump Creek subwatersheds as top priorities for water quality improvements with a focus on sediment and bacteria pollutants (ISCC & IASCD 2005). The TMDL implementation plan does not include the Snake River reaches.

Table 1. Excerpt from 1998 Idaho 303(d) list (DEQ 1998).

| <b>303(d) Listed Segments in the Mid Snake River/Succor Creek Subbasin</b> |   |             |                |                                      |                     |
|--|---|-------------|----------------|--------------------------------------|---------------------|
| HUC - 17050103 _ by waterbody alphabetically                               |   |             |                |                                      |                     |
| <b>Waterbody</b>   | <b>Boundaries</b>                         | <b>WQLS</b> | <b>AU</b>      | <b>Pollutants</b>                    | <b>Stream Miles</b> |
| Birch Creek  | Headwaters to Snake R.                    | 2684        | 021_02, 03, 04 | Sed.                                 | 27.24               |
| Brown Creek  | Headwaters to Catherine Creek             | 2682        | 019_02, 03, 04 | Sed.                                 | 16.99               |
| Castle Creek   | T5SR1ES28 to Snake R.                     | 2680        | 014_03,04,05   | Flow Alt., Sed., Temp                | 12.78               |
| Corder Creek   | Headwaters to Snake R.                    | 2685        | 025_02         | Sed.                                 | 17.5                |
| Cottonwood Creek   | Headwaters to Succor Creek                | none        | 003_02         | Temp                                 | 4.21                |
| Hardtrigger Creek  | Headwaters to Snake R.                    | 2675        | 008_02         | Sed.                                 | 12.55               |
| Jump Creek   | Headwaters to Snake R.                    | 2673        | 005_02, 03     | Hab Alt                              | 20.54               |
| McBride Creek  | Headwaters to Oregon line                 | 2672        | 004_02, 03     | Flow Alt., Sed., Temp                | 11.81               |
| Pickett Creek  | T5SR1WS32 to Catherine Creek              | 2681        | 016_02, 03     | Sed.                                 | 4.85                |
| Pickett Creek  | Headwaters to T5SR1WS32                   | 6681        | 016_02         | Flow Alt., Sed., Temp                | 11.52               |
| Rabbit Creek   | Headwaters to Snake R.                    | 2677        | 026_02         | Sed.                                 | 11.87               |
| Reynolds Creek   | Diversion to Snake R.                     | 2676        | 009_04         | Sed.                                 | 4.06                |
| Sinker Creek   | Diamond Creek to Snake R.                 | 2679        | 006_03         | Flow Alt., Sed., Temp                | 10.77               |
| Snake River  | CJ Strike Res. to Castle Creek            | 2670        | 006_07         | Sed.                                 | 23.46               |
| Snake River  | Castle Creek to Swan Falls                | 2669        | 006_07         | Sed.                                 | 13.27               |
| Snake River  | Swan Falls to Boise R.                    | 2668        | 006_07, 001_07 | Bac., DO, Flow Alt., Nutr., pH, Sed. | 54.7                |
| SF Castle Creek  | Headwaters to Castle Creek                | 2683        | 014_02         | Bac.                                 | 10.27               |
| Squaw Creek  | Unnamed trib. 3.9 km upstream to Snake R. | 2674        | 007_03         | Sed.                                 | 2.4                 |
| Succor Creek   | Oregon line to Snake R.                   | 2671        | 002_04         | Sed.                                 | 5.38                |
| Succor Creek   | Headwaters to Oregon line                 | 6671        | 002_02, 03     | Temp                                 | 22.19               |

Table 2. Mid Snake River/Succor Creek Subbasin assessment units with established TMDLs.

| <b>Waterbody</b>                                 | <b>Assessment</b> |                     |
|--|-------------------|---------------------|
|  | <b>Unit</b>       | <b>Pollutant(s)</b> |
| Snake River - Swan Falls to Marsing              | 006_07b           | Phosphorus          |
| Snake River - Marsing to Oregon State Line       | 001_07            | Phosphorus          |
| Snake River - Oregon state line to Boise River   | 000_07            | Phosphorus          |
| Upper Succor Creek - 1st and 2nd order tribs     | 003_02            | Sediment, Temp.     |
| Upper Succor Creek - 3rd order                   | 003_03            | Sediment, Temp.     |
| Sage Creek - 3rd order                           | 002_03            | Sediment, Bact.     |
| Succor Creek - 4th order below state line        | 002_04            | Sediment, Bact.     |
| Jump Creek - 1st and 2nd order                   | 005_02            | Sediment            |
| Jump Creek - 3 order                             | 005_03            | Sediment            |
| Sinker Creek - 4th order                         | 012_04            | Sediment, Temp.     |
| Castle Creek - 1st and 2nd order rangeland tribs | 014_02            | Temp.               |
| Castle Creek - 1st and 2nd order forested tribs  | 014_02a           | Temp.               |
| Castle Creek - 3rd order tribs                   | 014_03            | Temp.               |
| Castle Creek - lower 4th order                   | 014_04            | Sediment, Temp.     |
| Castle Creek - upper 4th order                   | 014_04a           | Temp.               |
| Castle Creek - 5th order                         | 014_05            | Sediment, Temp.     |
| South Fork Castle Creek - 1st and 2nd order      | 020_02            | Temp.               |
| South Fork Castle Creek - 3rd order              | 020_03            | Temp.               |

Mid Snake / Succor Creek TMDL Addendum - 2007

Mainstem Succor Creek, Castle Creeks and North Fork Castle Creek were placed on the 1998 303d list for reasons associated with temperature (DEQ 2007). Additional temperature data was collected in those tributaries and verified that temperature exceedences were occurring. In 2007, DEQ completed the Mid Snake / Succor Creek Watershed Addendum, which addressed the temperature TMDL's for the Idaho

portions of those tributaries. The Mid Snake/Succor Creek Watershed Addendum included Succor Creek Reservoir and Succor Creek from the Reservoir to the Idaho/Oregon border which had been overlooked in the 2003 loading analyses (DEQ 2003, DEQ 2007). The TMDL addendum established shade targets for Succor Creek and seven associated tributaries, Castle Creek, NF Castle Creek, SF Castle Creek and three other associated tributaries using the new methodology (DEQ 2007).

The South Fork Castle Creek was placed on the 1998 303d list for reasons associated with bacteria using data from 1979 (DEQ 2007). Subsequent analyses conducted in 2003 showed that the bacteria counts were well below current standard and that the reach was fully supporting its beneficial uses (DEQ 2007). Thus, DEQ recommended that the South Fork Castle Creek be de-listed for bacteria in 2007.

#### Mid Snake River / Succor Creek 2011 Five-Year Review

The 2011 review of Mid Snake River / Succor Creek Subbasin Assessment and TMDL indicated that water quality continued to decline despite an implementation plan that covers all the listed streams (DEQ 2011). Sedimentation, temperature exceedences, bacteria and phosphorus are still the main sources of pollution. The review recommended that Succor Creek and Jump Creek be given priority for implementation projects to address sediment and phosphorus exceedences (DEQ 2011). Highlights from the 2011 review are summarized as follows:

1. There have been no reported changes to the land use or climate in the subbasin.
2. An endangered mollusk, *Physa natricina*, has been identified in the Snake River.
3. Large increases in pollutant loads have been observed.
4. In general, the original assumptions, analyses, and loading allocations of the TMDL are valid. They could be simplified somewhat by replacing the SSTEMP analysis of Sinker Creek with the new PNV method.
5. The beneficial uses in the subbasin are generally appropriate.
6. The status of beneficial uses in the subbasin is mixed. The lower portions of Reynolds Creek and Vinson Wash were found to be impaired, but upper Reynolds Creek and part of Castle Creek are in excellent condition.
7. Beneficial uses in streams that have a TMDL are generally not met.
8. The E. coli criterion has changed slightly since the TMDL was approved. The change prevents a single sample from being used to show a stream is impaired and does not affect the streams in this TMDL.
9. DEQ now relies more heavily on the natural background clause of its water quality standards, which is used in lieu of the numeric temperature criteria in PNV analyses.

#### Mid Snake / Succor Creek TMDL Addendum - 2013

In 2010 and 2011, DEQ staff conducted bank surveys on several intermittent streams, with the goal of determining the extent of sediment impairment, if any. As a result, evidence was collected to support the delisting of the 2nd-order sections of Pickett and Birch Creeks and the entire Brown Creek system (DEQ 2013). Hardtrigger Creek, McBride Creek, and the lower reaches of Birch Creek were found to be probably impaired by sediment, and more intensive monitoring was suggested. The 2013 addendum to the Mid Snake River / Succor Creek Subbasin Assessment and TMDL focused on these 5 waterbodies (seven assessment units) (DEQ 2011a). The 2013 TMDL addendum quantifies sedimentation/siltation pollutant sources and allocates responsibility for load reductions needed for Birch Creek, Hardtrigger Creek, McBride Creek, Pickett Creek, and Vinson Wash to meet water quality standards Table 3, Figure 1 (DEQ 2013).

Table 3. Mid Snake River / Succor Creek 2013 addendum assessment units with established TMDLs (DEQ 2013).

| Waterbody   | Assessment |                |
|---|------------|----------------|
|   | Unit       | Pollutant(s)   |
| Birch Creek - upstream of Castle Creek Road to Snake River        | 021_03, 04 | TSS            |
| Hardtrigger Creek - headwaters to Snake River                     | 008_02     | Bank Stability |
| McBride Creek - headwaters to Snake River                         | 004_02, 03 | Bank Stability |
| Pickett Creek - Bates Creek confluence to Browns Creek confluence | 016_03     | Bank Stability |
| Vinson Wash - Poison Creek confluence to mouth                    | 023_03     | TSS            |

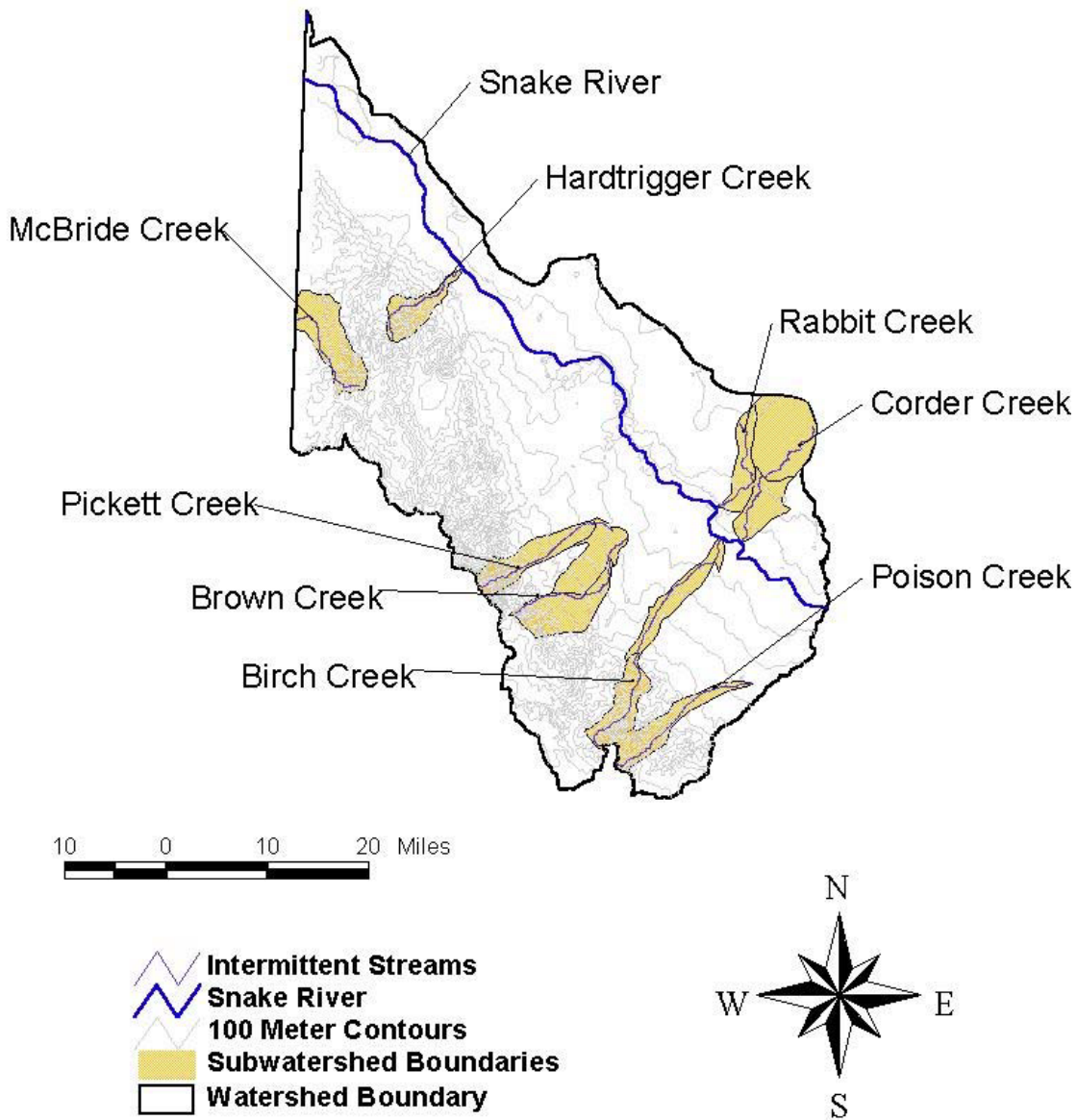


Figure 1. 303(d) listed intermittent streams within the Mid Snake / Succor Creek watershed (DEQ 2003).

## Project Setting

The Mid Snake River/Succor Creek Subbasin (17050103) is in southwest Idaho in an area that is known as the Owyhee Front, the north facing slopes of the Owyhee Mountains. The subbasin is a 2,002-square-mile semiarid watershed in the Snake River basin (Figure. 2). To the north of the Snake River, the terrain is primarily a gently rolling basaltic plain occasionally studded by gently sloped buttes. To the south lies a dissected lowland plateau of valleys, canyons, and mesas that increases in elevation as they rise to meet the Owyhee Mountains. The tributaries to the Snake River are primarily low-volume rangeland streams that run through sagebrush steppe country (DEQ 2003).

The predominant aspect of the Mid-Snake River/Succor Creek watershed is southeasterly. Elevations are highest in the southern part of the watershed. In this area, streams flow out of the front range of the Owyhee Mountains, coursing through basalt canyons and sagebrush covered hills, before flattening out in the valleys that surround the main stem Snake River (DEQ 2003).

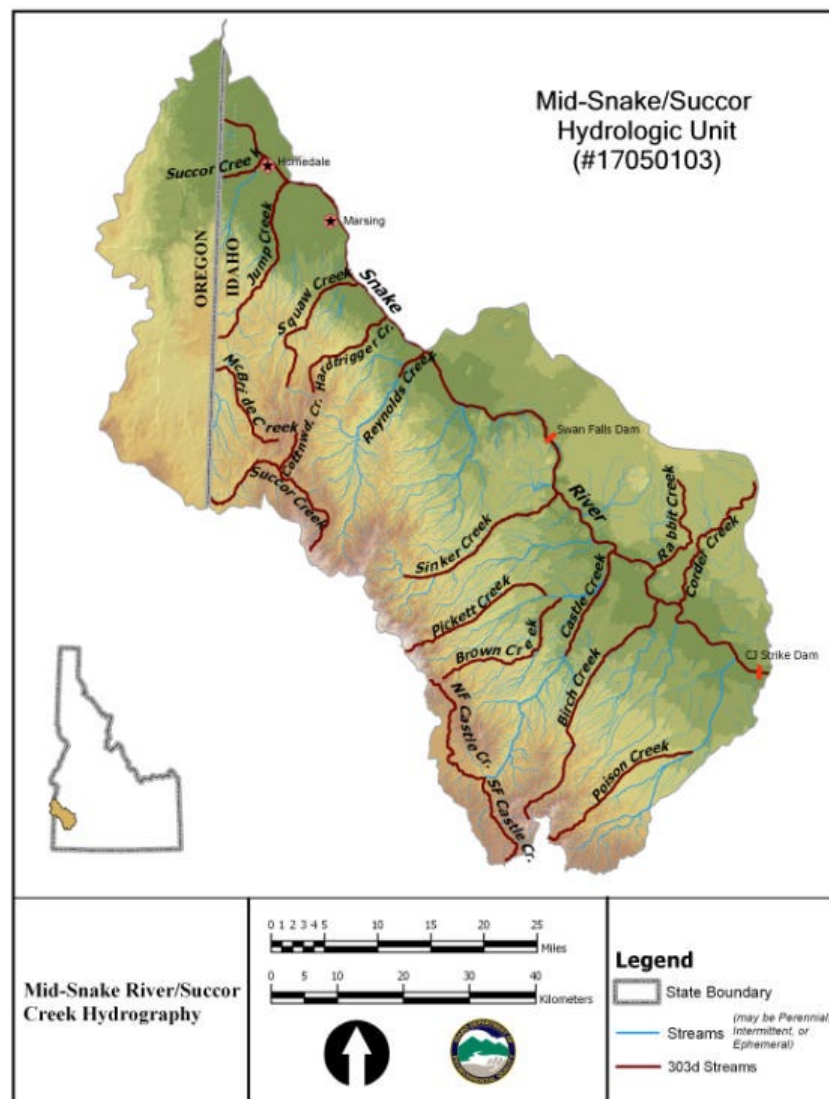


Figure 2. Mid Snake / Succor Creek subbasin (DEQ 2003).

The Mid Snake River/Succor Creek watershed is characterized by a semi-arid climate: hot and dry in the summer and cold and dry in the winter. The Owyhee Mountains receive an average of 30 inches of snow per year in the higher elevations, while the lower elevations along the Snake River receive an average snowfall of under 6 inches (DEQ 2003). The Mid Snake River/Succor Creek watershed lies entirely in the Snake River Plain ecoregion and is distinguished primarily by sagebrush steppe vegetation (Omernik and Gallant 1986).

The Mid Snake River/Succor Creek watershed is described by aridisols and aridic mollisol soils. Aridisols are mineral soils, typically found in arid regions, light colored, and low in organic matter. They often have surface accumulations of soluble salts and lime. Mollisols are well-drained soils with organic-rich surface horizons and that are rich in basic cations such as calcium (Ca ++), magnesium (Mg ++), potassium (K +), and sodium (Na +) (DEQ 2003).

The tributaries to the Snake River are generally low volume streams that have a combination of high ambient temperatures, poor shading, low flow volume, flow alteration, and naturally warm springs that often leads to exceedances of a temperature standard. Approximately 74% of the total stream lengths in the Mid Snake River/Succor Creek watershed are classified as intermittent (Montana State University 2002).

Most of the tributaries exhibit similar characteristics: they start along the front-range as higher gradient, lower sinuosity V shaped channels (Rosgen B channels) before exiting to the plains area and becoming more sinuous, lower gradient, chisel-shaped channels. Rosgen B-type channels are sediment transport channels and are most common throughout the upper elevations of the subbasin. These channels have moderate gradients, sinuosity, width to depth ratios, and entrenchment ratios. They occur in narrow, moderately sloping valleys dominated by riffles with occasional pools. Rosgen B-type channels usually have stable bottom material and are more dependent on riparian vegetation and large woody debris for stability (Rosgen 1996).

Twenty five percent of the land in the Mid Snake River/Succor Creek watershed is privately owned while 70% of the land is federally owned. Almost all the public land is managed by the BLM. A small percentage (5%) is state land. Both the U.S Fish and Wildlife Service (USFWS) and the state of Idaho have ownership of the islands in the Snake River below Swan Falls Dam (DEQ 2002a). The sparsely populated Mid Snake River/Succor Creek watershed encompasses parts of Owyhee, Elmore, Ada, and Canyon counties. The agricultural activities in the watershed provide the economic base for the towns and communities in the watershed.

#### Succor Creek

Succor Creek is a 67.3-mile long stream located in the states of Idaho and Oregon (Figure 3). The elevation change in the watershed is 4,400 feet, with the elevation of the headwaters at 6,600 feet and mouth at 2,200 feet. The headwaters of Succor Creek are located approximately 6 miles north of DeLamar, near Johnson Lakes in Owyhee County, Idaho. After flowing in a northeasterly direction to near Rooster Comb Peak, Succor Creek turns to the northwest for approximately 5 miles. The stream then turns to the southwest and enters Succor Creek Reservoir. The reservoir was constructed in 1979 for agricultural storage (DEQ 2003).

After exiting the reservoir, Succor Creek continues to flow in a southwesterly direction for another mile. It then turns to the northwest until it enters Oregon. In Oregon, Succor Creek travels primarily directly north. The stream flows through agricultural land, rangeland and Succor Creek State Park. Succor Creek

exits Oregon 5.4 miles above Homedale, Idaho, and travels in a northeasterly direction to its confluence with the Snake River. Only the portions of Succor Creek that are in Idaho were addressed in the 2003 subbasin assessment and TMDL (DEQ 2003).

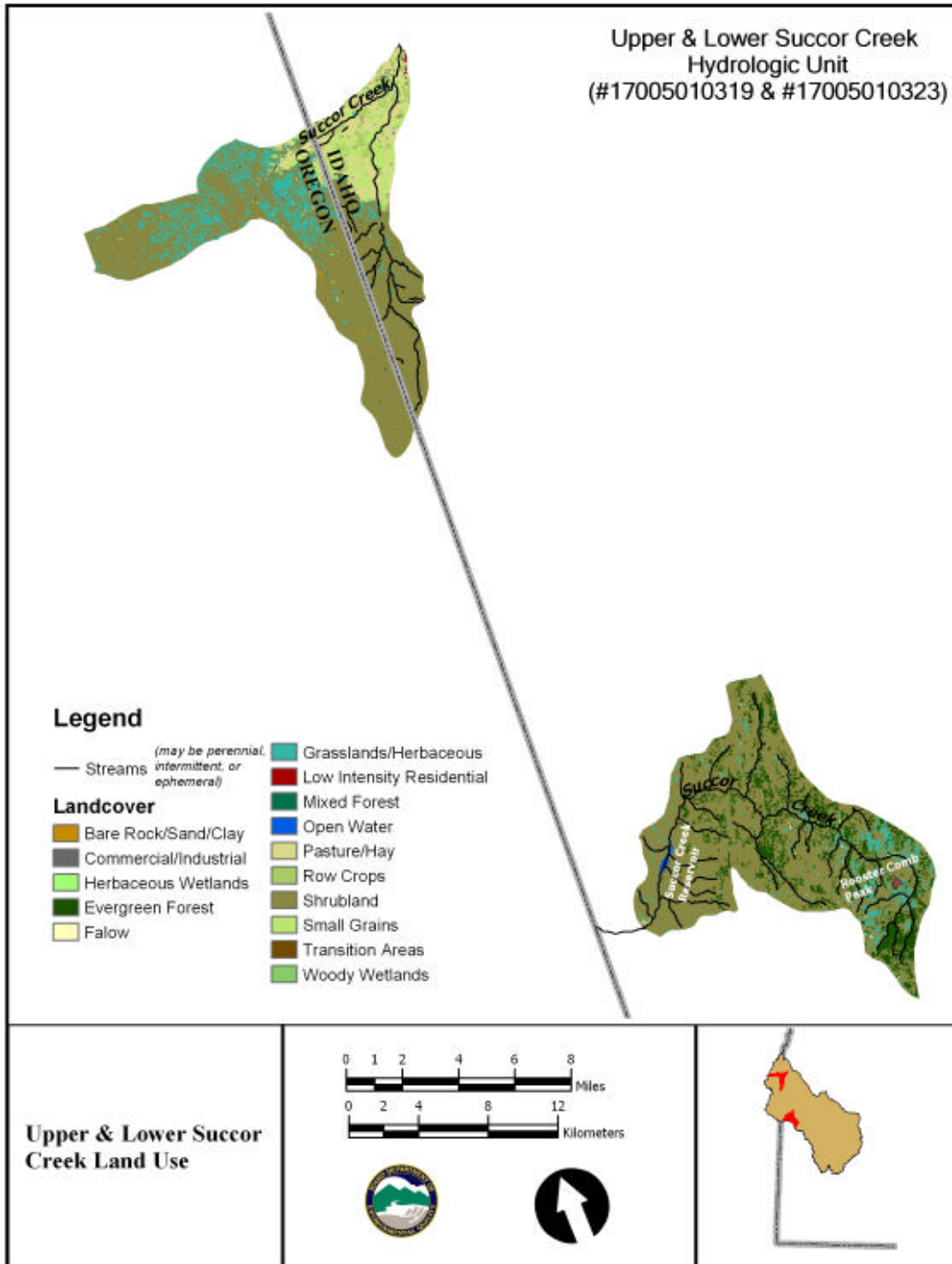


Figure 3. Succor Creek subwatershed land use (DEQ 2003).

### Jump Creek

Jump Creek is a 25.6-mile long stream that drains a 170 square mile watershed (Figure 4). The elevation change in the watershed is 2,040 feet, with the elevation of the headwaters at 4,240 feet and mouth at 2,200 feet. The headwaters of Jump Creek are located just above the Sands Basin in the Owyhee Mountain Range. After flowing in a northeasterly direction through the Sands Basin, Jump Creek passes through a narrow canyon of sheer rhyolite cliffs. The canyon reaches depths of 600 feet and is often less than a quarter mile across. The rhyolitic tuffs and natural arches that bind Jump Creek as it flows through the canyon are primarily of Miocene volcanic origin. After exiting the canyon, Jump Creek opens into the low gradient Snake River Plain where it flows in a northerly direction to the Snake River (DEQ 2003).

The Sands Basin portion of Jump Creek does not have year-round flow although perennial pools occur in some years. Flow occurs as a direct result of spring snowmelt or flash flooding from cloudbursts. The flashiness of the stream discourages the growth of a shrub community. Instead, the riparian community consists mostly of tall forbs and mesic site grasses. About 2 miles down the canyon, a series of springs originate along a one-quarter mile stretch of the creek, marking the beginning of the perennial section. Below the springs, the quantity of water gradually increases as the stream mixes with other springs and small intermittent tributaries. Near the end of the canyon the 60-foot Jump Creek Falls occur (Figure 1.10). These falls effectively isolate the upper segment of stream from the lower segment. As the stream enters the Snake River Plain it begins to mix with a series of agricultural drains and small tributaries until it enters the Snake River (DEQ 2003).

### Sinker Creek

Sinker Creek drains approximately 51,671 acres of primarily rangeland. A fourth order, low to moderately sinuous stream, Sinker Creek originates at over 8,000 feet in the Silver City Range of the Owyhee Mountains and flows in a northerly direction into the Snake River at 2,400 feet (Figure 5). Hulet Reservoir is located 12.9 miles upstream from the mouth of Sinker Creek. Sinker Creek is perennial except in extreme drought years. However, the stream goes dry near the mouth due to flow diversions. Additionally, the nearby Nahas Reservoir is filled with water from Sinker Creek. Sinker Creek cuts through steep V-shaped basalt canyon in places and in others opens into small low gradient valleys. In the lower sections, the channel is U-shaped (DEQ 2003).

### Castle Creek

Castle Creek is a perennial stream on the eastern end of the subbasin that drains approximately 129,542 acres and generally flows in a northeasterly direction (Figure 6). The fourth order creek begins at close to 6,700 feet near Toy Mountain pass. Catherine, Browns, Bates, Hart and Pickett Creeks all flow into Castle Creek. After the creek exits the Owyhee front it flows through rangeland and pastures before emptying into the Snake River around 2,400 feet. The 13-mile listed portion is a Rosgen C channel, a sediment depositing reach characterized by a U-shaped, and sandy channel bottom. In swifter parts of the stream, the substrate is made up of partially embedded cobbles. This creek exhibits entrenchment and unstable banks in portions of the lower watershed. A portion of the downcutting is due to episodic rain on snow events and some of the downcutting is attributable to anthropogenic influences such as stream straightening. Where the riparian area has not been disturbed or the channel is not deeply downcut, the riparian area is thick with cottonwoods, willows, wild roses, and grasses (DEQ 2003).

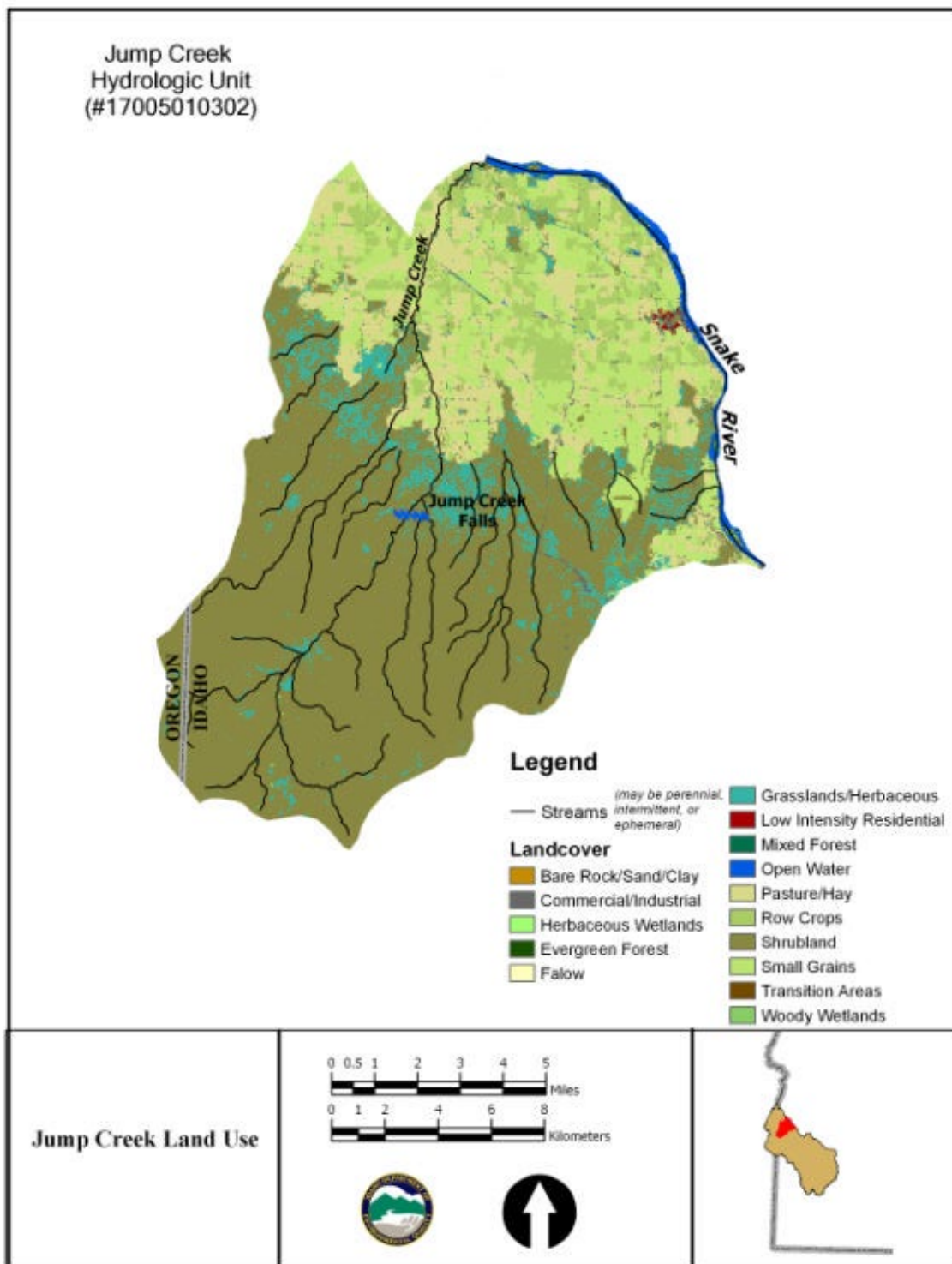


Figure 4. Jump Creek subwatershed land use (DEQ 2003).

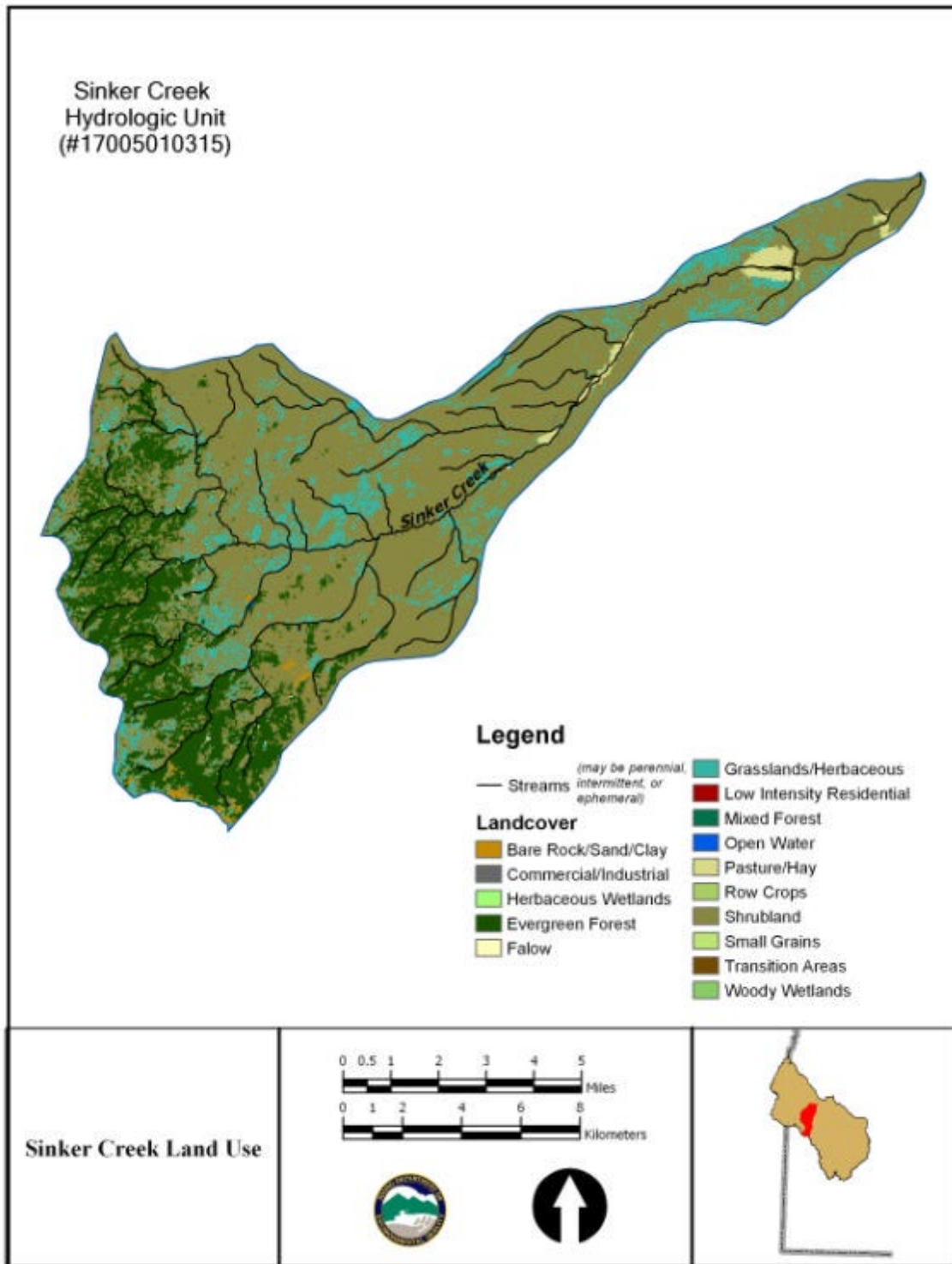


Figure 5. Sinker Creek subwatershed land use (DEQ 2003).

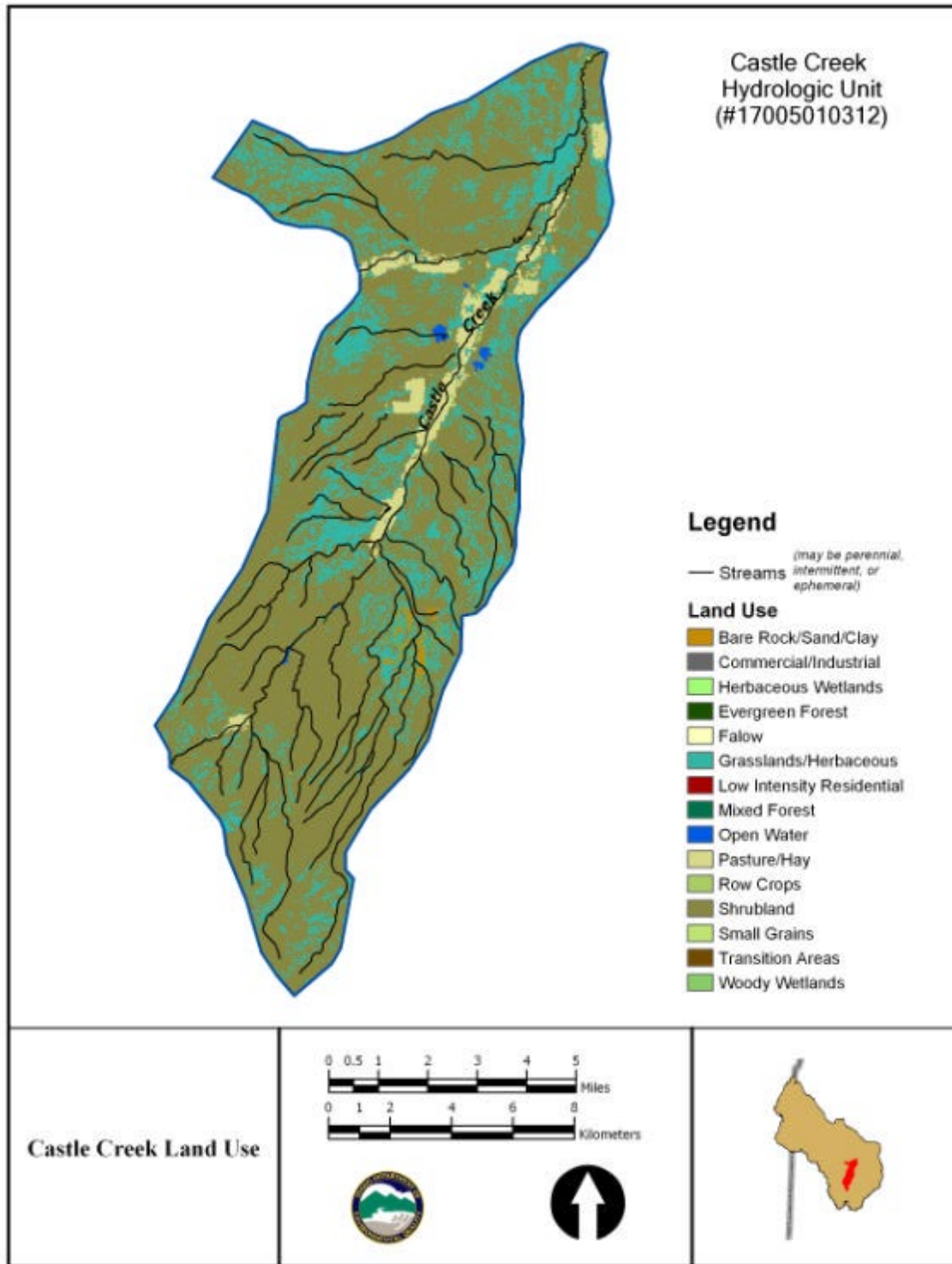


Figure 6. Castle Creek subwatershed land use (DEQ 2003).

### Birch Creek

The Birch Creek subwatershed generally follows a northeasterly direction while draining approximately 78 square miles (Figure 7). The upper main stem of Birch Creek leaves the Owyhee front range at an elevation near 7,050 feet. The upper, dry, sandy wash (AU 021\_03) is ephemeral and exhibits some natural entrenchment and unstable banks due to episodic rain events and the friable nature of the soils. The upper wash segments typically flow only in response to direct precipitation events and rarely reach the lower segments. Other erosion and sedimentation problems result from anthropogenic influences such as use of the wash channel by off-highway and 4-wheel drive vehicles and livestock (DEQ 2013).

The lower Birch Creek AU (ID17050103SW021\_04) then enters irrigated agricultural land and flows intermittently/perennially for approximately 1.7 of the final 2.5 miles before entering the Snake River at an elevation of 2,340 feet. The lower, intermittent/perennial segments of the creek exhibit some entrenchment and unstable banks due to natural soil conditions. Sediment delivery in the lower segment appears to correspond with irrigation patterns and does not correspond well to streamflow throughout the irrigation season. That is, throughout the irrigation season, flows generally range from approximately 15 to 24 cfs, with relatively high corresponding total suspended solid (TSS) concentrations of 217 to 742 mg/L, and greatly elevated June values (2,720 mg/L). Conversely, at the end of the irrigation season, in October, flows nearly double to 32.3 cfs, while TSS concentration drops to 10 mg/L, less than 5% of the lowest irrigation season value (DEQ 2013).

### Hardtrigger Creek

The Hardtrigger Creek subwatershed drains approximately 20 square miles and generally flows in a northeasterly direction. This 2nd-order creek begins at approximately 6,010 feet and joins the Snake River at around 2,230 feet (Figure 8). The main stem of Hardtrigger Creek is approximately 12.7 linear miles, exiting the Owyhee front through rangeland and then rural-developed and pastureland areas for the final 0.75 miles before its confluence with the Snake River. However, approximately 4.5 miles of Hardtrigger Creek between Stewart Gulch and the confluence with the Snake River is ephemeral and only flows in direct response to precipitation events. Hardtrigger Creek also has two intermittent/perennial tributaries that join in the upper rangeland portions, Middle Fork Hardtrigger and Little Hardtrigger. The unnamed northwest channel and Stewart Gulch, however, are dry and ephemeral, and only flow in direct response to precipitation events (DEQ 2013).

Hardtrigger Creek exhibits some unstable banks throughout various segments of the subwatershed, likely due in part to the friable nature of some of the soils but also due to anthropogenic influences such as 4-wheel use and dirt roads adjacent to the creek, BLM wild horse herds, and active livestock grazing. However, certain places also have well-established riparian vegetation consisting of willows, wild roses, and grasses (DEQ 2013).

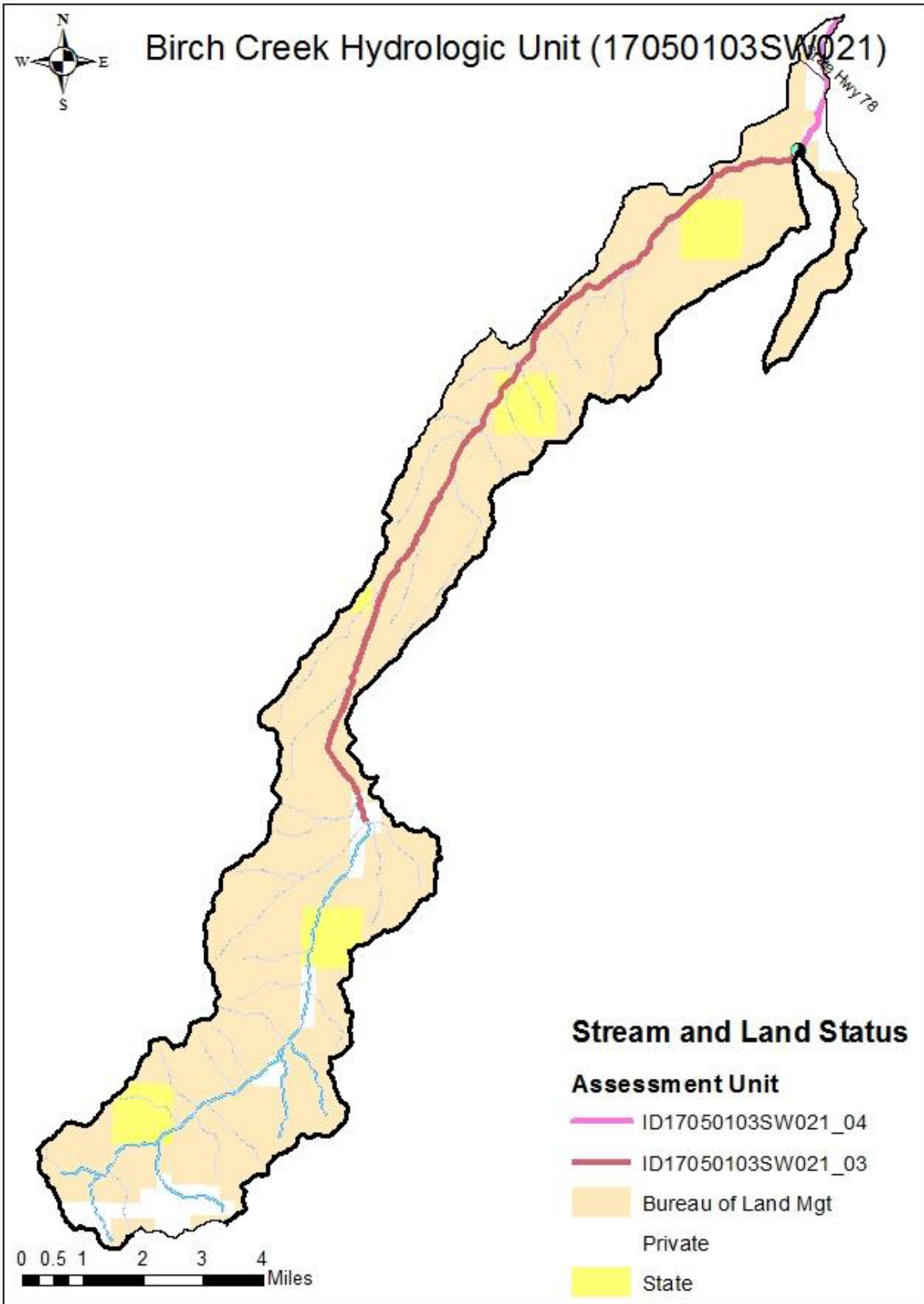


Figure 7. Birch Creek subwatershed land status (DEQ 2013).

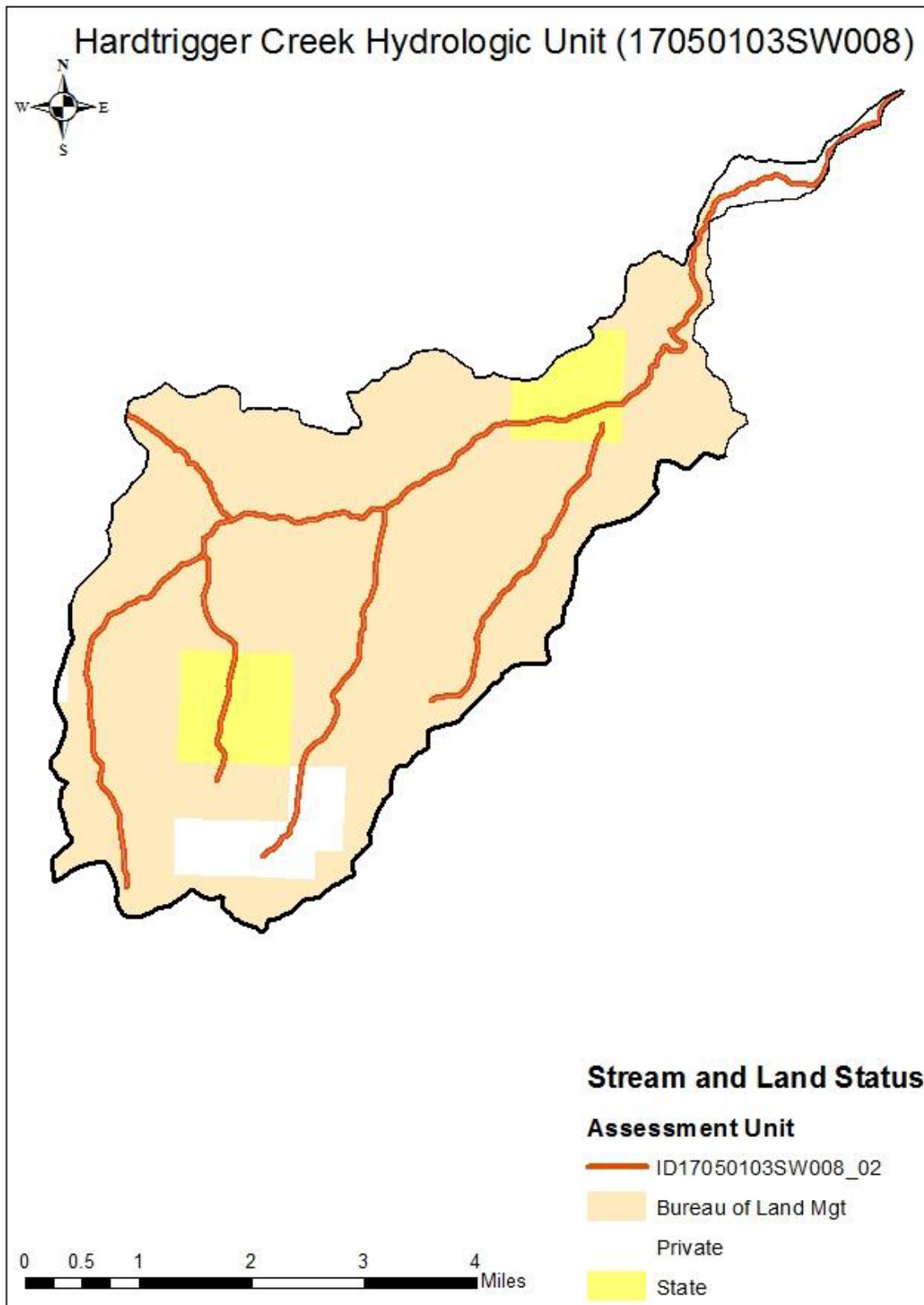


Figure 8. Hardtrigger Creek subwatershed land status (DEQ 2013).

### McBride Creek

The McBride Creek subwatershed drains approximately 38 square miles and generally follows a northwesterly and westerly direction. These 2nd- and 3rd-order tributaries begin at approximately 6,740 feet in elevation and cross into Oregon at around 3,850 feet (Figure 9). The main stem of McBride Creek, along with major tributaries, Little McBride Creek and Willow Fork, flow intermittently / perennially for approximately 17.4 linear miles from the Owyhee front, primarily through rangeland, until crossing the Oregon border. From there, it continues westward and joins Succor Creek. Numerous unnamed ephemeral channels, which join the main stem of McBride Creek throughout the watershed, are dry throughout the year, except in direct response to precipitation. The lower main stem (AU ID17050103SW004\_03) is approximately 2.5 linear miles and is also intermittent, particularly during the summer months (DEQ 2013).

The upper portion of the subwatershed (main stem McBride Creek, Little McBride Creek, and Willow Fork) has some well-established riparian vegetation but also exhibits signs of bank instability and erosion, likely due to anthropogenic influences such as adjacent roads, culverts, and livestock grazing. Conversely, in the lower segments of the watershed, bank instability appears to be more directly related to a combination of the friable nature of some of the soils, episodic high flow events, adjacent roads, and culverts. This lower portion also exhibits signs of current and previous lateral channel movement and recovery through formation of new channel floodplains and banks (DEQ 2013).

### Pickett Creek

The Pickett Creek subwatershed drains approximately 63 square miles until its confluence with Brown Creek and generally flows in a northeasterly direction. The creek begins at approximately 8,410 feet elevation and drops to approximately 2,680 feet where it joins Catherine Creek and then Brown Creek (Figure 10). The Pickett Creek AU only contains approximately 6.4 linear stream miles. It begins upstream at the confluence with Bates Creek, where it flows intermittently/perennially downstream for approximately 2.6 miles and joins Catherine Creek. It then continues downstream for approximately 3.8 miles where it joins Brown Creek. Pickett Creek exhibits unstable banks throughout various segments of the AU, likely due in part to the friable nature of some of the soils but also due to anthropogenic influences such as irrigated agricultural practices and livestock grazing adjacent to the creek. Where the riparian area has not been disturbed or the channel is not downcut, the riparian area contains cottonwoods, willows, wild roses, and grasses (DEQ 2013).

### Vinson Wash

Vinson Wash drains approximately 48 square miles and generally flows in a northeasterly direction. The wash begins at close to 6,320 feet in elevation and reaches the Snake River at around 2,350 feet (Figure 11). The upper portion of the subwatershed consists of several washes, including Poison Creek, which join to form Vinson Wash. From there, the ephemeral, sandy, and dry Vinson Wash leaves the Owyhee front range and passes through sagebrush habitat and managed rangelands for approximately 4.5 miles. It then enters irrigated agricultural land and flows intermittent/perennially for approximately 3.5 miles before entering the Snake River. Vinson Wash exhibits some natural entrenchment and unstable banks due to episodic rain events and the friable nature of the soils. Other areas of erosion and sediment problems result from anthropogenic influences such as use of the wash channel by off-highway vehicles and other 4-wheel drive vehicles and livestock grazing (DEQ 2013).

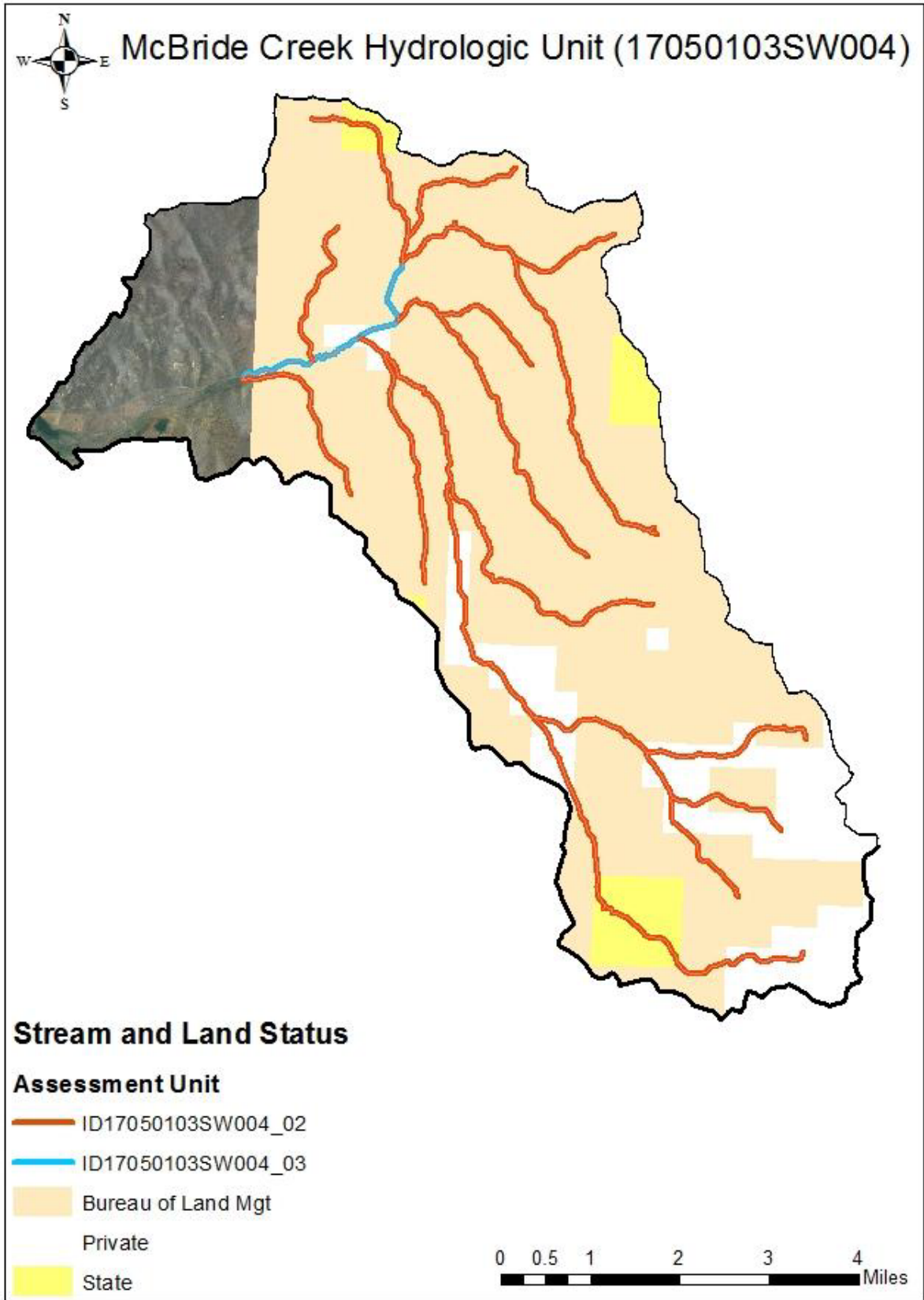


Figure 9. McBride Creek subwatershed land status (DEQ 2013).

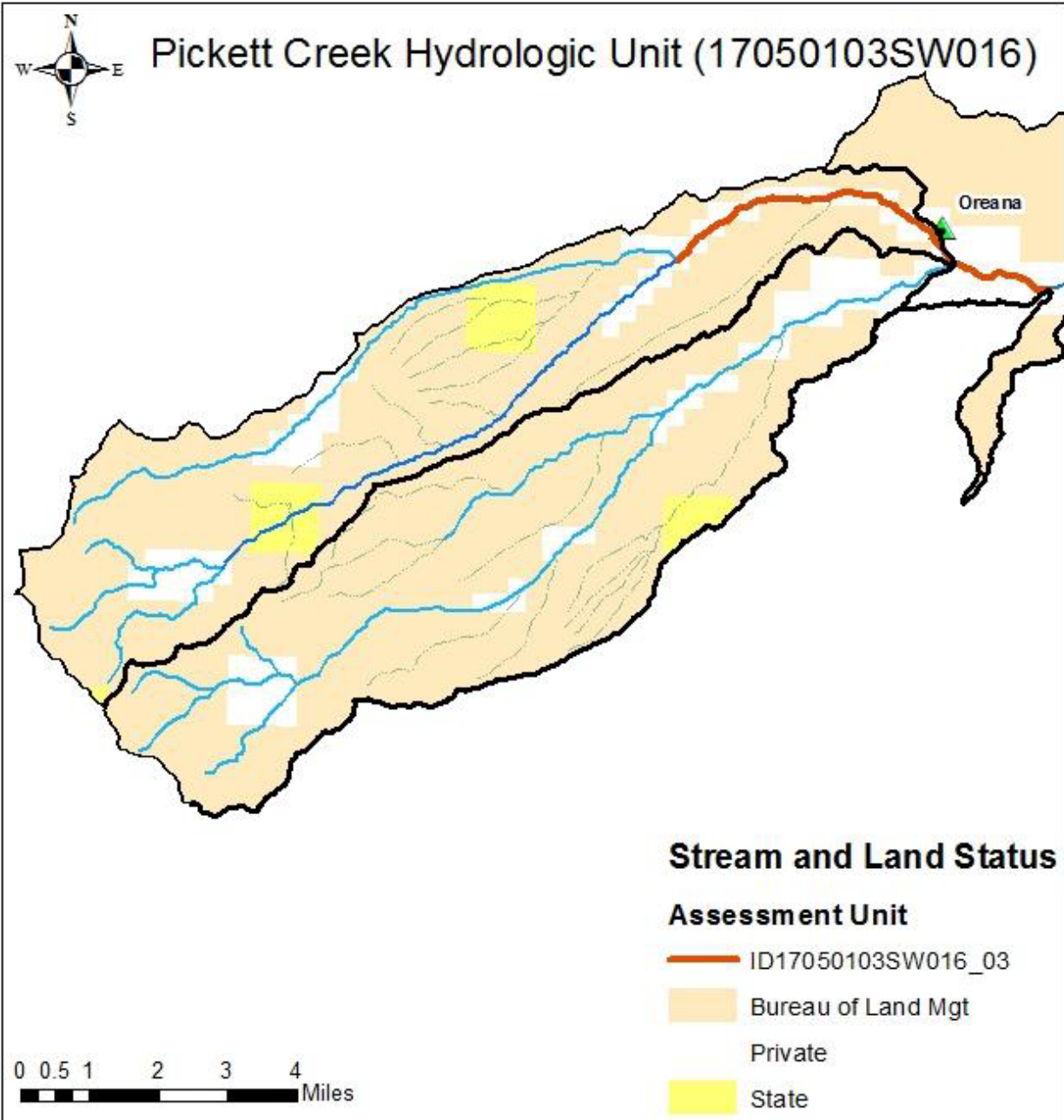


Figure 10. Pickett Creek subwatershed land status (DEQ 2013).

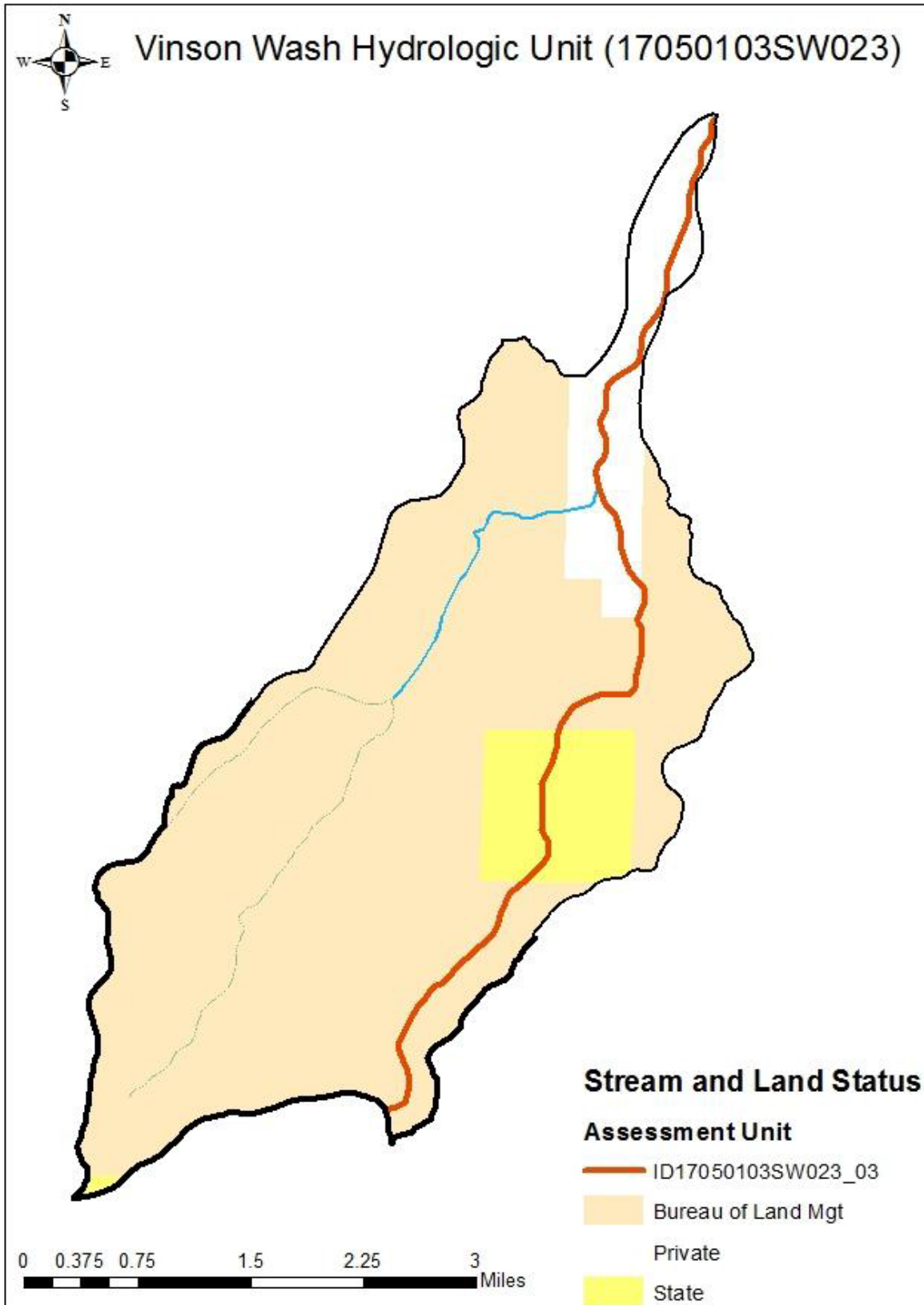


Figure 11. Vinson Wash subwatershed land status (DEQ 2013).

## **Land use and Land Ownership**

### Succor Creek

The primary land use within the publicly held portion of the Succor Creek watershed is rangeland grazing, especially in the upper segment. Within the privately held portion the land uses are primarily agricultural related activities such as rangeland grazing and sprinkler and gravity irrigated cropland. (DEQ 2003).

### Jump Creek

The primary land use within the publicly held portion is rangeland grazing. Within the privately held portion the land uses are primarily agricultural related activities such as rangeland grazing and sprinkler and gravity irrigated cropland (DEQ 2003).

### Sinker Creek

The primary land use within the publicly held portion is rangeland grazing. Both irrigated agriculture and rangeland grazing occur in the privately owned portion (DEQ 2003).

### Castle Creek

The upper part of the Castle Creek watershed is primarily rangeland, while the lower reaches near the Snake River are a mix of irrigated agriculture and rangeland. Additionally, bentonite mining occurs in the watershed. Parts of the watershed are considered to have high mineral potential and sedimentary rock alongside the creek is being mined for industrial minerals (BLM 1999). While private lands exist in the upper part of the watershed, land is primarily federally owned. Most of the private holdings in the area are closest to the Snake River and around the township of Oreana (DEQ 2003).

### Birch Creek

Approximately 95% of the Birch Creek subwatershed is rangeland, while the lower segment near the Snake River is primarily irrigated agriculture (<4%). While some private lands exist in the upper part of the watershed, this watershed is primarily US Bureau of Land Management (BLM) - and state-owned. Other private holdings in the area are irrigated agriculture near the Snake River between the towns of Oreana and Grand View (DEQ 2013).

### Hardtrigger Creek

Approximately 90% of the Hardtrigger Creek subwatershed is rangeland, while the lower reach near the Snake River is rural development and irrigated pasture (approximately 5%). While some private lands exist in the upper part of the watershed, most of the upper watershed is BLM-and state-owned. Most of the private holdings in the area are closest to the Snake River (DEQ 2013).

### McBride Creek

Approximately 90% or more of the McBride Creek subwatershed is rangeland, while about 6% is forested and less than 2% is irrigated agriculture. Although considerable private land exists throughout the watershed, most of the land is BLM- and state-owned. Most of the private holdings are along the middle to upper segments of McBride Creek and along the Little McBride and Willow Fork segments (DEQ 2013).

### Pickett Creek

Approximately 85% of the subwatershed is rangeland, while about 12% is forested and less than 2% is irrigated agriculture. Although considerable private land exists throughout the watershed, especially along the lower segments of Pickett and Catherine Creeks, most of the land is BLM-and state-owned (DEQ 2013)

### Vinson Wash

Approximately 98% of the subwatershed is rangeland, while the lower segment near the Snake River is private land, primarily as irrigated agriculture (<2%). Aside from these private lands near the Snake River, the remaining watershed is virtually all BLM- and state-owned (DEQ 2013).

## **Accomplishments**

The Mid Snake River / Succor Creek Subbasin: Five-Year Review of 2003 and 2007 Total Maximum Daily Loads summarizes implementation work completed in the subbasin (Tables 4-7) (ISCC and IASCD 2005, DEQ 2011).

Table 4. Mid Snake River / Succor Creek watershed accomplishments.

| <b>Practice Number</b>    | <b>Practice Title</b> | <b>Units</b>            |
|---------------------------|-----------------------|-------------------------|
| <b>Castle Creek</b>       |                       |                         |
| 382                       | Riparian Fencing      | 26,400 ft               |
| 614                       | Off Site Watering     | 6 troughs               |
| 393                       | Filter Strips         | 12,000 ft (10.7 ac)     |
| 442                       | Sprinkler Irrigation  | 22 fields (300 ac)      |
| 528                       | Grazing Management    | 11 producers (1,200 ac) |
| 420                       | Wildlife Habitat      | 2.5 miles (400 ac)      |
| <b>Jump Creek</b>         |                       |                         |
| 590                       | Nutrient Management   | 8 plans                 |
| 442                       | Sprinkler Irrigation  | 156 fields (4,296 ac)   |
| <b>Sinker Creek</b>       |                       |                         |
| 442                       | Sprinkler Irrigation  | 18 fields (369 ac)      |
| 528                       | Grazing Management    | 3 producers             |
| <b>Upper Succor Creek</b> |                       |                         |
| 528                       | Grazing Management    | 5 producers             |
| 614                       | Off Site Watering     | 2 troughs               |
| <b>Lower Succor Creek</b> |                       |                         |
| 658                       | Wetland Project       | 1 project               |
| 442                       | Sprinkler Irrigation  | 85 fields (944 ac)      |
| ISCC and IASCD 2005       |                       |                         |

Table 5. Mid Snake River/Succor Creek projects completed with DEQ 319 funds.

| <b>Project Description</b>                | <b>Sediment Reduction tons/yr</b> | <b>Phosphorus Reduction pounds/yr</b> |
|---|-----------------------------------|---------------------------------------|
| Babbington/Reynolds Creek Riparian Rehab. | 138                               | 276                                   |
| Succor Creek Field Pipeline               | 1,422                             | 1,209                                 |
| Shenk Animal Waste Containment I          | 32                                | 136                                   |
| Hart Creek Diversion                      | 3                                 | 6                                     |
| Reynolds Creek Water Quality Improv.      | 15                                | 30                                    |
| Thomas Diversion                          | 3                                 | 6                                     |
| Upper Pivot Project                       | 1,070                             | 2,140                                 |
| Shenk Animal Waste Containment II         | 32                                | 136                                   |
| N. Juniper Ridge                          | 232                               | 464                                   |
| Jump Creek Sediment Reduction             | 360                               | 416                                   |
| Jump Creek Spill Water Quality            | 475                               | 885                                   |
| D Lateral Water Quality                   | 166                               | 310                                   |
| A Lateral Irrigation Effic.               | 1,425                             | 3,880                                 |
| Reynolds Creek Juniper Removal            | n/a                               | n/a                                   |
| Pickett Creek Pipeline                    | 225                               | 600                                   |
| DEQ 2011                                  |                                   |                                       |

Table 6. Mid Snake River/Succor Creek projects completed with Idaho Soil and Water Conservation Commission and Owyhee Conservation District programs assistance.

| <b>Practice Number</b> | <b>Practice Title</b>                 | <b>Units Treated</b> |
|------------------------|---------------------------------------|----------------------|
| 322                    | Channel Bank Vegetation               | 164 ft               |
| 382                    | Fence                                 | 22,906 ft            |
| 393                    | Filter Strip                          | 1 acre               |
| 561                    | HeavyUse Area Protection              | 3                    |
| 464                    | Irrigation Land Leveling              | 21 acres             |
| 442                    | Sprinkler Irrigation System           | 687 acres            |
| 590                    | Nutrient Management                   | 1,476 acres          |
| 516                    | Livestock Water Pipeline              | 580 ft               |
| 512                    | Pasture & Hayland Planting            | 22 acres             |
| 378                    | Wildlife Pond                         | 2                    |
| 350                    | Sediment Basin                        | 4                    |
| 580                    | Streambank and Shoreline Protection   | 164 ft               |
| 606                    | Subsurface Drain                      | 4,960 ft             |
| 472                    | Riparian Zone Livestock Use Exclusion | 28 acres             |
| 313                    | Waste Storage Facility                | 2                    |
| 614                    | Livestock Watering Facility           | 5                    |
| DEQ 2011               |                                       |                      |

Table 7. Projects completed with USDA NRCS Program assistance.

| Practice Number | Practice Title                           | Units Treated |
|-----------------|--|---------------|
| 450             | Anionic Polyacrylamide (PAM) Application | 375 acres     |
| 411             | Microlrrigation System                   | 1 acre        |
| 443             | Surface Irrigation System                | 610 acres     |
| 447             | TailWater Recovery System                | 1             |
| 442             | Sprinkler Irrigation System              | 6,309 acres   |
| 449             | Irrigation WaterManagement               | 12,093 acres  |
| 590             | NutrientManagement Planning              | 6,854 acres   |
| 584             | Channel and Streambank Stabilization     | 290 ft        |
| 580             | Streambank and Shoreline Protection      | 525 ft        |
| 552             | Irrigation Regulating Reservoir          | 5             |
| 350             | Sediment Basin                           | 8             |
| 328             | Conservation Crop Rotation               | 6,842 acres   |
| 340             | Cover Crop                               | 412 acres     |
| 345             | Residue Management--Mulch-Till           | 2,076 acres   |
| 329A            | Residue Management--No-Till/Strip-Till   | 778 acres     |
| 344             | Seasonal ResidueManagement               | 1,750 acres   |
| 609             | Surface Roughening                       | 3,447 acres   |
| 324             | Deep Tillage                             | 42 acres      |
| DEQ 2011        |  |               |

Table 8. Project(s) completed by the Owyhee Conservation District with Water Quality Program for Agriculture (WQPA) funds.

|          |  |
|----------|--|
| 1        | Public awarness campaign   |
| 2        | Nutrient management planning   |
| 3        | 2008 Nutrient management implementation = 3,900 ac                         |
| 4        | 2009 Nutrient management implementation = 3,900 ac                         |
| 5        | 2010 Nutrient management implementation = 1,950 ac                         |
| 6        | Irrigation water management evaluations                                    |
| 7        | BMP effectiveness evaluations  |
| 8        | Inventory of surface water drainage system for Jump Creek and Succor Creek |
| DEQ 2011 |  |

## Resource Concerns

In the Mid Snake River/Succor Creek subbasin, the load allocations in the original TMDL and addendum consisted of heat, sediment, bacteria, and phosphorus reductions (DEQ 2011). Temperature TMDLs for Sinker and Succor Creeks (4 AUs) were approved by EPA in 2004 (DEQ 2003). The Succor Creek TMDL for temperature was converted to a potential natural vegetation (PNV) model, and 8 AUs in Castle Creek was added. Sediment TMDLs for Succor, lower Castle, Jump, Sage, and Sinker Creeks (9 AUs) were also approved in 2004. Instead of a water column target (i.e., an explicit numerical criterion), upper Succor, Castle, and Sinker Creeks used a surrogate measure of bank stability. A bacteria TMDL for lower Succor Creek (1 AU) was approved by EPA in 2004. Sage Creek, a major tributary of Succor Creek, was also assigned a bacteria load.

When DEQ completed the Mid Snake River/Succor Creek subbasin assessment in 2003, several intermittent streams were classified as unimpaired due to the lack of perennial flows. The EPA disagreed with that determination and subsequently required that Birch Creek, Hardtrigger Creek McBride Creek, Pickett Creek and Vinson Wash be assessed (DEQ 2010). Those assessments were completed in 2010 and resulted in a determination that TMDLs for sediment were necessary for 7 AUs (DEQ 2010). The Mid Snake River/Succor Creek Tributaries Sediment TMDL addendum was completed in 2013 (DEQ 2013).

### *Sediment*

#### Succor Creek, Sinker Creek and Castle Creek

Instream channel erosional processes are the primary source of sediment loading in Castle Creek, Sinker Creek, and Succor Creek. Annual erosion and sediment delivery are functions of a climate, where wet water years typically produce the highest sediment loads. Additionally, the annual average sediment load is not distributed equally throughout the year. Most of the erosion typically occurs during a few critical months (Table 9) (DEQ 2003).

Table 9. Stream bank erosion load allocations for Sinker Creek, upper Succor Creek and Castle Creek (DEQ 2003).

| <b>Water Body</b>                                      | <b>Current Erosion Rate (tons/mile/year)</b> | <b>Target Erosion Rate (tons/mile/year)</b> | <b>Current Total Erosion (tons/year)</b> | <b>Target Total Erosion (tons/year)</b> | <b>% Decrease</b> |
|--|--|---|--|---|-------------------|
| Sinker Creek   | 35.26  | 32.20                                       | 352.57                                   | 322.00                                  | 8.64%             |
| Succor Creek (Granite Creek to Chipmunk Meadows)       | 214.80                                       | 35.52                                       | 637.96                                   | 108.45                                  | 83.07%            |
| Succor Creek (Directly below reservoir to Oregon line) | 173.87                                       | 39.67                                       | 768.49                                   | 175.36                                  | 77.18%            |
| Castle Creek   | 56.35  | 43.41                                       | 704.35                                   | 542.63                                  | 21.00%            |

#### Jump Creek and Lower Succor Creek

Jump Creek and Succor Creek (from the Oregon line to the Snake River) contain elevated suspended solids concentrations as a result of agricultural return water. Using the available data, site-specific TSS targets were developed for those tributaries (Table 10) (DEQ 2003).

Table 10. Total suspended solids load allocations for Jump Creek and Lower Succor Creek (DEQ 2003).

| Name                                  | Typical Existing Load: 2001-2002<br>(tons/day) | Load Allocation<br>(tons/day)           | Percent Reduction<br>from Existing Load |
|---------------------------------------|--|---|---|
| Succor Creek above Sage Creek         | 1.19   | 1.19                                    | 0%                                      |
| Sage Creek                            | 8.79   | 1.84                                    | 79%                                     |
| <b>Succor Creek at Homedale</b>       | Load Capacity: 3.03                            | Load achieved with<br>reductions: 3.03  | --                                      |
| Mule Creek                            | 10.67  | 2.13                                    | 80%                                     |
| Field Scale near B- Line Canal        | 3.38   | 0.09                                    | 97%                                     |
| B-Line Canal                          | 1.19   | 0.88                                    | 26%                                     |
| Kora Canal                            | 5.08   | 0.35                                    | 93%                                     |
| B-4 Lateral                           | 0.41   | 0.18                                    | 57%                                     |
| Hortsman Drain                        | 15.83  | 8.22                                    | 48%                                     |
| <b>Jump Creek at Railroad Trestle</b> | Load Capacity: 12.06                           | Load achieved with<br>reductions: 11.25 | --                                      |

### Intermittent Creeks

The episodic nature of sediment pollution in intermittent streams makes direct monitoring extremely difficult. The period during which they are most likely to transport large amounts of sediment is during flash flood events. The intermittent/perennial portions of Birch Creek and Vinson Wash likely contain elevated suspended solid concentrations as a result of agricultural return water, making a certain sediment concentration an appropriate target for these TMDLs. The targets for TSS in Birch Creek and Vinson Wash are 20 mg/L average concentration during any 4 continuous months throughout the critical irrigation season (April 1–September 30) (Table 11). The 20 mg/L target is intended to protect aquatic species that may inhabit the stream, including fish and macroinvertebrates (DEQ 2013).

Table 11. Gross total suspended sediment load allocations for Birch Creek and Vinson Wash (DEQ 2013)

| Month     | Flow (cfs) | TSS   |          | Average TSS | Load Capacity at 20 mg/L | Average Load Reduction | (%)   |
|-----------|------------|-------|----------|-------------|--------------------------|------------------------|-------|
|           |            | mg/L  | tons/day | tons/day    | tons/day                 | tons/day               |       |
| April     | No Data    |       |          |             |                          |                        |       |
| May       | 15.4       | 217   | 9.0      | 40.0        | 1.0                      | 39.0                   | 97.6% |
| June      | 15.3       | 2,720 | 112.4    |             |                          |                        |       |
| July      | 18.8       | 742   | 37.7     |             |                          |                        |       |
| August    | 16.2       | 531   | 23.2     |             |                          |                        |       |
| September | 24.3       | 271   | 17.8     |             |                          |                        |       |
| October   | 32.3       | 10    | 0.9      | 0.9         | 1.7                      | 0                      | 0     |

For these tributaries where the largest amount of sediment is produced from instream erosion, a target of greater than 80% streambank stability is has been developed for intermittent/perennial stream segments of the Hardtrigger, McBride, and Picket Creek subwatersheds. The bank stability target is 80% (20% instability) to support cold water aquatic life. A 20% bank instability correlates to 28% fine particles in the stream, which is the threshold for cold water salmonid fishes (Table 12) (DEQ 2010). Reducing streambank erosion as prescribed within the TMDL is directly linked to improving riparian vegetation density and structure to armor streambanks, reduce lateral recession, trap sediment, and reduce the erosive energy of the stream (DEQ 2013).

Table 12. Streambank erosion load allocations for Hardtrigger, McBride and Pickett Creeks (DEQ 2013).

|                   |           | Current Load |               | Load Capacity |               | Necessary      |
|-------------------|-----------|--------------|---------------|---------------|---------------|----------------|
|                   |           |              | Total Erosion | Target        | Total Erosion | Load Reduction |
|                   | Current   |              | tons/yr       | Erosion Rate  | tons/yr       | tons/yr        |
|                   | Bank      | Erosion Rate | tons/day      | tons/mile/yr  | tons/day      | tons/day       |
| Water Body        | Stability | tons/mile/yr | tons/day      | tons/mile/yr  | tons/day      | (%)            |
| Hardtrigger Creek | 60%       | 33           | 435           | 7             | 91            | 344 tons/year  |
|                   |           |              | 1.19          |               | 0.25          | 0.94 tons/day  |
|                   |           |              |               |               |               | 79%            |
| McBride—Lower     | 61%       | 85           | 239           | 16            | 45            | 193 tons/year  |
|                   |           |              | 0.65          |               | 0.12          | 0.53 tons/day  |
|                   |           |              |               |               |               | 81%            |
| McBride—Upper     | 52%       | 41           | 706           | 21            | 366           | 340 tons/year  |
|                   |           |              | 1.93          |               | 1.0           | 0.93 tons/day  |
|                   |           |              |               |               |               | 48%            |
| Pickett Creek     | 80%       | 34           | 217           | 12            | 74            | 143 tons/year  |
|                   |           |              | 0.6           |               | 0.2           | 0.4 tons/day   |
|                   |           |              |               |               |               | 66%            |

*Temperature*

Temperature targets are established on a stream-by-stream basis and are based upon the lowest possible temperature that can be expected given practical stream shading, width/depth conditions, and monitored atmospheric conditions. Idaho water temperature criteria for cold water aquatic life is summarized below (Table 13). Since there are no thermal discharge point sources the solar load allocations in the TMDLs are the same as load capacities (DEQ 2011).

Table 13. State of Idaho water temperature criteria.

| Temperature Criteria  | Cold Water Aquatic Life (June 22-Sept 21) |
|-----------------------|---|
| Instantaneous Maximum | 22 °C., 71.6 °F                           |
| Maximum Daily Average | 19 °C., 66.2 °F                           |

Succor Creek and Castle Creek Temperature TMDL:

Succor Creek, Castle Creek and NF Castle Creek were placed on the 1998 303d list of impaired waters by EPA for reasons associated with temperature criteria violations. However, most of tributaries examined also exceeded appropriate solar loading targets and would be significant sources of heat to these listed water bodies. Additional temperature data was collected in 2002-2004 on Castle, NF Castle and Succor Creeks. The data verified temperature exceedances of the cold-water aquatic life and rainbow trout salmonid spawning criteria (DEQ 2007).

The original TMDL used the Stream Segment Temperature Model (SSTEMP) to establish temperature targets (DEQ 2003). The SSTEMP model was considered the best method available at the time the TMDL was developed. However, DEQ re-analyzed the upper Succor Creek and Castle Creek watersheds using the Potential Natural Vegetation (PNV) model. The PNV model generated more realistic shade curves developed for specific landscapes (DEQ 2007). Effective shade targets were established for Succor Creek, Castle Creek and associated tributaries based on the concept of maximum shading under PNV.

Additional streams were included in the TMDL that were not on a 303d list because major tributaries to a listed water body can be significant sources of excess solar loading (Table 14) (DEQ 2007).

Table 14. Total existing and target solar loading for Succor Creek and Castle Creek sub-watersheds.

| Stream   | Total                       | Total                     | Target %<br>Reduction |
|--|-----------------------------|---------------------------|-----------------------|
|  | Existing<br>Load<br>kWh/day | Target<br>Load<br>kWh/day |                       |
| Succor Creek (Headwaters to Oregon State Line)             | 954,008                     | 641,990                   | 32.71%                |
| Headwater Tributary to Succor Creek from Johnston Lakes    | 9,940                       | 6,982                     | 29.76%                |
| Headwater Tributary to Succor Creek east of Johnston Lakes | 19,995                      | 17,065                    | 14.65%                |
| Crane Creek  | 29,169                      | 14,978                    | 48.65%                |
| Granite Creek  | 43,831                      | 23,310                    | 46.82%                |
| Crows Nest Creek   | 50,593                      | 20,439                    | 59.60%                |
| Little Succor Creek  | 141,432                     | 84,430                    | 40.30%                |
| Cottonwood Creek   | 84,969                      | 53,084                    | 37.53%                |
| Castle Creek   | 1,296,582                   | 1,035,336                 | 20.15%                |
| Alder Creek  | 107,516                     | 81,922                    | 23.80%                |
| North Fork Castle Creek                                    | 378,599                     | 247,260                   | 34.69%                |
| South Fork Castle Creek                                    | 176,554                     | 117,718                   | 33.32%                |
| Clover Creek   | 33,444                      | 14,271                    | 57.33%                |
| Juniper Creek  | 85,683                      | 39,081                    | 54.39%                |

#### Sinker Creek

Sinker Creek has not been re-evaluated with the PNV methodology thus the temperature targets are derived from the SSTEMP model. Sinker Creek was found to only violate state temperature standards during the month of July, so July was chosen as the critical period. However, because the remedy is long-lived riparian shade, there is no practical critical period. The load capacity for Sinker Creek in July is 3.49 joules per square meter per second (J/m<sup>2</sup>/s). This is a measure of how much solar radiation can fall on the stream before it violates the temperature standards. To attain this load capacity value, the shade must be increased by 12% to 70.4%. This load only applies to the listed section, downstream of the confluence with East Fork Sinker Creek. This is probably an unattainable target. The hot, dry summers and low water levels of many Owyhee County streams mean that it is likely that even a reference-condition stream would violate these criteria (DEQ 2011).

#### *Bacteria*

Bacteria targets are consistent with the numeric water quality standards for the protection of human health. Idaho water quality standards (IDAPA 58.01.02.251.01) stipulate that E. coli is not to exceed 126 colony forming units (cfu) per 100 mL water sample, based on a geometric mean of several samples collected according to a specific protocol. The load allocation for bacteria is monitored at the following points:

- Coates Drain at the mouth
- Murphy Drain at the mouth
- Sage Creek at the mouth
- Succor Creek at the Oregon state line

## **Agricultural Inventory and Evaluation**

As conservation practices are implemented in the Mid Snake / Succor Creek subbasin to address resource concerns, it will be imperative to record water temperature, sedimentation and bacteria metrics pre and post project to verify data collection protocols and document progress towards TMDL objectives.

## **Treatment**

Table 15 provides a compilation of conservation practices that can address the water quality resource concerns identified in Mid Snake River / Succor Creek Watershed TMDL and associated addendums. The table is compiled from the Conservation Practices Physical Effects section of the NRCS Field Office Technical Guide (NRCS 2020). When implementing conservation practices, it is critical that the most appropriate practice, or suite of practices, be selected, targeted, and implemented in a watershed, while following recommended installation and maintenance guidelines. For a conservation practice to accomplish the task of reducing nonpoint source pollution it must meet three criteria. The practice must be technically feasible, economically feasible, and acceptable. By meeting all three of these criteria the conservation practices are defined as practicable (Resource Planning Unlimited 2013). Also, since many conservation practices involve costs and management changes, which will most likely have negative impacts on farm income, fair and equitable financial support and technical assistance through cost-share programs will improve their adoption (Sharpley et al 2006).

## **Priorities**

Implementation prioritizations and identified practices established within the Mid Snake River / Succor Creek Watershed TMDL Implementation Plan for Agriculture remain valid (ISCC and IASCD 2005). Practices that enhance riparian/wetland vegetation within priority reaches would be preferred since successful implementation would address both temperature and sedimentation resource concerns. Impaired reaches due to bacteria are localized in the lower portions of the watershed making prioritization more straightforward for conservation planners addressing health and human safety concerns.

Table 15. Conservation practices recommended to address water quality degradation resource concerns in the Mid Snake / Succor Creek subbasin (NRCS 2020).

| Practice   | Practice Code | Practice                                   | Practice Code | Practice   | Practice Code |
|--|---------------|--|---------------|--|---------------|
| <b>Excess pathogens and chemicals in surface water</b> |               | <b>Excessive sediment in surface water</b> |               | <b>Elevated water temperature</b>                        |               |
| Access Control   | 472           | Access Control                             | 473           | Access Control   | 472           |
| Alley Cropping   | 311           | Access Road                                | 560           | Aquatic Organism Passage                                 | 396           |
| Amendments for Treatment of Agricultural Waste         | 591           | Anionic Polyacrylamide Erosion Control     | 450           | Channel Bed Stabilization                                | 584           |
| Anaerobic Digester                                     | 366           | Brush Management                           | 314           | Forest Stand Improvement                                 | 666           |
| Animal Mortality Facility                              | 316           | Channel Bed Stabilization                  | 584           | Hedgerow Planting  | 422           |
| Conservation Cover                                     | 327           | Conservation Cover                         | 328           | Prescribed Grazing                                       | 528           |
| Conservation Crop Rotation                             | 328           | Conservation Crop Rotation                 | 329           | Range Planting   | 550           |
| Contour Buffer Strips                                  | 332           | Constructed Wetland                        | 656           | Restoration and Management of Rare or Declining Habitats | 643           |
| Contour Farming  | 330           | Contour Buffer Strips                      | 332           | Riparian Forest Buffer                                   | 391           |
| Cover Crop   | 340           | Contour Farming                            | 330           | Riparian Herbaceous Cover                                | 390           |
| Drainage Water Management                              | 554           | Contour Orchard and Other Perennial Crops  | 331           | Road/Trail/Landing Closure and Treatment                 | 654           |
| Fence  | 382           | Cover Crop                                 | 340           | Silvopasture Establishment                               | 381           |
| Field Border   | 386           | Critical Area Planting                     | 342           | Streambank and Shoreline Protection                      | 580           |
| Filter Strip   | 393           | Cross Wind Ridges                          | 588           | Stream Habitat Improvement and Management                | 395           |
| Forage and Biomass Planting                            | 512           | Cross Wind Trap Strips                     | 589c          | Structure for Water Control                              | 587           |
| Forage Harvest Management                              | 511           | Dust Control on Unpaved Roads and Surfaces | 373           | Tree/Shrub Establishment                                 | 612           |
| Grassed Waterway                                       | 412           | Field Border                               | 386           | Watering Facility  | 614           |
| Grazing Land Mechanical Treatment                      | 548           | Filter Strip                               | 393           |  |               |
| Heavy Use Area Protection                              | 561           | Forage and Biomass Planting                | 512           |  |               |
| Irrigation Land Leveling                               | 464           | Grade Stabilization Structure              | 410           |  |               |
| Irrigation Pipeline                                    | 430           | Grassed Waterway                           | 412           |  |               |
| Irrigation System, Microirrigation                     | 441           | Grazing Land Mechanical Treatment          | 548           |  |               |
| Irrigation System, Surface & Subsurface                | 443           | Heavy Use Area Protection                  | 561           |  |               |
| Irrigation System, Tailwater Recovery                  | 447           | Herbaceous Wind Barriers                   | 603           |  |               |
| Irrigation Water Management                            | 449           | Integrated Pest Management                 | 595           |  |               |
| Karst Sinkhole Treatment                               | 527           | Irrigation Ditch Lining                    | 428           |  |               |
| Livestock Shelter Structure                            | 576           | Irrigation Land Leveling                   | 464           |  |               |
| Nutrient Management                                    | 590           | Irrigation Pipeline                        | 430           |  |               |
| Prescribed Grazing                                     | 528           | Irrigation Reservoir                       | 436           |  |               |
| Residue and Tillage Management, No Till                | 329           | Irrigation System, Microirrigation         | 441           |  |               |
| Residue and Tillage Management, Reduced Till           | 345           | Irrigation System, Tailwater Recovery      | 447           |  |               |
| Riparian Forest Buffer                                 | 391           | Irrigation Water Management                | 449           |  |               |
| Riparian Herbaceous Cover                              | 390           | Karst Sinkhole Treatment                   | 527           |  |               |
| Rock Barrier   | 555           | Land Smoothing                             | 466           |  |               |
| Roof Runoff Structure                                  | 558           | Lined Waterway or Outlet                   | 468           |  |               |
| Row Arrangement  | 557           | Livestock Shelter Structure                | 576           |  |               |
| Short Term Storage of Animal Waste and Byproducts      | 318           | Mole Drain                                 | 482           |  |               |
| Sprinkler System                                       | 442           | Mulching                                   | 484           |  |               |
| Streambank and Shoreline Protection                    | 580           | Multi-Story Cropping                       | 379           |  |               |
| Stripcropping  | 585           | Pond                                       | 378           |  |               |
| Tree/Shrub Establishment                               | 612           | Precision Land Forming                     | 462           |  |               |
| Vegetative Barrier                                     | 601           | Prescribed Burning                         | 338           |  |               |
| Waste Separation Facility (no)                         | 632           | Prescribed Grazing                         | 528           |  |               |
| Waste Storage Facility                                 | 313           | Range Planting                             | 550           |  |               |

Table 15. Continued.

| Excess pathogens and chemicals in surface water | Practice Code | Excessive sediment in surface water                      | Practice Code | Elevated water temperature | Practice Code |
|---|---------------|--|---------------|----------------------------|---------------|
| Waste Transfer                                  | 634           | Residue and Tillage Management, No Till                  | 329           |                            |               |
| Watering Facility                               | 614           | Residue and Tillage Management, Reduced Till             | 345           |                            |               |
| Wetland Creation                                | 658           | Restoration and Management of Rare or Declining Habitats | 643           |                            |               |
| Wetland Enhancement                             | 659           | Riparian Forest Buffer                                   | 391           |                            |               |
| Wetland Restoration                             | 657           | Riparian Herbaceous Cover                                | 390           |                            |               |
|   |               | Rock Barrier   | 555           |                            |               |
|   |               | Roof Runoff Structure                                    | 558           |                            |               |
|   |               | Row Arrangement  | 557           |                            |               |
|   |               | Sediment Basin   | 350           |                            |               |
|   |               | Shallow Water Development and Management                 | 646           |                            |               |
|   |               | Silvopasture Establishment                               | 381           |                            |               |
|   |               | Spoil Spreading  | 572           |                            |               |
|   |               | Spring Development                                       | 574           |                            |               |
|   |               | Sprinkler System   | 442           |                            |               |
|   |               | Stormwater Runoff Control                                | 570           |                            |               |
|   |               | Streambank and Shoreline Protection                      | 580           |                            |               |
|   |               | Stream Crossing  | 578           |                            |               |
|   |               | Stream Habitat Improvement and Management                | 395           |                            |               |
|   |               | Stripcropping  | 585           |                            |               |
|   |               | Structure for Water Control                              | 587           |                            |               |
|   |               | Subsurface Drain   | 606           |                            |               |
|   |               | Surface Roughening                                       | 609           |                            |               |
|   |               | Terrace  | 600           |                            |               |
|   |               | Tree/Shrub Establishment                                 | 612           |                            |               |
|   |               | Upland Wildlife Habitat Management                       | 645           |                            |               |
|   |               | Vegetated Treatment Area                                 | 635           |                            |               |
|   |               | Vegetative Barrier                                       | 601           |                            |               |
|   |               | Water and Sediment Control Basin                         | 638           |                            |               |
|   |               | Watering Facility  | 614           |                            |               |
|   |               | Wetland Creation   | 658           |                            |               |
|   |               | Wetland Enhancement                                      | 659           |                            |               |
|   |               | Wetland Restoration                                      | 657           |                            |               |
|   |               | Wetland Wildlife Habitat Management                      | 644           |                            |               |
|   |               | Windbreak/Shelterbelt Establishment                      | 380           |                            |               |
|   |               | Windbreak/Shelterbelt Renovation                         | 650           |                            |               |
|   |               | Woody Residue Treatment                                  | 384           |                            |               |

## Funding and Technical Assistance

Financial and technical assistance is available to help landowners who want to incorporate water quality BMP's into their agricultural or ranching operations. Potential sources of aid may include:

- CWA 319 –These are Environmental Protection Agency funds allocated to Tribal entities and the State of Idaho. The Idaho Department of Environmental Quality (DEQ) administers the Clean Water Act §319 Non-point Source Management Program for areas outside the Tribal Reservations. Funds focus on projects to improve water quality and are usually related to the TMDL process.
- Resource Conservation and Rangeland Development Program (RCRDP) –The RCRDP is a loan program administered by the ISWCC for implementation of agricultural and rangeland best management practices or loans to purchase equipment to increase conservation.
- Environmental Quality Incentives Program (EQIP): EQIP provides financial and technical assistance to agricultural producers in order to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat.
- Regional Conservation Partnership Program (RCPP) - RCPP promotes coordination between NRCS and its partners to deliver conservation assistance to producers and landowners. NRCS provides assistance to producers through partnership agreements and through program contracts or easement agreements.
- The Agricultural Conservation Easement Program (ACEP) – ACEP provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits.. Under the Agricultural Land Easements component, NRCS helps Indian tribes, state and local governments and non-governmental organizations protect working agricultural lands and limit non-agricultural uses of the land. Under the Wetlands Reserve Easements component, NRCS helps to restore, protect and enhance enrolled wetlands.
- Conservation Technical Assistance (CTA) –The CTA provides free technical assistance to help farmers and ranchers identify and solve natural resource problems on their farms and ranches. This might come as advice and counsel, through the design and implementation of a practice or treatment, or as part of an active conservation plan.
- National Grazing Lands Coalition (NatGLC) –The National Grazing Lands Coalition' promotes ecologically and economically sound management of grazing lands. Grants are available that facilitate the following: (1) demonstration of how improved soil health affects grazing lands sustainability (2) establishment of conservation partnerships, leadership and outreach, (3) education of grazing land managers, professionals, youth and the public (4) enhancement of technical capabilities, and (5) improvement in the understanding of the values and multiple services that grazing lands provide.
- Conservation Reserve Program (CRP) –The CRP is a land retirement program for blocks of land or strips of land that protect the soil and water resources, such as buffers and grassed waterways

- Conservation Innovation Grants (CIG) –CIG is a voluntary program to stimulate the development and adoption of innovative conservation approaches and technologies for agricultural production.
- State Revolving Loan Funds (SRF) –These funds are administered through the IDEQ.
- Conservation Security Program (CSP) –CSP is a voluntary program that rewards the Nation’s premier farm and ranch land conservationists who meet the highest standards of conservation environmental management.
- HIP – This is an Idaho Department of Fish and Game program to provide technical and financial assistance to private landowners and public land managers who want to enhance upland game bird and waterfowl habitat. Funds are available for cost sharing on habitat projects in partnership with private landowners, non-profit organizations, and state and federal agencies.
- Partners for Fish and Wildlife Program in Idaho – This is a U.S. Fish and Wildlife program providing funds for the restoration of degraded riparian areas along streams, and shallow wetland restoration.

## **Maintenance, Monitoring and Evaluation**

DEQ will continue to monitor the watersheds as per Idaho Code 39-3611, at least on a 5-year interval using BURP protocol. Additional monitoring of BMP’s and the maintenance of BMP’s installed will be performed by the designated agency or the agency that funded the BMP installations.

All BMP’s will be maintained by the landowner for the life of the practice. BMP’s will be monitored and evaluated upon completion of the project, during annual reviews, and throughout the life of the practice. Monitoring and evaluations will enable staff to ensure practices are maintained and to evaluate BMP effectiveness for future projects.

Typically, when a volunteer approaches the local conservation district or NRCS for BMP assistance the district evaluates the current site-specific resource concerns. Individual conservation planning with willing landowners will determine the most appropriate BMPs to install on a case by case basis.

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